Summary of Thesis submitted for PhD degree

by Angappan Regupathi

on

Foreign Exchange Risk Management by Malaysian Public-listed Multinational Companies

This research investigated ① how Malaysian public-listed multinational companies manage foreign exchange (FX) risk, and ② what factors influence the companies' inclinations to undertake particular FX risk management (FERM) activities. Data were collected using questionnaires, from November 1997 to April 1998, from 106 of the 169 Malaysian-owned non-financial multinational companies listed on the Kuala Lumpur Stock Exchange (KLSE) in mid-1996.

FERM practices were measured using 54 research variables that can be grouped into seven categories – ① management of FX risk, ② FX exposure type, ③ FERM objective, ④ FERM responsibility, ⑤ FERM centralisation, ⑥ FERM policies and procedures, and ⑦ FERM techniques. While the findings were broadly similar to other studies in developed Western countries, some key differences were noted. Companies in Malaysia, compared to those in the West, seem more willing to manage FX risk, but appear to have less capacity, need, and opportunity, to undertake sophisticated FERM practices. They also seem less able to centralise their domestic subsidiaries' FERM.

Logistic regression analyses were used to identify possible predictors and their conditional effects on the companies' inclinations to undertake selected FERM activities, using 23 predictor variables that can be grouped into seven categories – ① company size, ② debt and leverage, ③ equity ownership, ④ listing board and sector, ⑤ FX involvement, ⑥ intra-company transactions, and ⑦ perceived FX risk attributes. Notwithstanding some shortcomings in the study, the findings suggested many new predictor effects, and indicated that the most important predictors, in descending order, are ① FX exposure characteristics, ② company size, ③ debt and equity, and ④ intra-company transactions. They also highlighted the importance of, and the differences in, the effects of various FX exposure dimensions – particularly, ① perceived exposure, ② individual exposure and exposure component, and ③ exposure ambiguity, apart from actual total exposure size.

THE UNIVERSITY OF HULL

Foreign Exchange Risk Management

by Malaysian Public-listed Multinational Companies

being a Thesis submitted for the Degree of

Doctor of Philosophy

in the University of Hull

by

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B.B.A.(Hons.) (UUM), M.B.A. (Aston)

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ABSTRACT

Foreign Exchange Risk Management by Malaysian Public-listed Multinational Companies

This research is about ① how Malaysian public-listed multinational companies manage foreign exchange (FX) risk, and ② what factors (predictors) influence the companies' inclinations to undertake particular FX risk management (FERM) activities. Of the 169 Malaysian-owned non-financial multinational companies listed on the Kuala Lumpur Stock Exchange (KLSE) in mid 1996, 106 participated in the study. Data were collected from them, between November 1997 and April 1998, using questionnaires mainly sent by mail, but some by personal and telephone interviews, and fax.

FERM practices were measured using 54 research variables that can be grouped into seven categories: ① management of FX risk, ② FX exposure type, ③ FERM objective, ④ FERM responsibility, ⑤ FERM centralisation, ⑥ FERM policies and procedures, and ⑦ FERM techniques. The findings were broadly similar to other studies in developed Western countries, but some key differences were noted. Companies in Malaysia, compared to those in the West, seem more willing to manage FX risk, but appear to have less capacity, need, and opportunity, to undertake sophisticated FERM practices. They also seem less able to centralise their domestic subsidiaries' FERM.

Logistic regression analyses, with stepwise backward elimination procedure, were used to identify predictors and their conditional effects on the companies' inclinations to undertake selected FERM activities. For this, 23 predictor variables were examined, and they can be grouped into seven categories: ① company size, ② debt and leverage, ③ equity ownership, ④ listing board and sector, ⑤ FX involvement, ⑥ intra-company transactions, and ⑦ perceived FX risk attributes. There were some notable shortcomings in the study, namely: ① omission of predictor variables, ② use of two questionnaire versions, ③ small sample size, and ④ variable measurement problems. Despite these, the study identified many new possible predictor effects. It also suggested that the most important predictors, in descending order, are ① FX exposure characteristics, ② company size, ③ debt and equity, and ④ intra-company transactions. It also highlighted the importance of, and the differences in, the effects of different FX exposure dimensions – particularly, ① perceived exposure, ② individual exposure and exposure component, and ③ exposure ambiguity, apart from actual total exposure size.

Ammaa

Not a son to seek wealth and fame,
I seek your blessing.
That is always abundant for me.
In re-birth, I seek the boon to be your son.
May you grant me this.

(Adapted from a popular Tamil film song)

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Chapter 1

Introduction

INTRODUCTION

This chapter provides a brief introduction to the study and the layout and content of the thesis. It begins with recounting the reasons that prompted the undertaking of this research. It then describes the main research questions, and the methods used to collect and analyse the relevant data to attain the answers to the research questions. At the end, the chapter, provides an overview of the layout of the thesis.

1.1. Foreign exchange risk management

The reasons for choosing foreign exchange risk management (FERM) as the topic of research for this study are as follows. ❶ The world economy is becoming increasingly integrated and global. More companies are sourcing raw material and funds from, and supplying goods and services to, as well as investing funds in, foreign markets (Shapiro, 1996, pp.9-10). Therefore, it can be concluded that increasingly more companies are experiencing greater foreign exchange (FX) exposures and risk. ❷ More companies are venturing across borders to be multinational companies (Eiteman, Stonehill, and Moffett, 1995, pp.5-8), and consequently, are increasingly exposed to more complex FX issues and risk. ❸ The demise of the Bretton Woods Agreement, devised to stabilise and maintain exchange rates at fixed parities, have increased the volatility of the FX markets (Mathur, 1982). This, in turn, poses greater FX risk to companies. ❹ The advent of new information technology (Soenan and Aggarwal, 1989), and innovative financial derivatives, poses both greater challenges and opportunities for companies to manage FX risk (Phillips, 1995). This further increases the opportunities and capabilities of companies in managing FX risk. ❺ Incidents of several high-profile corporate FX losses suffered by seemingly competent companies, e.g., Allied Lyons, in 1991, and financial institutions, e.g., Barings Plc, in 1995 (see Bishop, 1996), have heightened the concern and interest in the management of FX risk. In short, the integrated financial markets, growing international transactions and global operations of companies, volatility of FX markets, advanced information technology and innovative

financial instruments, and the real life FX losses of companies, all underline the importance of FERM.

1.2. FERM in Malaysia

This study focuses on companies in Malaysia, and how they manage FX risk. This is mainly because there has not been any previous research on FERM among Malaysian companies, although there were studies conducted on companies in other countries, particularly developed Western countries, e.g., the US, UK, Australia, and Canada. Besides this, there are other reasons too for this study to focus on FERM practices of companies in Malaysia.

The stage of development of the Malaysian economy provided further impetus to conduct this research on companies there. At the time of the commencement of the study, in late 1996, the Malaysian economy had been growing robustly at more than 8% per annum in gross domestic product (GDP), consistently over the previous eight years. The growth then was expected to continue at least into the new millennium. Apart from that, the economy was also becoming more open since the proportion of exports and imports over GDP had been rising and was forecast to remain high (Economist Intelligence Unit, 1999, pp.9-10). Moreover, more Malaysian companies were actively being encouraged by the government to venture abroad, and many companies were venturing abroad in search of raw materials, technology, markets, and even cheap labour. All these, in essence, made Malaysian companies increasingly exposed to FX risk.

The data collection for the study was undertaken during the currency crisis in the Far East, which commenced with the plummeting value of the Thai Baht in the middle of 1997 and had later spread to other countries in the Southeast Asian region. The crisis initially only affected the relevant currency values but in later stages had also affected the real economies and economic fundamentals. More recently, the region's economy has started to recover and the national currencies have begun appreciating, although they are still much lower than the pre-crisis levels. Therefore, it could be considered that companies in Malaysia were facing particularly greater FX risk due to this crisis.

Prior to September 1998, Malaysia had pegged its national currency, Ringgit, to a basket of currencies of its major trading partners, and maintained a managed float system of exchange rates. However, in September 1998, in the midst of the currency crisis, the government changed the exchange control system, and imposed selective currency control measures that aimed to arrest speculative attacks on the value of the national currency. The measures terminated the free market trading of Ringgit to quell speculation but retained the convertibility of the currency by imposing a fixed exchange rate vis-à-vis the US dollar, and made allowances for full convertibility for genuine commercial and business purposes. This implies that the FX risk for companies in Malaysia has been reduced by the imposition of the fixed exchange rate. However, the companies still face FX risk because the exchange rates of Ringgit against other currencies, other than the US dollar, was allowed to fluctuate. Moreover, companies in Malaysia have to face the risk, however minute the possibility, that the exchange control system might collapse due to lack of reserves. Furthermore, the fixed exchange rate system cannot be retained eternally, and therefore, must be dismantled eventually. In short, although the imposition of fixed exchange rate against the US dollar has reduced the immediate FX risks for most companies in Malaysia, it has by no means annulled FX risk altogether.

1.3. Previous empirical research

The extant literature on FERM, and particularly corporate FERM, is described in greater detail in Chapter 2. However, here, a brief introduction to the overall content of the literature is provided to identify the knowledge gap within, which this research undertakes to fill. Generally, studies in this area could be categorised into three groups based on the number of research variables and explanatory variables used in the study.

The first group comprises studies that have none or very few explanatory variables, but have only research variables. Broadly, these studies provided descriptions about the profile of activities, and tasks performed by companies and the characteristics of the FERM programmes adopted by them. This group of studies includes Soenan (1986), Belk and Glaum (1990), Bodnar, Hayt, Marston, and Smithson (1995) and Phillips (1995). The second group consists of studies that have only one or one type of research variable (or rather dependent variable) but has several explanatory variables. This

group of studies includes Nance, Smith, and Smithson (1993), Berkman and Bradbury (1996) and Mian (1996). Broadly, these studies attempted to identify factors that influence a company's likelihood of hedging, or a company's use of derivatives. The third group of studies used considerable numbers of both research variables and explanatory variables. Studies like Abdel-Malek (1976), Mathur (1982), Batten, Mellor and Wan (1993), and Dolde (1993) can be classified to be in this third group. This present research belongs to this last group because it focuses on several research and explanatory variables, and as will be seen, it uses more than any other study in the same group.

There is a distinct reason for the difference between the research studies in the second and third groups. The underlying theory for hedging (or the use of derivatives, or the managing of FX risk) has been well developed, and therefore, there are specific hypotheses that could be tested empirically. This was done by the studies in the second group. However, there is a clear lack of such theories and specific hypotheses for the other aspects of FERM. For example, there is no theory that proffer factors that influence the FERM objective adopted by a company. Similarly, there is no comparable theory that predicts factors that influence the degree of centralisation of FERM adopted by a company. Therefore, studies in the third group, which investigate a broader spectrum of FERM aspects, cannot accept or reject specific hypotheses, despite using explanatory variables (or factors). In fact, the researches generally did not control for the effects of other factors when identifying a particular factor's effect on the specific aspect of FERM. Again, this is simply because there is no theory to indicate the factors that should be controlled for in the analyses.

As implied above, studies in the second group, unlike those in the third, have not been able to adopt the deductive process of knowledge construction. In other words, these studies cannot take the path of testing hypotheses to establish or modify an existing theory. These studies have adopted an alternative path, the inductive process, to build knowledge. More specifically, they have identified factors that were found to have been significantly (both statistically and substantively) associated with a particular phenomenon or aspect of FERM, usually without controlling for other factors. Then, the studies usually provided rationale and justifications to explain the observed relationships between the factors and the particular FERM phenomenon. If these relationships were reconfirmed by other similar studies with fresh sample, these

relationships could then be inferred to be true. Following this, the confirmed factors and their associated explanations could be used to construct a unified theory to explain the particular phenomenon. This is the approach taken by this study.

In short, the empirical researches, especially those in the third group, reflect the clear lack of theories to explain the phenomena related to company FERM activities and FERM characteristics. This study aims to provide findings and justifications for these findings, and through the inductive process, help contribute in constructing the relevant theories to explain these phenomena.

1.4. Research questions

This study addresses two research questions. ❶ How do Malaysian public-listed multinational companies manage FX risk? ❷ Why do they manage their FX risks in a particular manner? This latter question can be rephrased as, what factors influence which particular FERM activities performed by the Malaysian public-listed multinational companies? Although there are two research questions, greater emphasis is placed on addressing the second, rather than the first.

The primary aim of this study is contribute towards the construction of theories that should explain the phenomena associated with the FERM programmes adopted by companies. This research focuses its investigations into seven categories of FERM activities and FERM characteristics. These are ① management of FX risk, ② FX exposure types, ③ FERM objective, ④ FERM responsibility, ⑤ FERM centralisation, ⑥ FERM policies and procedures, and finally, ⑦ FERM techniques. Broadly, almost all the issues or aspects examined by previous studies on the topic of corporate FERM can be considered to be in one, or the other, of these seven categories of FERM activities and characteristics. These categories are elaborated in greater detail in Chapter 3. The findings in this study about company FERM activities and characteristics should provide the answer for the first research question. These findings should provide a profile of FERM activities and characteristics performed by the Malaysian public-listed multinational companies. This, in short, should indicate how these companies manage FX risk.

Apart from that, this study focuses on seven categories of factors (predictors) that are examined to see if they influence company FERM activities. These predictor categories are ① company size, ② debt and leverage, ③ equity ownership, ④ listing board and sector, ⑤ FX involvement, ⑥ intra-company transactions, and ⑦ perceived FX risk attributes. These predictors are specified in greater detail in Chapter 3. Among these, some predictors are new, meaning that they have not been used in prior studies. Some other predictors have been used previously to varying extents. The intention of this study is to identify the predictors and their conditional influences on specific FERM activities. Note that Figure 1.1 provides an overview of the categories of research variables and predictor variables used in this research.

The data analysis in this area can be very complex and time consuming especially due to the lack, or absence, of theories in this area. In order to reduce the complexity of the analysis, it has been assumed that all company FERM activities are independent of one another. This might not be as unreasonable as it seems initially. Previous studies in this area have not been able to establish strong relationships between different FERM activities or characteristics of the same company. In fact, prior empirical studies only suggested that a few, less than three, FERM activities might be associated with one another. These are examined in greater detail in Chapters 2 and 6.

1.5. Research method

Most of the empirical studies in this area have used mail questionnaires, while a few have used the case study method, to collect data. Usually, a study that wishes to establish relationships or identify predictors that explain particular dependent or research variables, in this area, uses mail questionnaire or standard secondary data sources, e.g., company annual report, to obtain the data. Case study method is useful for undertaking an in-depth study into the intricate and complex corporate practices and norms of handling and dealing with FX risk. However, it is generally judged unsuitable for establishing statistical relationships or identifying predictors based upon statistical results because there is a danger that the data from the case study may be biasedly encoded. Therefore, in keeping with the above convention, this study adopts the mail questionnaire method to collect the required data.

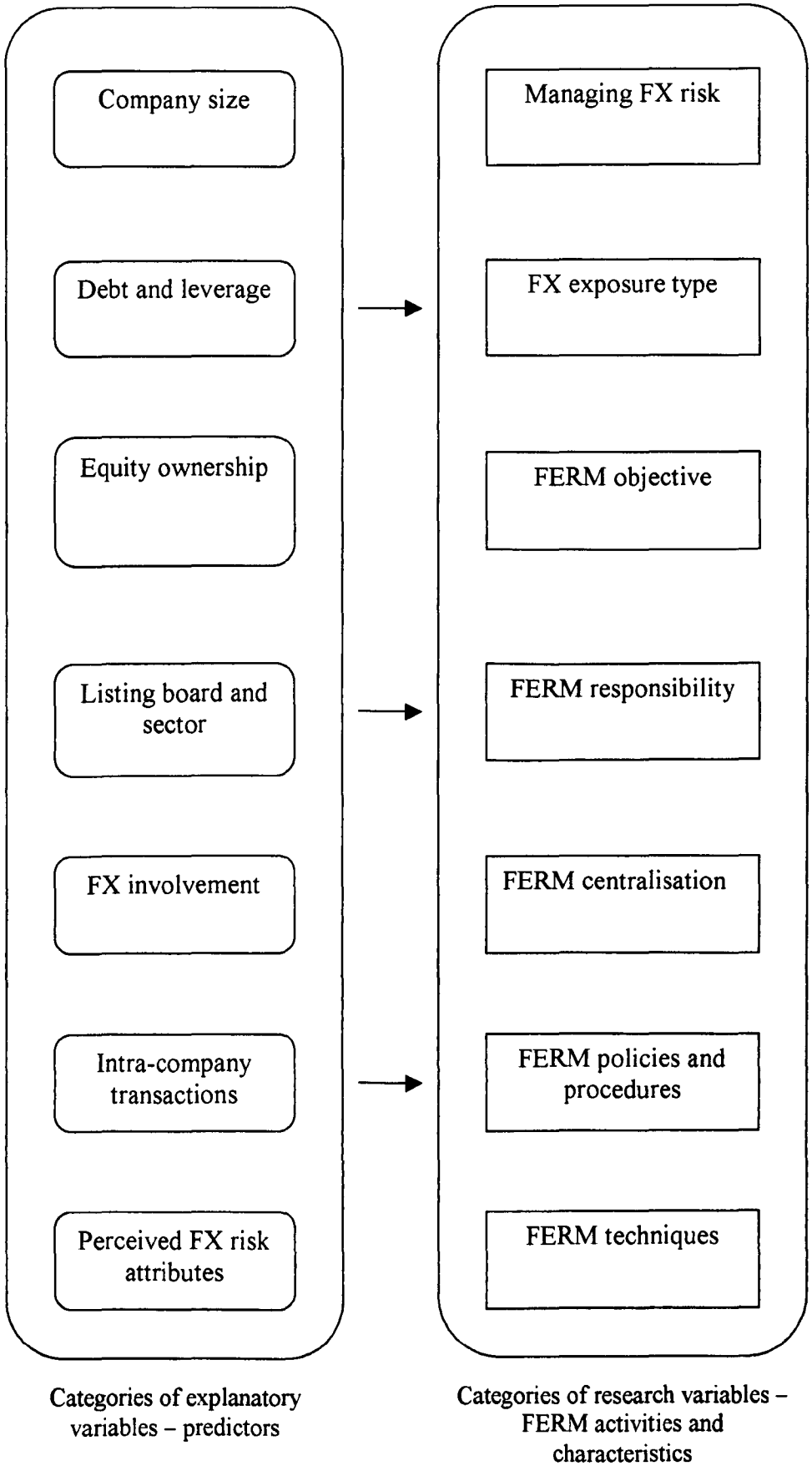


Figure 1.1: Categories of variables in the study

However, unlike previous studies (in the third group, as explained earlier), this study attempts to provide findings about individual predictor effects on particular FERM activities that control for the effects of other predictors – at least, those incorporated in the study. In other words, in attempting to uncover the effect a predictor has on a particular FERM activity, the analysis should incorporate other predictors as well. Therefore, multiple regression models have been used. More specifically, logistic regression models have been used because the dependent variables in this study are dichotomous. As the number of cases in the analysis were often small compared to the number of explanatory variables or predictors used, this study has used stepwise backward elimination procedure in the undertaking the logistic regression analysis. This technique simply includes all predictors on the first run, and then step-by-step eliminates predictors that are statistically insignificant, until a reasonably good regression model is attained. This technique is discussed in Chapter 5. However, as pointed out by statisticians (see Ghauri, Gronhaug, and Kristianslud, 1995, p.50), this approach undermines the statistical conclusion or validity of the findings. However, as the intention of this study is to identify and suggest possible predictors rather than establish or reject a hypothesised predictor, this loss of validity is not very serious.

1.6. Thesis overview

In the next chapter, the academic literature on hedging and corporate FERM is reviewed. Following this, in Chapter 3, the research method used by this study is elaborated in greater detail. It also provides a full description of all the variables used in the study. Chapter 4 presents the data and descriptive findings of this study. It specifically addresses the first research question on how Malaysian public-listed multinational companies manage FX risk. Chapter 5, on the other hand, deals with the findings from the logistic regression analyses. This chapter is particularly concerned with the second research question, i.e., identifying possible predictors that influence particular FERM activities undertaken by the companies. Chapter 6 discusses the findings about predictor effects on specific company FERM activities, and compares them to findings from prior researches. It also provides rationales and justifications to explain the observed findings. Chapter 7 summarises the findings and their implications

and provides the conclusions of this study. It also identifies shortcomings in this study and proposes some pointers for future research in this area.

Chapter 2

Literature Review

INTRODUCTION

In this chapter, the literature related to the managing, or hedging, of FX risk is reviewed. The purpose of this chapter is to pool and present the extant knowledge regarding FERM that serves as the base from which this study is built. Particularly, this review is meant to identify gaps in the literature that can be filled by this study. Moreover, this review is also useful for the purpose of comparing the findings of this study with those from previous studies, and this is carried out in Chapter 4 and Chapter 6. This chapter can be divided into two parts. The first part reviews the theories underlying the topic of hedging FX risk. The second part reviews the findings from the empirical studies in the area of FERM.

2.1. Theoretical background

As mentioned above, this part reviews some pertinent issues related to the theories underlying the concept of hedging. This part is further divided into three sections, each discussing a specific issue. The first issue concerns the relevance of hedging. Arguments that support, and those that refute, that hedging FX risk is relevant are examined closely. The second issue is about how hedging enhances value. The relevant theories are explored to present a unified description of how hedging (FX risk) might enhance company value. Finally, the third issue is about the factors that are posited to affect a company's likelihood of hedging FX risk. Factors that are expected to influence a company's inclination to hedge or manage FX risk are described in some detail.

2.1.1. Does hedging matter?

One of the most contentious debates in this field revolves around the relevance of hedging FX risk. The arguments advanced against hedging FX risk can be summed up into five points. It is claimed that hedging FX risk is not relevant because ① FX risk

does not exist, ② FX risk does not matter, ③ hedging FX risk does not reduce risk, and ④ hedging does not increase value. The fifth point, following the arguments of Markowitz (1952), contends that ⑤ hedging can be undertaken by shareholders, and implies that companies should not hedge FX risk. The first argument denies the very existence of FX risk. The second dismisses the relevance of FX risk although not necessarily its existence. The third doubts whether hedging can reduce a company's total risk. The fourth questions whether hedging can increase a company's value. If any one of the arguments is true, then hedging would have to be dismissed as irrelevant or ineffective. On the other hand, if the fifth argument is accepted then companies should not hedge or manage FX risk because that should be left to the shareholders. These points are explored in greater depth in this section, before the arguments are summed up at the end.

FX risk is a component of a company's total risk. Therefore, an increase in the FX risk would increase the company's total risk, and consequently, increase the company's cash flow volatility. According to the tenet of risk-aversion, a reduction in risk (value uncertainty) should enhance the value of an asset. This then implies that a company with greater total risk, due to greater FX risk, would be less valued by shareholders – with other factors held constant. In other words, the principle of risk-aversion suggests that a reduction in a company's FX risk should enhance the company's value.

Hedging is generally used to offset FX exposures. Then, it can be said that hedging would reduce FX risk, and therefore, should reduce the cash flow volatility, encountered by a company. Thus, invoking the tenet of risk-aversion, it can be concluded that hedging should increase company value. Figure 2.1 depicts the link between hedging and company value, from the perspective of the risk-aversion principle. However, as explained below, the alternative pronouncements in theory, and indeed, the expected workings in practice, complicate the simple and straightforward link presented between hedging and company value. Next, the arguments that refute that hedging increases company value are examined.

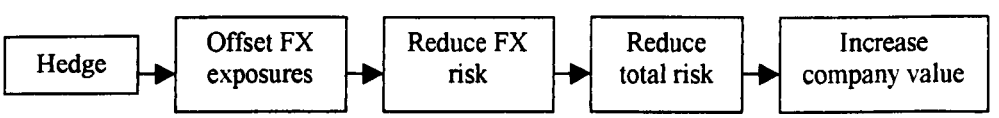


Figure 2.1: How hedging increases company value – the perspective of risk aversion principle

Does FX risk exist?

The first argument alleges that FX risk does not really exist. This is implied by the Purchasing Power Parity (PPP) theorem. The PPP implies that there is no real FX risk because changes in FX rates are offset immediately and completely by changes in the price levels (of goods and services). Dufey and Srinivasulu (1983), and Buckley (1987) agreed that if the PPP was true, FX risk, and therefore hedging, would have been irrelevant. However, there is ample evidence that show PPP does not hold, at least in the short-term.[1]

Moreover, both Dufey and Srinivasulu (1983), and Buckley (1987), explained that even if the PPP held in terms of an index of tradeable goods, it was unreasonable to assume that a company's relative price of inputs and outputs would change accordingly. Therefore, FX risk does exist especially, as Buckley (1987) pointed out, when a company's involvement overseas had a finite time horizon. He explained that under such a circumstance, there was insufficient time to expect the relationships of exchange rate, interest rates and inflation rates to have been at equilibrium on average.

Mahajan and Mehta (1991) explored the states of efficiency of the FX, capital, and goods markets and their implication on the relevance of hedging. They seemed to suggest that, when all the three were efficient,[2] hedging would have been irrelevant. This is because any change in the exchange rate would be immediately offset by changes in the interest rates, inflation rates, and the prices of goods. Of course, when all three markets are efficient, the PPP is expected to hold, and therefore, there is no real FX risk. Actually, they assert that hedging is relevant only when the financial markets are efficient and the goods market is inefficient. Levi and Sercu (1991) presented a subtly different argument. They stated that hedging required a competitive[3] FX market, but they claimed that hedging was only relevant if there were inefficiencies in the

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[1] For example, see Officer (1984), Taylor (1995), and Rogoff (1996), for surveys of the empirical findings in this area.

[2] Mahajan and Mehta (1991) noted that the FX market is more likely to be efficient compared to the capital market, and that the latter, in turn, is more likely to be efficient compared to the goods market. In general, the further away a market is from the real sector, the more efficient it is.

[3] Actually, a competitive market, a requisite condition for an efficient market, is necessary for the very existence of a market. A market is competitive if no one particular party can gain successively at the expense of the other party. This is important because otherwise the market will cease to exist as the party that loses out will recognise the outcome, and will not want to forge the transaction. Therefore, if the goods market is uncompetitive, deals in the market cannot be forged, and consequently, the market would collapse.

capital, product or labour markets. Therefore, the works of Mahajan and Mehta (1991) and Levi and Sercu (1991), taken together, appear to suggest that hedging is relevant only when the financial markets (FX and capital) are efficient and the goods and labour markets are inefficient (due to the presence of transaction costs, taxes, information asymmetry, other market imperfections). This is because a change in the exchange rate would not be immediately and fully offset by changes in the prices of goods – a violation of PPP. Therefore, in such a circumstance, FX risk does exist and hedging may be relevant.

Does FX risk matter?

The second argument contends that, even if it does exist, FX risk does not matter, or is irrelevant. The Portfolio theory and the Capital Asset Pricing Model (CAPM) suggest that FX risk does not matter if the risk is wholly unsystematic. Unsystematic risk can be easily diversified away (at no cost) by shareholders through simply holding an investment (a company's share) in a portfolio of well-diversified investments. The Portfolio theory and CAPM imply that, in public companies with shares widely held by diversified shareholders, only systematic (undiversifiable) risk really matters. In other words, shareholders of these companies are concerned only about the portion of risk that cannot be diversified away. Consequently, this implies that the value of an asset (company share) is dependent (partially) on the level of systematic risk, and not the total risk, posed by the asset. Note that Figure 2.2 illustrates the link between hedging and company value as postulated by the Portfolio theory, CAPM and the Efficient Market Hypothesis (EMH).

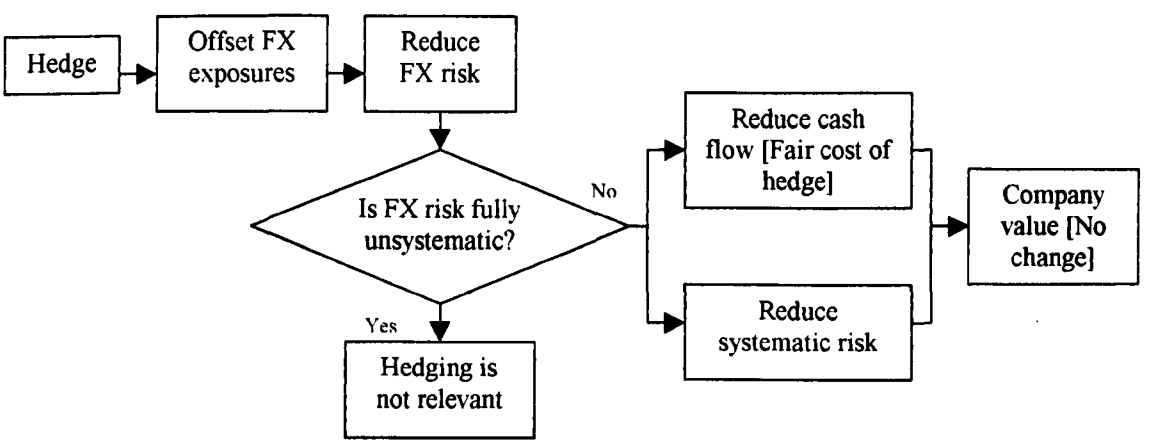


Figure 2.2: Hedging does not change company value – the perspectives of Portfolio Theory, CAPM and EMH

Assuming FX risk is wholly unsystematic, the implication is that shareholders will not pay extra for the risk reduction achieved by the company through hedging because they can easily diversify away the risk. Therefore, this implies that FX risk does not matter if it is unsystematic, and therefore, hedging is redundant. According to this view, hedging may reduce a company's FX risk and its total risk but this will not increase company value because shareholders will not pay more for the company's shares as they can easily diversify away this risk on their own. Several authors, including Levi and Sercu (1991), acknowledged this view.

However, Rawls and Smithson (1993) pointed out that this might not apply for private- or closely-held companies whose shareholders were less diversified, and were concerned more about total risk (rather than merely systematic risk). Thus, for a private- or closely-held company, FX risk, and therefore, hedging, is more likely to be relevant.

Moreover, in practice, there is some evidence to suggest that at least a small portion of the FX risk of a company may not be diversifiable as the same underlying factors also affect FX risk in other companies (or investments) in a similar fashion. Dufey and Srinivasulu (1983), on the other hand, explained that, in real-life, shareholders are concerned about default risk (not merely systematic risk) and the associated financial distress costs, arising from the total risk of a company. Thus, all these imply that FX risk does exist and is relevant.

Does hedging reduce risk?

The third argument casts doubt over the assumption that hedging reduces FX risk. Forward rates are observed to be equally uncertain as future spot rates, and therefore, hedging against future spot rates with equally volatile forward rates is of dubious value. However, Dufey and Srinivasulu (1983) contended that hedging forward made available exact information regarding anticipated cash flows, in spite of exchange rate changes, and allowed precious time for a company to plan and execute changes in its operations. Thus, they stressed that hedging was useful in reducing operating uncertainty and risk.

On the other hand, Copeland and Joshi (1996) also pointed out that hedging, in real-life, failed to reduce significantly the cash flow volatility (reflecting the total risk) of most companies. This implies that hedging is, at best ineffective, or at worst irrelevant.

However, there were some problems with the study by Copeland and Joshi (1996). ① It was a simulated, rather than an empirical, study. ② It had used a combination of translation and transaction losses (or gains) on income statement to measure income volatility, while the hypothetical hedge was only made for the transaction exposure. ③ The estimation method of FX loss (or gain) in the income statement was not very accurate (they themselves conceded this). ④ It had used income (as opposed to cash flow) volatility. These cast some doubt about the findings. Moreover, if indeed hedging is irrelevant, it would be difficult to explain some of the financial debacles, where companies have lost huge sums in FX, which seemingly could have been avoided, had the FX exposures been properly hedged.

Does hedging increase value?

The fourth argument questions whether, or not, hedging can increase the value of a company. Even assuming FX risk to be at least partially systematic, (undiversifiable) as required by the Portfolio theory and CAPM if FX risk was to be relevant, several arguments could be offered to counter the claim that hedging is relevant.

Firstly, Dufey and Srinivasulu (1983) noted that EMH implied that hedging FX risk is a fair bet. Similarly, Buckley (1987) also pointed out that the bulk of empirical work confirmed the Expectation Theory, i.e., that the forward rate was the unbiased estimator of the future spot rate. Both these points imply that the gains and losses in FX from unhedged exposures would average out over the long run. In other words, the expected FX gains or losses, of a company that hedges, and a comparable company that does not hedge, will be the same, i.e., zero, over the long run. Therefore, hedging does not matter. However, this argument totally ignores the impact on the company's risk, and focuses solely on the company's return. As Dufey and Srinivasulu (1983) pointed out, this contention was only true if the economic agents were risk-neutral. They noted that, in real life, the economic agents are usually risk-averse. In essence, they claim that there will be additional value from reduced FX risk for these risk-averse agents. Therefore, hedging FX risk is potentially valuable.

Secondly, EMH implies that the FX and capital markets are efficient, and therefore hedging instruments and the systematic risk are fairly priced. This means that there are no excess returns (gains) to be derived from hedging FX risk. This too implies, in turn, that hedging does not add value. Modigliani and Miller (1958) claimed that financial

policy decisions, under perfect capital market conditions, merely affected how the value of a company was apportioned among its claim-holders, but they did not affect the value of the company. This then means that hedging, a financial policy decision, does not affect company value, and is therefore, irrelevant for the company. Again, this argument ignores the impact of risk. It also invokes the assumption of a perfect capital market, although this is not attainable in reality.

Thirdly, assuming an efficient capital market but with the presence of transaction costs means that (systematic) FX risk can be off-loaded only at a fair cost. As Buckley (1987) pointed out, the cost of hedging forward was the higher bid-ask spread on the forward rates, compared to the spot rates. The implication is that hedging can off-load this risk, but only at a cost that may reduce company value. Thus, if the risk is (partially) systematic, hedging may switch the higher, for a lower, amount and volatility of cash flows in a company – which may either increase or decrease the company value (the present value of cash flows). Hedging may reduce the company's systematic risk but may not be able to increase, as a result, the company's value. Again, Figure 2.2 illustrates this diagrammatically. However, Dufey and Srinivasulu (1983) contended that the objective of hedging was not to make excess FX returns but to achieve a desired mixture of the risk and return characteristics in FX. They implied that hedging systematic FX risk could re-align the risk-return characteristics of the company, and therefore, hedging is relevant, although it might not necessarily increase company value.[4]

Despite the implications of the Portfolio theory, CAPM, and EMH, Buckley (1987) claimed that a policy of not hedging was dangerous because a company might incur a huge FX loss on a single transaction denominated in a foreign currency, and that might

[4] Some proponents of hedging argue that hedging allows a company to lock in a FX premium when the forward rate is more favourable than the spot rate to the company. Thus, they claim that the secured premium should help increase the value of the company. However, Levi and Sercu (1991) refuted this argument. In an efficient FX market, they pointed out, this argument implicitly suggests that the hedge would also lock in the discount (disadvantage) in the forward rate to the counter-party of the deal. No counter-party will want this deal then, and therefore, the hedge cannot be forged. Thus, the folly of this argument becomes clear. More precisely, the risk premium does not actually reflect a FX gain (or loss) – it merely reflects the difference between the forward rate (expected future spot rate) and the spot rate. The FX gain (or loss), whereas, is determined by the difference between the actual and expected (forward) future spot rates. Even if a company secures a positive premium in a forward hedge, it may suffer FX loss (opportunity loss, rather) as the future spot rate may be even more favourable than the current forward rate. Therefore, Levi and Sercu (1991) dismissed the argument, as invalid, that claimed hedging was useful because it allowed a company to lock in a FX gain. Rather, hedging simply allows a company to lock in a preferred or acceptable FX rate.

lead to financial distress. He likened covering forward as insurance, the cost of which was the difference between the forward spread and the spot spread. Although hedging might not adhere to the maxim of maximising profit, the policy was sensible, he claimed, to a risk-averse manager of a company.

Besides, Rawls and Smithson (1993) explained that hedging FX risk could reduce a company's total risk, and cash flow volatility. Then, among other things, this should reduce the probability of default and the expected cost of financial distress, and thereby, increase the company's value. The pronouncements of Rawls and Smithson (1993) are examined in greater depth and breadth in a little later in this chapter. Therefore, FX risk does matter, and hedging is relevant, notwithstanding the implications of Portfolio theory, CAPM and EMH.

Should companies hedge?

Another common debate in the academic literature associated with hedging is concerned with who should hedge the FX risk, the company or the shareholders. It is often argued that companies, compared to shareholders, have greater information about the FX risk faced by the company, and therefore, are better placed to hedge this risk. Moreover, it is also argued that transaction costs in hedging FX risk are huge, and that companies are better able, than shareholders, to assume these costs. Furthermore, companies are better able to obtain low-cost hedges than shareholders because companies are usually better credit risks, and have greater volume of FX to transact. It is also commonly argued that companies have greater ability to acquire the required skills to manage a hedging programme. All these points suggest that companies, rather than shareholders, should hedge FX risk.[5]

However, Levi and Sercu (1991) pointed out that an optimal hedge should have been determined based on a portfolio, and not on a company-by-company, basis. As recognised by Dufey and Srinivasulu (1983), a company's FX gains and losses can be

[5] Hedging by a company is also said to be better because it overcomes the restrictions placed on individual shareholder's short-selling activity. Proponents of this view point out that it is more difficult for individual shareholders to borrow in foreign currencies and to sell them forward. However, Levi and Sercu (1991) dismissed this argument pointing out that trading in currency futures allowed individual shareholders to execute short selling if required. Further, they pointed out that, in a competitive market, no single company could achieve excess profit continuously by supplying short FX positions.

useful for the shareholders to hedge their own exposure needs.[6] This implies that shareholders may prefer to be exposed to the FX risk of a company, in order to hedge against the FX risk arising from their individual consumption needs. Companies that hedge their FX risk will be negating the natural hedge sought by the shareholders. Moreover, Levi and Sercu (1991) argued that companies did not have information about the exposure or hedge preference of each shareholder, and even if they had, it was impossible to fulfil each shareholder's preference. Further, they also argued that this exposure could be hedged, or rather diversified, easily by the shareholders by holding the shares of this company with the shares of another company that has opposite exposures. Nonetheless, this point then assumes that shareholders have full information about companies' exposures – which may not be reasonable.

Dufey and Srinivasulu (1983) contended that the consumption exposure is shareholder-specific, and therefore, should be left to the shareholders to hedge, but FX risk faced by a company ought to be managed by the company. This is presumably because the company is better informed about its risk, has greater ability to deal with the risk, and is able to execute the hedge at lower cost. Thus, they appear to advocate two-tier hedging, one by the company and the other by the shareholder. On the other hand, Levi and Sercu (1991) stated that such double hedging was wasteful, and simply not optimal. However, the ideal optimal hedge from the perspective of shareholders simply cannot be attained because of the shareholders lack full information about the exposures and cash flows of companies. Moreover, empirically, the market for off-balance-sheet hedging is dominated by companies, and not individual shareholders. This suggests that companies, rather than individual shareholders, have either greater necessity, ability, or both, to undertake hedging.

Summary of arguments

Above, the arguments about the issue of the relevance of hedging have been examined. Here, the major arguments and the associated conclusions are highlighted. Figure 2.3 summarises the arguments involved in a diagram. ① It was established that FX risk does exist because PPP does not hold, at least in the shorter-term. ② It was inferred that FX risk, and hedging, are relevant when the FX, and capital markets are competitive but

[6] The exposure needs of shareholders were referred to as "consumption bundles" in Dufey and Srinivasulu (1983).

the goods and labour markets are inefficient, due to the presence of transaction costs, taxes, government regulations or intervention, information asymmetries, etc. It could be postulated that the greater the inefficiencies, the greater the need for hedging.

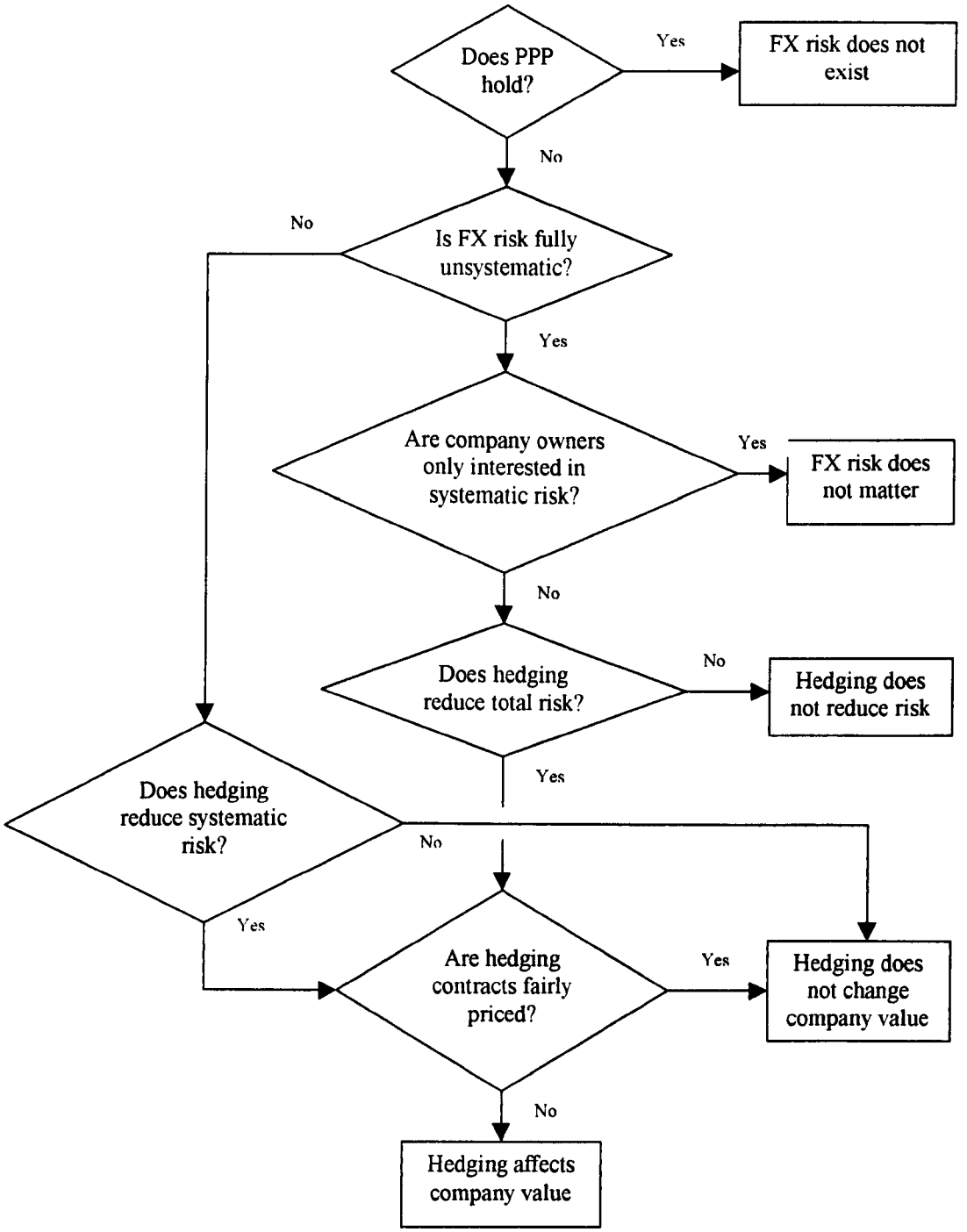


Figure 2.3: Arguments regarding hedging relevance

③ In closely-held, or private, companies, where the shareholders are less well-diversified, it could be concluded that FX risk is more relevant. ④ There is evidence that show FX risk is not wholly unsystematic, i.e., it cannot be fully diversified away. It was also shown that shareholders are also concerned about company's default risk, and therefore, its total risk. They are not merely concerned about systematic risk. These points then imply that even in widely-held, or public, companies, FX risk is likely to be relevant.

⑤ Since FX risk is partially systematic, and hedging reduces FX risk, it can be inferred that hedging reduces a company's systematic risk, and is therefore, relevant. ⑥ Since FX market is efficient but imperfect – due to the presence of transaction costs, for example – hedging can reduce a company's systematic risk only at a fair cost. This implies that hedging may reduce the company's return, apart from reducing the company's systematic risk. The net effect on the present value of the company, in an efficient market, is postulated to be zero. In other words, the reduction in return (due to the cost of hedging) is commensurate with the reduction in the systematic risk. This then would have no effect on the present value of the company. Nonetheless, hedging cannot be dismissed as irrelevant just because it does not affect the present value of a company. Hedging can re-align the risk-return characteristics of the company to a desired level, and that can affect the future value of the company, and is therefore, relevant.

Thus, from above, it can be seen that the major points all support the argument that hedging is relevant. This argument is further strengthened in a later section where it is explained how hedging might actually increase, rather than decrease, a company's return, apart from reducing the company's systematic risk. Under such a circumstance, the function of hedging is elevated to increasing company value, rather than merely re-aligning risk-return characteristics, in an efficient market environment.

Finally, it was pointed out that companies, compared to shareholders, are better placed to hedge the companies' FX risk because companies have ① better information regarding their exposures and risk, ② usually better ability to take advantage of the economies-of-scale associated with the huge transaction costs of hedging, ③ greater ability to obtain more competitive rates to hedge their exposures because they are better credit risks, and also because they deal in greater volume of exposures, ④ greater ability

to acquire the skills required in managing a professional hedging programme, and ⑤ greater dealing flexibility. Nonetheless, it must be conceded that hedging by the company could be sub-optimal for the shareholders. However, given an imperfect market environment, with information asymmetry, the optimal hedge from the perspective of shareholders is simply unattainable. It is probably prudent to say that a company should hedge its FX risk, whereas the shareholders should hedge their consumption exposure with whatever information they have available – as suggested by Dufey and Srinivasulu (1983).

2.1.2. Hedging and value enhancement

In the above section, it was established that hedging is relevant, and that it may be better for companies to hedge their FX risk rather than merely leaving it to their shareholders. In this section, on the other hand, the relevance of hedging is explored in greater depth and breadth. More precisely, it examines how hedging might enhance company value, in a efficient but imperfect market environment.

As seen earlier, the MM proposition claims that hedging is irrelevant. The MM proposition is built upon several assumptions that do not hold in real life. It assumes, among other things, the absence of ① taxes; ② financial distress, and bankruptcy costs; ③ contracting costs; ④ information costs; and ⑤ capital market imperfections. When these assumptions are violated, hedging can be shown to be relevant and valuable. In other words, in real life, hedging can enhance company value.

Rawls and Smithson (1993) highlighted the shortcomings of the MM proposition, and also claimed that hedging can increase company value if it: ① reduced the company's taxes, ② reduced the company's financial distress costs, or ③ improved the company's investment decisions. Each of these points is discussed further next. Please refer to Figure 2.4 that depicts the general link between hedging and company value as proposed by Rawls and Smithson (1993). A more detailed link between hedging and company value is depicted by Figure 2.5.

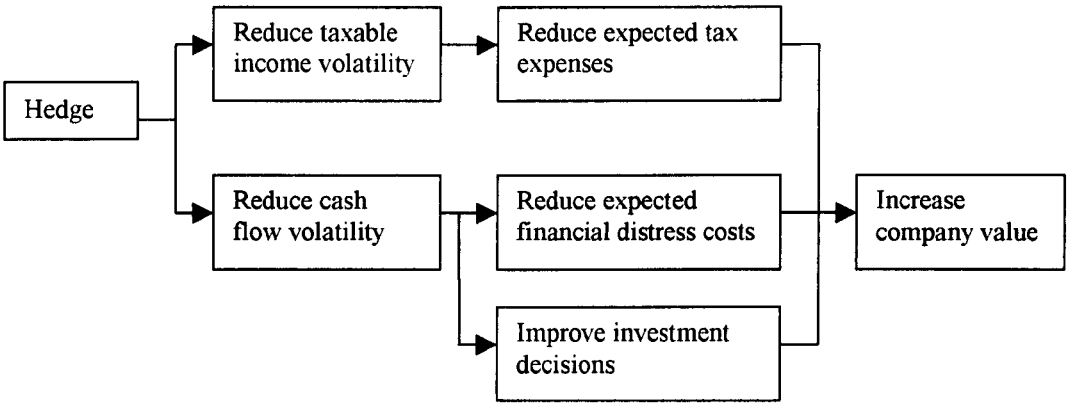


Figure 2.4: How hedging increases company value – adapted from Rawls and Smithson (1993)

Reduce tax expenses

Rawls and Smithson (1993) observed that when the corporate taxes were "convex", i.e., when the applicable tax rates increased with the increase in taxable income,[7] a company with reduced income volatility, say due to hedging, would have less expected income tax expenses, compared to a company with greater income volatility. This is because the upper limit of income (at which the higher tax rates are applicable) would be lower for a company with less, compared to a company with more, income volatility. This implies that a company that reduces its income volatility with hedging, given a "convex" tax schedule, will be able to acquire greater tax savings compared to without hedging. Rawls and Smithson (1993) postulated that the magnitude of tax savings from reduced income volatility (or hedging) depended upon ① the progressiveness of rates in the tax schedule (greater progressiveness, greater tax savings), and ② the income volatility of the company (greater income volatility, greater tax savings).

Zimmerman (1988) explained that the presence of tax shields and other tax credits, such as tax loss carry forwards, also made the tax schedule more "convex". As with the progressive tax schedule, the tax shields also yield reduced expected tax expenses for companies that hedge compared to companies that do not. DeAngelo and Masulis (1980) and Gurel and Pyle (1984) proposed that, generally, if a company's pre-tax income fell below a certain level, the value of the tax preference items would be reduced by either the loss of the tax shield or the postponement of its use. These points

[7] These are referred to as a schedule of progressive corporate tax rates.

imply that reduced income volatility (from hedging) would result in greater tax savings for a company that has tax shields, despite the absence of progressive tax rates. In short, the discussions above point out that hedging, given a "convex" tax rates (due to progressive tax schedule or the presence of tax shields), reduces the company's income volatility, and thereby, increases the expected tax savings, and consequently, the company's value.

Reduce financial distress costs

Mayers and Smith (1982), and Smith and Stulz (1985), pointed out that hedging reduced the probability of financial distress for a company that is presently solvent[8] by reducing the variance of the company value, and consequently, reducing the expected costs of financial distress. Rawls and Smithson (1993) explained that the magnitude of this reduction would depend upon ① the probability of encountering financial distress, and ② the costs of financial distress. Naturally, the greater these two are, the greater is the reduction in the expected costs of financial distress, and likewise, so is the benefit from hedging.[9] In turn, the probability of financial distress for a company is postulated to depend upon ① the company's fixed claims coverage (lower fixed claims coverage, higher probability of financial distress), and ② its income volatility (higher income volatility, greater probability of financial distress). Therefore, hedging may reduce income volatility and reduce the expected costs of financial distress, and consequently, increase the company's value. Hedging can reduce financial distress costs of a company by ① reducing its expected cost of bankruptcy (often referred to as the direct financial distress cost), or ② reducing its contracting and debt costs (often referred to as the indirect financial distress cost). These are discussed further next.

[8] For companies that are insolvent, hedging could increase the probability of financial distress (see Binder, 1989).

[9] Copeland and Joshi (1996) assert that hedging is necessary only if a company's probability and costs of financial disruption are high. Otherwise, the FX risk could be assumed by the company without very much cost impact. Copeland and Joshi (1996) use the term "time to ruin" rather than the probability of financial distress. The term, however, refers to the probability of a company *not* encountering financial distress.

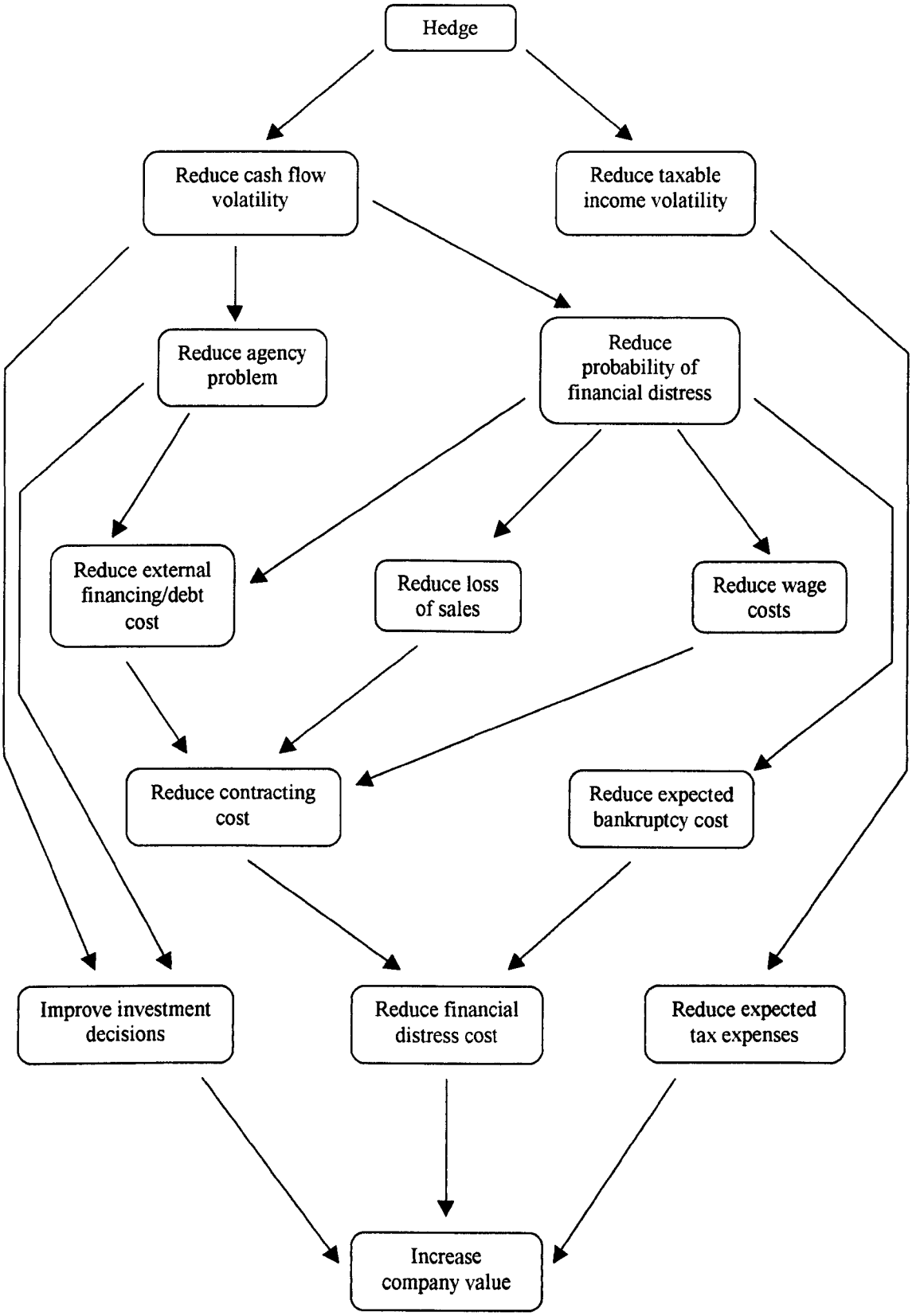


Figure 2.5: How hedging increases company value – an overview

Reduce bankruptcy costs

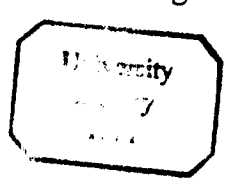
Rawls and Smithson (1993) explained that when a company is forced into bankruptcy, liquidation or reorganisation, the legal and accounting fees could be substantial. If a company goes into bankruptcy, these substantial fees need to be paid from the assets of the company. This will reduce the amount that can be allocated to the claim-holders, i.e., bondholders and especially, shareholders. Therefore, reduced earnings volatility (due to hedging) may reduce the probability of bankruptcy for a company, and consequently, may reduce the expected cost of bankruptcy. This, in turn, may enhance the company value.

Reduce contracting costs

Warner (1977b) explained that the indirect costs of financial distress could be very large because it would increase the company's contracting costs with customers, suppliers, employees and investors. These contracting costs can arise from ① reduced sales, ② higher employee wages, and ③ higher external financing costs. These are explained below.

Levi and Sercu (1991) pointed out that the sales, for a company that has a distinct level of financial distress would be depressed if the company sold products that require follow-up service or parts. For example, Wang, a US computer company, had great difficulty selling its products to customers when it had financial problems (see Rawls and Smithson, 1993). Therefore, companies that face financial distress may encounter reduced sales. This reflects the contracting costs when dealing with customers for companies with financial distress.

Levi and Sercu (1991) also highlighted that employees and managers are usually unable to diversify their personal income uncertainty arising from the volatility of their company's earnings. Therefore, employees and managers in a company with a significant level of financial distress may demand higher wages as compensation. Therefore, companies that have financial distress may incur greater wage expenses. This reflects the contracting costs when dealing with employees and managers for companies in financial distress.



On the other hand, Levi and Sercu (1991) also stated that managers, when given the opportunity to hedge, might lose their motivation to perform because of the additional security afforded by hedging. They, nonetheless, conceded that disallowing managers to hedge might prompt them to seek other risk-reduction means that may be less desirable to the company's shareholders. Hence, this indicates that hedging could well be the least-cost method of overcoming the conflict of interest between shareholders and management.[10]

Levi and Sercu (1991) also said that external financing or refinancing could be very expensive for companies, especially for those with financial distress. This contention is also supported by Froot, Scharfstein, and Stein (1993). Therefore, companies that have financial distress are likely to incur greater external financing costs (or transaction costs). This reflects the contracting costs when dealing with external investors for companies in financial distress. This also includes the increased cost of debt incurred by a company that has greater financial distress. This is expanded further below.

To summarise, reduced volatility of a company's earnings, and consequently, reduced financial distress, might ① avoid reduced sales, ② reduce employee compensation costs, and ③ reduce the company's external financing costs. Further this should reduce the expected cost of financial distress for the company. In short, hedging can reduce the volatility of a company's earnings, reduce the contracting costs, and consequently, increase the company's value.

Reduce cost of debt

A company's cost of debt is partially determined by the agency problem[11] within the company. Therefore, next, the concept of agency problem is discussed first. This is followed by an explanation about how the agency problem affects a company's cost of debt.

All companies that have a mixture of debt and equity in their capital structure, with at least some variability in their incomes, will encounter the agency problem. The agency problem is characterised by the conflict of interest between rival claim-holders, mainly,

[10] However, Levi and Sercu (1991) contended that this could not be proven. They further claimed that this conflict could be avoided by assessing, and rewarding, the managers' performances based on what would have happened if the company had hedged, rather than allowing actual hedges.

[11] This concept was first introduced by Jensen and Meckling (1976).

the bondholders and shareholders, on the earnings and assets of a company.[12] The agency problem arises due to the difference or gap in the nature of expected (possible) payoffs between the bondholders and the shareholders of a company. The greater this gap, the greater the agency problem. Rawls and Smithson (1993) identified two factors that affected the agency problem – ① the debt-equity ratio of the company (the higher the ratio, the greater the agency problem), and ② the range of investment opportunities available to the company (the wider the investment projects, the greater the agency problem).

Nance, Smith, and Smithson (1993) explained that bondholders, realising that the management (on shareholders' behalf) could behave opportunistically, would offer less debt (credit) and demand greater return (cost of debt). Therefore, agency problem can reduce a company's debt capacity, and also increase its cost of debt. The latter is just one of the agency costs arising from the agency problem. Other agency costs are described later.

The agency problem could be reduced by reducing the variability of the income stream of a company, i.e., by hedging (see Mayers and Smith, 1987). Myers (1977) and Bessembinder (1991) claimed that, given that a company uses leverage (debt in the capital structure) and it has growth options in its investment opportunities set,[13] hedging could reduce the volatility of the company's earnings (or internal funds). This would then reduce the pay-off difference between shareholders and bondholders. Conceivably, this, in turn, would reduce the conflict between the two groups of claim-holders. Therefore, hedging can reduce a company's cash flow volatility, reduce the conflict between its bondholders and shareholders, and as a result, expand the company's debt capacity and reduce its cost of debt and capital – and this could increase the company's value.

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[12] Myers (1977) explained that a company's investment opportunities were akin to call options when debt was part of the capital structure. Thus, bondholders prefer investment projects with stable income streams whereas the shareholders may prefer those with greater income volatility. This is one distinct aspect of the conflict of interest between bondholders and shareholders. Dobson and Soenan (1993) implied that the agency problem could be heightened by information asymmetry. The management, acting in the interest of the shareholders, always has better information than the bondholders about the company's cash flows and investment opportunities.

[13] Interestingly, however, Smith and Watts (1992) found that companies that had more growth options in their investment opportunities set had used lower leverage.

Improve investment decisions

Hedging may improve the investment decisions of a company by ① reducing the agency problem within the company, ② ensuring adequate internal funds are available for its investment projects, and ③ removing the effect of exchange rate movement on divisional performance assessment. These issues are described in greater detail below.

Reduce agency costs

As explained above, the agency problem in a company will have cost implications – greater the agency problem, greater the cost of debt. However, this is only one of the costs of agency problem. As will be explained below, the agency problem may also affect the investment decisions of a company, and these too carry cost implications.

Rawls and Smithson (1993) explained that the agency problem could reduce the incentive for the company's management to undertake efficient investment decisions. They described three situations in which the agency problem might result in the failure of the management to undertake efficient investment decisions. These are, respectively, called ① "underinvestment", ② "risk shifting", and ③ "asset substitution". These are described next.[14]

When a company's debt is greater, or almost greater, than the company's assets, the returns from a profitable investment project undertaken by the company may accrue mainly to the bondholders, rather than the shareholders. Therefore, the company's management (acting in the best interest of shareholders), when faced with such an investment opportunity, may reject it. This is called underinvestment. A company's management, promising to invest in a low-risk project, may solicit funds from the bondholders but, after securing the funding, may invest the funds in a project with higher risk for the benefit of the shareholders and to the detriment of the bondholders. This is known as risk shifting. The management of a company that already has huge debts may issue further debt to obtain funds, but use the funds to pay dividends to shareholders instead of investing the funds in its operations. This further increases the leverage of the company, as well as reducing the value of the company, and is referred

[14] The concept of underinvestment was first introduced by Myers (1977). These concepts are explained with simple numerical examples by Dobson and Soenan (1993).

to as asset substitution.

In short, when any of the above situations occurs, the company fails to make efficient investment decisions, i.e., it fails to, accept all profitable projects, and reject all unprofitable ones. This failure would culminate in the deterioration of the company's value. Therefore, these failures to make efficient investment decisions caused by agency problem also have cost implications, and are also known as agency costs.

As explained earlier, hedging can reduce the agency problem in a company. The reduced conflict between bondholders and shareholders not only reduces the cost of debt, but also improves the management's incentive to execute investment decisions efficiently. In fact, Mayers and Smith (1987) explained that hedging could reduce the probability of a company defaulting on its contractual payments, thereby, increasing the company's shareholders' cash flow from a positive net present value (NPV) project.

Ensure adequate internal funds

Froot et al. (1993, 1994) asserted that the primary goal of hedging is to ensure that there is enough cash to make value-enhancing investments in the company.[15] This conclusion was based upon three basic premises: ① external factors can affect cash flows of a company, ② cash flows are important to fund good investments, and ③ good investments are the key to corporate value. These points are elaborated below.

Froot et al. (1994) explained that changes in external factors, e.g., exchange rates, interest rates, and commodity prices, could affect changes in a company's cash flows.[16] Therefore, these external factors could cause a company to have, either excess supply of, or demand for, internal funds. Froot et al. (1994) argued that companies tended to avoid external funding at almost all costs – forgoing investment in even very profitable projects when there was inadequate internal funds available. This is because new external financing is very costly and difficult. New equity financing involves the problem of pricing (with the possibility of under-pricing), and it may convey the signal to the investors that the company's stock is overvalued (this based upon the information

[15] Lewent and Kearney (1993), in a case study of Merck, stated that one of the company's FERM goals was to ensure adequate funds for investment in its research and development programme.

[16] They also pointed out that, in some cases, the external factors could also affect changes to (the desirability of) a company's investment opportunities.

content hypothesis).[17] New debt financing, likewise, may involve huge financial distress costs, and higher probability of bankruptcy. Froot et al. (1994) added that new debt financing by a company was often constrained by the company's limited debt-capacity, and therefore, was undesirable. They argued that excessive investment volatility, arising from the volatility of internal cash flows, could threaten a company's ability to meet its strategic objectives. Of course, if a company fails to invest effectively as planned (according to its strategic objectives) then the company's value will be eroded.

Essentially, the above discussions imply the following three points. ❶ The exchange rate, interest rate, and commodity price changes could increase the volatility of a company's cash flows. ❷ The cash flow volatility may force the company to cut back on investments if the cash flows are inadequate to fund its investment opportunities because companies rely heavily on internally generated funds. ❸ The cut back investments may result in the reduction of the company's value. Additionally, it is implied that hedging could reduce the volatility of a company's cash flows, and therefore, reduce the fall in the company's value.[18]

Reduce performance bias

Levi and Sercu (1991) acknowledged that hedging could be used to remove the "noise" due to exchange rate movements from the divisions' performances. Thus, hedging affords a company to make effective investment and resource allocation decisions based upon divisional assessments, which, in turn, are based upon hedged cash flows that remove the effect of exchange rate movements. Again, the implication is that better investment and resource allocation decisions lead to increased company value. However, Levi and Sercu (1991) contended that a company could still remove the "noise" from the divisions' performance without actually hedging. This can be done by tracking their performances in terms of what would have happened if the divisions had hedged, rather than allowing actual hedges. Therefore, according to Levi and Sercu (1991), hedging for this reason is only valid if the cost of hedging is less than the cost of

[17] This is due partly to the information asymmetry between managers within and investors outside a company (Myers and Majluf, 1984).

[18] However, Froot et al. (1994) claimed that companies should only hedge if the reduced volatility of earning (internal funds), arising from hedging, increased the ability of the company to undertake value-increasing investments. They noted that hedging might not necessarily increase every company's ability to undertake these investments.

monitoring the fictional hedges of the divisions.

2.1.3. Factors influencing hedging

The relevance of hedging, and how hedging might enhance company value was discussed in the two sections above. Inadvertently, in those discussions, some factors that affect a company's likelihood of hedging or managing FX risk had been implied, sometimes indirectly. However, in this third and final section, these, as well as additional, factors that are thought, or theoretically expected, to affect the likelihood of corporate FERM or hedging of FX risk are enumerated more clearly. First, however, the factors implicit in the discussions of the previous two sections are highlighted below.

Discussions about hedging relevance revealed two factors. It was stated that hedging was more relevant when the goods and labour markets were less efficient. This implies that companies in less developed economies are more likely to need hedging, as the markets there are more likely to be less developed. It was also pointed out that in a public company, where shares are more widely held, only systematic (undiversifiable) risk is relevant, and therefore, FX risk is not likely to be relevant. Then, in a private company, where shares are more closely held, FX risk and hedging are more likely to be relevant. This implies that, private companies, compared to public companies, are more likely to hedge or manage FX risk.

From the discussions concerning how hedging might affect or enhance company value, several other factors had been noted. It was noted that hedging FX risk would reduce the cash flow volatility of the company, and thereby, increase the company value. Tacit in this argument, are two related factors. Hedging is more likely to be undertaken by companies that have high levels of FX risk, and where FX risk accounts for a considerable proportion of the company's total risk (cash flow volatility). Otherwise, hedging FX risk would not be ineffective in reducing the company's risk.

It was also noted that hedging, given "convex" tax rates (due to progressive tax schedule, tax shields, or tax credits), could reduce the expected tax expenses of a company. This then implies that companies that are subjected to progressive tax rates, or those that have access to tax credits or tax shields, are more likely to manage FX risk.

Then, it was noted that a company that has a higher proportion of fixed claims (fixed operating costs and interest) is likely to have higher financial distress costs. This then implies that a company that has a lower fixed claims cover is more likely to need hedging.

It was also stated that companies that sell products that require follow-up service or parts face greater costs from increased financial distress. Likewise, companies that use greater proportion of debt in their capital structure, and those that have wider ranges of investment opportunities, were stated to face greater costs from increased financial distress. These points then imply that companies that sell products that require follow-up sales or parts, those that use greater proportion of debt (leverage), and those that have wider investment opportunities, are more likely to manage FX risk. Note that the above factors have been extracted from the discussions in previous the sections. New additional factors are further identified next.

Hedging alternatives

Smith and Watts (1992) reported that choices in dividend policy, compensation, and leverage were correlated, and were generally driven by common predetermined variables, e.g., investment opportunity set, taxes, regulation, etc. Similarly, Nance et al. (1993) and Mian (1996) argued that, given the investment opportunities of a company, hedging and other related policy choices, e.g., leverage, liquidity and dividend pay-out, were substitutes.

Nance et al. (1993) pointed out that one alternative of hedging was to reduce the use of debt in the capital structure (reduce the leverage). Similar to hedging, leverage reduction also reduces financial distress, and agency problem. However, Nance et al. (1993) reminded that reducing leverage, although might reduce the need for hedging, might also reduce the debt-related tax shields and increase the company's tax liability, and therefore, this alternative was be less attractive. Therefore, the implication is that less leverage can be considered to be a substitute to hedging, albeit a partial one. It must be noted that this point had already been discussed previously. Greater use of leverage was associated with greater financial distress costs. Then, greater use of leverage was linked with greater need for hedging. Seen inversely, less use of leverage is, therefore, associated with less hedging.

Rawls and Smithson (1993) pointed out that the agency problem could be reduced by assuring the bondholders that attempts to transfer wealth from bondholders to shareholders would not occur. This can be done by instituting restrictive convenants, in the debt issues, that restrict dividend payments and sets target debt coverage ratio (Smith and Warner, 1979). The issuance of mortgage bonds can also achieve this by disabling the company from shifting the funds to riskier projects. Making the company's debt convertible to shares can align the interests of bondholders and shareholders, and thus, reduce the agency problem.[19] Issuing preferred stock instead of debt, to reduce the possibility of default, can also reduce the agency problem. This is because companies can omit preferred dividend payment without being forced into bankruptcy. Apart from that, investments in more liquid, and less risky, assets reduce the probability of default, and therefore, reduce the need for hedging (see Smith and Warner, 1979). Likewise, a company that has a low dividend payout ratio would help assure bondholders that wealth transfer would not occur and also help control the underinvestment problem (see Kalay, 1982).

Above, alternative tools to hedging were identified. These alternative tools serve to reduce the agency problem within a company, and thereby reduce the need for hedging. A company that uses less leverage, more restrictive convenants in its debt contract, more mortgage bond, more convertible debt, more preferred stock, more liquid (less risky) assets, less dividend pay-out, is less in need of hedging, or managing, FX risk. Below, more factors are enumerated and discussed.

Company size

Nance et al. (1993) explained that smaller companies were more likely to have taxable income in the progressive region of the tax schedule. Besides that, they claimed that the smaller companies were also more likely to utilise tax loss carry forward schemes. These points imply that smaller companies are more likely to hedge, than larger companies, to take advantage of the lower tax rates, and tax shields on losses.

[19] Nance et al. (1993) explained, "...convertible debt includes an embedded option in the company's assets which makes this liability more sensitive to company-value changes and thereby reduces the sensitivity of equity value to company-value changes".

Nance et al. (1993) also pointed out that company size could also affect a company's incentive to hedge. Financial distress can lead up to bankruptcy, liquidation or reorganisation – where a company faces huge direct costs. Nance et al. (1993) suggested that smaller companies were more likely to hedge because, as Warner (1977a) pointed out, the direct costs of financial distress were less than proportional to company size. Copeland and Joshi (1996) also presented a similar argument. This implies that smaller companies have greater expected bankruptcy costs (in proportion to their company size)[20], and therefore, are more likely to hedge. The two preceding arguments, respectively, tax hypothesis, and financial distress hypothesis, appear to state that smaller companies are more likely to hedge FX risk. However, two alternative arguments contend that larger companies are more likely to hedge. These are examined below.

Hedging involves information scale economies (Block and Gallagher, 1986; and Booth, Smith, and Stolz, 1984), because it requires managers with specialised information to manage the hedging programme within a company.[21] This implies that larger companies are more likely to hedge.[22] These arguments indicate that there are informational economies of scale in hedging. Nance et al. (1993) felt that hedging with the use of swaps, forwards, and over-the-counter options, involved significant scale economies in the structure of transactions costs. Copeland and Joshi (1996) noted that the amount of investment involved in hedging is considerable, both in terms of the initial investment as well as continuing costs. These points imply that larger companies are more likely to hedge (with these instruments) because they are better able to pay the huge transaction costs. This, in turn, indicates that there are transactional economies of scale in hedging.

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[20] Altman (1984), however, suggested that the indirect costs of financial distress (contracting costs, as explained earlier) of a company were very much larger than the direct costs associated with bankruptcy.

[21] Dolde (1993) identified that management's lack of knowledge and skill were the major difficulty in making hedging decisions in companies. The study also implied that larger companies were better able to acquire the required knowledge and skill.

[22] Yet, Mayers and Smith (1990) found that smaller (insurance) companies hedged (re-insured) more. Nonetheless, there might have been an element of managerial familiarity at play – even small insurance companies are familiar with the concept and practice of reinsurance – unlike small company managers who may not be familiar with hedging and derivatives.

Level of FX risk

Houston and Mueller (1988) reported that companies that had greater FX exposure hedged more. Likewise, Berkman and Bradbury (1996) felt that companies exposed to greater FX risk (FX trade) were more likely to hedge, although they did not find strong evidence of this. The implication is that FX risk would increase cash flow volatility and probability of financial distress. Therefore, hedging could be useful to reduce the FX risk, cash flow volatility and expected financial distress costs for a company that has a considerable level of FX risk.

Copeland and Joshi (1996), on the other hand, asserted that hedging was effective only when a company's FX risk was a significant component of the company's total risk. Otherwise, the reduction in FX risk attained through hedging might have very little impact on the overall cash flow volatility of the company. These arguments imply that a company that has a greater level of FX risk, or more precisely, the company that has a greater proportion of FX risk (over total risk), is more likely to hedge. However, this argument has been visited in a previous section.

Present and future exposures

Closer analysis of the work of Copeland and Joshi (1996), reveal two further implicit factors. These are related to the total FX risk factor seen above. More precisely, these factors are concerned with the pattern of FX exposures of the company. These are discussed below.

Correlation

Copeland and Joshi (1996) implied that the correlation, between a company's future cash flows, and its current outstanding cash flows, in foreign currencies, must be (highly) positive in order for hedging to reduce the company's cash flow volatility significantly. Otherwise, they explain that hedging may, in certain circumstances, increase the company's cash flow volatility. To illustrate this, assume that the correlation between future exposures and present exposure is negative. The FX gain (or loss) on present transaction exposure would then act as a natural, albeit partial, hedge[23]

[23] Strictly, this is not really a hedge in conventional terms because of the time lapse between the present committed cash flow and the anticipated future cash flows.

of the FX loss (or gain) from anticipated future exposures, arising from subsequent cash flows in the foreign currencies. Thus, hedging to cover present transactions exposure may expose the subsequent cash flows in foreign currencies, and thereby, increase the cash flow volatility of the company.

Comparative impact on future exposures

It was discovered that hedging is relatively more effective if the impact of present exchange rate change on a company's future cash flows is small compared to its impact on the company's current outstanding cash flows denominated in foreign currencies. Otherwise, the future exposures would outweigh the effect of the hedged present exposure, and therefore, hedging (present exposure) will have little impact on the overall cash flow volatility of the company. The joint effect of this and the previous factors is depicted in Table 2.1 below.

Table 2.1: Joint effect of correlation between present and future exposures, and comparative impact of present FX rate change on future exposures, on the effectiveness of hedging.

Correlation between exposures	**Comparative impact on future exposures**	**Hedge strategy**	
		Don't Hedge	Hedge
Positive correlation between future exposures and present exposure	Smaller than present exposure	Future exposures adds to present exposure; cash flow volatility is high	Present exposure is off-set by hedge; future exposures remain but small; cash flow volatility is lower
	Larger than present exposure	Present exposure adds to future exposures; cash flow volatility is very high	Present exposure is off-set by hedge; future exposures remain large; cash flow is only marginally lower
Negative correlation between future exposures and present exposure	Smaller than present exposure	Future exposures partially off-set present exposure; cash flow volatility is low	Present exposure is off-set by hedge; future exposures remain but small; cash flow volatility is low
	Larger than present exposure	Present exposure partially off-sets future exposures; cash flow volatility is lower	Present exposure is off-set by hedge; future exposures remain large; cash flow volatility is higher

Broadly, when the correlation between present and future exposures is positive (and greater), and when the impact of present FX rate change on future exposures is comparatively smaller than on the present exposure, the effectiveness of hedging is greater, in terms of reducing the cash flow volatility of a company. Note that when the correlation between present and future exposures is positive, hedging is always preferable to not hedging – regardless of the comparative impact on future exposures. However, when the correlation is negative, hedging might be less effective – especially

when the impact of exchange rate change on the future exposures is comparatively greater than the impact on present exposure. Note that the unshaded cells depict the preferred option between hedging and not hedging given the two factors. However, the lightly shaded cells, when the correlation is negative and the comparative impact on future exposure is smaller, the choice between hedging and not hedging is less clear-cut.

Management compensation

Smith and Stulz (1985) pointed out that managers, whose pay-off or "end-of-period wealth," was a "convex" function of the company value, would have been less inclined to hedge the financial risk of the company. When managers are given stock options or when they are paid bonuses based upon the income performance of the company, the managers' pay-off would be a "convex" function of the company value. Therefore, under such circumstances, managers would be more aligned to the preference of the shareholders, i.e., they would prefer greater, not less, earnings volatility for the company. On the other hand, managers, whose personal wealth is a "concave" function of the company value, would prefer to hedge company cash flows. However, the above point is possibly true if managers are risk-neutral, and are well-diversified. On the contrary, if managers are risk-averse, and are less well-diversified, they are likely to prefer hedging even despite being given pay-off that is "convex" to the value of the company. Nonetheless, the implication is that management compensation can be designed to reduce or increase the agency problem, and it may affect the investment decisions, and consequently, the hedging decision of the company.

Regulated industry

Smith and Watts (1992), and Barclays and Smith (1995a, 1995b), explained that managers in regulated industries have less discretion in their choice of investments. They also pointed out that it was easier for bondholders to observe managerial action in regulated industries. Therefore, regulated industries have lower degrees of information asymmetry between the management and the bondholders, and therefore, lower levels of agency problem. Moreover, companies in regulated industries also have less contracting costs when in financial distress. Consequently, companies in regulated industries are less likely to hedge.

Hedging disclosure requirements

Mian (1996) observed that the accounting treatment given to a hedge, set out by the disclosure requirements, could result in the increase of the volatility of (reported) earnings. This might cause a mismatch between revenue and expenses. In other words, hedging could serve to reduce the volatility of actual cash flows but simultaneously increase the volatility of accounting earnings. It could be argued that, with information asymmetry, the increased volatility of reported earnings might increase the contracting and agency costs of a company. Consequently, this implies that companies are more likely to hedge if the disclosure requirements are more flexible rather than rigid.

Summary of factors

Finally, here, all the factors that were posited, above, to affect a company's likelihood of hedging or managing FX risk are enumerated below. A company is more likely to hedge or manage FX risk when: (1) the company is in an economy with less developed goods and labour markets, (2) the company is a private or closely-held company; (3) the company has greater FX risk; (4) the company has a greater proportion of FX risk over total risk; (5) the company is subjected to progressive tax rates; (6) the company has access to tax credits or tax shields; (7) the company has lower fixed coverage ratio; (8) the company sells products that require follow-up service or parts; (9) the company uses greater proportion of debt in its capital structure; (10) the company has a wider choice of investment opportunities; (11) the company uses a lower proportion of restrictive debt; (12) the company uses lower proportions of mortgage bonds, convertible debt, and preferred stock; (13) the company has less liquid and more risky assets; (14) the company has a high dividend pay-out policy; (15) the company is larger in size; (16) the company's future and present exposures are more highly (positively) correlated; (17) the impact of exchange rate change on the company's future exposures is smaller compared to the impact on its present exposure; (18) the management's wealth is a "concave" function of the value of the company; (19) the company is in a less regulated industry; and finally, (20) the company is in an accounting environment that has more flexible hedging disclosure requirements.

2.2. Review of empirical studies

In this second part of the chapter, the empirical studies relevant to the topic of FERM are thoroughly reviewed. However, this part begins first with an explanation about the potential problems that would be encountered in such a review when the various studies focus on different dependent variables. Although there are several key empirical studies in this area, some studies did not focus directly on FERM. For example, some studies focused on ① hedging, some on ② managing financial risk, and others on ③ using derivatives, rather than managing FX risk. In essence, this means that the various studies had been investigating various topics or dependent variables rather than focusing on the same topic or dependent variable. This fact can confound the making of cross-study comparisons and conclusions. Since this is critical in any review of empirical studies, the nature of the problem that could be involved should be examined first before embarking on the proper review of the empirical studies.

Firstly, when a study focused on companies that hedged, rather than those that managed, FX risk, the study might have omitted companies that speculated in, or those that aspired to attain some gains (profit) from, FX. Secondly, when a study focused on companies that managed financial risk, it might have also included companies that managed interest rate risk, commodity price risk, equity risk (see Bodnar et al., 1995) apart from including those that managed FX risk. Thirdly, when a study focused on companies that used derivatives, it might have also included companies that used derivatives for hedging, investment, and funding purposes (see Phillips, 1995). Focusing on companies that used derivatives, however, might have resulted in failing to include companies that hedged FX risk without using derivatives. Apart from that, derivatives could have also been used for funding purposes. Derivatives used for investment are meant to make gains from price movements of derivatives, arbitrage, or changes in the underlying exchange rates, interest rates, commodity prices, or equity prices. Therefore, derivatives used to hedge FX risk and derivatives used to attain investment gains from exchange rate changes can be considered to constitute only a portion of FERM – for this concept omits companies that manage FX risk without using derivatives.

Therefore, due the discrepancies explained above, companies that used derivatives, in general, cannot be considered as companies that managed FX risk. Nonetheless, the evidence in both Bodnar et al. (1995) and Phillips (1995) suggest that an overwhelming majority of US companies and organisations, respectively, that used derivatives had used them for hedging, and a considerable majority of these also hedged FX risk. Therefore, is some ground to assume that companies or organisations that used derivatives also managed FX risk. Moreover, Mian (1996) did not find any significant difference in the results of his study with alternate treatments of derivative users as hedgers, and as non-hedgers (speculators). Thus, Mian (1996) concluded that derivative users could be considered to be either hedgers or speculators. This lends support to the contention that derivatives are used mostly for managing financial risk – both to hedge and to speculate.

Consequently, despite the difference described above, it could be argued that derivative users are most likely to be managers of financial risk, and managers of financial risk are most likely to be managers of FX risk. Apart from these, companies that managed FX risk could have been referred to as hedgers of FX risk in some of the previous studies, although technically, these two are slightly different – all hedgers are managers, but not necessarily vice-versa. Finally, it is concluded that the findings from different empirical studies that focused on different dependent variables could be compared against one another, but it should be done with some caution and vigilance.

Having understood the potential problems in reviewing different studies that focused on different aspects, the proper review of the empirical studies can be undertaken. The objective of this part is to conduct a comprehensive review of the key issues related to FERM. The remainder of this part is organised into eight sections. Each of the first seven reviews a particular component of a company's FERM activities and characteristics. The key components are ❶ managing FX risk, ❷ FX exposure type, ❸ FERM objective, ❹ FERM responsibility, ❺ FERM centralisation, ❻ FERM policies and procedures, and finally, ❼ FERM strategies and techniques. Apart from reviewing these key components and discussing the relevant findings from the empirical studies, the review also identifies the factors that have been empirically found to be associated with some of the key activities or characteristics of a company's FERM. Note that the major defining attributes of the key studies are presented in the Appendix A. The final section in this part summarises the empirical findings that are discussed in the earlier

sections.

2.2.1. Managing FX risk

Although there are several studies in this area that examined the proportion of companies that managed FX risk, the proportions across different studies have not been congruent or consistent. There were several key variances in attributes of these studies. Different studies were conducted at different times, and had focused on different countries. These studies were also based upon different sample selection processes – some studies chose large, or public companies, and had omitted smaller and private companies to varying degrees. The impact of this becomes apparent when the effect of company size on the company's inclination to manage FX risk is reviewed below. Besides, as described earlier, some studies had focused on different aspects closely related to FERM, rather than focusing directly on FERM.

As pointed out above, studies that used samples with large proportions of large (or public) companies consistently had reported proportions of companies that managed FX risk that were more than half. Dolde (1993) suggested that about 85% of Fortune 500 companies used risk management products. Batten et al. (1993) indicated that about 77% of large (with total sales more than A$10 million) Australian companies managed FX risk. Nance et al. (1993) showed that about 62% of Fortune 500 and S&P 400 companies used hedging instruments. On the other hand, only Berkman and Bradbury (1996) found that only 48% of New Zealand public listed companies used derivatives.[24]

However, studies that used more representative samples that included both large and small companies (including organisations), implied that the proportion that managed FX risk was much lower than suggested above. Bodnar et al. (1995) suggested that only about 35% of US companies used derivatives (defined as forwards, futures and swaps) to manage financial risks – not only FX risk. Mian (1996) undertook a study that involved a large sample of 3022 companies, including a large proportion of small companies. In this study, only 14% companies declared in their annual report that they hedged FX risks. It is not clear if this portion included the companies that only

[24] However, this might have been due to the unobtrusive method of data collection (from company annual reports) used in the study, unlike the obtrusive means (mail questionnaires) used in most other studies.

disclosed that they used derivatives but did not disclose whether these were used to hedge (FX risk) or to speculate (in FX). Only Phillips (1995), on the contrary, suggested that about 63% of organisations, i.e., including profit-oriented companies, non-profit enterprises, as well as government agencies, used derivatives. However, derivatives here were defined to encompass not only the derivative contracts, as in most other studies, but also the derivative securities. Moreover, the derivatives were used not only for managing financial risks, but they were also used for obtaining funding, and for investment.

Factors associated with managing FX risk

Here, the empirical studies are reviewed to identify the factors that have been found to be associated with a company's increased likelihood of managing FX risk. This aspect is probably the most extensively researched empirical topic in the area of FERM. Although there are several empirical studies, the three studies of Nance et al. (1993), Berkman and Bradbury (1996) and Mian (1996) provide almost all of the key factors that have been postulated theoretically to affect a company's likelihood of managing FX risk. Therefore, Table 2.2 provides a brief overview of the three studies by indicating the various factors involved and their significance in influencing a company's likelihood of managing FX risk.[25] Notice the factors have been organised in descending order, in terms of the strength of the factor's effect on a company's likelihood of managing FX risk. These factor effects are described in that given order below.

Clearly the most significant factor appeared to be company size. As mentioned earlier, the effect was the most consistent and recurring in all the three studies. Geczy et al. (1997) also found that larger companies (those with greater economies-of-scale) were more likely to use currency derivatives. Moreover, findings in Dolde (1993), Batten et al. (1993), Bodnar et al. (1995), and Phillips (1995), too suggested that larger companies were more likely to manage FX risk. The theoretical considerations in terms of company size, as seen earlier, revolve around two competing contentions. Financial distress cost and tax hypotheses suggest that smaller companies face greater financial distress costs, and therefore, are more inclined to manage FX risk. The other, scale economies hypothesis, suggests that larger companies have greater ability to meet the

[25] Geczy, Minton, and Schrand (1997) too provide similarly useful factors. Although not shown in the table, the relevant findings are mentioned and discussed where these are relevant.

high transactional costs, and informational needs (knowledge and skills), in managing FX risk. Therefore, the empirical evidence on company size supports the argument of scale economies over that of financial distress costs.

Table 2.2: Factor effects on a company's likelihood of managing FX risk – in three selected studies

	Unconditional effect			Conditional effect			Factor Effect
Factors	Nanc	Berk	Mian	Nanc	Berk	Mian	
1. Company size	★	★	★	★	★	★	Robust
2. Dividend pay-out	★	★	★	★	★		
3. Tax shields	★		★	★		★	
4. Asset liquidity	★	★	★	?	★		
5. R&D expense	★			★			Singular
6. Regulated utility			★			★	
7. Debt maturity			★				
8. Interest cover	?	?		?	★		Weak
9. FX involvement		★			?		
10. Tax loss	★	★	☆	?	★	?	Mixed
11. Progressive tax	★		☆	★		?	
12. Leverage	?	★	☆	?	★		
13. Market-to-book	?	☆	?	?	?	?	Unexpected
14. Convertible debt	?	☆		?	?		
15. Asset growth cash flow			?	?			None
16. Director shares			?	?			

Key

Factor
- ★ -- significant
- ☆ -- significant, unexpected
- ? -- not significant
- blank cell -- factor not used

Study
- Nanc -- Nance et al. (1993)
- Berk -- Berkman & Bradbury (1996)
- Mian -- Mian (1996)

Following company size, the next most consistent factor appears to be the dividend pay-out policy. Companies that had higher dividend pay-out policies were more likely to manage FX risk.[26] Companies that pay out higher dividends are postulated to heighten agency problem within the company – due to the increased level of suspicion felt by bondholders of managers who may act in the interest of shareholders and against the interest of bondholders, by transferring wealth from bondholders to shareholders. On the other hand, higher dividend pay-out could also effect higher expected cost of

[26] However, the association between dividend pay-out and a company's inclination of managing FX risk was not independent of other factors in Mian (1996). In other words, the effects of other factors were not controlled for.

financial distress arising from the draining of internal funds. Thus, the findings support both these arguments – companies that pay out greater dividends are more inclined to manage FX risk, to reduce the agency problem and the expected financial distress cost.

The next most consistent factor appears to be tax shield – investment tax credit, in Nance et al. (1993), and foreign tax credit, in Mian (1996).[27] Generally, the results indicated that companies that had tax shields were more likely to manage FX risk. The theory behind, tax hypothesis, predicts that companies with tax shields will manage FX risk to reduce the companies' expected tax expenditure. A company may not be able to utilise its tax shield, or may have to postpone the utilisation of its tax shield, if the company's unhedged earnings fall below a certain level. Thus, if the tax shield is postponed, it becomes less valuable, but it becomes valueless if it cannot be utilised, e.g., say because it expires the following fiscal year. Therefore, by managing FX risk, the company reduces its earnings volatility, and consequently, reduces the possibility of not being able to utilise the tax shield currently, and in turn, reduce the company's expected tax expenditure.

Following tax shield, the next most consistent factor seemed to be asset liquidity. The evidence in Nance et al. (1993) was weak, i.e., only the unconditional effect was significant, but both the unconditional and conditional effects in Berkman and Bradbury (1996) were significant. The unconditional effect in Mian (1996) was also significant although conditional effect was not available. The study had used only t-tests and correlation statistics to uncover the unconditional association between asset liquidity and the likelihood of managing FX risk. The evidence, nonetheless, seems robust. Furthermore, Geczy et al. (1997) found that a company with tighter financial constraints, particularly, lower asset liquidity, was more likely to use currency derivatives. In other words, companies with higher asset liquidity appeared to be less inclined to hedge. The financial distress cost hypothesis explains that companies that have higher asset liquidity face less probability of financial distress, and therefore, are less in need of FERM.

[27] Berkman and Bradbury (1996) did not include this factor because tax shield is not available in New Zealand.

Next, some unique factors, investigated in only one of the studies but showed significant results, are examined. There were three such factors: ① research and development expenditure, ② regulated utility, and ③ debt maturity. Each of these is discussed next. Firstly, Nance et al. (1993) found that companies that had higher research and development expenditures were more inclined to hedge FX risk. Geczy et al. (1997) also found a similar finding. A company with greater growth opportunities (particularly, research and development expenses) was more likely to use currency derivatives. This is predicted by the theory of agency problem. Companies that have greater growth options, i.e., companies that spend more on research and development, provide greater latitude and discretion to the managers in making the investment decisions. Given the market imperfections, e.g., information asymmetry, this would heighten the agency problem and cost for the companies. Therefore, companies that manage FX risk could reduce their cash flow volatility, and therefore, reduce the conflict of interest between bondholders and shareholders – the agency problem.

Secondly, Mian (1996) found that regulated utility companies, compared to other companies, were less likely to hedge FX risk. This is also predicted by the theory of agency problem. Regulated utilities, generally have less growth options in their investment opportunity sets, and therefore, have less discretion in making their investment decisions. Thus, bondholders in such companies are less likely to be suspicious of the management and shareholders. Therefore, regulated utilities, compared to other companies, have less incentive to manage FX risk. From another perspective, the information asymmetry in regulated utilities is not as severe as in other companies simply because the companies are closely regulated by the government. Consequently, the agency problem in these companies is less severe. Again, this reinforces the contention that regulated utilities are less in need of managing FX risk.

Thirdly, Mian (1996) also found that companies that used greater long term debt were less inclined to hedge FX risk. This was only an unconditional effect because the effects of other factors had not been controlled for. Despite this, the discovered effect is rather interesting. Although Mian (1996) felt that the effect was unexpected, there appears to be a simple rationale. Companies that use greater long term debt, and by implication, use less short term debt, could be conceived to be under less financial distress due to the lower probability of default from using more long term debt. Therefore, these companies are less in need of managing FX risk. Nonetheless, Mian

(1996) provided an alternative explanation. He contended that companies that managed FX risk were more likely to have used borrowing facilities in other currencies (other than the US dollar). Since most of the borrowing facilities in other currencies are predominantly short-term in maturity, he suggested that these companies might have ended up using a large proportion of short term debt rather than long term debt.

Next, the factors that displayed only weak effects are discussed. These factors were included in more than one study, but were found to be significant in only one study. There were two such factors: ① interest coverage, and ② FX involvement. First, Berkman and Bradbury (1996) found that companies with greater interest coverage ratio used less derivatives. However, Nance et al. (1993) had not found similar evidence. Mian (1996), on the other hand, did not even use this specific factor. Nonetheless, the effect is intuitively appealing. Companies with higher interest coverage are generally considered to be under less financial distress, and therefore, are less in need of FERM. Second, Berkman and Bradbury (1996) found only weak evidence (unconditional effect) that suggested companies with greater assets overseas (FX involvement) had used more derivatives. Similarly, Abdel-Malek (1976) found that companies that had large FX involvement (proportion of exports and imports over total sales), were more likely to manage FX risk. More recently, Geczy et al. (1997) found that companies that had greater FX exposure were more likely to use currency derivatives. Generally, companies that have greater FX involvement are considered to face higher financial distress costs due to greater FX risk. Therefore, managing this risk could reduce this risk and reduce the companies' expected financial distress costs.

Next, factors that showed mixed effects are examined. These factors displayed different effects in different studies. There were three such factors: ① tax loss carry forward, ② progressive tax income, and ③ leverage. These are explained next. Companies that had tax loss carry forward appeared to have been more inclined to hedge FX risk in Nance et al. (1993), and Berkman and Bradbury (1996), although the effect was not significant when controlled for other factors in the former study. On the contrary, companies that had tax loss carry forward were less likely to hedge in Mian (1996). According to the tax hypothesis – as explained in relation to tax shields above – companies that have tax loss carry forwards are expected to be more inclined to manage FX risk to reduce the company's expected tax expenditure. However, unlike the case for tax shields (foreign or investment tax credits), the evidence for tax loss carry forward is mixed.

Companies that had significant chance (more than 5%) of having their incomes fall within the progressive tax bracket, were found to be more likely to hedge in Nance et al. (1993) but they were found to be less inclined to hedge in Mian (1996). The tax hypothesis predicts that companies that have incomes that fall within the progressive tax rate region of the tax schedule would be more inclined to manage FX risk to reduce the company's expected tax expenditure. This reduction in the expected tax expenditure can be attained by reducing the probability of a company's income increasing above a certain level – where the company will be subjected to a higher tax rate. Notice that this is slightly different from the prescription of the tax hypothesis for tax shields, including tax loss carry forwards. Nonetheless, the empirical evidence is, again, mixed.

Companies that used greater leverage were found to have used more derivatives in Berkman and Bradbury (1996), but were found less likely to hedge in Mian (1996). Leverage did not appear to have any impact in Nance et al. (1993). Generally, it is accepted that companies that use greater leverage are under greater financial distress, and as a consequence, they face greater agency problem. Therefore, both the hypothesis of financial distress cost and the theory of agency problem predict that companies that use greater leverage are more likely to manage FX risk. Nonetheless, Dolde (1993), and Nance et al. (1993) admitted that proving this substitution effect of leverage – higher leverage, higher likelihood of hedging – is difficult because the effect is confounded by the proxying effect of leverage. For instance, companies that have higher business risk, or higher growth options, are more likely to, simultaneously, use less leverage and also manage FX risk. In this instance, without controlling for the growth options and business risk of a company, the leverage may seem to be negatively related to the likelihood of managing FX risk.

Some other factors provided weak but unexpected effects. These factors were used in more than one study but only displayed unexpected and yet only unconditional (weak) effects. Two such factors were identified from the studies. These are: ① market-to-book value of assets, and ② convertible debt and preferred stock. They are briefly explored next. In Berkman and Bradbury (1996), companies that had greater market-to-book value of assets used less derivatives. Generally, market-to-book value of assets is used as a proxy of the growth options encountered by a company. The higher the market-to-book value, the higher the growth options of a company it is assumed. The agency problem theory asserts that companies that have greater growth options would

face greater agency problem and costs. Therefore, these companies are predicted to be more likely to undertake FERM to reduce the cash flow volatility, and in turn, reduce the companies' agency problem. However, the empirical evidence was contrary to this prediction, although the evidence was weak.

Companies that used greater convertible debt and preferred stock appeared to use more derivatives, in Berkman and Bradbury (1996). Greater use of convertible debt, and preferred stock, are expected to reduce the agency problem in a company by reducing the polarisation and conflict of interest between bondholders and shareholders. Thus, the agency problem theory predicts that companies that use more convertible debt and preferred stock would be more inclined to manage FX risk. However, the weak empirical evidence did not support the above prediction.

Finally, the discussion turns to the factors that simply did not appear significant. There were two such factors, ① asset growth cash flow, and ② shares held by directors, both used in Berkman and Bradbury (1996). First, Froot et al. (1994) argued that the goal of financial (or FX) risk management is essentially to ensure that there was adequate internally generated cash flows to fund the company's investment opportunities. Berkman and Bradbury (1996), therefore, contended that companies that generate greater internal cash flow for asset growth ought to be less inclined to manage FX risk. However, the empirical evidence was unavailable to support this contention. Second, often managers' personal pay-off and wealth risk cannot be diversified away, and is dependent upon the companies' cash flow volatility. Thus, the theory of risk diversification implies that managers would be more likely to undertake managing FX risk if that reduces their personal undiversifiable risk. More precisely, companies with larger proportions of shares held by the managers (or directors, as in this case of Berkman and Bradbury, 1996) are expected to be less likely to undertake FERM. However, there was no empirical evidence to support this.

Above, the various factors that had been examined in previous empirical studies, in relation to a company's likelihood of managing FX risk, was reviewed. As mentioned earlier, this is one of the most thoroughly researched aspects of the empirical

investigations into FERM. There were 16 factors examined, but generally only four appear robust whereas another three appear promising.[28]

2.2.2. FX exposure type

In the previous section, the managing of FX risk was reviewed. This section, however, the managing of different types of FX exposure is reviewed. By definition, a company that manages any one type of FX exposure also manages FX risk. Previous empirical studies on FERM are reviewed to collate information on the types of exposure that the companies managed.

Generally, it is accepted that there are three types of FX exposure – transaction, accounting, and economic, exposures. However, it must be noted that the earlier studies did not include the topic of economic exposure because the concept was coined only fairly recently. For example, one of the earliest empirical studies that investigated about companies managing economic exposure was Belk and Glaum (1990).

Mathur (1982) and Soenan (1986) identified that most companies, in US and UK, respectively, attempted to minimise, i.e., manage, both transaction and translation (or accounting) exposures but the findings indicated that, comparatively, more companies managed transaction exposure. In addition, Soenan (1986) identified that there was a shift from managing translation, to managing transaction, exposure, among the UK companies. Collier et al. (1992) found, among UK companies that managed transaction risk (or exposure), a quarter of them did not manage translation risk.

Belk and Glaum (1990) pronounced transaction exposure as the "centrepiece" in most of the 17 UK companies involved in their case study. Based on the limited evidence from the their small case study, they indicated that the most managed types of FX exposure, in descending order, were transaction, accounting and economic exposures. Batten et al. (1993) found that about 61% of the large Australian companies in the study managed only transaction exposure. Moreover, if the proportion of companies that managed transaction exposure together with other exposures was considered, transaction exposure clearly appeared to be the most managed exposure.

[28] The findings of Marshall (2000) indicated that the industrial sector was also an important factor because companies in the service industry placed less importance on FERM. This, in turn, is probably because the industry is less dependent on overseas business and face less overseas competition.

Bodnar et al. (1995) too provided evidence that indicated transaction exposure was the most managed FX exposure using derivatives. This study also identified several other types of exposure. In particular, transaction exposure was broken down into exposures arising from firm commitment transactions,[29] transactions anticipated within a year, and transactions anticipated beyond a year. Consequently, exposures arising from transactions of firm commitment and those anticipated within a year appeared to be the most managed (transaction) exposures, in particular. Balance sheet exposure (or accounting exposure) and competitive exposure (or economic exposure) were among the least managed exposures using derivatives. Rawls and Smithson (1993), in the review of two empirical studies regarding the management of FX risk, also identified transaction exposure as the most managed. Further, the study also noted that exposures from transactions of firm commitment, and those anticipated within a year, and also beyond a year, were the most managed. Nonetheless, the study also found a significant proportion (15%) of companies that managed translation (or accounting) and competitive (or economic) exposures, respectively. Similarly, the findings from Marshall (2000) and Joseph (2000) also indicated that transaction exposure was the most managed, followed by accounting exposure, and finally, economic exposure.

In short, the findings above highlight two key points. ① Transaction exposure is the most managed FX risk exposure, followed by, accounting exposure, and finally, economic exposure. ② The exposures from firm commitment transactions, followed by those from transactions within a year, and beyond a year, in that descending order, are the most managed transaction exposures.

Belk and Glaum (1990) recorded that about three-quarters of the 17 UK companies in their case study had managed accounting exposure. The study, notably, pointed out that accounting exposure management was influenced by the company's expectation on future exchange rate movement. However, they recorded that only slightly more than half of the small number of companies in their case study managed economic exposure. They pointed out that the economic exposure management in most companies was more like an extension of transaction exposure management because it mainly depended on managing expected future cash flows in foreign currencies. The study also noted that economic exposure management in most companies was influenced by perceived

[29] These are normally transactions denominated in foreign currencies that have been booked into the accounts of the company, i.e., for which invoices have been sent or received.

competitor action. Notwithstanding the findings in their study, Belk and Glaum (1990) claimed that economic exposure was the most important and crucial exposure that companies ought to manage.[30]

2.2.3. FERM objective

This third section reviews the objective adopted by the companies in managing FX. Rawls and Smithson (1993) concluded, from the review of two empirical studies on FERM, that formal statements of objective in FERM were rare among companies. This appears to be congruent with the findings of several other earlier studies. Abdel-Malek (1976) identified that the FERM objectives adopted by Canadian companies were too "broad and simplistic." Mathur (1982), and Soenan (1986) found that a significant number of, respectively, US and UK, companies did not have formal objectives in managing FX risk. Generally, the studies appeared to indicate that a significant number of companies did not have very formal objectives for the management of FX risk.

Rawls and Smithson (1993) pointed out that about a quarter of companies, from the two studies they reviewed, had sought competitive advantage with FERM while the rest sought only to minimise risk. Bodnar et al. (1995) contended that very few companies had used derivatives for speculative purposes. In a related study, Grant and Marshall (1997) found that large UK companies that used derivatives used them to reduce risk (mainly interest rate and FX risk). Only a minority intended to "enhance yield", i.e., were interested in FX gains occasionally and to a limited extent. Only a very few speculated using derivatives. In a more recent study, Marshall (2000) found that a vast majority of multinational companies (in the US, UK, and Asia-Pacific) had adopted objectives to minimise earnings and cash flow fluctuations. Very few had indicated intention to benefit from FX gains. Therefore, based upon these observations, it could be concluded that, in most companies, FERM objectives were geared towards risk

[30] Previous empirical studies did not particularly uncover factors that influenced the type of FX exposure managed by companies. Nonetheless, Collier et al. (1990) implied that UK companies, compared to US companies, appeared more inclined to manage translation exposure. However, this effect was not fully explained by the study. Further, because of the small number of cases involved, this effect might be unreliable. However, Marshall (2000) found that larger companies placed less importance on accounting exposure. He also found that companies in the service industry placed less importance on economic exposure, whereas those in consolidated/other industries placed greater importance on that exposure.

minimisation. However, as will be described in a later portion about FERM policies and procedures, many companies had adopted more conservative or aggressive approaches, to varying degrees, in attempting to achieve their FERM objectives.

To summarise, the discussions above could be divided into two broad themes. First, the formality of the FERM objectives, examined whether or not the adopted objective for FERM was formal. Second, the type or nature of the objectives, examined the content of the FERM objectives. This could be based on two different dimensions: ① the extent to which the objective was oriented towards minimising FX risk, and ② the extent to which the objective was oriented towards maximising FX gains.

Factors associated with FERM objective

Here the factors that were identified as having been associated with the FERM objective adopted by companies, are reviewed. However, the studies revealed only factors that appeared to be associated with a company's likelihood of adopting a formal (or written) FERM objective. There were no factors associated with the type of FERM objective adopted by the company, in terms of the objective's orientation towards FX gains maximisation. For example, the studies did not reveal any factor that seemed to influence a company's inclination towards FX gains maximisation, in its FERM objective.

Mathur (1982) found companies that were larger, and those that had greater FX involvement (proportion of foreign sales), were more likely to have adopted formal objectives for the management of FX risk. The study, however, did not provide any rationale for this observation. Perhaps, larger companies are better able to absorb the costs involved in instituting a sophisticated and systematic programme of FERM, including adopting formal objectives. Companies with greater FX involvement, on the other hand, are likely to be more exposed to FX risk, and therefore, are probably more likely to adopt formal objectives as part of a systematic attempt to reduce this risk.

In short, the discussions above centred around two major themes. The first examined the incidence of adopting formal FX risk objectives among companies, whereas the second examined the type and nature of FERM objectives adopted by the companies. Two factors, company size and FX involvement, were found to be associated with the companies' likelihood of adopting formal FERM objectives. However, previous studies

failed to identify factors that were associated with the companies' inclination to adopt objectives of specific nature or type.

2.2.4. FERM responsibility

This section reviews the responsibility of managing FERM among companies. Abdel-Malek (1976) observed that treasurers mainly made the decisions in FERM in companies, with little or no participation from top management, although formally, the treasurer's proposed decisions required top management approval. Similarly, Collier and Davis (1985) observed that in most of the UK companies, in their study, treasurers, and not finance directors, were responsible for FERM. Soenan (1986), however, found that the responsibility for policy on FERM rested mainly with the vice-presidents of finance (or finance directors), while the operational responsibility mainly rested with the treasurers.

Dolde (1993), on the other hand, noted that the responsibility for FERM was performed mostly on a part-time basis, in most companies. In fact, the study recorded that about two thirds of companies had no professional exclusively responsible for FERM. In other words, the persons responsible for FERM were also often responsible for other tasks or functions.

Previous empirical studies also investigated the issue of cost-profit accountability of FERM activities in companies. More precisely, about this issue, these studies noted whether or not a company's treasury operations, particularly its FERM operations, were run based on a profit-centre (or cost-centre) concept. This issue may be considered as an extension of the FERM responsibility of a company because it is about how the responsibility for FERM in a company is organised and accounted for. Belk and Glaum (1990) identified that more than half of the 17 companies, that participated in their case study, had organised their treasury departments as cost-centres. Apart from these, a significant number of companies expected their treasury departments to contribute some profit although they were not formally profit-oriented. Only a few companies' treasury departments operated as profit centres. Very few companies in the two studies reviewed by Rawls and Smithson (1993) had run their treasury departments as profit-centres. This implies that FERM in most companies was not profit-motivated.

In short, the above discussions revolved around five specific aspects related to the issue of FERM responsibility in a company. Firstly, the level of top management involvement in FERM responsibility was reviewed. Secondly, the hierarchical level at which the responsibility for FERM mainly lay in a company was examined. More specifically, it investigated whether the treasurer or the finance director of a company was responsible for the bulk of the FERM activities in the company. Thirdly, the nature of the FERM tasks performed by the persons responsible in a company, either on a part-time or full-time capacity, was looked at. Fourthly, the number of persons responsible for FERM in a company was also examined. Finally, the cost-profit accountability of FERM operations of a company was in investigated. More precisely, it recorded whether or not the FERM operations of a company were organised based upon the tenets of a profit-centre.

Factors associated with FERM responsibility

Here, factors found associated with one particular aspect related to the responsibility of managing FX risk, in a company, are reviewed. Specifically, it highlights the factors that have been found to influence a company's hierarchical level at which FERM responsibility is mainly placed. However, the studies failed to establish factors that influence other aspects related to the responsibility of FERM activity in a company.

Collier and Davis (1985) found that companies that had high levels of risk, compared to those with low risk, were more likely to place responsibility for FERM with the finance director rather than the treasurer. This implies that the greater the FX risk faced by a company, the responsibility for FERM should rest with the person or persons with higher authority, and therefore, higher up in the company structure or hierarchy.

The study also discovered that companies that "closed-out" exposures, compared to those that "actively managed" the exposures, were more inclined to place the responsibility for FERM with the finance director, rather than the treasurer. This, in turn, implies that companies that undertake partial covers, i.e., those that adopt more aggressive approaches to FERM, are more likely to entrust their treasurers, rather than their finance directors, with the responsibility for FERM. When partial covers are undertaken, the activities of FERM probably require greater, or special, knowledge and skills that are most likely to be the domain of the treasurer rather than the finance director. This is because the treasurer is more likely to be more competent in actively

dealing with FX risk on a day-to-day basis, and perhaps is better able to continuously scan and assess the market, in search of FX gains or to avoid excessive FX losses.

Therefore, two factors were identified to be associated with the hierarchical which the primary responsibilities for FERM are placed. In essence, a company that ① faces a high level of risk, and ② undertakes full cover, i.e., adopts a more conservative approach to FERM, is more likely to place the responsibility for FERM with the persons who have greater authority, and are higher up in the companies' hierarchical structure. In other words, the responsibility for FERM in such a company is placed with the finance director rather than the treasurer. On the contrary, companies that have lower levels of risk, and those that adopt more aggressive approaches to FERM, are more likely to entrust the responsibility for FERM to the persons with greater competence and opportunity (or skill, rather than authority) to oversee the day-to-day operations of FERM.

2.2.5. FERM centralisation

This section reviews the issue of centralisation of FERM. In particular, it examines the degree of centralisation adopted by companies in managing FX risk. Mathur (1982) found that the US companies that participated in his study were mostly centralised in managing FX risk. Collier and Davis (1985) observed that more than half of the UK companies in their study had centralised the management of FX risk. Similarly, in Belk and Glaum (1990), more than half of the 17 companies in the case study, were centralised. Dolde (1993) identified that a great majority of the companies that participated in the study had centralised at least some aspects of FERM within the company. Soenan (1986) also found consistent findings, but in addition, observed that many UK companies were partially centralised, i.e., at regional or subsidiary level. Soenan (1986) also claimed that there was a trend detected towards greater centralisation. Bodnar et al. (1995) found that FERM were centralised in all, except for 15%, of companies where the execution (or implementation) aspect was decentralised.

Factors associated with FERM centralisation

Factors identified as being associated with the degree of centralisation practised by companies in managing FX risk are examined next. Figure 2.6 depicts the factors

discussed in greater depth below. Abdel-Malek (1976), Collier and Davis (1985), and Belk and Glaum (1990) identified that overseas subsidiaries of a company, compared to domestic subsidiaries of the same company, were less likely to have been centralised, or were more autonomous, in managing their FX risk. All these studies pointed out that overseas subsidiaries were generally more autonomous in managing FX risk, compared to domestic subsidiaries of the same company. Collier and Davis (1985) explained that overseas subsidiaries were less centralised because of tax and exchange control differences.

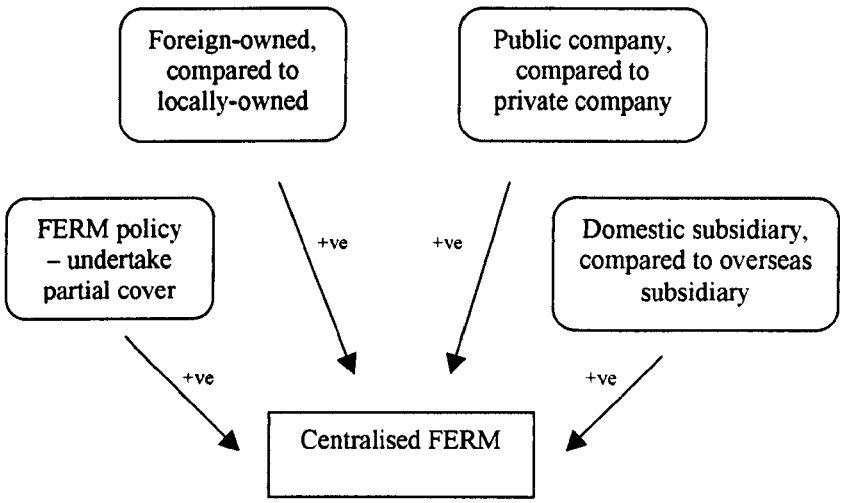


Figure 2.6: Factors associated with a company's degree of centralisation of FERM

Batten et al. (1993) found that foreign-owned companies, compared to Australian-owned (local) companies, were more inclined to centralise dealings in FX risk. The study also found public companies, compared to private companies, were more likely to have centralised FERM. The implications are that ① foreign-owned companies, compared to locally-owned companies, and ② public companies, compared to private companies, tend to centralise FERM to a greater degree. However, the study did not provide any explanation to justify the observed effects.

Collier and Davis (1985) found that companies that "closed-out" exposures, were more inclined to decentralise their management of FX risk, compared to companies that "actively managed" exposures. This implies that companies that undertake only full cover, i.e., those that adopt more conservative approaches to FERM, are likely to adopt less centralised control structures to allow at least the implementation of this policy, to be executed by the subsidiaries. On the other hand, companies that undertake partial covers, i.e., those that adopt more aggressive approaches to FERM, are likely to adopt

more centralised management to co-ordinate and manage company-wide exposures. In other words, companies that adopt more aggressive stances in FERM are likely to centralise FERM activity to control and avoid the potential burgeoning of risk that would otherwise have been the case with decentralisation.

As seen above, four factors were identified to be associated with the degree of centralisation used by the companies in managing FX risk. First, a company is more likely to centralise the management of exposures arising from its domestic subsidiaries, compared to its overseas subsidiaries. Second, a company is more likely to centralise its FERM if it is a public company, rather than a private company. Third, a company is more likely to centralise its FERM if it is a foreign-owned company, rather than a locally-owned company. Finally, a company is more likely to centralise if it undertakes partial covers, rather than undertaking full covers, of exposures.

2.2.6. FERM policies and procedures

This section reviews the findings concerning the policies and procedures adopted by companies in managing FX risk. More precisely, it reviews five separate aspects of policies and procedures related to FERM. In particular, ① the incidence of managing only significant exposures, rather than all exposures, ② the undertaking of partial cover rather than full cover, ③ the overall system or programme of FERM, ④ the forecast procedures used in FERM, and finally, ⑤ the computer technology used, in managing FX risk, are reviewed.

Mathur (1976) identified that some companies managed FX risk based on a "threshold level." This means that an exposure within a specified level is assumed, i.e., not hedged, but an exposure beyond this limit would be hedged. This implies that these companies were generally risk minimisers but were willing to assume some levels of FX risk. In other words, these companies managed only significant exposures, and this implies that they were more aggressive (compared to companies that hedged all exposures) because they were willing to accept some levels of uncovered exposure.

Soenan (1986) identified that most companies hedged FX risk selectively. This indicates that these companies exercise some levels of discretion in hedging decisions, and appear more willing to take on risks in search of gains from FX, and therefore, can

be considered to be more aggressive in their approach to FERM. In Collier and Davis (1985), about half of the UK companies "closed-out," whereas the other half "actively managed," FX (or rather transaction) risks. Likewise, Belk and Glaum (1990), in a case study based upon 17 UK companies, found some companies undertook partial hedge (or cover) while some undertook full cover, and among companies that adopted partial hedge, some companies were more aggressive in trading in FX than others. Parallel findings were forthcoming from Batten et al. (1993). About 70% of large Australian companies that hedged FX risk, hedged FX exposures partially, whereas the others hedged fully. The findings further indicated that about half of those that hedged partially, traded moderately in FX, while the other half traded actively. Clearly, companies that hedge fully or "close-out," are risk minimisers by intent, and can be considered to be conservative in their approach. Companies that partially hedge, and moderately trade in FX could be conceived as risk minimisers but with greater threshold for risk, or alternatively as risk minimisers with some penchant for FX gains. Finally, companies that partially hedge but trade in FX actively, or aggressively, are more akin to FX gains maximisers. To summarise, less than half the companies that managed FX risk, fully hedged all their exposures, whereas the others partially hedged their exposures, although only a small proportion appeared to be aggressively trading in FX.

Abdel-Malek (1976) observed that the planning and control procedures, of Canadian companies that managed FX risk just after the Canadian dollar was allowed to float, were not systematic. He noted that the policies and strategies employed in FERM were reactive and influenced by happenings in the market. He added that these were not critically thought and mission-led. However, he claimed that the companies had put in greater effort and had attained greater sophistication in managing FX risk, over a period of 18 months, after the floating of the Canadian dollar. Dolde (1993), in a more recent study, on the other hand, concluded that FX risk in companies was typically managed on a "piecemeal" basis and was not well-integrated into the companies' financial and strategic planning. However, he predicted that, in the future, the management of FX risk would be more integrated and strategic. An even more recent study, Bodnar et al. (1995), reported that less than half of the companies had regular reporting cycles for the activity of FERM. Most companies appeared to be reporting, to their top management, the companies' FX risk situation roughly only every quarter. All these findings indicate that, typically, FERM is not very sophisticated and well-integrated into the planning

processes of companies. Generally, this indicates that FERM does not involve all functions, levels, or units of a company – it remains the exclusive domain of a particular department, or specific persons within a company.

Mathur (1982) noted that a significant portion of the US companies in his study had used subjective means to forecast exposures and exchange rates. Soenan (1986) recorded that the UK companies' forecast on cash outflow was more accurate than on cash inflow. The study also noted that all companies forecast exchange rates less than a year forward. In other words, no company attempted forecast of exchange rates beyond a year.

Dolde (1993) observed that most companies had used stand-alone personal computers (PCs), and only few companies had used mainframe computers, for FERM. Interestingly, however, a significant minority of companies that managed FX risk did not use any computer. The study also noted that most companies used both standard (purchased) and custom (written) software for the purposes of FERM. Again, however, a considerable minority did not use any computer software in managing FX risk. Bodnar et al. (1995) recorded that most companies used standard spreadsheets and custom software in aiding FERM activity.

Factors associated with FERM policies and procedures

Here, factors identified, by previous empirical studies, to be associated with FERM policies and procedures adopted by companies are reviewed. However, factors for only three aspects related to a company's FERM policies and procedures were available from previous studies. More precisely, factors that appeared to influence the companies' ① likelihood of undertaking partial covers, ② proportion of exposure covered, and ③ likelihood of using computer technology in FERM, had been identified. These are reviewed below.

Soenan (1986) found that industrial companies, compared to trading companies, were more likely to fully hedge transaction exposure. This implies that industrial companies, compared to trading companies, were more likely to be conservative in managing transaction exposure.[31] Soenan (1986) did not provide any rationale for this

[31] However, this effect was reversed for accounting exposure – trading companies were more likely to fully hedge compared to industrial companies.

observation. Nonetheless, it could be because industrial companies typically face greater risks compared to trading companies. Normally, trading companies have greater diversification in the products that they trade, and greater bases of suppliers and customers, compared to industrial companies. Therefore, it is possible that the industry sector to which a company belonged was actually a proxy for the level of risk encountered by the company. Given this, it implies that a company is more likely to undertake partial cover in managing transaction exposure if it encounters less risk.

Collier and Davis (1985) found that companies that faced high levels of risk were more likely to "close-out" transaction exposure, compared to companies that faced low levels of risk. In essence, companies were more risk-averse, and therefore, fully covered their exposures, when the risk was high. However, they were less risk-averse, and they "actively managed" or partially covered their exposures, when the risk was low. This result seems to show that a company's risk attitude is not constant, and is affected by the level of risk faced by the company. Further, this implies that a company that faces low volume of transaction exposure tends to be more aggressive in their FERM and is more likely to undertake partial cover. Whereas, a company that faces high volume of transaction exposure tends to be more conservative, and is more likely to undertake full cover. In other words, a company is more likely to undertake partial cover if it faces lower (transaction) risk. This appears to agree with the findings of Soenan (1986) described above.

On the other hand, Collier et al. (1990) noted that among companies that managed accounting exposure, companies that had high levels of translation risk appeared more inclined to "actively manage" accounting exposure, compared to companies that had low levels of translation risk.[32] This was contrary to the effect observed above for transaction exposure. Although the number of cases involved in the study is very small, the findings nonetheless appear to be parallel with the findings of Soenan (1986). The findings imply that companies are more likely to undertake partial cover of their accounting exposures, when the level of (translation) risk is higher. Collier et al. (1990) also provided further case study evidence, based upon 23 UK and US companies, to

[32] It must be noted that the level of translation risk did not appear to have any effect on a company's decision to manage accounting exposure – it only appeared to have an effect on the company's likelihood of undertaking partial cover of its accounting exposure.

support the findings above.[33]

Briefly, the findings above indicate that, for managing transaction exposure, a company is more likely to undertake partial cover if it has a lower level of risk. On the other hand, a company is more likely to undertake partial cover of its accounting exposure if it has a higher level of translation risk. These two results seem to imply that when the risk is higher, a company is more conservative, and therefore, is less likely to undertake partial cover of its transaction exposure. Indirectly, this implies that when the risk is higher, there is greater concern about transaction exposure. On the contrary, the results on accounting exposure might suggest that when the translation risk is higher, there is also greater concern about accounting exposure but the concern only amounts to the companies undertaking partial covers of accounting exposure. In other words, this probably indicates that companies typically have greater concern for, and more averse of, transaction exposure than accounting exposure. Thus, when transaction risk is higher, there is an increased concern to fully cover transaction exposure. However, when translation risk is higher, there is an increased concern for (only) partially covering accounting exposure.

Dolde (1993) found that smaller companies hedged greater proportions of their exposures. An increase in company size, as seen earlier, increased the company's likelihood of managing FX risk. However, Dolde (1993) argued that the increase in size also simultaneously decreased the company's need to fully hedge its exposures – due to reduced financial distress and increased ability to assume financial distress costs. This effect was especially significant among companies that had "views" on the future movement of the exchange rates. Therefore, larger companies, especially those that had expectations (views) on the movement of exchange rates, hedged less proportion of their exposures, and therefore, were less conservative in their approach to FERM. This lends credence to the financial distress costs hypothesis that predicts smaller companies

[33] However, in addition, Collier et al. (1990) observed that US companies, compared to UK companies, were more likely to "close-out" transaction exposures. This implies that UK companies were more likely to undertake partial cover of transaction exposures, and therefore, were more likely to be aggressive in managing transaction exposure. Further, Collier et al. (1990) also found UK companies, compared to US companies, were more likely to "actively manage" accounting exposure. In fact, UK companies appeared more likely to both manage and "actively manage" accounting exposure. Later findings in Collier et al. (1992) also corroborated these results. These findings indicate that UK companies are more likely to manage accounting exposure, and to adopt more aggressive approaches in managing the accounting exposure. However, the studies stopped short of presenting any justification for this observation. Moreover, the number of companies involved in the studies was small. In short, these characteristics cast doubt over the reliability of these results.

are more likely to hedge – although in this case smaller companies, were actually found to hedge greater proportions of their exposures, and therefore, were more conservative in their FERM.

Above, the factors that appeared to influence ① a company's likelihood of undertaking partial cover, and ② the proportion of exposure covered by a company, were reviewed. Briefly, the findings indicate that, a company is more likely to undertake partial cover (of its transaction exposure) if it has a lower level of risk. A company covers a greater proportion of its exposure if the company ① is smaller, and ② has no view or expectations on the future movement of exchange rates. On a broader perspective, all the above findings, taken together, seem to suggest that a company would cover a greater proportion of its (transaction) exposure if the company ① is smaller, ② has less knowledge and confidence on the future exchange rate movements, and ③ faces greater risk. Figure 2.7 presents these factors in a diagram.

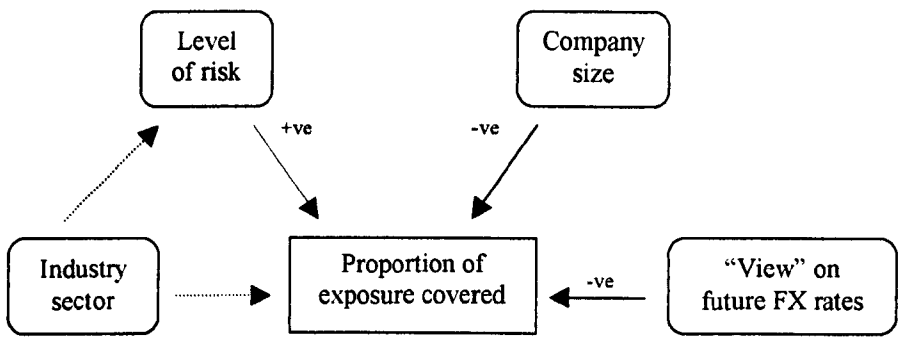


Figure 2.7: Factors associated with the proportion of exposure covered by a company

Batten et al. (1993) found that companies with high levels of FX involvement, compared to those with low involvement, were more inclined to use computer technology (hardware and software) for assisting in the activities of FERM. Bodnar et al. (1995), on the other hand, found that larger companies were more likely to use computer software (both standard and custom) to price derivatives. These findings together suggest that larger companies, and companies that have greater FX involvement, are more likely to use computer technology in managing FX risk.

2.2.7. FERM techniques

This section reviews the findings regarding the final key component, the techniques used by companies to manage FX risk. Mathur (1982) claimed that the US companies, in his study, used internal and external hedging techniques extensively in managing FX risk. He also recorded that companies also used forward contracts. However, other financial instruments for managing FX risk appeared not widely used then. Soenan (1986) noted that UK companies had used, in descending order, forward contracts, international money markets, and leading and lagging techniques, to manage FX risk.

A later study, Glaum and Belk (1992), found that forward contracts were the most used tools in managing FX risk among the 17 UK companies that participated in the case study. They also noted that most companies had used currency options but the usage volume was low. They found that about half of the companies had used swaps but none had used them particularly or exclusively for hedging purposes. Significantly, none of the 17 companies had used currency futures. However, from the two larger-sample empirical studies reviewed by Rawls and Smithson (1993), it can be concluded that forward contracts, followed by swaps, options, and futures, in that declining order, were the most used instruments.

Batten et al. (1993) found that almost half of the Australian companies, in the study, used both "physical", e.g., forward and spot contracts, and "synthetic", e.g., options and swaps, products. However, slightly less than half of the companies used only "physical" products, while very few companies used only "synthetic" products. The study also indicated that forward contracts were the most used instruments, while options, and then, swaps, were the most used "synthetic" products. Bodnar et al. (1995) indicated that forward contracts were the most used for managing FX risk, followed by over-the-counter (OTC) options, and swaps. Phillips (1995) implied that derivative contracts, rather than derivative securities, were used for FERM. He also implied that OTC contracts were more used. More precisely, his study showed that forward contracts (a subset of OTC derivative contracts) were the most used technique for FERM. In contrast, Grant and Marshall (1997) indicated that among the derivatives used by large UK companies, swaps, forwards and futures were the most used, followed by options. However, this also includes derivatives, particularly swaps, that are broadly used to manage interest rate risk. Interestingly, they found that the standard derivatives

(forwards and plain options) are more popular that specialised (sophisticated) derivatives because standard derivatives have greater liquidity, compared to specialised ones. Joseph (2000), on the other hand, found that UK industrial companies in his study used only a few specific techniques to hedge exposures, and the companies appeared to use currency derivatives more than internal hedging techniques.

It must be noted that, generally, previous studies have primarily focused on the techniques used to manage FX risk, or more precisely, only transaction exposure, but not accounting or economic exposures. Nonetheless, Belk and Glaum (1990) recorded that the three-quarters of the 17 UK companies in their case study that managed accounting exposure, managed the exposure mainly by adjusting local currency borrowing to match the exposure in the currencies. They also noted that most of the companies that managed economic exposure (slightly more than half of the small number of companies in their case study) had used mainly financial instruments, and not operating or strategic changes as espoused by the literature. More recently, Marshall (2000) investigated the FERM techniques that were used to manage each of the three FX exposure types. For managing transaction exposure, he found that forward contracts were the most used technique. Among external techniques, swaps and then options were the next most used. On the other hand, netting, matching, and pricing policies (in that descending order) were the most used internal techniques. For managing translation (accounting) exposure, most companies used balance sheet hedging, followed by netting and matching. Notably, more than half the companies that managed accounting exposure did not use any external hedging technique to manage the exposure, although those who did, relied upon forward contracts, options and swaps. For managing economic exposure, changing pricing strategy was the most used, and notably, different companies had adopted different methods to manage this exposure because the nature and extent of economic exposure vary from one company to another.

To summarise, the findings above indicate that the forward contract is the most used technique to manage FX risk. This is followed by OTC options and swaps. Currency futures do not appear very popular. However, the findings indicate that non-derivative internal and external hedging techniques are used only to a limited extent.

Factors associated with FERM techniques

Some factors that had been identified as being associated with the FERM techniques used by companies in managing FX risk, are reviewed next. Bodnar et al. (1995) indicated that larger companies were more likely to use OTC products (as opposed to exchange-traded products). The study did not offer any explanation for this observation. Nonetheless, this effect probably reflects the fact that larger companies are better able to obtain more favourable quotations for OTC products. However, this does not necessarily mean that larger companies will use more OTC products, i.e., in higher frequency or more extensively. This effect simply implies that, among the larger companies, the proportion that used OTC products was greater. Thus, this effect is regarding the use, and not degree of usage, of the hedging technique. The effects concerned with the latter are examined in the paragraphs below. However, since forward contracts have been found to be the most popular OTC products used for managing FX risk, this results can be interpreted to mean that the larger a company, the greater is its likelihood of using forward contracts (OTC products).

Mathur (1982) found that companies that were larger, and those that had greater FX involvement, had used more internal hedging techniques. On the contrary, however, companies that had greater FX involvement had used less external hedging techniques, as well as forward contracts. These findings suggest that forward contracts, external, and internal hedging techniques are substitutes. Moreover, the findings also suggest that companies that have greater FX involvement are better able to use internal hedging techniques, and therefore, are less dependent on external techniques and forward contracts.

Batten et al. (1993) found that public companies, compared to private companies, in Australia, used less "physical" products. Although the study did not provide an explanation, this may suggest that public companies probably have greater, and more favourable, access to other techniques, and therefore, used less financial instruments to hedge. From another perspective, public companies probably have shareholders who are more diversified. These companies then may afford to assume a greater portion of their FX exposures uncovered. Therefore, they may have used less overall hedging, and consequently, used less financial instruments. However, since forward contracts were the most used "physical" products in the study, the result could be interpreted to mean

that, comparatively, public companies used less forward contracts.

Mathur (1982) reported that companies that managed transaction exposure appeared to use more forward contracts. However, this possibly reflects simply that forward contracts are the most used tools for managing transaction exposure. Mathur (1982) also found that companies that centralised the management of FX risk appeared to use forward contracts more. However, the study did not provide any justification for the above findings. Possibly, companies that centralise FERM are able to pool and co-ordinate company-wide exposures, and consequently, they are better able to hedge these exposures using forward contracts.[34] In other words, under decentralisation – more sparse, and widely spread, exposures – the opportunity to use forward contracts is possibly lower. Moreover, the terms of forward contracts are often better for the company when the parent, rather than the subsidiary, undertakes the deal.

Batten et al. (1993) also noted that companies that have high FX involvement, compared to those with low FX involvement, appeared to use more foreign funding facilities. Again, the study did not provide an explanation for this. However, this may simply reflect that companies that have high FX involvement were in greater need of, and were better able to obtain, foreign funding facilities to manage FX risk. Besides this, the study also found that foreign-owned companies, compared to local companies, appeared to use less foreign funding facilities. Foreign-owned companies, or subsidiaries, are often extended loans by their parent companies, directly or by guarantee, and therefore, these companies are possibly less in need of separate foreign funding facilities.

Above, the factors associated with four aspects related to the strategies and techniques used to manage FX risk were reviewed. The four aspects are ① the likelihood of using forward contracts, ② the degree of usage of forward contracts, ③ the degree of usage of internal hedging techniques, and finally, ④ the degree of usage of foreign funding facilities. The findings indicate that a company is more likely to use forward contracts when it is larger. However, a company uses more forward contracts when it ① has lower FX involvement, ② is a private, rather than a public, company, ③ manages, rather than does not manage, transaction exposure, and ④ practises greater centralisation of

[34] Moreover, pooling of exposures enables better exposure netting possibility. Therefore, the proportion of net exposure hedged using forward contracts could increase partly due to this.

FERM. Figure 2.8 portrays these factors in a diagram. These indicate that companies that have higher FX involvement, and public companies, use forward contracts less extensively, i.e., they are less dependent on the use of forward contracts. On the other hand, companies that have more centralised FERM appear able to use forward contracts more extensively. The result also shows that companies that manage transaction exposure use more forward contracts. On the contrary, a company uses more internal hedging techniques when it ① is larger, and ② has higher FX involvement. This means companies that are larger, and those that have greater FX involvement, use internal hedging techniques more extensively. Finally, a company uses more foreign funding facilities when it ① has higher FX involvement, and ② is locally-owned, rather than foreign-owned.[35]

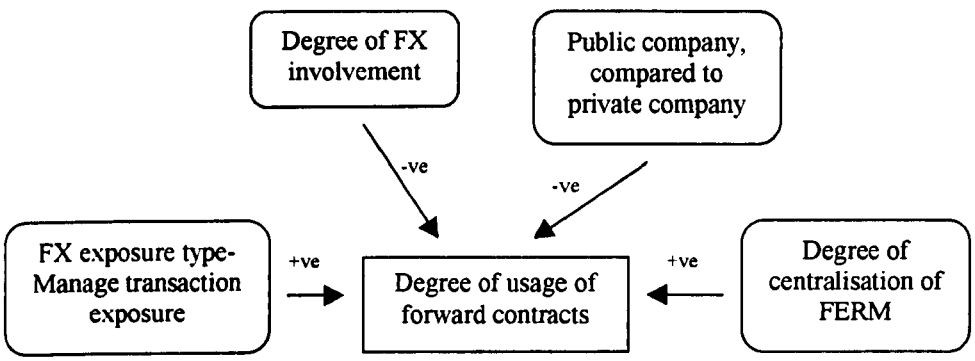


Figure 2.8: Factors associated with the degree of usage of forward contracts by a company

2.2.8. Summary of findings

In this final section, the findings, from the empirical studies that have been discussed above, are presented briefly. The activities and characteristics of FERM adopted by companies are re-stated briefly. It also includes factors that have been found to be associated with some particular aspects of the FERM activities or characteristics reviewed in this chapter. Notice that the associations are based upon aggregate, but not necessarily conditional, effects. In other words, the reported associations are that which would be expected on average without controlling for the effects of other factors. Table 2.3 presents the various factor effects in a table format.

[35] Phillips (1995) noted that small exposures were more likely to be managed by using, either forward contracts, options or swaps, but large exposures were more likely to be managed using swaps. However, the study did not provide any rationale for this observation.

Table 2.3: Factor effects on specific FERM activities and characteristics -- findings from previous studies

		FERM activity / characteristic	Manage FX risk	Adopt formal FERM objective	Hierarchical level of FERM responsibility	Degree of FERM centralisation	Proportion of exposure covered	Use computer technology for FERM	Use forward contracts	Degree of usage of forward constacts	Degree of usage of internal hedging techniques	Degree of usage of foreign funding facilities
	Factor											
1	Company size		+	+			--	+	+		+	
2	Dividend payout		+									
3	Asset liquidity		--									
4	Tax shield		+									
5	Foreign-owned company					+						--
6	Industrial sector compared to trading sector						+					
7	FX involvement		+	+				+		--	+	+
8	Level of risk				+		+					
9	Long-term debt		--									
10	R&D expenditure		+									
11	Regulated industry		--									
12	Interest cover		--									
13	"View" on future FX rates						--					
14	Public company					+				--		
15	Overseas subsidiary					--						
16	Manage transation exposure									+		
17	Degree of FERM centralisation									+		
18	Undertake partial cover				--	+						

Managing of FX risk

Various studies found varying proportions of companies that managed FX risk. Generally, the proportion of companies that managed FX risk was lower if a greater proportion of smaller, or private, companies were included in a study. However, generally, studies that focused on large, and public, companies, have found that more than half the companies managed FX risk. A company was more likely to manage FX risk if it ① was larger, ② had a higher dividend pay-out policy, ③ had tax shields (foreign tax credit, or investment tax credit), and ④ had lower asset liquidity.[36]

FX exposure type

Transaction exposure was the "centrepiece" of FERM in most companies, and it was the most managed type of exposure. Following that, accounting, and then economic, exposures, in that order, were the most managed. Among transaction exposure, exposures from firm commitment transactions, followed by anticipated exposures less than 12 months forward, and anticipated exposures more than 12 months forward, in that descending order, were the most managed. However, no important factor was identified to be associated with a company's likelihood of managing a particular type of FX exposure.

FERM objective

A significant number of companies had no formal FERM objectives. A company was more likely to adopt formal FERM objective if it ① was larger, and ② had a higher level of FX involvement. Nonetheless, most companies' objectives were to minimise FX risk, while only a few sought competitive advantage from FX. However, previous studies did not identify any factor that was associated with the type of FERM objective adopted by a company, e.g., the degree of inclination to maximise FX gains.

[36] Apart from these, there were other miscellaneous factors. A company that ① had higher R&D expenditure, ② was not a regulated utility, ③ had used lower debt maturity (long term debt over total debt), ④ had lower interest coverage (earnings before interest and tax divided by interest expenses), and ⑤ had higher FX involvement, was also more likely to manage FX risk. However, these factor effects were, either singular, i.e., not confirmed by two or more studies, or weak.

FERM responsibility

Generally, there was lack of top management participation in FERM, although formally, top management approval was needed. In most companies treasurers were responsible for FERM, while in others finance directors were responsible. However, generally, responsibility for FERM policies were with finance directors, while that for FERM operations were with treasurers. In a company, the bulk of the responsibility for FERM was more likely to be placed higher up the company's organisational hierarchy – in other words, more likely to be handled by the finance director, rather than the treasurer – if the company ① had a higher level of risk, and ② adopted the policy to fully cover all exposures, rather than partially cover at least some of its exposures. In most companies, FERM accounted for only a part of the responsibility of the persons entrusted with the tasks, while most companies had no professionals exclusively responsible for FERM.

FERM centralisation

Most companies had centralised FERM. Generally, it was found that at least some aspects of a company's FERM tasks were centralised. In some cases, only the execution, or implementation, aspect was decentralised. Some companies practised partial centralisation – at regional or subsidiary levels. A company was more likely to centralise its FERM if it ① was foreign-owned (rather than locally-owned), ② was a public (as opposed to private) company, and ③ adopted the policy to partially cover at least some of its exposures (rather than fully cover all its exposures). Moreover, the management of the exposures arising from overseas subsidiaries was found to be less centralised, compared to the management of exposures from domestic subsidiaries.

FERM policies and procedures

A small minority of companies managed only significant exposures – based upon threshold levels. Most companies hedged exposures partially. Generally, FERM in companies appeared to be unsystematic, and reactive, and managed on a "piecemeal" basis, i.e., it was not integrated into company's financial and strategic planning. Less than half the companies had regular reporting cycles of FERM to the top management. Most companies used subjective means of forecasting FX rates and exposures. Forecasts of exchange rates were less than 12 months forward. Some of the companies

that hedged partially traded actively in FX. A company would hedge a greater proportion of its FX exposures if it ① was smaller, ② had a high, rather than a low, level of risk, ③ did not have knowledge or confidence for predicting the future FX rate movement.[37] About one half of the companies accounted for their FERM activities on cost-centre bases, some others had some slight profit-motive in managing FX risk, but only a few accounted for their FERM activities on profit-centre bases. Most companies used stand-alone PCs, and very few used mainframe computers, while a significant minority did not use computers at all. Most companies used custom and standard software but a significant minority did not use any software for FERM. Standard spreadsheet and custom software appeared to be the most popular for FERM tasks. A company was more likely to use computer technology for FERM if the company ① was larger, and ② had a higher level of FX involvement.

FERM techniques

Most companies had used internal, external hedging strategies, including forward contracts. In one of the earlier studies, the most used, in descending order, were forward contracts, international money market hedge, and leading and lagging. However, in more recent studies, forward contracts, over-the-counter (OTC) options, and currency swaps were the most used in declining. Nonetheless, it was clear that forward contracts were the most used technique for managing FX risk. A company was more likely to use OTC techniques, including forward contracts, if the company was larger. However, a company would use more forward contracts, i.e., more extensively, if the company ① was a private, as opposed to public, company, ② had a lower level of FX involvement, ③ had more centralised FERM, and ④ managed transaction exposure. A company would use more internal hedging strategies if it was larger, and had a higher level of FX involvement. A company would use more foreign funding facilities if it ① was locally-owned, rather than foreign-owned, and ② had a higher level of FX involvement.

[37] Apart from these, one study found that companies in the industrial sector, compared to those in the trading sector, covered a greater proportion of their exposures. However, it was argued that this might have been a manifestation of the level of risk as companies in the industrial sector typically face greater risks compared to those in the trading sector. On the other hand, unlike the case in managing transaction exposure described above, the findings suggested that companies covered a greater proportion of their accounting exposure if their translation risk was greater.

SUMMARY

In this chapter, the academic literature of FERM was reviewed. The review was divided into two parts. The first part was concerned with the pertinent theories underlying hedging of FX risk. This part covered three issues. The first issue was about the relevance of hedging FX risk. It was concluded that hedging, or managing, FX risk is relevant. It was also argued that given information asymmetry, and agency problem, companies would be inclined to hedge rather than leaving this task to the shareholders. The second issue was concerned with how hedging might enhance company value. In short, it was explained that hedging might increase company value by reducing the expected tax expenses, reducing expected financial distress costs, and improving investment decisions. The third issue was about the factors theoretically expected to affect a company's likelihood of hedging, or managing, FX risk. The second part of this chapter presented the empirical findings from the key studies in the field of FERM. These findings were organised into seven key components of a company's FERM activities and characteristics. Factors that have been found to be associated to some of the specific activities and characteristics have also been identified.

In the next chapter, the concepts and findings found in the literature would be used as the bases to develop and describe the key research characteristics of this study. In particular, the seven key components of a company's FERM activities and characteristics are retained as the seven groups of key research variables (or dependent variables) in this study. Apart from this, the factors that have been identified, in this chapter, to influence selected FERM activities and characteristics of a company, are used as predictor variables in this study. These are further expanded and elaborated in the next chapter.

Chapter 3

Research Method

INTRODUCTION

This chapter mainly describes the methods that have been used in this research to collect and analyse the data, in order to address the two research objectives of this study. Thus, the two broad research questions that are associated to the research objectives are specified first. Then, this chapter identifies the variables used in the study. Particularly, it enumerates the 54 research variables and 16 dependent variables, subsumed under seven categories, and the 23 predictor, grouped into another seven categories. After this, the chapter discusses the method of study that has been employed to address the two research objectives. The scope of this study is also specified. In other words, the chapter identifies the broad characteristics of companies to which the findings of this study can be generalised. Following this, the sources of data are identified. Then, the construction of the population frame and steps leading up to the formation of the research sample are described. After this, the process of data collection for this study is explained in-depth. The chapter then describes the measurement of the individual research and explanatory variables in detail. Following this, the specific research questions are listed. In other words, these are precise questions for which answers are sought from the findings of this study. The analyses used in this study to address these specific research questions are then identified. This is followed by a description of the design of the questionnaire used in this study. Finally, the chapter ends with a summary.

3.1. Research objectives

As briefly introduced in the first chapter, this study addresses two broad research questions. Firstly, how do Malaysian public-listed multinational companies manage foreign exchange (FX) risk? Secondly, why do the companies manage FX risk in a particular manner? More precisely, to investigate the first question, the study examines the companies' dispositions on some selected FX risk management (FERM) activities and characteristics. The activities and characteristics investigated are enumerated in the

next part.

On the other hand, the second question can also be interpreted as – what factors influence the companies' FERM activities. Specifically, to address this question, the study investigates if some selected factors, or predictors (explanatory variables), appear to influence the companies' undertaking of particular FERM activities. The particular activities, and the specific predictors, that are investigated in order to answer this question, are enumerated also in the next part. Although there are two main research questions, the second is possibly more important, both in terms of contribution to the extant literature on FERM, and also in terms of wider interest to researchers in this field. Therefore, greater emphasis is given, in this research, to addressing the second question.

3.2. Variables

As mentioned above, in order to answer the two broad research questions, some research variables, some dependent variables and some predictor variables are investigated. These variables are introduced next. The reasons for the choice of variables are also explained. The more precise nature of the variables, however, becomes clearer when the measurement of these variables is explained in a later part. First, the research variables are enumerated, followed by the dependent variables and the predictors.

3.2.1. Research variables

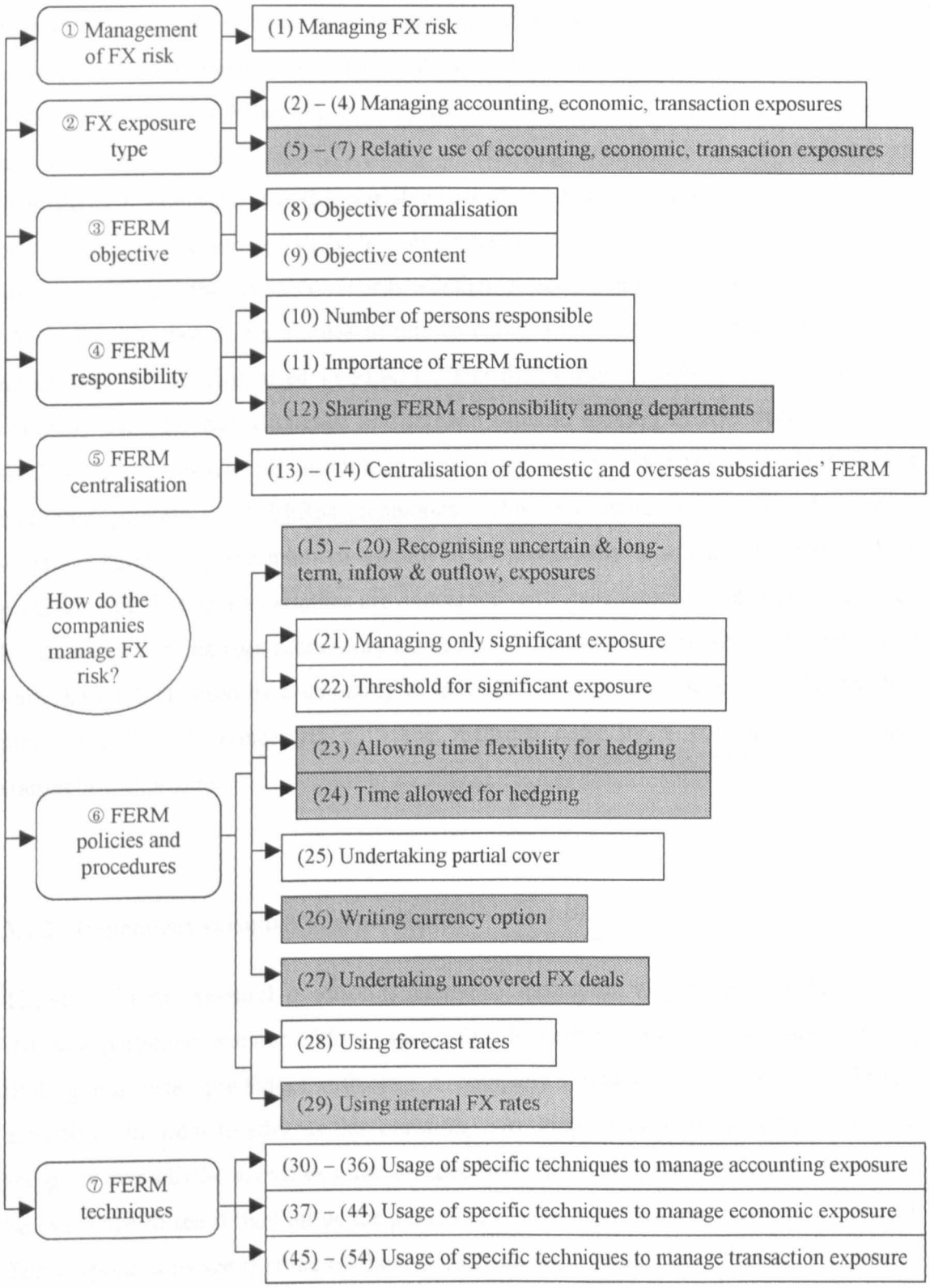
Recapitulating, the first broad research question is concerned with uncovering how the companies manage FX risk. As mentioned earlier, in order to address this question, the study examines the companies' dispositions on selected FERM activities and characteristics. More specifically, it uses some research variables that measure the FERM activities and characteristics of companies.[1] The research variables can be

[1]Research variables are generally variables that measure aspects of the main phenomenon of interest in a study. In this study, the phenomenon of interest is FERM, and therefore, the research variables here measure companies' FERM activities and characteristics.

grouped into seven categories. These categories are the same as those used in Chapter 2 to organise previous empirical findings in this area. As implied in that chapter, the categories fairly represent and include a wide range of activities and characteristics of the FERM programme adopted by most companies. Moreover, they also reflect and incorporate the aspects of FERM that are the most researched.

In short, the study attempts to describe the companies' dispositions on some selected FERM activities and characteristics – measured by 54 research variables, subsumed into seven categories – in order to describe how the companies managed FX risk. Figure 3.1 depicts the link between the categories of research variables and the individual research variables in this study. Note that more than half of the research variables are new, or in other words, these have not been used previously in other studies. These are indicated by shading in the diagram. The categories and the individual research variables are enumerated below.

① Management of FX risk. This category consists of only one research variable that records whether or not a company managed FX risk. ② FX exposure type. This category comprises six research variables. The first three note whether or not a company managed particular types of FX exposure, respectively, accounting, economic, and transaction exposures, whereas the other three variables are about the relative usage of the particular types of FX exposure. ③ FERM objective. This category subsumes two variables. The first variable is about the formalisation of the adopted FERM objective. The second is about the content of the objective. ④ FERM responsibility. This category encompasses three variables. The first research variable is concerned with the number of persons responsible for FERM in a company. The second variable deals with the importance accorded to the FERM tasks or function, while the third variable records whether or not several departments were jointly responsible, in a company, for FERM. ⑤ FERM centralisation. This category includes two research variables. The first is concerned with the centralisation of management of FX exposures arising from a company's domestic subsidiaries, while the second variable is concerned with the centralisation of management of exposures arising from overseas subsidiaries. ⑥ FERM policies and procedures. This category incorporates 15 research variables that are related to the policies and procedures adopted by a company in its FERM programme. The first six variables are concerned with a company's exposure recognition policy. More specifically, they note whether or not a company recognised



Shading denotes research variables that have not been used in previous studies.

Figure 3.1: An overview of the links between the first broad research question, the research variable categories, and the research variables.

its cash inflows and outflows, denominated in foreign currencies, that are uncertain and long-term, as FX exposures. The following two variables are concerned with a company's policy on managing only significant FX exposures. The next two variables are concerned with a company's policy of allowing time flexibility for hedging an identified FX exposure. Another variable records whether or not a company undertook partial cover. Yet another variable notes whether or not a company wrote currency options, while another variable records whether or not a company undertook uncovered FX deals. The last two variables in this category are concerned with the procedures, rather than the policies, used in FERM. The first variable records whether or not a company used forecast exchange and interest rates in making FERM decisions. The final variable notes whether or not a company used internal FX rates in its planning and budgeting processes. ⑦ FERM techniques. This final category includes 25 research variables concerning the methods employed by a company to manage FX risk. More precisely, the first seven variables are concerned with the strategies and techniques used by a company to manage accounting exposure. The next eight variables are concerned with the methods used by a company to manage economic exposure. Finally, the last nine variables are concerned with the methods used by a company to manage transaction exposure.

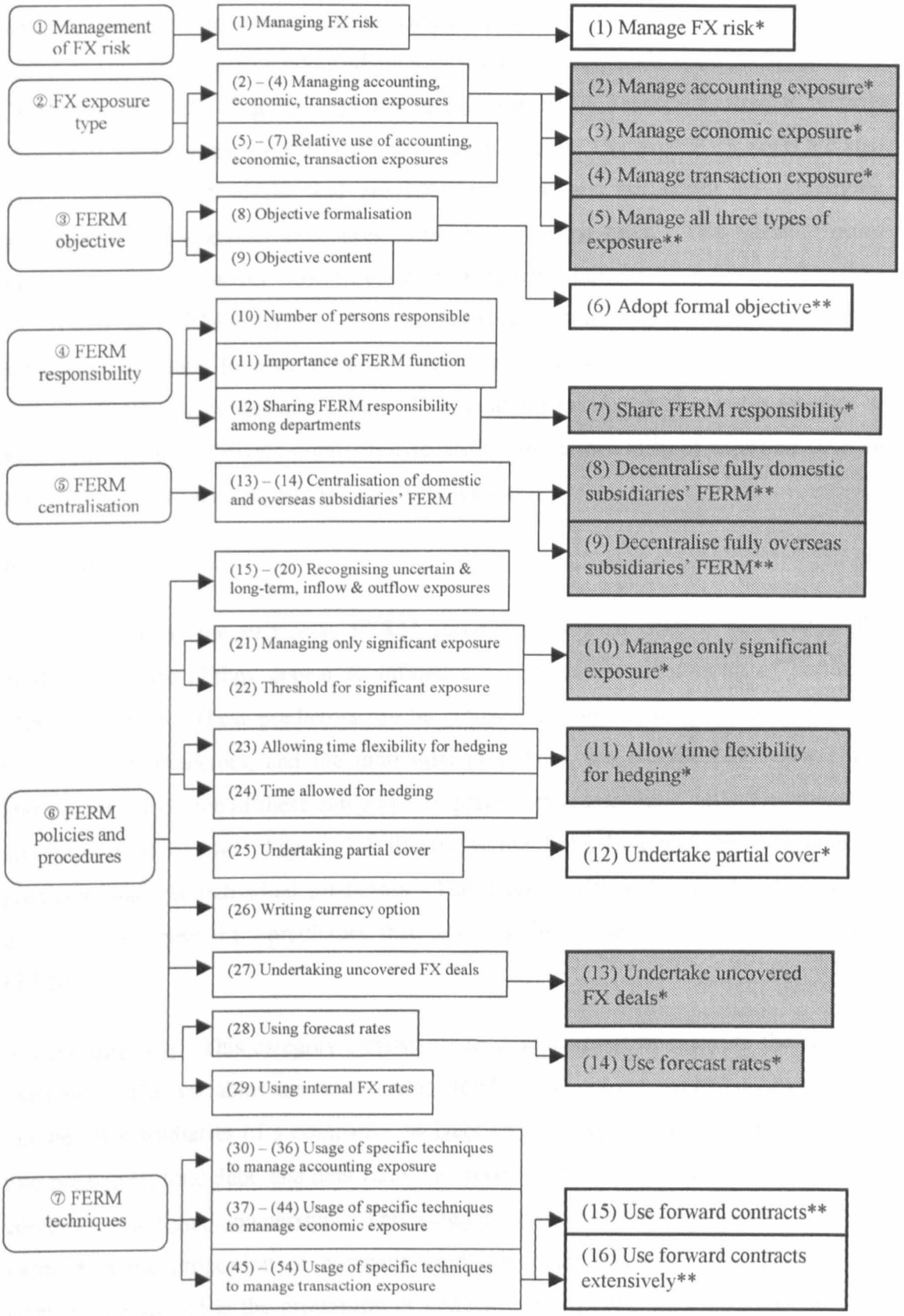
3.2.2. Dependent variables and predictors

The second broad research question is related to finding out why companies manage FX risk in a particular manner. More practically, the research question is concerned with finding out what predictors influence a company's undertaking of specific FERM activities. In order to address this question, two things must first be defined. Firstly, the particular FERM activities must be specified. Secondly, the predictors, that are to be examined to see if they influence particular FERM activities, must also be identified. The purpose is to see if some of these predictors seem to influence the undertaking of particular FERM activities. In other words, the undertaking of FERM activities are conceived to be dependent on the influence of these selected predictors. Therefore, the FERM activities, or rather the undertaking of these activities, are dependent variables. Next, the dependent and the predictor variables that are explored in this research are introduced.

Dependent variables

As mentioned earlier, there are 16 particular FERM activities, or dependent variables, selected for the purpose of addressing the second broad research question. All the 16 FERM activities have been derived from some of the FERM activities and characteristics that are used to address the first broad research question. In other words, the dependent variables are all derived from the research variables introduced above. Figure 3.2 depicts the links between the seven categories of research variables, research variables and 16 dependent variables. The reasons for the choice of the 16 activities are explained in greater detail later. However, it may be noted that this was done mainly to limit the breadth and complexity of the analysis and discussions. Nonetheless, the chosen dependent variables are representative of the range of FERM activities and characteristics chosen for study in this research. Further, it may be noted that 11 of the dependent variables were new, i.e., they have not been used in previous studies. These new variables have also been highlighted by shading in Figure 3.2. The chosen FERM activities, or dependent variables are listed below.

(1) Manage FX risk. This dependent variable records whether or not a company managed FX risk. (2) Manage accounting exposure. This variable notes whether or not a company managed accounting exposure. (3) Manage economic exposure. This records whether or not a company managed economic exposure. (4) Manage transaction exposure. This variable notes whether or not a company managed transaction exposure. (5) Manage all three types of exposure. This dependent variable records whether or not a company managed all the three types of FX exposure, i.e., accounting, economic, and transaction exposures. (6) Adopt formal objective. This variable notes whether or not a company adopted a formal FERM objective. (7) Have joint responsibility. This records whether or not a company had (practised) joint responsibility across several departments for managing FX risk. (8) Allow full autonomy to domestic subsidiaries. This variable notes whether or not a company allowed full autonomy (decentralisation) to its domestic subsidiaries for managing FX risk. (9) Allow full autonomy to overseas subsidiaries. This dependent variable records whether or not a company allowed full autonomy (decentralisation) to its overseas subsidiaries for managing FX risk. (10) Manage only significant exposure. This variable notes whether or not a company managed only FX exposures that were deemed to be significant. (11) Allow time flexibility for hedging. This records whether or not a



Shading indicates dependent variables that have not been used in previous studies. Asterisks and double asterisks denote dependent variables that are directly adopted and transformed, respectively, from research variables.

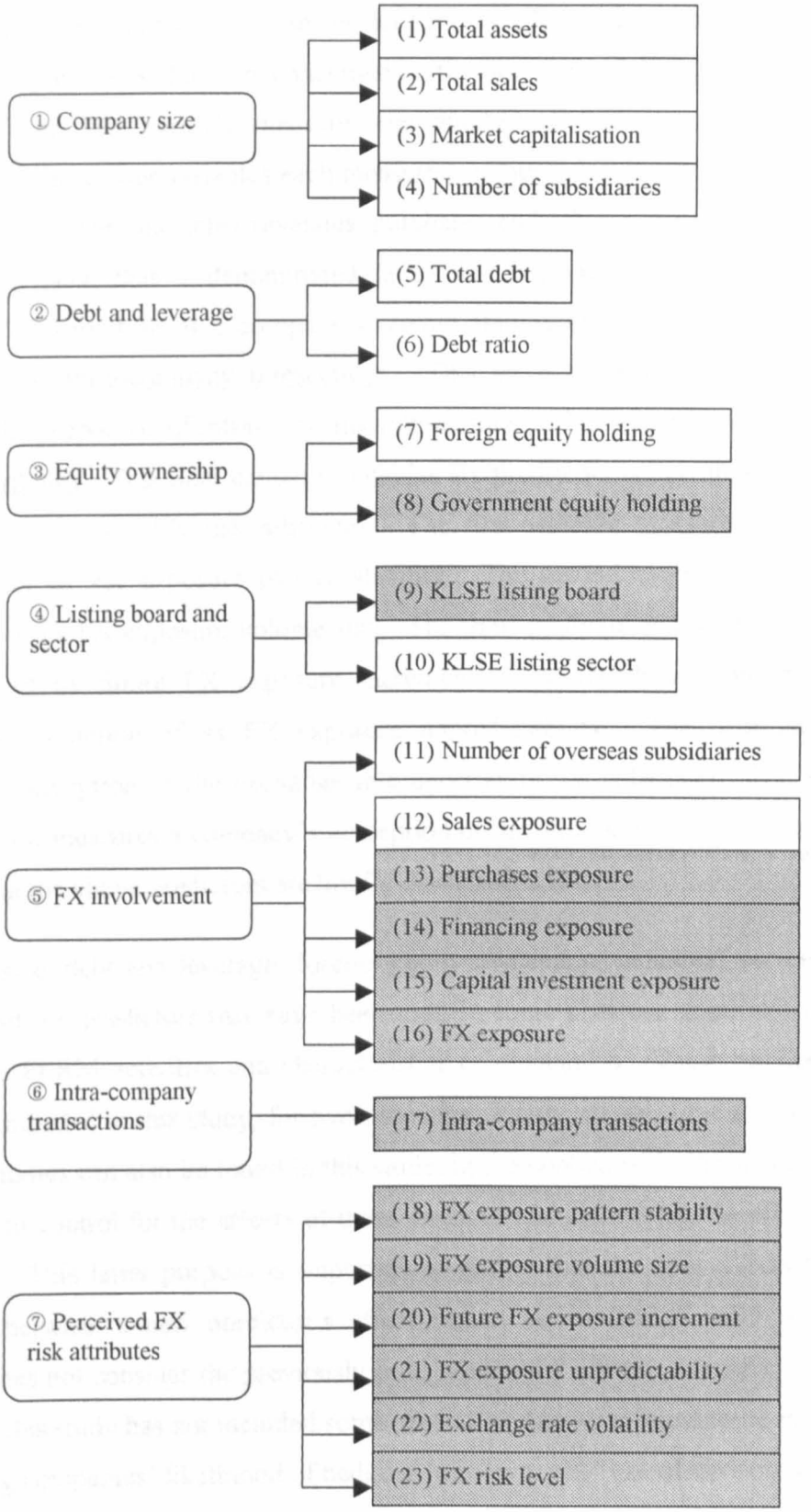
Figure 3.2: An overview of the links between the research variable categories, the research variables, and the dependent variables.

company allowed time flexibility in hedging an identified FX exposure. (12) Undertake partial cover. This variable notes whether or not a company undertook partial cover of FX exposures. (13) Undertake uncovered FX deal. This dependent variable records whether or not a company undertook uncovered FX deals. Uncovered FX deals are also known as naked FX deals, and are FX deals that are not offset by underlying commercial or operational exposures. (14) Use forecast rates. This variable notes whether or not a company used forecast exchange and interest rates, more often than not, in making FERM decisions. (15) Use forward contracts. This records whether or not a company used forward contracts, specifically, to manage transaction exposure. (16) Use forward contracts extensively. This final dependent variable notes whether or not a company used forward contracts extensively (more than 60% of exposure covered with forward contracts), to manage transaction exposure.

Predictors

Having identified the particular FERM activities, the next step is to identify the predictors to see if they appear to influence a company's undertaking of particular FERM activities. These predictors can be grouped into seven categories as well. The categories of predictors, and the individual predictors, are enumerated below. The reasons for the choice of these categories of predictors are provided after the categories are introduced below. Figure 3.3 illustrates the links between the categories of predictors and the individual predictors. The diagram also indicates, by shading, the predictors are new, i.e., predictors that have not been used by previous studies in FERM.

① Company size. This category consists of four predictors that measure the size of a company. The variables are total assets, total sales, market capitalisation, and the number of subsidiaries of a company. ② Debt and leverage. This category comprises two predictors, total debt, and debt ratio, i.e., relative debt or debt over total assets, of a company. ③ Equity ownership. This category subsumes two predictors. The first variable is the proportion of company equity held by foreigners (non-Malaysians), whereas the second is the proportion of company equity held by the government and government agencies. ④ Listing board and sector. This category also encompasses two predictors. The first notes whether a company is listed on the Kuala Lumpur Stock Exchange (KLSE) second board or main board. The second variable records the sector



Shading denotes predictors that have not been used in previous studies on FERM

Figure 3.3: An overview of the links between the predictor categories and the predictor variables.

under which a company is listed on the KLSE. ⑤ FX involvement. This category includes six predictors that are concerned with the level of FX involvement of a company. The first variable measures the number of overseas subsidiaries of a company. The next four variables each measure a company's proportion of transactions of, respectively, sales and other revenues, purchases and other expenses, financing, and capital investment, that is denominated in foreign currencies. The sixth predictor measures the proportion of a company's overall transactions denominated in foreign currencies. ⑥ Intra-company transactions. This category is made up of only one predictor, the proportion of intra-company transactions within a company. ⑦ Perceived FX risk attributes. This final category includes six predictors concerning a company's perception of its own FX risk attributes. The first variable measures a company's perception of its FX exposure pattern stability. The second measures a company's perception of its FX exposure volume size. The third predictor measures a company's perception of its future FX exposure increment. The fourth variable measures a company's perception of its FX exposure unpredictability. The fifth measures a company's perception of the exchange rate uncertainty (or volatility). The sixth and final predictor measures a company's perception of its FX risk level. The justifications for selecting the above predictors are briefly discussed below.

Company size, debt and leverage, foreign equity ownership, industrial sector, and FX involvement are predictors that have been used in some previous empirical studies to explain the FERM activities and characteristics of companies. These predictors have also been included in this study, for two purposes. Firstly, to see if the effects found in previous studies can also be found in this study, in the context of Malaysian companies. Secondly, to control for the effects of these predictors in identifying the effects of new predictors. This latter purpose is important to ensure that the new effects found are valid. Otherwise, a new predictor's effect cannot be confirmed valid because the analysis does not consider the previously used predictors' effects. However, it must be noted that this study has not included some predictors that were found to be important in influencing companies' likelihood of hedging (or companies' use of derivatives). These predictors include ① dividend pay-out, ② asset liquidity, and ③ tax shields. Apart from these, ④ debt maturity (long-term debt over total debt), and ⑤ interest cover too appeared to be influential although the latter two predictors' effects were not confirmed by several studies, or were weak. Admittedly, the omission of these five predictors

poses the potential problem of missing variables. The researcher did not realise, when embarking on the study, the following: ① there were studies that had used these predictors, ② the predictors were important, and ③ the potential problem of omitting important predictors. However, the predictors could not be included later because the source of the data was not immediately available, and also because of the time constraint. Nonetheless, this threat is only directly relevant for the undertaking of the first FERM activity, the managing of FX risk, because the available empirical evidence do not suggest that these predictors are important determinants for other FERM activities.

Apart from predictors indicated by prior studies, the study also included some new predictors that have not been used by previous studies. These include government equity holding, KLSE listing board, intra-company transactions, and perceived FX risk attributes. Although FX involvement predictors have been used previously, this study has included several new measurements of the same construct. These include measuring the proportions of purchases, financing, capital investment, and overall, transactions that are denominated in foreign currencies. The new predictors have been indicated by shading in Figure 3.3. The choice of these new predictors is briefly explained next. Firstly, in Malaysia, the involvement of the government in commercial business is perceived to be more prevalent than in western countries. Thus, the proportion of company equity held by government was included to see if this had a bearing on the FERM activities of companies. Secondly, Batten et al. (1993) included public and private companies, to see if the status affected the companies' FERM practice. Although this study is based on only public-listed companies in the KLSE, it has included companies on the main and second boards. Generally, companies in the main board are larger, financially more secure, and have greater status and reputation than the companies in the second board. The study wanted to investigate if this played a part in the FERM activities adopted by companies. Thirdly, the level of intra-company transactions was thought to be capable of influencing some aspects of FERM, say the decision to centralise, and the use of hedging techniques, and therefore, this variable was included. Fourthly, Collier and Davis (1985) and Collier et al. (1990) used companies' level of risk as explanatory variables. However, the measurements used in these studies were rather subjective, and qualitative. Definitely, the task of objectively measuring the level of risk, even FX risk, is difficult and complex. That is probably

why this concept or variable has not been used in prior empirical studies. This study, however, focuses on measuring the constructs related to a company's perception about attributes of its own FX risk, to see if these influenced the company's FERM activities. As enumerated earlier, the attributes are ① exposure pattern stability, ② exposure volume size, ③ future exposure increment, ④ exposure unpredictability, ⑤ exchange rate volatility, and ⑥ level of FX risk.

In summary, in order to answer the second broad research question, the 23 predictors are tested to see if some of them appear to influence each of the 16 FERM activities specified above. The testing or analysis method that is used for this purpose is identified and described in a later part of this chapter. Next, however, the chapter explains the general method of research employed by this study to address the two broad research questions.

3.3. Method of study

Prior to explaining the method of research utilised in this study, first, the research methods used by previous empirical studies on FERM are briefly reviewed. Prior empirical research on FERM can be divided into three groups. The first group consists of mainly descriptive studies that described the FERM activities adopted by companies and FERM characteristics of companies. Therefore, these studies were based primarily on research variables (FERM activities and characteristics), and the studies did not use predictors, or used very few predictors that were only marginally relevant to the study objective. The studies in this group include Belk and Glaum (1990), Bodnar et al. (1995) and Phillips (1995).

Unlike the studies in the first group, those in the second group used a few explanatory variables. The studies, apart from describing the FERM activities and characteristics, were more inclined towards identifying explanatory variables (or predictors) associated with the FERM activities or characteristics. More specifically, these studies were designed to identify unconditional association or correlation between explanatory variables and FERM activities or characteristics. This group includes Abdel-Malek (1976), Mathur (1982), Batten et al. (1993), and Dolde (1993).

On the contrary, studies in the third group used several explanatory variables (or predictors) but focused on only one specific FERM activity or characteristic (or dependent variable), namely the likelihood of hedging and the degree of use of derivatives. These studies were designed to measure conditional effects of predictors on companies' likelihood of hedging or companies' use of derivatives. Notably, these studies tried to test specific hypotheses. The group comprises Nance et al. (1993), Berkman and Bradbury (1996) and Mian (1996). See Table 3.1 for an overview (generalisation) of the research method attributes of the three groups of empirical studies. The main attributes of the key studies can be found in Appendix A.

Table 3.1: The three groups of empirical studies on FERM, and their general attributes.

	Group 1	Group 2	Group 3
Objective	Descriptive, exploratory	Identify explanatory variables, unconditional	Identify predictors, conditional; test specific hypotheses
Research or dependent variables	Many	Some	One or very few
Explanatory or predictor variables	None or very few	Some	Many
Data source	Mail questionnaire Interview Case study	Mail questionnaire Interview	Mail questionnaire Annual report

There is a distinct reason for the differences between the studies in the second and third groups. The underlying theory for hedging, or the use of derivatives, has been relatively well developed, and therefore, there are specific hypotheses that could be tested empirically. This was done by the studies in the third group. However, there is a clear lack of such theories and specific hypotheses concerning other FERM activities or characteristics. For example, there is no theory that proffer predictors that influence the FERM objective adopted by companies. Similarly, there is no comparable theory that predicts factors that influence the degree of centralisation of FERM adopted by companies. Therefore, studies in the second group, unlike studies in the third group, could not test specific hypotheses because there is no theory from which to derive hypotheses. Moreover, the findings were often unconditional, again, because there is no theory to indicate other predictors the studies should control for when identifying a

particular predictor.

In other words, the studies in the second group cannot take the path of testing (rejecting) hypotheses to establish (modify) an existing theory because there is no available theory. These studies adopt an alternative path to constructing theories and developing knowledge. They identify factors that are, statistically, significantly associated with a particular FERM activity or characteristic. The studies then provide rationales and justifications to explain the observed relationships between the factors and the research variable. If these relationships are reconfirmed by other similar studies with fresh sample, these relationships can be inferred, by induction, to be true. Following this, the confirmed factors and the provided justifications can be used to construct a unified theory to explain the particular FERM activity or characteristic.

Having discussed the research methods used by previous studies, the method adopted by this study is explained next. This study, as explained earlier, poses two broad research questions. The first broad research question is about describing the FERM activities and characteristics of Malaysian public-listed multinational companies. In this perspective, this study is similar to studies in the first group. However, the study's second research question is about identifying predictors that appear to influence the companies' FERM activities. Moreover, the study uses several predictors, unlike studies in the first group, and also focuses on several FERM activities (dependent variables), unlike studies in the third group. Seen from this perspective, the study seems to be related to the second group of empirical studies. However, as explained earlier, the second research question is the more important than the first. Therefore, in terms of research objective, and the number, and nature, of variables used, this study appears to be most closely related to studies in the second group.

Therefore, this study adopts the methods similar to those used by the studies in the second group. However, there are two distinct differences between this study and the studies in the second group. Firstly, this research uses several, considerably more, research and predictor variables. Secondly, it controls for other predictors (explanatory variables) in attempting to identify predictors that influence a particular FERM activity. In other words, it tries to identify the conditional influence of a predictor. This latter characteristic is similar to that found in studies in the third group. However, these conditional influences extend to FERM activities for which there is no available theory,

and therefore, this study cannot test specific hypotheses. As explained above, this study hopes to contribute to theory building by identifying possible predictors and providing justifications for these predictors, that could be confirmed or rejected by future studies. These can later be used to present a unified theory or theories regarding specific FERM activities.

In short, this study adopts quantitative methods of analysis to both describe the companies' FERM activities and characteristics, and identify the predictors that appear to influence companies' undertaking of specific FERM activities. Especially on the second and more important research objective, the study is similar to those used in previous studies in the second group. However, in addition, it uses more variables, and tries to identify conditional influences. The underlying orientation of the study is not to test specific hypotheses using empirical results but to proffer hypotheses derived from observed empirical results. The next part outlines the scope of this study.

3.4. Scope of study

As mentioned earlier, this study is limited to investigating the phenomena of FERM among Malaysian public-listed multinational companies. This shows that that there are three apparent dimensions of the scope of study. However, there is also a fourth hidden dimension. These four dimensions to the scope of study are explained next. Essentially, these dimensions specify the characteristics of companies to which the findings of this study could be generalised or applied.

The study focuses on Malaysian-owned companies, i.e., defined as companies in which the majority of equity is held by Malaysians. Only Malaysian companies are targeted because a previous study suggested that foreign-owned companies (subsidiaries) in Malaysia have little idea about, and control over, FERM.[2] This implies that their FX exposures were managed by their parent companies in foreign countries. Therefore, foreign-owned companies have been omitted.

[2]This was found in a research exercise carried out by the researcher and his two colleagues at Universiti Utara Malaysia, in 1994.

This research, due to practical constraints, focuses on only public-listed companies, i.e., those listed in the KLSE. This is because it is easier to obtain secondary data about public companies. Some of the data required, about these companies, are usually regularly published. Further, there are lists or directories of listed (public) companies. No equivalent directory is available of all private companies in Malaysia. Apart from that, public companies are considered to be more obliging to participate in this type of mail-questionnaire research. Consequently, the study focused on listed public companies, and therefore, excluded private companies.

Further, the study focuses on only multinational companies. Here, multinational companies are defined as companies that have at least one operating subsidiary in another country, other than Malaysia. Multinationals were chosen with the intention of focusing on a particular issue of interest, i.e., the centralisation of FERM, specifically pertaining to the management of overseas subsidiaries' FX exposures. Admittedly, this issue could have also been investigated even if all companies, both multinationals and non-multinationals, had been included in the study. However, only multinationals were included because of the following reasons. ① Previous empirical studies in this area have predominantly focused on only large multinational companies. This, therefore, allows the results of this study to be compared directly with those prior results. ② The results from including all companies is unlikely to be representative of all companies, because – as prior studies indicate – smaller companies that have low FX exposures (i.e., non-multinationals) are less likely to respond to the questionnaires. In other words, despite including both multinationals and non-multinationals, the findings then would likely have been representative of only multinationals anyway. ③ Moreover, non-multinational companies have broadly less awareness of, and knowledge about, FX and the intricacies involved in FERM. Therefore, if they were also included, the sophistication and the length of the questionnaire should have been reduced, and this would have affected the quality and quantity of the data. ④ Finally, had the sample been expanded to include non-multinationals, it would have been more costly and difficult to collect the data, especially in terms of making individual follow-up on each company to boost the response rate, as was done in this study. More particularly, these additional cost and effort would have been inefficient, as the response rate from non-multinationals would have remained poor nonetheless.

Finally, this research excludes all financial companies, i.e. banks and financial institutions. This is because, it is difficult, if not impossible, to delineate operational strategies from exposure strategies in the financial companies. FX risk and exposures are very much the mainstay for financial companies, unlike for non-financial companies. The inadvertent intent of this study is to examine how companies, in which FX exposure is not a mainstream commercial operation, manage the exposure. Moreover, it is suspected that there will be a lack of heterogeneity (or variance) among the financial companies along the measures used in this study. Therefore, including them in the study may obscure the underlying evidence. Consequently, financial companies were dropped from this study.

In short, the scope of study helps define the population frame of this study. Thus, the population frame here comprises all Malaysian public-listed multinational companies that are non-financial. In other words, the findings of the study are expected to be generalisable to all cases (companies) that fall within this population frame. Apart from this, as will be explained below, the defining of the scope of study also helps identify the relevant data sources for constructing the population frame, and this is described in a later part of this chapter. However, first, the several types of data sources used in this research are discussed below.

3.5. Data sources

There are broadly two main research activities in this study that require data from external sources. First, data are required to determine the population frame and to construct the sample. Second, data are also required for performing analyses that provide results that, in turn, provide answers to the research questions. In other words, data are first required to determine the population frame and identify the sample cases (companies) that must be targeted in order to collect further data, from the cases, that are required to perform analyses and provide findings. Thus, the data required in the research can be divided into two types based upon the purpose of the data. The first type of data is for determining the population frame and sampling, while the second type is for analysis.

For the first type of data, to determine the population frame and sample, ideally, as defined by the scope of study outlined above, a directory of all non-financial Malaysian public-listed multinational companies is required. However, such a directory is not directly available. Nonetheless, the KLSE annual companies' handbook of 1996 (KLSE handbook) is found to be the most complete and extensive directory that is appropriate for use in this study. The handbook provides some standard information about almost all the public-listed companies on the exchange. However, the handbook had to be manually examined to select companies that were non-financial, Malaysian, and multinational, to determine the population frame. Apart from the KLSE handbook, the study had to extract some information from the Extel Financial Information Services network, available at Universiti Utara Malaysia. The development of the population frame is described in the next part.

The data for constructing the population frame are from secondary sources. Conversely, the data required for analyses are not all directly available from secondary sources. The bulk of the data, in fact, have to be obtained from primary sources, mostly by using mail questionnaire. Notably, most previous empirical studies on FERM, in all three groups conceptualised earlier, had used mainly mail questionnaire for collecting the data required for analysis.[3] Generally, the data for all the research variables, including the dependent variables, are obtained from using the questionnaire. However, the data for predictor variables are obtained from two sources – the KLSE handbook, as well as the questionnaire. These are elaborated further in later parts. Below, the forming of the population frame and sample is described.

3.6. Population frame and sampling

The population of a study should clearly define the group of elements to which the findings of the study can be generalised. In that vein, the population of this study is defined as all the Malaysian multinational companies, not in the finance sector, that are

[3]Some studies had used interviews. Only a few had used case study method for data collection, while a few had used data extracted mainly from secondary sources. For example, Belk and Glaum (1990), and Collier et al. (1990) had used case study method. On the other hand, Berkman and Bradbury (1996) and Mian (1996) had used data from companies' audited financial statements and annual reports. See also Table 3.1.

listed on the KLSE. The population frame is a listing of all the elements in the population.[4] Figure 3.4 illustrates the steps in determining the population frame of this study, by using a flowchart diagram. The steps are described below.

In order to build the population frame, all the four volumes of the KLSE handbook for 1996 were used. The KLSE handbook, the source of the population frame, contains only listed companies. Therefore, private companies are all ready excluded by design. In order to exclude financial companies, the companies listed under the Finance sector, as classified by the KLSE, are omitted. There were 512 non-financial public-listed companies featured in the KLSE handbook. However, there were 541 non-financial companies listed in the KLSE as reported in the daily press (New Straits Times, 1 February 1997, p.25). It is clear that not all listed companies were featured in the handbook. Thirty-five companies, found listed in the newspaper, were not featured in the handbook.[5] Perhaps, this was because the companies were only recently listed. As the required information regarding these excluded companies are much more difficult to obtain through other sources, the companies were not included in the population frame.

In order to select only Malaysian companies, the study identified companies in which more than 50% of equity was held by Malaysians. From the 512 companies (excluding companies in the Finance sector), 474 (92.58%) companies were Malaysian, according to the above definition. Next, to select only multinational companies, companies that have at least one overseas subsidiary were identified. The KLSE handbook normally lists the subsidiaries of every company featured, and the subsidiaries that do not have the suffixes, "sdn. bhd." or "bhd." (respectively, "private limited" and "limited"), are assumed to be overseas subsidiaries. This is because companies incorporated in Malaysia must have either of these two suffixes. From the 474 Malaysian companies, 208 (43.88%) were multinational companies by this rule. Table 3.2 and Figure 3.5 provides the breakdown of the number of companies, using the three criteria ① Malaysian-owned, ② multinational and ③ listed in the main board (or second board).

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[4]For a brief explanation of the concepts of population, and population frame, see Sekaran (1992), p.226.

[5]On the other hand, however, six companies featured in the handbook were not in the newspaper. Perhaps, this was because the companies' shares were not traded or suspended for that day. Therefore, the apparent discrepancy between the number of companies in the newspaper and the KLSE handbook is $|541 - 512|$ that is equivalent to $|35 - 6| = 29$. See Table 3.2.

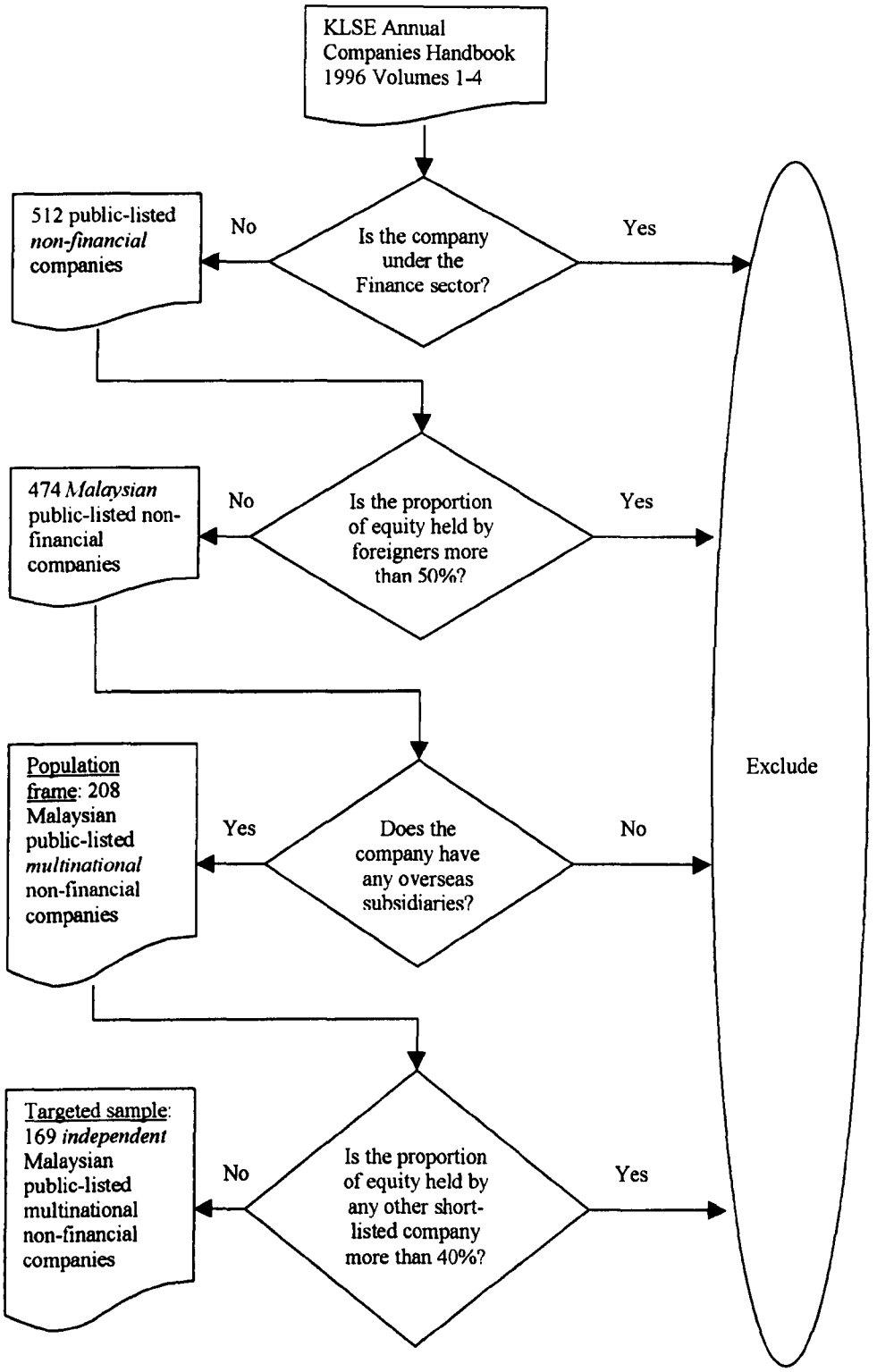
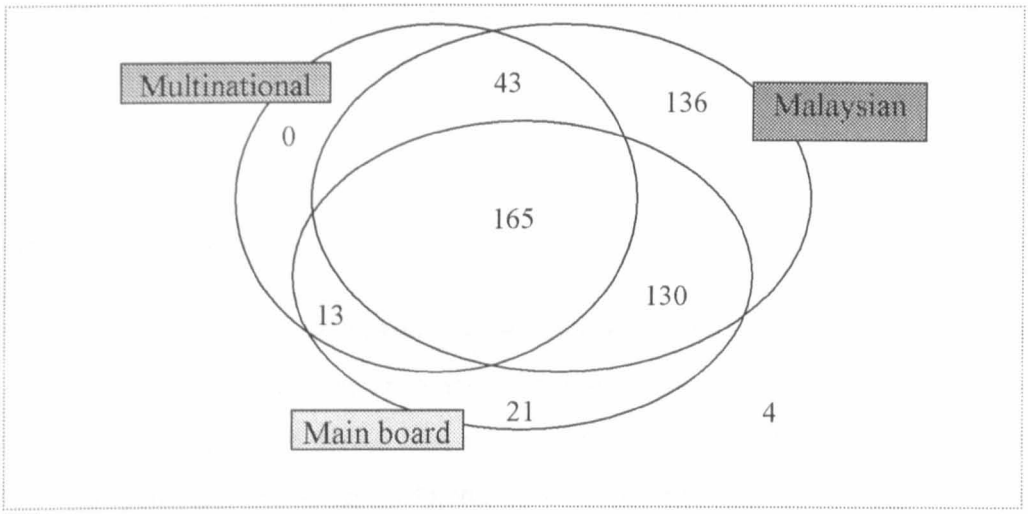


Figure 3.4: Flowchart indicating the steps involved in determining the population frame and targeted sample.

Table 3.2: Breakdown of the number of (non-finance sector) companies listed on the KLSE.

Board	**Malaysian**	**Multinational**	**Both** (Malaysian & Multinational)	**Total** (as in KLSE handbook)	**KLSE** (as in NST)
Main	295	178	165	329	340
Second	179	43	43	183	201
Total	*474*	*221*	*208*	*512*	*541*

Source: KLSE Annual Companies Handbook 1996, volumes 1-4; and New Straits Times, 1 February 1997, p.25



Source: KLSE Annual Companies Handbook 1996, volumes 1-4

Figure 3.5: Venn diagram showing the breakdown of the number of (non-finance sector) companies listed on the KLSE.

Following that, the 208 companies (public-listed, non-financial, Malaysian and multinational) constitute the population frame of this study. However, the short-listed companies were checked further to see if a substantial portion of their equity (40% or more) was held by any of the other short-listed companies. Here, when a company holds at least 40% of another company's equity, the latter company is assumed to be a "subsidiary" of the former company. Such "subsidiaries" were then dropped. This was done to ensure that the sample companies were independent. Failing to do this might have culminated in double-counting and confusion, as the "subsidiaries" were likely to have been dependent on their parent, or holding, companies for managing their FX risks. However, companies ("subsidiaries") that were held by non-short-listed companies (private, foreign-owned or non-multinational) were retained. This was because including these companies would have not resulted in double-counting. Consequently, 39 such companies ("subsidiaries") were removed because they were

deemed to be subsidiaries of other short-listed companies, yielding a targeted sample of 169 companies.

Further, it was initially intended that companies that had begun operations only recently, i.e., less than five years ago, should be excluded. This was because FERM practice, in these companies, is less likely to be well established. However, it was later discovered that the KLSE strictly requires all companies that apply for listing must have begun operations at least 5 years prior to the application. Therefore, further exclusions were unnecessary. In the next part, the process of data collection is described in greater detail.

3.7. Data collection

As mentioned earlier, both secondary and primary data have been used for this research. Generally, secondary data were extracted from the KLSE handbook, and were used for determining the population frame and research sample. The data were also used for some of the predictor variables. On the other hand, primary data were collected by using questionnaire, and were used for all research and dependent variables, and for some of the predictor variables. Generally, secondary data were collected first, and therefore, the collection this data is described next. Following this, the collection of primary data is explained.

3.7.1. Secondary data

The secondary data were important in determining the population frame and the targeted sample described in the previous part. The relevant data are enumerated as follows. ① Listing sector. This was important to exclude all companies listed in the finance sector. ② Foreign equity holding. This data was important to remove foreign-owned companies, where the proportion of equity held by foreigners is more than 50%. ③ Number of overseas subsidiaries. This data was used to ensure that only companies that had at least one overseas subsidiary each were included in the population frame. ④ Major shareholders and their holding of equity. The purpose was to determine if the company was dependent on, or a subsidiary of, other companies. All these data were

extracted from the KLSE handbook. Moreover, having determined the targeted sample, other relevant data, for the 169 companies in the sample, were further obtained from secondary sources. The addresses of the companies were extracted from the KLSE handbook, but the telephone, and fax, numbers had to be culled from the Extel Financial Information Services Network.

Apart from that, some of the secondary data were used for the purpose of analysis. Actually, these data constitute some of the predictor variables enumerated earlier. Note that the first three types of data, above, that were used for the purpose of forming the population frame and sample, also served as data for three predictors. In other words, apart from being used for building the population frame and sample, these data were also used for analysis. Recapitulating, these include a company's (1) listing sector, (2) proportion of equity held by foreigners, and (3) number of overseas subsidiaries. Besides these, secondary data were used also for other predictors. The predictors include a company's (4) total assets, (5) total sales, (6) total debt, (7) number of shares outstanding, (8) market price of shares, (9) number of subsidiaries, (10) proportion of equity held by government, and (11) listing board (main or second board). In short, all the data for the relevant predictors were extracted from the KLSE handbook. The measurement of these variables is explained later in this chapter. In the following part, the collection of primary data is explained in-depth.

3.7.2. Primary data

The primary data for this study were all collected by using questionnaires. The data was collected in three phases. In the first phase, the questionnaire was used as a framework based on which quasi-structured interviews were conducted by the researcher on a small number of companies. The feedback from this stage was used to revise the questionnaire for later use. Initially, in the second phase, the revised questionnaires were supposed to be administered by post, and finally, in the third phase, some undergraduate students' help was to be enlisted to personally follow-up on companies that did not respond to the mail questionnaire, to boost the response rate.

However, in practice, the plan had to be improvised because of the delays in conducting and completing the first phase. Many companies that were approached for interviews declined, or delayed consenting to the interviews. Initially, it was planned that the first phase should be completed in three weeks, but it took about two months. Furthermore, the undergraduate students whom were to be involved in the final phase had only a limited time during the semester to follow-up on the companies. Since the first phase was delayed and was not completed on time, the students were then asked to be involved in the second phase, rather than the final phase. They were asked to select fresh companies rather than companies that did not respond to the mail questionnaires. They were given the same questionnaire that was used in the first phase, to collect the data. This was because then the questionnaire was not revised. Thus, the third phase, i.e., data collection using mail questionnaire, was commenced when the first phase was completed, and the questionnaire was revised using the feedback and some general qualitative assessment of the responses obtained from the interviews.

Therefore, in short, the first phase consisted of quasi-structured interviews conducted by the researcher, based upon the framework provided by a questionnaire. The second phase of data collection was conducted using essentially the same questionnaire but it was administered using undergraduate students. The third phase of data collection involved a modified version of the questionnaire that was sent to the companies, mainly by post, although some were sent by fax. Table 3.3 summarises the attributes of each of the data collection phases. Below, the rationale for each phase, is explained, along with the selection procedure of participant companies and the actual collection of data in each phase.

Table 3.3: The three phases of primary data collection, and their general attributes.

Data collection	Phase 1	Phase 2	Phase 3
Questionnaire version	First (QV1)	First (QV1)	Second (QV2)
Conducted by ...	Researcher	Students	Researcher
Collection method	Interviews	Interviews Mail / Fax Telephone	Mail / Fax Telephone

Phase one

The interviews, in phase one, were carried out for two purposes. Firstly, it afforded insight into actual company practices and norms, which would have been lacking in a purely questionnaire-based study. This insight was invaluable in the interpreting the findings of the study, and further in offering conclusions and recommendations. Therefore, the interviews enriched the knowledge acquired, not merely because of the richness of the data, but also because they provided evidence from a different perspective. Secondly, the interviews also served as a means to validate, or pilot test, the questionnaire before it was modified and used in the third phase of data collection.

Therefore, the first phase needed to include a small number of companies that should represent the wide variance that would have been found in the population frame, to test the applicability and suitability of the questionnaire to all companies in the population. In other words, the choice of companies in this first phase should be able to highlight the weaknesses of the questionnaire so that these can be improved for use in the third phase. Consequently, the selection of companies for participation in the first phase is described below. Figure 3.6 presents the process in a flowchart diagram.

The targeted sample of 169 companies was divided into eight clusters, according to their listing sector (industry) on the KLSE. Further, each cluster was divided into two equal sub-clusters using the median size of total assets of each cluster. The intention was to choose one company from each sub-cluster. This was to have each cluster represented by one large and one small company. Although random choice of one company in each sub-cluster is possible, it may be less desirable – especially when the sub-cluster is small. A small number of randomly chosen companies is less likely to adequately reflect the broad variance found in the population. Consequently, several qualitative guidelines were drawn to select the companies. These guidelines ensure that companies that have some rare characteristics (specified by the guidelines) are represented in this phase. Otherwise, e.g., with the use of random sampling, these companies are less likely to be chosen.

The companies chosen, as a whole, were meant to satisfy the following requirements outlined as follows. Firstly, the nature and extent of company equity ownership by another company, was considered. A company may hold less than 40% of equity in another company – therefore, the former is not the parent, or holding, company of the

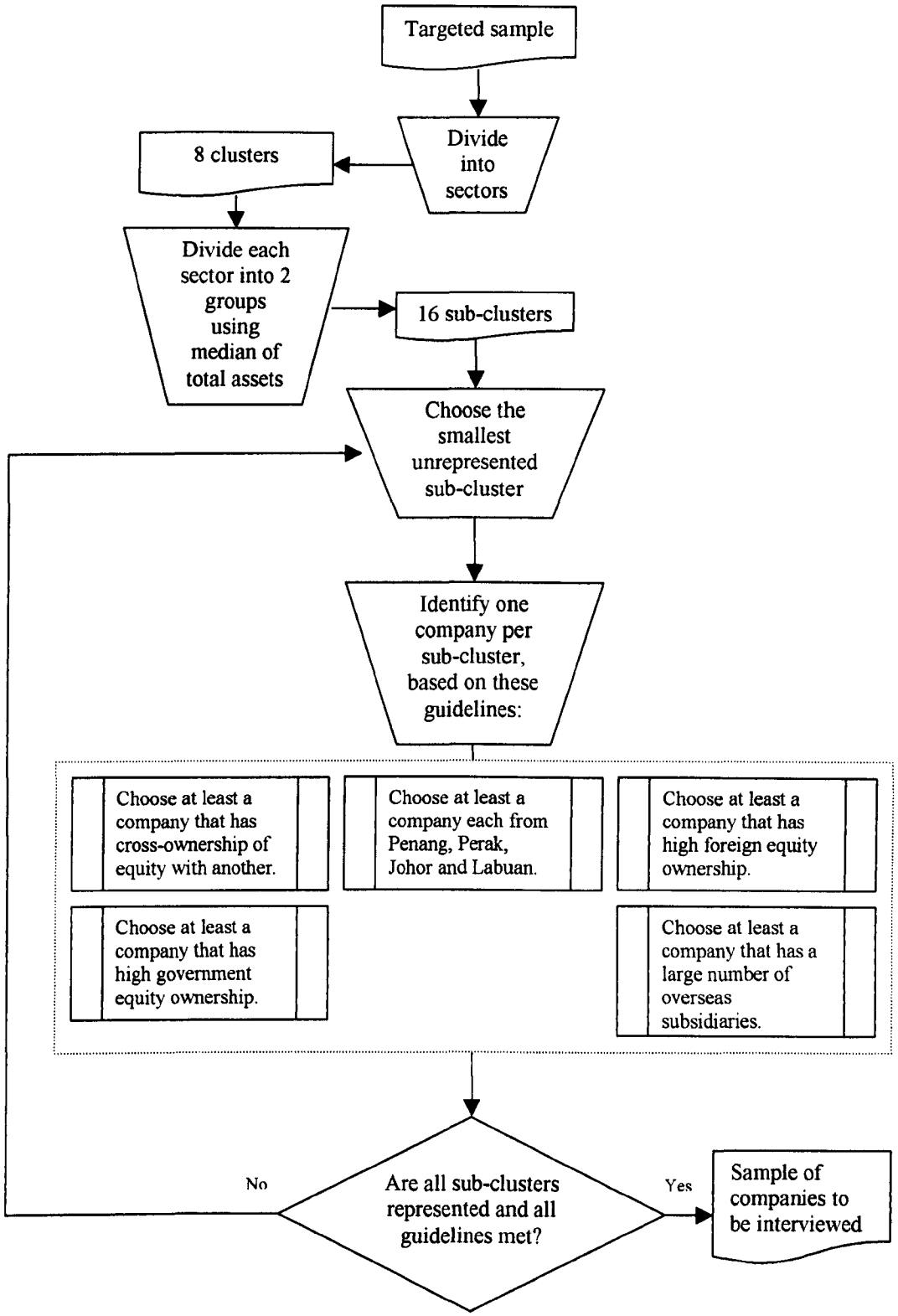


Figure 3.6: Flowchart depicting the selection of companies for the first phase of primary data collection.

latter – but this proportion may be substantial, i.e., more than 5% of the latter's equity. The situation can be further complicated by cross-ownership of equity. A company may own a portion of another company while the latter owns a portion of the former. This practice of cross-ownership is not unusual amongst companies in Malaysia. Therefore, the first guideline was meant to ensure that at least one company that engaged in the practice of cross-ownership of equity would be chosen.

Secondly, the location of the registered office of a company was also considered. Most companies in the population were located in Kuala Lumpur, the financial centre of the country, and Selangor, the encircling major state. In other words, very few companies were located in other states. Therefore, the second requirement was intended to ascertain that at least one company each from the locations of Penang, Perak, Johor, and Labuan was chosen. Unfortunately, this requirement was not met because the companies in Johor and Labuan declined to participate in the interviews.

Thirdly, the proportion of company equity owned by government agencies was also considered. Thus, the third guideline was meant to ensure that at least one company in which the government held a high proportion (more than 30%) of equity was selected. This is because there were only a few such companies in the targeted sample. Likewise, fourthly, the proportion of equity owned by foreigners was also taken into account. The intention was to choose at least one company, in which foreigners held a high proportion (more than 30%) of equity. Again, this was because such companies were less common.

Fifthly and finally, the number of overseas subsidiaries of a company was also considered. Only a few companies in the population had high numbers of overseas subsidiaries. Therefore, the final guideline was in place to choose at least one company that had a large number of overseas subsidiaries (more than 20), and at least one company with only one overseas subsidiary.

Therefore, from the population frame, based on the above guidelines, 16 companies had been selected. Recapitulating, the choice of companies fulfilling the five guidelines was expected to expose the questionnaire to maximum data variance, given the small sample size. This is important to ensure that the validity and reliability of the questionnaire. Unfortunately, some of the 16 initially selected companies did not want to participate in the interviews. Each company that declined to participate was replaced with another

from the same sub-cluster. This process was continued until consent was obtained from a suitable replacement in each sub-cluster. However, replacements for some of the companies, given the constraint of the guidelines, were difficult to find, although finally 16 companies participated in the first phase of data collection. These 16 companies, as a whole, did not quite meet all the guidelines specified above. Table 3.4 lists the companies (pseudonyms have been used to protect the identity of the companies) and some selected characteristics of these companies. The characteristics relate to the criteria set by the guidelines explained above. The table indicates that several of the guidelines were not met. This implies that the companies that participated possibly did not provide the wide variance expected in their responses, in order to test the questionnaire for suitability to all companies in the population. Nonetheless, this does not appear to pose any serious threat to the study, specifically, the other phases of data collection.

The chief financial officers of the selected 16 companies were contacted, between 1 November and 15 November 1997 to seek their consent. If a company agreed to participate, an appointment, stating the date and time, of interview was fixed. If a company declined to participate, a suitable replacement was looked for. However, as explained earlier, in some cases no suitable replacement could be found. All the interviews were conducted between 21 November 1997 and 20 January 1998. The chief financial officer, or person responsible for managing FX risk, in each of the 16 companies, was sent the questionnaires prior to the interview, and was requested to fill out the questionnaires. Then, during the interview, the person was also asked about the weaknesses of the questionnaire, apart from the answers to the questions in the questionnaire. Additionally, during the interview, reasons underlying the responses in the questionnaire were also sought. An interview, on average, was about an hour long, in each company. The interviews were recorded on audio tapes as back-up source.

In this phase, from the 21 companies approached for the first phase, 5 companies had categorically declined to participate in the study.[6] Notably, the data collected in the first phase accounted for 17 companies although only 16 companies participated. This is because two of the companies – that were separately listed, but had cross-ownership of

[6] Actually, many more companies were approached but although some declined requests for interviews, they expressed that they might complete and return the questionnaire if it was sent by post.

equity and both had the same major shareholder – had managed FX risk jointly. Therefore, the response rate for phase one was about 80% (i.e., 16 out of 20 companies). Nonetheless, since the first phase accounted for 21 companies, these companies were removed from the sample for the following phases of data collection.

Phase two

The initial population frame was revised, for the second phase. The 21 companies accounted for in the first phase were dropped from the list of 169 companies. Therefore, the revised population frame, for the second phase, had 148 companies. The data in this phase were collected using the same questionnaire that was used in the first phase. However, the task of collecting the data was delegated to undergraduate students.

This was done solely to increase the response rate in the study. It was suggested that the likelihood of response (completed and returned questionnaire) in mail-questionnaire surveys was likely to be higher when there was personal follow-up (e.g., personal visits to the companies, regular reminders via the telephone or post). Since the researcher would only be able to follow-up personally on a limited number of companies, the decision was made to involve students to assist in the task of ensuring the highest number of responses. It is important to note that the students' pivotal contribution in this study was only in ensuring a higher response rate than it would have been otherwise. They personally followed-up on their respective companies to secure the return of the completed questionnaires. However, they were not critically involved in encoding or interpreting company responses as the questionnaire had been prepared by the researcher. The students were also given clear instructions, by the researcher, on how to conduct the data collection process. Therefore, they were not in a position to introduce bias or prejudice into the study.

This involved 34 students, who were in their second, third or final years, studying for their degree of Bachelor in Business Administration, and who were enrolled for the International Finance course, in the second semester in the academic year of 1997-98, at Universiti Utara Malaysia. The task of collecting company responses was incorporated

as part of the students' coursework requirement for the International Finance course.[7] This was done to ensure that the students would undertake the task with commitment and responsibility. Apart from this, the students were offered a compensation of RM10.00 each for every completed questionnaire they managed to return.[8]

The students were given three one-hour workshops to instruct them on administering the questionnaires, and to counsel them on tactfully providing answers to the possible queries the companies might have about the study. They were asked to choose two companies each from the 148 available companies in the revised population frame. However, each student was required to assist in obtaining the completed questionnaire from only one of the two chosen companies. The choosing of companies by the students was co-ordinated by the researcher to avoid overlaps. The relevant companies' contact particulars were made available to the students, and the students were expected to follow-up on their companies of choice. Nonetheless, the researcher was deeply involved in obtaining confirmation, from the chosen companies, for participating in the study.

Students were encouraged to personally visit the companies and meet the persons responsible for FERM, and if necessary, to go through the questionnaire with the persons and record their responses. This was mainly to enhance the companies' confidence that the study was genuine and that there was considerable commitment put into the study. However, only a few students were able to visit the companies personally. Most of the students had followed-up on the companies through the telephone. The students had performed the data collection tasks after the New Year holidays, between 3 January 1998 and 15 February 1998. Nonetheless, only 23, out of the 34 students, managed to obtain completed questionnaires from their companies.

In the end, there were 38 companies that were approached in the second phase, by the students. However, only 23 companies provided reasonably complete or useable questionnaires. Therefore, the response rate was 61% for this second phase.

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[7]For this, the researcher is especially grateful to Puan Rozita Abdul Karim, the lecturer who was responsible for the International Finance course during that semester. The researcher is also grateful to Dr Che Ani Mad, and Encik Engku Ngah Sayuddin, then respectively, the dean of the School of Management, and the co-ordinator of Finance courses in the school, for their help and support. Also, the researcher is indebted to all the students who had undertaken this task.

[8]However, only five students accepted the compensation payment.

Consequently, all the 38 companies were omitted from the sample, yielding 110 companies for use in the third phase.

Phase three

The third and final phase of data collection is based upon the use of mail questionnaires. Figure 3.7 provides a flowchart illustrating the activities involved in this phase. The questionnaire was revised, taking into account the feedback and experience gained from the first phase. The revision of the questionnaire is briefly discussed in a later part. Following that, all the 110 companies in the updated sample were contacted, through the telephone, to obtain particulars, i.e., name, designation, telephone and fax numbers, of the persons responsible for FERM. The questionnaires were mailed to all the 110 companies, on 21-22 February 1998.

The persons responsible for FERM in each company were then contacted by telephone, after four days of mailing, to have the research explained to them. They were requested to participate in the survey. Verbal commitment, from each of them, was sought. Apart from that, the companies were also urged to return the completed questionnaire promptly. The questionnaires could be returned by using either the self-addressed postage-paid envelopes enclosed with the questionnaire or by using the fax. The return of questionnaires was monitored very closely. About five days after reminding through the telephone, if the company still had not sent the questionnaire, another call was made to remind and tactfully urge the person to return the questionnaire promptly. This was continuously carried out throughout until 13 April 1998. However, after that date, no further effort was put in. Companies that had returned the questionnaires (in all phases) were sent a letter of thanks, and were given re-assurance that company identity and company-specific information would not be revealed in the findings of this research. Further, they were also promised a summary report of the findings from this research upon its completion.

In summary, 67 companies, out of the 110 targeted in this phase, responded to the mail questionnaire. This provided a response rate of about 61%. The responses and data are presented in the next chapter. In the next part, however, the measurement of all the variables in this study is specified in detail.

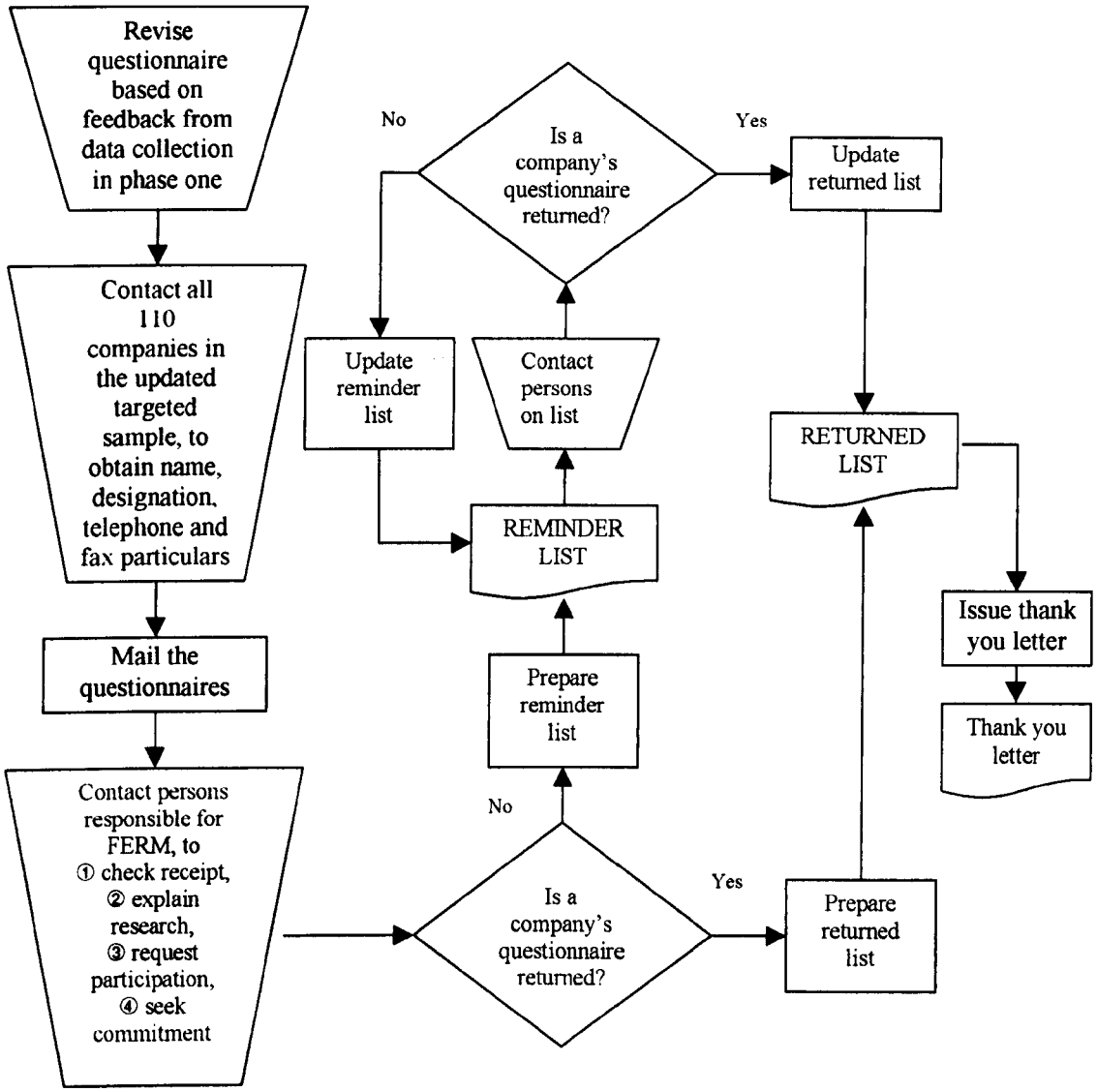


Figure 3.7: Flowchart illustrating the process of primary data collection in the third phase.

3.8. Measurement of variables

This part is dedicated to explaining the measurement of the variables used in the study. However, before that, this part explores the specific issues arising from the use of questionnaires in this study. As indicated earlier, most of the variables in this research have been measured using the questionnaire, but there were two questionnaire versions used. The first version (QV1) had been used in the first and second phases of primary data collection. The feedback and experience from administering QV1, particularly in phase one, were used to modify the questionnaire, to produce the second version (QV2). Appendices C-1 to C-3 provide copies of the questionnaires that were, respectively, used in the three phases of data collection. The salient features of the questionnaires in the first and second phases were the same, although the instructions and concluding remarks were, of course, different. Nonetheless, in the discussions that follow, these two questionnaires are assumed to be the same, and are referred to as QV1. On the other hand, the revised questionnaire used in the third phase is referred to as QV2.

Initially, the plan was to use only the QV2 responses for quantitative analysis. The QV1 was meant merely for pilot testing the questionnaire. The response from using QV2 was expected to be large, but due to the changes in the plan, as explained earlier, QV2 was only used in the third phase, and not in both the second and third phases. Therefore, this finally resulted in 38 responses from using QV1, and 69 from QV2. Since the number of valid cases (or responses) in QV2 alone is rather small for robust quantitative analyses[9], the responses from both versions, QV1 and QV2, had to be combined. However, this posed some problems because the questions and the responses in the two questionnaire versions were different. Basically, there were two major differences in QV2 compared to QV1. These are elaborated below.

Firstly, some questions pertaining to a company's financial characteristics in QV1 referred to the year 1996, whereas the same questions in QV2 referred to the year 1997. This was because QV1 was used at the end of the calendar year 1997 when the companies were aware about their financial positions, at most recent, for the previous fiscal year of 1996. On the other hand, QV2 was used in the early part of 1998, when

[9] Actually, the number of valid cases from QV2 is even smaller if only the cases that managed FX risk are included in an analysis.

the companies were aware of their financial positions for the fiscal year of 1997. Secondly, the provided possible responses (or answers) for some of the questions were different. The answer choices for some of the questions were changed in QV2, in order to attain better "spread" or greater variance in the responses because the responses from the QV1 were found to be more skewed to one end of the scale. The implications of these two differences in the questionnaire versions used are explored further below.

It must be noted that the process of primary data collection, using questionnaires, was carried out over a period of 6 months, virtually without a break, although it was carried out over two calendar years. Further, it must be reminded that, notwithstanding the discrepancy in the year of reference of the data in the two versions, the different years of reference used in QV1 and QV2 were respectively the most appropriate and relevant for each. The problem only arises due to the need to combine these two differing versions. Despite the discrepancy, the responses were combined for several reasons. ① The analyses would have less robust, otherwise, had they been performed on a smaller number of cases. The results would then have been less significant statistically. ② The actual differences in the responses are not likely to be significant because the affected data are all ordinal rather than interval or ratio, and the data are measured in relative terms (percentages), rather than absolute terms. Therefore, these are less likely to vary very much over the short-term (in the subsequent year). ③ There is no reason to suspect that the actual differences would be systematic. Therefore, these "random" variations are expected to even out, and not affect the overall findings.

On the other hand, it also important to note that the decision to change the choice of answers for some of the questions in QV2 had been correct, as the responses were more "dispersed" than the responses for the same questions in QV1. Unfortunately, the number of respondents obtained using QV2 was, by itself, rather limited. Thus, these responses from both versions had to be combined. However, as the responses were different, some of the affected ordinal responses had to be collapsed for combining. Furthermore, some of the responses in QV1 had to be rounded up or down to fit into the new collapsed categories of responses. Consequently, the combining of responses has culminated in the loss of data quality. Nonetheless, arguably, the loss of data quality was more than offset by the increased quantity of valid responses. Again, there is no reason to believe that there has been any systematic bias arising from the combining of these responses.

Consequently, as pointed out above, it is argued that the combining of the responses of the two versions was both necessary and acceptable, although it may not have been ideal. Next, the measurement of the individual variables is described in greater detail. The measurement of the research variables is described first, followed by that of the dependent variables, and the predictor variables. The variable label, the short name given to each variable, is noted within brackets in capital letters. These are the labels given to the variables in the computer software, SPSS for Windows version 6.0, that was used to do the analyses. Where relevant, the collapsing and the approximation of original responses as well as the discrepancy in the reference year of responses, arising from the combining of the responses from the two questionnaire versions, have been noted in the footnotes to the discussion. Appendices D-1 to D-3, respectively, provide the lists of research, dependent, and predictor variables and indicate how these were measured or derived.

3.8.1. Measuring research variables

Recapitulating, all the data for the research variables in this study were obtained by using questionnaires. In other words, the research variables were measured by the responses provided by the companies to the questions in the questionnaires. Therefore, in explaining the measurement of research variables, the relevant questions, in the questionnaires, that measured particular variables must be specified. Appendix B-1 provides a list of all the research variables, and summarises how the variables were measured.

The first research variable, managing FX risk (MANAGE), recorded whether, or not, a company managed FX risk. Therefore, it is a dichotomy, i.e., it has only two possible values. This variable was measured by the first question in both versions of the questionnaire.

The next three research variables, respectively, recorded whether or not a company managed accounting, economic, and transaction exposures. The variables are, respectively, (ACCTEXP), (ECONEXP), and (TRANEXP). Again, these are dichotomous variables. These variables were measured, respectively, by questions 18a, 19a, and 20a in QV2, and also by questions 14a, 16a, and 15a, in QV1. The following three

variables, (ACCTRAN1), (ECONRAN1), and (TRANRAN1), recorded a company's relative use of each of the three types of FX exposure. These were measured, in terms of ranking, by question 17 in the QV2 and question 13 in the QV1. However, the rankings given to each type of FX exposure were treated as values of a separate variable. Therefore, these questions contributed three ordinal scale variables[10] with the values of each ranging from 1 (most used) to 3 (least used).

The next research variable, (OBJTYPE), measures the degree of formalisation of FERM objective, adopted by a company. It recorded if the objective was, undefined, informal (implied) or formal (written). Therefore, this is a three-category ordinal scale variable. This was measured by question 2a in QV2, and question 2 in QV1. Following this, the next variable, (OBJECT) measured the content of the FERM objective adopted by a company. It broadly measured a company's broad goal in managing FX risk. This is a six-category nominal scale variable. This was measured by question 2b in QV2, and question 3 in QV1.

The next research variable, (PERSONUM), measured the number of persons who were responsible for FERM in a company. This was measured by question 3a, in QV2, which was an open-ended question. The measure is based on the ratio scale. However, this was not measured directly in QV1. The variable, (FUNCTION) measured the level of importance placed by a company on the FERM tasks or function performed by the persons responsible. The importance given to the tasks was inferred from the qualitative description given to the tasks. The FERM tasks were identified to constitute "a small", "a major", or "the major", component of the persons' functions. Therefore, this is a three-category ordinal scale variable. This was measured by question 3b in QV2 and question 4 in QV1. The variable, (JOINTRES), on the other hand, measured whether or not, in a company, several departments were jointly responsible for FERM. Therefore, this was a dichotomy measured by question 4 in both versions.[11]

The research variables, (DSUBCEN2) and (OSUBCEN2) measured the extent to which responsibility for FERM was centralised within a company. More specifically, it identified, if the parent or subsidiary was, or both of them were, responsible for

[10]For a concise explanation about the four types of measurement scales, nominal, ordinal, interval and ratio, see Sekaran (1992), pp.159-164.

[11]However, only a part of question 4 in QV1 measured this variable directly.

managing the subsidiary's FX exposures. The variables measured the degree of centralisation in relation to the FX exposures of, respectively, domestic subsidiaries, and overseas subsidiaries. These were measured, respectively, by question 6 and question 8, in QV2, and question 5a and question 5b in QV1. These were based on a three-category ordinal scale.[12]

Next variable, (EXINLIKE), recorded whether or not a company recognised likely, i.e., uncertain, cash inflows denominated in foreign currencies as FX exposures. Likewise, (EXOTLIKE) recorded whether or not the company recognised likely cash outflows in foreign currencies as FX exposures. Another variable, (EXINLONG), measured whether or not the company recognised long-term cash inflows, i.e., more than 12 months from the present, denominated in foreign currencies as FX exposures. Similarly, (EXOTLONG) measured whether or not the company recognised long-term cash outflows in foreign currencies as FX exposures. Therefore, all the four variables are dichotomous variables. These were measured by questions 9a and 9b in QV2.[13]

Next, the research variable (SIGNIFIC) identified whether or not a company managed only significant FX exposures. Therefore, this variable is a dichotomy. This was measured by question 10a in QV2 and question 7a in QV1. On the other hand, variable (SIGVOLUM) specifically measured the volume of exposure that was considered to be significant, by a company, on a ratio scale. This was measured by question 10b in QV2 and question 7b in QV1. These were open-ended questions.

The variable (LAPSE) recorded whether or not a company allowed time lapse between the identification and the hedging of an exposure. In other words, it noted whether or not a company allowed time flexibility for hedging an identified FX exposure. Again, this variable is a dichotomy. This was measured by question 11a in QV2 and question 8a in QV1. Besides this, (LAPSTIME) measured the time allowed by a company for an identified exposure to be hedged. This was measured on a ratio scale by question 11b in

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[12] Actually, the answers provided in the two versions were based on a five-category ordinal scale, but the answers were different. Therefore, these had to be collapsed to three common categories to combine the responses from the two versions.

[13] Only comparable concepts were measured in QV1. Questions 7a, and 7b, measured when FX receipts (EXINFLOW), and FX payments (EXOTFLOW), respectively, were recognised as FX exposures by a company. As the questions were significantly different from those in QV2, the responses from the two versions could not be combined, and were kept separate.

QV2 and question 8b in QV1. As above, these were open-ended questions.

Variable (PROPORT) recorded whether or not a company sometimes undertook partial cover of FX exposures. Therefore, this is a dichotomous variable. This was measured by question 14 in QV2 and question 10 in QV1. Another variable, (OPTIONS), recorded whether or not a company undertook writing of currency options. Therefore, this too is a dichotomous variable. This was measured by question 15 in QV2 and question 11 in QV1. Yet another variable, (UNOFFSET), recorded whether or not a company undertook naked FX deals, i.e., FX deals that were not offset by underlying commercial or operational exposures. This too is a dichotomous variable. This was measured by question 16 in QV2 and question 12 in QV1.

Variable (EXRATE1) recorded whether or not a company used forecast rates (both FX rates and interest rates), more often than not, in making FERM decisions. Again, this variable is also a dichotomy. This was measured by question 12 in QV2 and question 9 in QV1.[14] Another variable, (INRATE), records whether or not a company used internal FX rates in its planning and budgeting processes. Again, this variable is a dichotomy. This was measured by question 13 in QV2.[15]

The last 25 research variables, as explained earlier, are concerned with measuring the extent to which a company used a particular strategy or technique to manage a specific type of FX exposure – accounting, economic and transaction exposures. These variables can be divided into three groups – each representing a type of FX exposure. For example, seven variables, from (ABTBAC2) to (ADONOT2), measured the proportion of accounting exposure that was managed using the various techniques, respectively, from back-to-back loans to doing nothing. Similarly, eight variables, including (EBTBAC2) and (EDONOT2), measured the proportion of economic exposure managed using the specific techniques. Finally, nine variables, including (TBTBAC2) and (TDONOT2), measured the proportion of transaction exposure managed using the particular techniques. Again, Appendix B-1 provides the complete list of strategies and techniques examined in this study. For brief explanations about the various strategies

[14]Originally, question 9 in QV1 has a four-category ordinal scale rather than the dichotomous scale seen in question 12 in QV2. However, the responses "always" and "often", in QV1, were coded as "yes", while the responses "seldom" and "never" were coded as "no", and these were combined with the responses from QV2.

[15]This measure was not included in QV1.

and techniques, refer to the glossary sheet attached with the copy of the questionnaires, in Appendix C-1 to C-3. Note that each variable measured the proportion of the given type of exposure managed using the particular technique or strategy. All these variables were measured in a three-category ordinal scale.[16] These variables were measured by the questions 18b, 19b, and 20b, in QV2, and questions 14b, 16b, and 15b in QV1.

3.8.2. Measuring dependent variables

Above, the measurement of individual research variables was described. In this part, however, the measurement of the 16 dependent variables, enumerated earlier in the chapter, is described. As mentioned earlier, each dependent variable is actually derived from a research variable. To recapitulate, the purpose of dependent variables is to identify predictors that appear to influence the dependent variables. As mentioned earlier, the number of dependent variables was limited to 16 in order to limit the breadth and complexity of the study. Some further reasons for about the choice of dependent variables are elaborated below.

Firstly, only research variables that displayed considerable variance were chosen (adopted) or transformed (adapted) to be dependent variables. This is because, otherwise, there would then be very little variance that can be explained by the predictor variables' variance.[17] Secondly, only research variables that are dichotomous, or only those that can be easily transformed to dichotomies, were adopted or adapted to become dependent variables.[18] Dichotomous variables or dichotomies can only assume two values or outcomes. In this case, each dependent variable records whether or not a company undertook a particular FERM activity. The reasons for choosing only dichotomous dependent variables are as follows. ① Most of the research variables are

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[16] Actually, the questions in both versions were based upon a five-category ordinal scale, but the answers (range of exposures) used in each version were different. Therefore, the responses from both versions had to be combined by collapsing the five categories into three common categories. Further, it must be noted that the answers in QV1 referred to the fiscal year 1996, while those in QV2 referred to the fiscal year 1997.

[17] For example, the research variable, writing currency options, was not chosen because there were very few companies that had written currency options. Note that the choice of dependent variables is a decision that was made after the collection, and preliminary analysis, of the data.

[18] For example, the research variable, the number of persons responsible for FERM, was not chosen because it could not be transformed easily into a dichotomy.

predominantly dichotomies. Some research variables are ordinal in scale but these can be easily transformed into dichotomies. ② A common type of dependent variables (dichotomies) was chosen to enable easier comparison of results across different dependent variables. ③ Analysis using non-dichotomous ordinal scale, or nominal scale, dependent variables is complex, and unavailable in standard statistical computer packages. Moreover, such analysis cannot be performed manually without the assistance of computer programmes as it involves Maximum Likelihood estimation and algorithms.[19]

Next, the measurement of the dependent variables is specified in greater detail. Appendix B-2 provides a list of all the dependent variables, and summarises how the variables were adopted or adapted. As implied above, there are two groups of dependent variables. The first group consists of 10 dependent variables that are simply the same dichotomous research variables, described above, that have the same name. In other words, these research variables were adopted without any transformation. The variables include ① managing FX risk (MANAGE), ② managing accounting exposure (ACCTEXP), ③ managing economic exposure (ECONEXP), ④ managing transaction exposure (TRANEXP), ⑤ sharing FERM responsibility among departments (JOINTRES), ⑥ managing only significant exposures (SIGNIFIC), ⑦ allowing time flexibility for hedging (LAPSE), ⑧ undertaking partial cover (PROPORT), ⑨ undertaking uncovered FX deal (UNOFFSET), and ⑩ using forecast rates (EXRATE1).

However, five other dependent variables were derived from research variables that were measured originally using a three-category ordinal scale. These research variables were transformed (collapsed) into dichotomies. These are enumerated next. ❶ The research variable (OBJTYPE) recorded the FERM objective adopted by a company as "undefined", "informal", or "formal". These categories in (OBJTYPE) were transformed into a dichotomous scale, in (OBJTYPE1). The first two categories were merged and re-labelled as "no" – formal objective is not adopted, while the last category was retained but re-labelled as "yes" – formal objective is adopted. Thus, the dependent variable (OBJTYPE1) noted whether or not a company adopted formal FERM objective. ❷ The research variable (DSUBCEN2) recorded the responsibility for managing FX exposures arising from domestic subsidiaries of a company as handled by "parent", "parent and

[19]See Agresti (1996), pp.8-10, for a brief explanation of Maximum Likelihood estimation.

subsidiary", or "subsidiary". These were transformed into a dichotomy by merging the first two categories, and re-labelling them as "no" – full decentralisation is not practised or full autonomy is not allowed, while retaining the last category but re-labelling it as "yes" – full decentralisation is practised or full autonomy is allowed. This resulted in the adapted dependent variable (DCEN2). ❸ Likewise, the same preceding procedure is followed to transform the research variable (OSUBCEN2) to the dependent variable (OCEN2). ❹ The research variable (TFORCO2) measured the proportion of transaction exposure that was managed using forward contracts by a company, using the three categories, "not used", "up to 60%", and "more than 60%". The first category, "not used" was retained but re-labelled as "no", while the other two categories were merged and re-labelled as "yes" – forward contracts are used. The transformed dependent variable, (FORCON1), therefore, measured whether or not a company used forward contracts to manage transaction exposure. ❺ On the other hand, the first two categories of (TFORCO2) were merged and re-labelled as "no" – forward contracts are not used extensively, while the last category was retained but re-labelled as "yes" – forward contracts are used extensively. This resulted in the dependent variable, (FORCON2), which measured whether or not a company used forward contracts extensively to manage transaction exposure.

The last remaining dependent variable was derived from combining the data from three separate research variables, (ACCTEXP), (ECONEXP) and (TRANEXP). Specifically, companies that managed all the three exposures were placed in the "yes" category, while the others – that did not manage at least one of the three types of FX exposure – were placed in the "no" category. Thus, the adapted dependent variable, (USE3), measured whether or not a company managed all three types of FX exposure.

3.8.3. Measuring predictors

Unlike the data for research variables (and dependent variables) that were wholly obtained by using the questionnaire, the data for predictors were only partly obtained from the questionnaire. In fact, the major portion of the data for predictors was extracted from the KLSE handbook. It must be noted, however, that the data available from the KLSE handbook were valid for the end of fiscal year 1995. On the contrary, the data for the research variables, and some of the predictors, collected using the

questionnaire, were valid for the end of fiscal year 1996 and 1997. This may pose concern about data compatibility. Nonetheless, the data collected were the most recent and up-to-date from each source of data. In other words, although the data from the KLSE handbook were for the end of fiscal year 1995, these were the most recent data available then when the study was undertaken. Seen from another perspective, since the study was conducted in the year 1997-1998, the primary data collected using questionnaire cannot refer to the year 1995 as that would require the respondents to recall information, and this may not be reliable or valid. In short, the apparent disparity in the year of reference of the data is unavoidable. Nonetheless, this disparity is not expected to be serious because it is unlikely to introduce bias in the results of the study. In spite of this, it would be wise to interpret the results of this study by taking into consideration the year(s) applicable to the specific variables involved.

As explained earlier, the study examines some selected predictors to see if they appear to influence the selected FERM activities or the dependent variables described above. These predictors have been enumerated earlier. Next, the measurement of the predictors included in the study is described. Appendix B-3 lists all the predictor variables, and indicates how the variables were measured. The first four predictors measured the size of a company. They are (ASSETS_B), (SALES_B), (MKTVAL_B), and (TSUBNUM). The first three predictors measured, respectively, the total assets, total sales, and market capitalisation, of a company in billions of Ringgit. The fourth predictor measured the number of subsidiaries held by a company. The data for all the four predictors were obtained from the KLSE handbook.[20]

The predictor (DEBT_B) measured the total debt in billions of Ringgit used by a company. On the other hand, (PERDEBT) measured the debt ratio of a company. This can be interpreted as the relative debt or the proportion of assets funded by debt.[21] The data for both predictors were also taken from the KLSE handbook.

[20] Actually, the data for market capitalisation was obtained through computation as follows: market capitalisation = book value of debt + (market price of share × number of shares outstanding).

[21] More specifically, it measured a company's ratio of debt to assets. Therefore, it can be computed as follows: debt ratio = total debt ÷ total assets.

Predictor (EQFOREIN) measured the proportion of a company's equity held by foreigners. It is probably worth reminding that all the companies included in the study were Malaysian. In other words, the proportion of equity holding by foreigners, in each company was less than 50%. Predictor (EQGOVT), on the other hand, measured the proportion of equity held by government and government agencies. The data for both these variables were also extracted from the KLSE handbook.

The predictor (BOARD) recorded whether or not a company was listed in the second board – otherwise, the company was listed in the main board – in the KLSE. Therefore, this is a dichotomous variable. Another predictor (SECTOR) recorded the industry sector under which a company was listed in the KLSE. This is an eight-category nominal variable. These data too were extracted from the KLSE handbook. However, the handbook only provided the listing sector for the companies listed on the main board. The second board companies' listing sector was obtained from the KLSE official Internet web-site (http://www.klse.com.my).

Next, (OSUBNUM) measured the number of overseas subsidiaries held by a company. This was also extracted from the KLSE handbook. Specifically, all operating (non-dormant) units listed as subsidiaries for a company, without the suffixes, "bhd." and "sdn.bhd.", respectively, "limited", and "private limited", were noted to be overseas subsidiaries. This is because all companies incorporated in Malaysia must have either of these suffixes. The next four predictors, (PERSAL3), (PERPUR3), (PERFIN3), (PERCAP3), measured whether or not more than 25% of, respectively, sales and other revenues, purchases and other expenses, financing or borrowings, and capital investment, were denominated in foreign currencies. These, therefore, are dichotomies. These were respectively measured by questions 21a, 21b, 21c, and 21d, in QV2, and questions 17a, 17b, 17c, and 17d, in QV1).[22] Predictor (FOREIGN3) measured whether or not more than 30% of total transactions that was denominated in foreign currencies. This too is a dichotomy. This was measured by question 22a in QV2, and question 26a

[22] Actually, the questions in both versions were based upon a five-category ordinal scale but the answers (proportion range) used in the versions were different. Therefore, the responses from both versions had to be combined by collapsing the five categories into three common categories. These were later collapsed into two categories because the number of cases in the third category was very small. Further, the responses from QV1 were combined, with some approximation, with the responses from QV2. More precisely, responses of "21% or more", in QV1, were assumed to be "26% or more", in the combined responses. Moreover, it must be noted that QV1 referred to the year 1996, while QV2 referred to the year 1997.

in QV1.[23]

The predictor (INTRACO2) measured the proportion of intra-company transactions (over total transaction volume) for a company. This was measured, using a three-category ordinal scale, by question 23 in QV2 and question 18 in QV1.[24]

The predictor (STABLE1) recorded whether or not a company perceived its FX exposures had a stable pattern from one year to another. Therefore, this is a dichotomy. This was measured by question 24 in QV2 and question 19 in QV1.[25] Another predictor (VSIZE) measured a company's perception of its own FX exposure volume size, using a five-category Likert-type interval scale[26], ranging from "very small" to "very large." This was measured by question 25 in QV2 and question 20 in QV1. Predictor (VCHANGE) measured a company's perception of its FX exposure volume change (increment) over time, again, using the Likert-type interval scale. This was measured by question 26 in QV2 and question 21 in QV1, with responses ranging from "decreasing rapidly" to "increasing rapidly". Yet another predictor (XPREDIC) measured a company's perception of its FX exposure unpredictability. This was measured by question 27 in

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[23]Note that, actually, the questions measured the proportion of transactions denominated in Ringgit, rather than foreign currencies. However, this can be easily converted because the proportion of transactions in Ringgit is equal to one minus the proportion of transactions in foreign currencies. Again, the answers for questions in both versions were based upon a five-category ordinal scale but the answers in QV2 and QV1 were different. Thus, the responses from both versions had to be combined into three categories. Again, these were then collapsed into two categories because there was no case in the third category. Further, it must be noted that the responses from QV1 were combined with the responses from QV2, with some approximation. More precisely, responses of "between 21% and 40%", in QV1, were assumed to be "more than 30%", in the combined responses. Moreover, QV1 referred to the year 1996, while QV2 referred to the year 1997. Apart from this, the proportions of transactions denominated in specific foreign currencies were also measured by questions 22b-d in QV2, and questions 26b-d in QV1. There are 13 such explanatory variables. All these were measured using a combined three-category ordinal scale. See Table 3.5(c) for the list of these variables. Apart from these, (CURNUM) measured the number of currencies in which a company had transactions. This was measured by question 25 in the QV1. This question was dropped due to lack of space in QV2. Note that the 13 explanatory variables that measured the proportions of company transactions denominated in foreign currencies and (CURNUM) were not used as predictors. They were used only to provide some background description about the companies' FX involvement characteristics (see chapter 4).

[24]Although the questions measured the proportion of intra-company transactions on a five-category ordinal scale, this was later collapsed because the numbers of cases in the last three categories were small. Note that QV1 referred to the year 1996, while QV2 referred to the year 1997.

[25]Actually, question 19 in QV1 had a five-category Likert-type interval scale, rather than the dichotomy scale used in question 24 in QV2. The responses "very unstable" and "unstable" in QV1 were re-coded as "no" – indicating unstable FX exposure pattern, while the other responses, were re-coded as "yes" – indicating stable pattern, when the responses from both versions were combined. Moreover, QV1 referred to the year 1996 while QV2 referred to the year 1997.

[26]See Sekaran (1992), p.162, for a brief overview of Likert-type interval scale measures.

QV2 and question 22 in QV1, using the Likert-type scale, with responses ranging from "very unpredictable" to "very predictable".[27] Predictor (VOLAT) measured a company's perception of the exchange rate uncertainty (volatility). This was measured by question 28a in QV2 and question 23 in QV1, with responses ranging from "very certain" to "very uncertain", also using the Likert-type scale. Similarly, (RISK) measured a company's perception of the level of its own FX risk, using the five-point Likert-type scale, with responses ranging from "very low" to "very high". This was measured by question 29a in QV2 and question 24 in QV1.[28]

3.9. Research questions

At the beginning of this chapter, the two broad research questions were expounded. Having described the various variables, and their measurements, above, this part, enumerates the specific research questions in greater detail. The purpose of this is to focus the investigation of the study. The broad research questions that were described earlier are rather too diffuse, for example, to identify specific statistical tests to address the research objectives. The specific research questions that are associated with the first broad research question are enumerated first. These are followed by the questions that are associated with the second broad research question.

[27] Actually, the questions measured a company's perceived FX exposure predictability, rather than unpredictability. However, Likert-type scales can be easily reversed, and therefore, this was reversed to reflect exposure unpredictability.

[28] Apart from these, questions 28b and 29b in QV2 measured, respectively, a company's perception of exchange rate uncertainty, and the company's perception of the level of its FX risk prior to the advent of the currency crisis (prior to June 1997). These questions were not formally incorporated into QV1, although they were orally included in a few cases. These were only later added in QV2. However, these were not used as predictors in further analysis. Besides that, the study had attempted to measure the corporate FX risk attitude as another predictor. However, this concept was very difficult to tap successfully especially given the constraint of a brief questionnaire. The instrument used by McInish, Ramaswami, and Srivastava (1993) to measure the risk attitude of individual respondents was initially adapted for use in QV1. However, the feedback indicated that respondents had misunderstood, and were confused by, the question. Therefore, this question was later modified for QV2, but this measure too had similar albeit less severe problems. See question 27 in QV1, and question 30 in QV2. As a result, this concept was omitted.

3.9.1. FERM activities and characteristics

These research questions are concerned with the companies' FERM activities and characteristics. The answers to these questions, together, attempt to describe the practice of FERM among the Malaysian public-listed multinational companies. In other words, the answers to these questions should jointly address the first research objective – describe how the companies manage FX risk. Notice that these questions have been organised into the seven categories of research variables enumerated earlier.

① Management of FX risk. (1) Do the companies manage FX risk? This question attempts to establish the proportion of companies that managed FX risk.

② FX exposure type. (2) What types of FX exposure are managed or used by the companies? This question actually tries to establish the proportions of companies that managed particular types of FX exposure – accounting, economic, and transaction exposures – and the proportions that managed, one, two, or all three types of FX exposure. (3) Are certain types of FX exposure more used than others, and if so, which is the most used, and which is the least used, type of exposure? Broadly, this question attempts to confirm if one particular type of FX exposure is used more than other types, and further, seeks to establish the ranks of the three types of FX exposure, from the most used to the least used.

③ FERM objective. (4) How formal are the FERM objectives adopted by the companies? This question is concerned with establishing the proportions of companies that have formal objectives. (5) What is the content of the objectives adopted by the companies for FERM? This question aims to find out what are the companies' considerations in the adopted FERM objectives, and which are the most popular consideration(s).

④ FERM responsibility. (6) How many persons are responsible for FERM in each company? This question wishes to establish the number of persons responsible for FERM, typically, in a company. (7) How important are the tasks of FERM, in each company, compared to other tasks performed by the same persons? This question, on the other hand, endeavours to assess the importance and status given to FERM tasks, relative to the other tasks performed by the same persons. (8) Are several departments jointly responsible for FERM in each company? This question attempts to establish the

proportion of companies that have joint responsibility across departments for managing FERM.

⑤ FERM centralisation. (9) To what extent is FERM centralised, in the companies, specifically in relation to FX exposures arising from subsidiaries? This question is interested in determining the degree of centralisation of FERM practised among companies, specifically in relation to managing subsidiaries' FX exposures. (10) Are domestic subsidiaries more, or less, centralised in FERM, compared to overseas subsidiaries? This question, on the other hand, seeks to establish if there is a difference between the levels of centralisation imposed on domestic and overseas subsidiaries, of the same company.

⑥ FERM policies and procedures. (11) Do companies recognise likely (uncertain, rather than certain) exposures, and long-term (rather than short-term) exposures? This question is concerned with estimating the proportions of companies that recognised uncertain, and long-term, FX exposures. (12) Are companies more willing to recognise FX exposures arising from cash outflows, compared to those arising from cash inflows? This question, however, seeks to see if there is a difference in a company's recognition of FX exposures arising from cash outflows and cash inflows. (13) Do companies manage only significant exposures? Actually, this question tries to determine the proportion of companies that managed only significant FX exposures. (14) How large an exposure is considered significant by a company? This question, on the other hand, attempts to assess the size of an FX exposure that is considered significant by the companies. (15) Do companies allow time flexibility between the identification, and the hedging, of an exposure? This question aims to determine the proportion of companies that allowed time flexibility for hedging. (16) How much time is usually allowed between the identification and hedging of an exposure? On the other hand, this question wishes to assess the time allowed, by the companies, before an FX exposure is hedged. (17) Do companies undertake partial cover of an FX exposure? This seeks to establish the proportion of companies that undertook partial cover or partial hedge. (18) Do companies undertake writing currency options? This aims to establish the proportion of companies that undertook writing currency options. (19) Do companies undertake uncovered FX deals that are not offset by underlying commercial or operational exposures? This question actually endeavours to measure the proportion of companies that undertook uncovered FX deals (or naked FX deals). (20) Do companies, more

often than not, use FX and interest rate forecasts to make hedging decisions? This question is concerned with finding out the proportion of companies that used FX and interest rate forecasts, more often than not, in making FERM decisions. (21) Do companies use internal FX rates, as target, or benchmark rates, in their planning or budgeting processes? This question is interested in uncovering the proportion of companies that used internal FX rates in their planning and budgeting.

⑦ FERM strategies and techniques. (22) Which strategies and techniques do companies use to manage FX risk, and which are the most used techniques or strategies? These questions aim to establish the most used or popular techniques and strategies that were used to manage FX risk. (23) Is a particular technique or strategy more used for managing a specific type of FX exposure than other techniques or strategies? This question, on the other hand, attempts to establish if one particular technique or strategy is used more than others, and further, seeks to assess the rank of each technique or strategy, compared to other techniques and strategies, in terms of usage.

The answers to the above questions, together with the analyses and their results, are discussed in the next chapter. Next, the specific research questions pertaining to the second broad question are specified below.

3.9.2. Predictors that influence FERM

The second broad research question asks why do Malaysian public-listed multinational companies manage FX risk in a particular manner. This question is equivalent to asking what predictors influence specific FERM activities undertaken by the companies. More specifically, the intention is to identify predictors that appear to influence the companies' likelihood of undertaking particular FERM activities. In short, the second research objective is related to identifying possible factors that might influence Malaysian public-listed multinational companies' undertaking of particular FERM activities.

More practically, the study is interested in uncovering which of the selected 23 predictors are associated with each of the 16 selected FERM activities (dependent variables). Therefore, the specific research questions, in this case, can be stated in the

following format:

Does predictor X_i appear to influence the companies' likelihood of undertaking FERM activity Y_t? Note that $i = \{1, 2, \ldots, 23\}$, and $t = \{1, 2, \ldots, 16\}$, representing specific FERM activities.

Note that this only provides correlational relationship between a predictor and a dependent variable. This does not amount to establishing a causal relationship between the two variables. Mainly, this is because this study is not an experiment where the other factors (predictors) can be fully controlled, and therefore, a causal relationship cannot be established.[29] Nonetheless, the study attempts to highlight correlational relationships that imply that particular predictors influence specific FERM activities. Further, the study also attempts to portray the conditional relationship between a predictor and a dependent variable, i.e., on the premise that other predictors are held constant, i.e., mathematically controlled. The statistical method of analysis used for this purpose, the logistic regression analysis, is explained briefly in the next part, although the application and the assessment of this analysis technique is elaborated in greater detail in Chapter 5.

3.10. Analysis and statistical methods

The data in this study are a collection of mainly qualitative data from the questionnaires, and some quantitative data from the KLSE handbook. There are two broad types of analysis used in this study. In order to address the first broad research question, mainly descriptive statistical methods are used. Frequency tables, cross-tabulation tables, and graphs (especially for describing quantitative explanatory variables or predictors) are used. Apart from that, the specific research questions, associated with the first broad research question, as seen above, also include some analyses involving the comparison of research variable data across separate categories or groups. As the research variable data of concern are mainly qualitative, non-parametric statistics have been used for this purpose. More specifically, Wilcoxon matched-pairs signed-ranks test, Kruskal-Wallis

[29] Ghauri, Gronhaug, and Kristianslund (1995), p.30, outlines the requisites for establishing causal relationships. Indeed, it could be argued that a causal relationship cannot be fully proven, and that it is not required anyway. Kerlinger (1973), pp.392-393, provides the preceding argument.

one-way ANOVA, Friedman's two-way ANOVA have been employed. These are used and explained in Chapter 4.

On the other hand, the second broad research question aims to identify predictors that appear to influence particular FERM activities. However, more specifically, it intends to identify conditional predictor influence, with controlling for the effects of other predictors. Thus, this can be only accomplished in a multiple regression mode because all the predictors are simultaneously included in the regression function, to discern the conditional effect of one predictor on the dependent variable. Furthermore, as explained earlier, all the dependent variables, or FERM activities, chosen in this study are dichotomies. Given the conditional effect criterion, and the type of dependent variable (dichotomies), only two techniques of analysis can be considered. These are the logistic regression model and probit model.

This study adopts the first technique, logistic regression model. It has two main advantages compared to the other technique. Firstly, it is a technique that has been used by previous studies in this area.[30] Probit model, in contrast, has rarely been used. Thus, the use of this technique should allow for the results of this study to be directly compared to the results of other studies in this area. Secondly, the interpretation of results, effects, or the coefficient estimates, is comparatively easier with logistic regression. In a logistic regression model, the coefficient estimates are in the form of the logit (log of the odds) on an event of interest occurring (against it not occurring). Since the odds of an event occurring is closely (and monotonically) related to the probability of the event occurring, the interpretation of the fitted coefficients is intuitively appealing. The coefficient estimates in a probit model, on the other hand, are in the form of standard normal z-scores that are associated with the left-tail probability of an event of interest occurring. Therefore, the interpretation of results in probit models is rather less easy.[31]

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[30] In fact, Agresti (1996), p.103, claims that logistic regression model is the most popular for binary (dichotomous) data.

[31] Agresti (1996), pp.79-80, implies this, but explains that, in most cases, both logistic regression and probit models should provide closely similar final results and interpretation, and that it would be very rare to find them otherwise. For an in-depth exposition on probit models, see Aldrich & Nelson (1984).

Often, when dichotomous dependent variables are involved, other models are also proposed as suitable. In particular, ① log-linear model, ② logit model, and ③ linear discriminant analysis, are often, at first glance, considered appropriate. In fact, logistic regression model is confused with logit model, and logit model with log-linear model. Generally, a log-linear model is best suited to discern relationships among several categorical or nominal variables, but it does not distinguish between dependent and explanatory variables. In other words, it is less adequate to deal with situations that involve continuous explanatory variables, and when there is a clear distinction between dependent and explanatory variables, as in this study. Conversely, a logit model, unlike the log-linear model, distinguishes between dependent variable and explanatory variables, but on the other hand, unlike the logistic regression model, it does not usually accommodate continuous explanatory variables. Thus, the logit model too is unsuitable for this study.

Another distinct difference is that the logistic regression model is fitted with disaggregated data, i.e., individual case-level data, whereas, logit model and log-linear models are fitted with aggregated data, i.e., multi-way contingency table data. In other words, the latter models are fitted using the cell frequency numbers in the cross-tabulation of categorical variables. Moreover, the log-linear model, unlike logit and logistic regression models, does not provide coefficient estimates are not readily available in the format comparable to that found in normal regression models.[32] The discriminant analysis, however, provides two sets of different parameter estimates for the predictors, called linear discriminant functions – one set for cases where the event of interest occurred, and the other set for cases where the event of interest did not occur. This technique seems more suited to predicting or classifying cases into categories of dependent variable, rather than identifying predictors that influence the dependent variable.[33]

In short, logistic regression model or analysis is the most appropriate technique to be used in order to address the second broad research question. However, the logistic regression model, typically, only includes dependent variables that are dichotomous.

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[32]See DeMaris (1992) for a concise review of the similarities and differences of three models. See especially pages, 7, 11, 42, and 44.

[33]See Ghauri et al. (1995), pp.122-124, for a brief explanation of linear discriminant analysis.

When the dependent variable is polytomous (multi-category, nominal, or sometimes ordinal), multinomial or polytomous logistic regression models should be used. These techniques are theoretically well developed. See Menard (1995), pp. 80-90, and DeMaris (1992), pp. 61-77. Unfortunately, these models are unavailable in the standard statistical packages. For example, it is unavailable in the SPSS for Windows version 6.0 that is widely used at the university. In fact, it is also not available in the more recent SPSS for Windows version 8.0. The estimation of these models and analyses without computer software is almost impossible, because logit estimation uses maximum likelihood estimation using iterative algorithms, commonly Newton-Raphson algorithm. See Agresti (1996), pp. 195-196. In other words, the model fitting and subsequent analyses cannot be done without the computer software. A potential recourse was to use the logit model, which is supported by the SPSS for Windows 6.1. See Norusis (1994), pp. 71-78. However, as explained earlier, the logit model is not suitable when continuous explanatory variables are present, although these can be accommodated using cell covariates. Trials using the same set of data, with a dichotomous dependent variable, and one continuous explanatory variable (predictor), and a nominal predictor, in both the logistic regression model and the logit model, produced different results. This may have been due to the different fitting method used by each technique. As explained earlier, the former uses individual case-level (not aggregated) data whereas the latter uses contingency table cell frequency (aggregated) data. Furthermore, the further analysis in terms of assessing the fitted model, predictor effects and significance, residuals etc., are more complex with logit model. Certainly, the standard output from the use of logit model, compared to that from the use of logistic regression model, in the SPSS for Windows package, is less informative, more difficult to interpret, and generally not reminiscent of the normal or logistic regression format.

Therefore, in the interest of parsimony, and specifically, to limit the complexity of the analysis, the study used the logistic regression model even when a dependent variable, or a research variable rather, was originally, non-dichotomous. This was done, as explained earlier, by transforming the research variables into dichotomies. This may reduce the efficiency or power of analysis because the collapsing of categorical variables into dichotomies involves loss of data quality. Nonetheless, the study does not aim to establish (or reject) the effect of specific predictors, but rather it tries to identify

possible predictors. Therefore, this loss of efficiency of analysis is arguably acceptable in exchange for the increase in parsimony the transformations allow.

3.11. Questionnaire design

The questionnaire had been designed and further improved after some piloting was done, with feedback from two postgraduate students and two university lecturers[34], prior to its use in data collection. Apart from that, the feedback, experience and responses from using the first version of the questionnaire (QV1), especially in the first phase, were used to modify and improve the questionnaire, to produce the second version (QV2). The following are some key issues that had been considered in designing the questionnaire, especially the second version.

The most important consideration was the length of the questionnaire. As the respondents were all chief financial officers of public companies, they were likely to be very busy. Therefore, a long and elaborate questionnaire had to be avoided. Initially the questionnaire was six pages in length. From the feedback, the less important portions were excluded. Questions related to information that could be obtained from other sources were also dropped, resulting in a five-page questionnaire. Besides that, some highly related questions, with separate numbers initially, were renumbered with sub-numbering of (a) and (b). This was done to give the impression that the questionnaire contained fewer questions. A small font size, that kept the questionnaire short without making it too strenuous to read, was used.

Next, the ease with which the respondents could understand the questions, and the structure, sequence and flow of questions, were considered. To enhance respondent understanding, and more importantly, to avoid misunderstanding, a glossary was enclosed with the questionnaire. This clarified the exposure measures, as well as the strategies and techniques referred to in the questionnaire. Elsewhere, where it was felt that the terms mentioned could be construed as vague, brief explanations were provided in parentheses, next to the terms. The structure of the questionnaire was modified in

[34]The lecturers involved were Encik Nasruddin Zainuddin and Puan Rozita Abdul Karim, both lecturers of Finance at Universiti Utara Malaysia, and two post-graduate students, under the tutelage of Encik Nasruddin Zainuddin, at Universiti Utara Malaysia.

QV2 from the feedback obtained from the interviews. Please see Appendix C-1 and Appendix C-3 for the differences between the two versions. Nonetheless, the content of the questionnaire was organised into nine sections with section headings to indicate to the respondent about the structure of the questionnaire. However, no description or explanation preceded each section simply because the section headings appeared to be adequate. Furthermore, such explanation would have made the questionnaire longer. The first six sections are about a company's FERM activities and characteristics – starting with ① the objective of FERM[35], followed by ② the responsibility for FERM, and ③ the degree of centralisation of FERM, ④ the type of FX exposure measure used, ⑤ the policies and procedures of FERM, and finally, ⑥ the strategies and techniques used in FERM. The final three sections dealt with related company attributes and characteristics. In other words, they reflect some of the categories of predictors used in the study. These are: ⑦ the volume of FX, and intra-company, transactions, ⑧ the perceived FX risk attributes, and ⑨ the FX risk attitude. It was felt that the sections had been arranged in a reasonable and meaningful order – considering these from the perspective of the respondent. Additionally, the respondents were requested in the questionnaire, to contact the researcher if they had any query. The questionnaire carried the telephone number and contact address of the researcher.

Next, the ease with which the respondents could answer the questions was considered. Almost all questions, except for seven, required the respondents to merely tick given responses – either the yes-no or multiple-choice type of questions. Out of the seven, one required the ranking of given responses, while another four were partially open-ended, i.e., each was preceded by a yes-no type of answer followed by a brief numerical answer if the answer to the preceding question was "yes". In fact, only the other two were directly open-ended questions. Even these required only brief responses. Moreover, only one open-ended question had requested company financial information. Even this was requested in rounded terms of thousands of Malaysian Ringgit, and therefore, the respondent should not have felt uneasy for disclosing the information.

[35]The sections reflect the seven categories of research variables used in the study. However, the first category, the management of FX risk, was not marked as a separate section, in the questionnaire, because it involved only one question.

Finally, the ease with which the respondents could return the completed questionnaire was considered. Self-addressed and postage-paid envelopes were enclosed with the questionnaires. The respondents were also provided an alternative way of returning the completed questionnaire – through fax. The fax number and the researcher's name were carried on all pages of the questionnaire.

SUMMARY

The study attempts to address two broad questions – how do Malaysian public-listed multinational companies manage FX risk, and why do they manage FX risk in a given manner. More precisely, the study attempts to ① examine the companies' dispositions in a set of selected activities and characteristics of FERM, and ② identify predictors that appear to influence the companies' undertaking of particular FERM activities. In line with previous studies of this nature, this research employs quantitative methods of analysis to address these two research objectives. It uses 54 research variables that collectively measure several aspects of FERM activities and characteristics in order to address the first research objective. These variables can be subsumed into the seven categories. These include ① management of FX risk, ② type of FX exposure, ③ FERM objective, ④ FERM responsibility, ⑤ FERM centralisation, ⑥ FERM policies and procedures, and finally ⑦ FERM strategies and techniques. The research also uses 16 dependent variables and 23 predictors in order to address the second research objective. The dependent variables are all dichotomies, and are derived from some of the research variables. The predictor variables too can be grouped into seven categories. These include ① company size, ② debt and leverage, ③ equity ownership, ④ listing board and sector, ⑤ FX involvement, ⑥ intra-company transaction, and finally ⑦ perceived FX risk attributes.

The study uses descriptive statistics to address the first research objectives. Further, as the data for research variables are more qualitative, non-parametric statistics are used to address some specific research questions associated with the first research objective. On the other hand, since the dependent variables are all dichotomies, and intention is to identify conditional effects of predictors on the dependent variables, the study employs logistic regression analysis to address the second research objective.

The data for this study can be viewed to have been collected in three stages. The first stage was concerned with the data required for building the population frame and determining the sample. This was collated from the KLSE handbook. The second stage encompassed the collection of secondary data for the bulk of predictor variables used in the study. These data too were extracted from the KLSE handbook, but they were extracted later – after determining the companies in the targeted sample. The final stage of data collection was concerned with the (primary) data for all the research and dependent variables, and some predictor variables. These data were collected using two versions of questionnaires in three phases. The first version, QV1, was used in the first and second phases of data collection. In the first phase, a small number of companies were interviewed based on the framework provided by QV1. In the second phase, the QV1 responses from companies were followed-up and monitored by a group of undergraduate students co-ordinated by the researcher. The second version, QV2, a modified and improved questionnaire, was used in the final phase. In this phase, the questionnaire was administered mostly using the mail.

In short, this chapter described the methods used to collect and analyse the data to address the two broad research questions of this study. The next chapter, however, presents the collected data, and then focuses specifically on addressing the first research question – how do Malaysian public-listed multinational companies manage FX risk. In other words, it describes their FERM practices.

Chapter 4

FERM Practices

INTRODUCTION

In this chapter, all the data collected for this study are presented and examined. As the title suggests, the chapter is mainly dedicated to describing the FERM practices, i.e., FERM activities and FERM characteristics, of Malaysian public-listed multinational companies. The chapter is actually divided into four major parts. The first part assesses the collected data for non-response bias. The second part describes briefly the data associated with the predictors (or explanatory variables) of this study. The third part describes, in detail, the data associated with the research variables. More specifically, it describes the FERM practices of the companies that participated in this study. In addition, it also presents relevant findings from previous studies conducted on companies in other countries. In the final part, the findings about the corporate FERM practices are reviewed and discussed in greater depth. Finally, this chapter ends with a summary of the key points and findings.

4.1. Non-response bias

As explained in the previous chapter, out of the 169 companies in the targeted sample, 106 companies provided useable responses. Appendix D-2 provides a table that lists the companies that participated in this study.[1] In this first part, the data collected from these companies are examined for non-response bias. In other words, the companies that participated in the study are investigated to see whether or not they are representative of all the 169 companies in the targeted sample. This is done to determine if the findings of this study are generalisable to the intended population as defined in Chapter 3 – all (non-financial) Malaysian public-listed multinational companies.

In order to investigate non-response bias, variables, for which data were available for both respondents and non-respondents, had to be selected. Unfortunately, data for the research variables and dependent variables, since these were collected using

[1] Note that the names of these companies have been kept anonymous to protect their identity.

questionnaires, were not available for non-respondent companies. Consequently, seven predictor variables were chosen: ① total assets, ② total debt, ③ number of overseas subsidiaries, ④ proportion of equity held by foreigners, ⑤ proportion of equity held by the government, ⑥ listing board, and finally, ⑦ listing sector. This study investigated the difference, in each of these seven variables (or characteristics), between the respondent (106) and non-respondent (63) companies, using the t-test and Pearson chi-square statistics.[2]

The results of the above analyses are presented in Appendix E. Note that the appendix has been constructed using direct extracts of the SPSS output of these analyses. The results indicate that the respondent companies had greater total assets and greater proportion of equity held by the government, compared to non-respondent companies. This implies that companies with greater total assets, and companies in which the government held a greater proportion of equity, were more likely to have participated in this study. In all other characteristics, however, there was no significant difference between the respondent and the non-respondent group of companies. Overall, these results seem to imply the presence of some slight non-response bias. In other words, the companies that participated in this study might not be wholly representative of the companies in the population. This, in turn, implies that the findings of this study may not be fully representative of the conditions in the population.

However, arguably, this does not pose a serious problem because the differences between the two groups of companies were only significant in two out of the seven selected variables. Moreover, the difference in total assets between the groups was only marginally significant. Furthermore, although the difference in government-held equity between the groups was significant, the influence of this factor or predictor, i.e., government-held equity, on a company's FERM activities seems to be very limited, as will be seen in later chapters. Apart from that, this slight bias is unlikely to affect the predictor influences or effects on companies' FERM activities, which this study

[2] Kinnear and Gray (1994), pp.74-75, recommend the use of (independent samples) t-test for comparing the interval, or ratio, level data of two independent samples (or groups). They also recommend the use of Pearson chi-square test for comparing the nominal level data of two or more independent samples. Because the first five selected variables have ratio level data, and the last two variables have nominal level data, the t-test and chi-square test have been used here. See Kinnear and Gray (1994), pp.91-93 and pp.165-168, respectively, for simple introductions to the use and interpretation of these tests.

attempts to identify in the next chapter. This is because these effects are derived based on the data from all companies – those that have high and those that have low proportions of government-held equity, and those that have large as well as those that have small total assets. In short, although there is a slight difference in the characteristics of respondent and the non-respondent companies, this should not seriously affect the findings of this study.

4.2. Company characteristics and attributes

This second part of the chapter describes the data associated with the predictor variables used in this study. Broadly, the predictor variables[3] describe some selected characteristics and attributes of the companies that participated in this research. As seen in the previous chapter, the many predictors used in this study can be broadly grouped into seven categories as follows: ① company size; ② debt and leverage; ③ equity ownership; ④ listing board and sector; ⑤ FX involvement; ⑥ intra-company transactions; and finally, ⑦ perceived FX risk attributes. Therefore, the discussions about the predictor variable data are organised in the preceding sequence of predictor categories. Appendix F-1 provides some descriptive statistics and frequency tables, where appropriate, about these predictor variables. This appendix too is made up of extracts directly taken from the SPSS output. Many of the predictor variables have data distributions that are highly skewed. Appendix F-2 provides graphs that help illustrate the extent of skewness in the data, particularly for the variables that are highly skewed.

4.2.1. Company size

The first predictor category is about company size, and to recapitulate, it includes four variables: ① (ASSETS_B) measured the total assets of a company in billions of Ringgit; ② (SALES_B) measured the total sales of a company, also in billions of Ringgit; ③ (MKTVAL_B) measured the total market capitalisation of the company – this is the sum

[3] These variables, as explained in the previous chapter, and as will be clear in the following chapter, are used in this study primarily to explain (or predict) the observed dependent variables, i.e., FERM activities.

of a company's book value of total debt and the market value of its total equity; and ④ (TSUBNUM) counted the number of subsidiaries held or owned by a company. The distribution characteristics of the four variables on company size were similar especially in the skewness of their distributions. All the distributions were highly positively skewed. This meant that in all these variables, there were merely a handful of cases with extremely large values. More practically, this meant that there were only a very few companies that were extremely large. Incidentally, the non-response bias analysis earlier disclosed that respondent companies were slightly larger than non-respondent companies. Please see Appendix F-1 for the descriptive statistics on these variables and Graphs A to D, in Appendix F-2, for illustrations of the skewness of these distributions.

4.2.2. Debt and leverage

The second category of predictors consists of two variables: ① (DEBT_B) measured the total amount of debt used by a company, in billions of Ringgit, and ② (PERDEBT) measured the ratio of debt to total assets. This latter variable can also be seen to have measured the proportion of asset funded by debt – this is akin to measuring the leverage (proportional or relative debt) used by the company. The distribution characteristics of the variable (DEBT_B) were similar to that of predictor variables that measured company size. It was highly positively skewed. However, the distribution characteristics of (PERDEBT) showed almost no skewness. Appendix F-1, and especially Graphs E and F in Appendix F-2, illustrate the distribution of the values.

4.2.3. Equity ownership

The third predictor category comprises also two variables: ① (EQFOREIN) measured the proportion of equity held by foreigners (non-Malaysians), and ② (EQGOVT) measured the proportion of company equity held by the government and government agencies. Actually, this research had focused on only Malaysian companies, and therefore, by default, it has omitted companies in which foreigners held more than 50% of equity. Thus, the range of values for (EQFOREIN) starts from 0% to just under 50%. The distribution is slightly positively skewed. The distribution of data for (EQGOVT), on the other hand, is highly positively skewed – similar to that seen with variables that

measured total debt and company size. Notably, the non-response bias analysis had earlier indicated that respondent companies had greater proportions of their equity held by the government than non-respondent companies. Appendix F-1, and Graphs G and H, in Appendix F-2, demonstrate the distribution of values for these characteristics.

4.2.4. Listing characteristics

The fourth predictor category incorporates two variables as well: ① (BOARD) identified whether a company was listed on the main or second board of the KLSE, and ② (SECTOR) noted the sector onto which a company was listed in the KLSE. Appendix F-1 shows that, out of the 106 companies that participated in the study, 79 companies (75%) were listed on the main board while the others (27, 25%) were listed on the second board. On the other hand, the highest number of companies (29, 27%) were listed on the trading and services sector of the KLSE, whereas 22 (21%) were listed on the industrial, 17 (16%) on consumer, 14 (13%) on construction, and 13 (12%) on property sectors. The other sectors with less numbers of companies, in descending order, are plantation, mining and hotel.[4] Notably, the non-response bias analysis earlier did not reveal any difference between the respondent and non-respondent companies along the dimensions of listing board and sector.

4.2.5. FX involvement

This predictor category covers seven variables: ① (OSUBNUM) counted the number of overseas subsidiaries owned or held by a company; ② (PERSAL3) measured the proportion of sales and other revenues denominated in foreign currencies; ③ (PERPUR3), similarly, measured the proportion of purchases and other expenses denominated in foreign currencies; ④ (PERFIN3) measured the proportion of a company's financing denominated in foreign currencies; ⑤ (PERCAP3) measured the proportion of a company's capital investment denominated in foreign currencies; ⑥ (FOREIGN3) measured the proportion of company (total) transactions denominated in foreign

[4] Note that companies listed on the finance sector of the KLSE, as explained in Chapter 3, have been excluded in this study.

currencies; and finally ⑦ (CURNUM) measured the number of currencies in which a company had transactions. The data associated with these variables are described, one by one, next. The data for variable (OSUBNUM) was very highly positively skewed. These show that a very small number of companies had very large numbers of overseas subsidiaries whereas most companies had only very few overseas subsidiaries. See Appendix F-1 for the descriptive statistics and Graph I, in Appendix F-2, for an illustration of the skewness in its distribution.

Among the 102 companies that provided valid responses to the questions pertaining to variable (PERSAL3), 78 companies (77%) indicated that they had only up to 25% of sales and other revenues denominated in foreign currencies. The rest (24 companies, 23%) indicated that they had more than 25% of sales and other revenues denominated in foreign currencies. On the other hand, out of the 104 companies that provided valid data for (PERPUR3), 67 companies (64%) indicated that they had only up to 25% of purchases and other expenses denominated in foreign currencies. The rest (37 companies, 36%) indicated that they had more than 25% of purchases and other expenses denominated in foreign currencies. Appendix F-1 provides these data in frequency tables.

There were 101 companies that provided data for (PERFIN3), and 87 companies (86%) indicated that they had only up to 25% of financing denominated in foreign currencies. The rest (13 companies, 14%) indicated that they had more than 25% of financing denominated in foreign currencies. Of the 101 companies that provided data for (PERCAP3), 82 companies (81%) indicated that they had only up to 25% of total capital investment denominated in foreign currencies. The rest (19 companies, 19%) indicated that they had more than 25% of capital investment denominated in foreign currencies. Again, see Appendix F-1 for the frequency tables.

The information above indicates that the largest number of companies had substantial (i.e., more than 25%) foreign currency denomination in the following types of transactions, in descending order: ① purchases and other expenses, ② sales and other revenues, ③ capital investment, and finally, ④ financing. In other words, this implies that a larger number of companies had substantial FX exposure in purchases (and other expenses) than in sales (and other revenues). Notably, it also implies that only a relatively small number of companies had substantial FX exposure in financing or

borrowing.

Among the 104 companies that provided data for (FOREIGN3), 53 (51%) indicated that they had only up to 30% of their (total) transactions denominated in foreign currencies, while the others (51, 49%) said that they had more than 30% of their transactions denominated in foreign currencies. Again, Appendix F-1 provides this information in a short frequency table. In short, just slightly less than half of the companies in the study had more than 30% of their total transactions denominated in foreign currencies. This indicates that almost half of Malaysian public-listed multinational companies have substantial FX exposures.

The data for variable (CURNUM) are very highly positively skewed (see Appendix F-1). Of the 38 companies that provided valid responses,[5] most (34, 89%) had only between two and six currencies in which they had transactions. This includes five companies (13%) that had transactions in only two currencies, another 13 (34%) that had transactions in three or four currencies, and another 16 (42%) that had transactions in five or six currencies. A very small minority, four companies (11%) had transactions in more than six currencies. These imply that the FX problem faced by Malaysian public-listed multinational companies is typically not very complex because they do not have to deal with many currencies. Table 4.1 shows that, on aggregate, the companies in the study had greatest exposures in the following foreign currencies, in descending order: Dollar, Yen, Singapore dollar, British pound, Australian dollar, and Mark. These closely reflect the importance of the currencies of Malaysia's main trading partners and the currencies widely used for regional trade within South East Asia.

[5] Note that this question was only included in the first version questionnaire that was used in the first two phases of data collection. Therefore, only 39 companies that participated in these phases had the opportunity to respond to this question.

Table 4.1: The extent of use of key currencies
(Note: The table shows the numbers of companies that had the specified proportions of transactions denominated in the specified currencies)

		Proportion of total transactions			
No	Currencies	=<25%	26-70%	>70%	Total
1	Malaysian Ringgit	-	51	53	104
2	US Dollar	58	32	1	91
3	Japanese Yen	16	6	-	22
4	Singapore Dollar	22	1	-	23
5	British Pound	20	1	-	21
6	Australian Dollar	15	2	-	17
7	German Mark	15	1	-	16
8	Hong Kong Dollar	4	1	-	5
9	Swiss Franc	5	-	-	5
10	Italian Lira	3	1	-	4
11	Indonesian Rupiah	4	-	-	4
12	Thai Baht	3	-	-	3
13	Chinese Yuan	2	-	-	2
14	Philippine Peso	2	-	-	2
15	Others	7	-	-	7

4.2.6. Intra-company transactions

This predictor (INTRACO2) measured a company's intra-company transactions – the transactions between parent and subsidiaries and between subsidiaries – as a proportion of the company's total transaction volume. Valid responses were obtained from 101 companies. Most companies (64, 63%) had intra-company transactions that accounted for only up to 20% of total transactions, whereas 25 companies (25%) indicated that their intra-company transactions accounted for between 21% and 40% of their total transactions. Only a small number (12, 12%) indicated that their intra-company transactions accounted for more than 40% of total transactions. Again, this information is presented in Appendix F-1. The result reflects that the scale of intra-company transactions among Malaysian public-listed multinational companies is rather limited.

4.2.7. Perceived FX risk attributes

This final category of predictors includes six variables: ① (STABLE1) noted whether or not a company perceived its FX exposure pattern to be stable – the exposure pattern is deemed to have been stable when it did not change drastically over time; ② (VSIZE)

measured a company's perception of its own total FX exposure size; ③ (VCHANGE) measured a company's perception of its FX exposure increment or change in the future; ④ (XPREDIC) measured a company's perception of its FX exposure unpredictability; ⑤ (VOLAT) measured a company's perception of exchange rate uncertainty or volatility; and finally ⑥ (RISK) measured a company's perception of the level of FX risk encountered by the company. The data for these variables are presented in Appendix F-1 in frequency tables, and these data are described below.

Among the 101 companies that provided valid responses for (STABLE1), a huge majority of 84 companies (83%) perceived that their exposure patterns did not change drastically over a year. Nonetheless, the rest (17%), a small minority, felt that their exposure patterns did change drastically. This means that most companies felt that their FX exposures were stable. This suggests that most Malaysian public-listed multinational companies do not appear to expect their exposure patterns would change drastically.

From the 105 companies that provided responses for the question associated with (VSIZE), most (32 companies, 31%) companies perceived that they had very small total FX exposures. In fact, about 53% felt that they had either small or very small total FX exposures, whereas, only 28% felt that they had either large or very large total exposures. This implies that Malaysian public-listed multinational companies, on aggregate, seem to feel that their total FX exposures are small.

Among the 104 companies that provided responses for (VCHANGE), most (56 companies, 54%) perceived that there was no change in the FX exposures they faced over time. Nonetheless, about 33% felt that the FX exposures were increasing over time, whereas, only 13% felt that they were decreasing. This indicates that, on aggregate, Malaysian public-listed multinational companies appear to expect their FX exposures would increase slightly in the future.

From the 103 companies that provided responses for (XPREDIC), most (37 companies, 36%) companies felt that their exposures were neither predictable nor unpredictable. About 34% felt that the exposures were either unpredictable or very unpredictable, whereas about 30% felt that theirs were either predictable or very predictable. This implies that Malaysian public-listed multinational companies, in general, seem to be equally split among those that feel their FX exposures are predictable, those that feel

otherwise, and others that feel their exposures are neither predictable nor unpredictable.

Among the 104 companies that provided responses for (VOLAT), most (46 companies, 44%) felt that the exchange rates were uncertain (or volatile). Distinctly, about 67% felt that the exchange rates were either uncertain or very uncertain, whereas, only 4% felt that they were certain. This clearly shows that Malaysian public-listed multinational companies, on aggregate, appeared to feel that the exchange rates were volatile, at the time of the currency crisis.

Finally, among the 104 companies that provided valid responses for (RISK), most (29 companies, 28%) felt that the level of FX risk faced was low. In fact, about 48% felt that the level of risk faced was either low or very low, whereas, only 32% felt that the level of risk was either high or very high. Therefore, this indicates that Malaysian public-listed multinational companies, on aggregate, seem to feel that they face rather low levels of FX risk.

4.3. Company FERM practices

This third part of the chapter presents the data associated with the research variables of this study. Restating, the research variables are concerned with the FERM practices among the Malaysian public-listed multinational companies that participated in this research. The findings about company FERM practices are organised according to the seven broad categories of research variables used in the previous chapter: ① management of FX risk, ② FX exposure type, ③ FERM objective, ④ FERM responsibility, ⑤ FERM centralisation, ⑥ FERM policies and procedures, and ⑦ FERM techniques. Appendix G contains the frequency tables and a few descriptive statistics, where necessary, about data from the research variables. This appendix comprises extracts directly taken from the SPSS analysis output. Where relevant, the findings from this study are interspersed with comparable findings from previous studies.

4.3.1. Management of FX risk

As described previously, the research variable (MANAGE) recorded whether or not a company managed FX risk. Among the 106 companies that participated in the survey, 67 companies (63%) managed FX risk while the others, 39 companies (37%) did not. Therefore, just less than two thirds of the companies managed FX risk. Generally, this is within the range found by comparable previous researches in this area, i.e., studies that included only large, or public, companies. For example, Dolde (1993) reported that 85% of the 244 companies (of Fortune 500) managed FX risk. Batten et al. (1993) found that 77% of the 72 large Australian companies (from Salescan) had managed FX risk, and Nance et al. (1993) found that 62% of the 169 companies (of Fortune 500 and S&P 400) hedged FX risk. Consequently, since this study too focused on (large) public-listed multinational companies, the proportion that managed FX risk was comparable with those in the preceding studies.

In contrast, the proportions of companies that managed FX risk were lower, in previous studies, if smaller, or private, companies had also been included. For example, Bodnar et al. (1995) only found that 35% of the 530 companies (from Compustat 1993) used derivatives to manage financial risks, and Mian (1996) found that only between 18% and 26% of 3022 companies (from Compustat 1992) hedged FX risk.[6]

On the other hand, the proportions of companies that managed FX risk in previous empirical studies were lower too if unobtrusive methods of data collection had been used, but the proportions were higher if mail-surveys or questionnaires had been used instead. For example, Berkman and Bradbury (1996) collected the data from companies' audited financial statements, and found that only 48% used derivatives. Similarly, Mian (1996) used company annual report footnotes to collect the required data, and found that only between 18% and 26% of companies hedged FX risk. Generally, obtrusive means of data collection, like the questionnaire used in this study, inadvertently, tend to be selective of companies that manage FX risk. This is because companies that do not manage FX risk are less likely to respond when they are sent the

[6] Although Phillips (1995) reported that 63% of organisations (including small businesses and non-business institutions) used derivatives, the study had also included use of derivatives for funding and investment, apart from for hedging.

questionnaire.

Therefore, the proportion of companies that managed FX risk, based on the pool of companies that responded to the questionnaire in this study, is probably greater than the proportion of companies that managed FX risk in the targeted population. Consequently, it was likely that *less* than two thirds of Malaysian public-listed multinational companies (of the 169 companies in the targeted sample) managed FX risk. Generally similar proportions of companies that managed FX risk were found by previous studies conducted in the US, and Australia, especially when the studies were on large or public companies, and had used obtrusive means of data collection (e.g., mail questionnaires).

Before proceeding with other research variable data, it must be noted that companies that do not manage FX risk, by definition, do not perform any activity associated with FERM. On this basis, the companies that did not manage FX risk were requested, in the questionnaire, to skip the subsequent questions on FERM activities and FERM characteristics. In fact, companies that did not manage FX risk were assumed to have not responded to these questions.[7] In essence, although 106 companies participated in the study, only 67 companies (that managed FX risk) provided relevant or useful responses for the questions on specific FERM activities and FERM characteristics. Therefore, only 67 or fewer companies have provided data for the research variables described below.

4.3.2. FX exposure type

There are three types of FX exposure – accounting, economic and transaction. Two specific aspects of company use of these exposure types have been investigated in this study. Firstly, the study noted whether or not a company managed each exposure type. From another perspective, it identified the exposure types managed by a company. Secondly, it examined the relative usage level of each of the three types of FX exposure

[7] Although there were three companies that did not manage FX risk that provided responses to these questions, their responses were entirely consistent with them not managing FX risk. In other words, none had provided conflicting responses.

for a company. The data associated with both these aspects are described next.

The variables (ACCTEXP), (ECONEXP), and (TRANEXP), examined the first aspect. They recorded whether or not a company managed, respectively, accounting, economic, and transaction, exposures. Among the 67 companies that managed FX risk, only 31 companies (46%) managed accounting exposure. Only 30 companies (45%) managed economic exposure while 61 (91%) managed transaction exposure. See Appendix G for the relevant frequency tables. These results indicate that transaction exposure was the most used or managed type of FX exposure.

The variables (ACCTRAN1), (ECONRAN1), and (TRANRAN1), investigated the second aspect. Companies that managed FX risk were asked to rank the three FX exposure types in terms of the extent to which these exposures were used in their companies. Generally, a rank reflects the level of use of a specific exposure type, relative to the use of other exposure types, within a company.[8] Among the 31 companies that managed accounting exposure, 12 companies (39%) ranked it to be the most used, 14 (45%) ranked it to be the next most used, while five companies (16%) ranked it to be the least used FX exposure type. On the other hand, among the 30 companies that managed economic exposure, only six companies (20%) ranked it to be the most used, while 14 (47%) ranked it to be the next most used, and 10 (33%) ranked it to be the least used exposure type. Finally, among the 61 companies that managed transaction exposure, 49 companies (80%) ranked transaction exposure to be the most used, 11 (18%) ranked it to be the next most used, while only one company (2%) ranked it as the least used FX exposure type. The above information can be found in three separate frequency tables in Appendix G. The above data are also aggregated in cross-tabulation format in Appendix H-1.

Examining the companies' responses from another perspective reveals that 28 companies managed only one FX exposure type, while 23 companies managed two exposure types, and the rest, 16 companies managed all three FX exposure types. This is shown in Table 4.2. Among the 28 companies that managed only one type of FX

[8] Actually, forced ranking method had been employed. This inadvertently meant that companies were able to assign rankings even to FX exposure types not managed by them. In order to correct this apparent discrepancy, the rankings assigned to the exposure types not managed were re-coded as missing.

exposure, 25 companies managed only transaction exposure, two companies managed only accounting exposure, while only one company managed only economic exposure. In fact, among the 23 companies that managed two types of exposures, 10 companies managed accounting and transaction exposures, while 10 other companies managed economic and transaction exposures, but only three companies managed accounting and economic exposures. Note that Table 4.2 presents the numbers of companies that managed not only a given number of FX exposure types, but also a given permutation (descending order) of exposure types based upon their usage rankings.

Table 4.2: Types of FX exposure managed

		Number of companies	
Manage only one FX exposure type			28
	Transaction exposure only	25	
	Accounting exposure only	2	
	Economic exposure only	1	
Manage only two FX exposure types (in descending order of use)			23
	Transaction, then accounting, exposures only	7	
	Transaction, then economic, exposures only	7	
	Accounting, then transaction, exposures only	3	
	Economic, then transaction, exposures only	3	
	Accounting, then economic, exposures only	3	
	Economic, then accounting, exposures only	0	
Manage all three FX exposure types (in descending order of use)			16
	Transaction, accounting, economic, exposures	6	
	Transaction, economic, accounting, exposures	4	
	Accounting, transaction, economic, exposures	4	
	Economic, transaction, accounting, exposures	1	
	Economic, accounting, transaction, exposures	1	
	Accounting, economic, transaction, exposures	0	

These findings above clearly reflect the prominence of transaction exposure management among the companies. However, to establish more conclusively whether or not companies used a specific type of FX exposure more than the other types of FX exposure, the Kruskal-Wallis one-way ANOVA[9] test was performed on the aggregated

[9] Kinnear and Gray (1994), pp.74-75, recommend the use of this test for comparing the ① ordinal level data of ② several (three or more) ③ independent samples (when the same subjects or cases do not provide the data for the three or more measures). Notably, the test is based upon the rankings of the measures rather than the measures themselves. The attributes, in comparing the three variables, (ACCTRAN1), (ECONRAN1) and (TRANRAN1), match the preceding requisites, and therefore, the Kruskal-Wallis one-way ANOVA has been used. See Howitt and Cramer (2000), pp.446-448, for a simple but potent explanation of this non-parametric test.

level data[10] of variables (ACCTRAN1), (ECONRAN1), and (TRANRAN1). Please see Appendix H-1. The test statistic (chi-square, corrected for ties) is very significant, and it establishes that the usage rankings assigned to each FX exposure type are statistically different from those assigned to the other exposure types. In other words, it discloses that the companies did not use or manage all the three FX exposure types to the same extent. More precisely, the mean ranks (in Appendix H-1) for each FX exposure type indicate that transaction exposure is the most used (managed), followed by accounting exposure and economic exposure.

In short, firstly, this research found that transaction exposure was the most managed of the three types of FX exposure. This is consistent with the findings from previous studies, e.g., Batten et al. (1993). In fact, Belk and Glaum (1990) described transaction exposure as the "centrepiece" of FERM in most of the UK companies involved in their study. Secondly, this research found that, after transaction exposure, accounting and then economic exposures were the most managed. This too is consistent with the prior empirical findings because Belk and Glaum (1990), Bodnar et al. (1993), Marshall (2000), and Joseph (2000) had all found similar results.

4.3.3. FERM objective

This study explored two specific aspects of company FERM objective. Firstly, it identified the degree of formalisation of FERM objective adopted by a company. Secondly, the study recorded the intent or content of the objective, in particular, whether the company aimed to minimise or reduce FX risk or losses, or to increase or maximise FX gains.

The first aspect is addressed by the variable (OBJTYPE). Among the 67 companies that managed FX risk, four companies (6%) had undefined FERM objectives, while 48 companies (72%) had only implied or informal objectives. Only 15 companies (22%) had formal and written objectives for FERM. Appendix G also presents the frequency table for this variable. This result shows that only slightly more than a fifth of the

[10] Aggregated level data are obtained from combining individual level nominal data. These can be attained by attaching weights to the cases. Kinnear and Gray (1994), pp.45-46, explain how the weighting of cases can be carried out in SPSS for Windows.

companies that managed FX risk had adopted formal FERM objectives. In other words, almost four fifths of companies did not have formal FERM objectives despite managing FX risk. Generally, prior empirical works have found significant but only small proportions of companies that did not have formal FERM objectives. For example, Mathur (1982) and Soenan (1986), found only minorities of such companies in, respectively, the US and UK.[11]

The second aspect of FERM objective is addressed using the variable (OBJECT). Among the 63 companies that had adopted at least implied or informal FERM objectives, most (41, 65%) companies had adopted objectives akin to minimising FX risk, while 14 companies (22%) had adopted objectives geared to minimising FX losses. Very few companies (8, 13%) had adopted objectives that even considered the dimension of FX gains – this includes four companies (6%) that had adopted objectives that aimed to maximise FX gains. The relevant frequency table is presented in Appendix G. In total, the FERM objectives adopted by these companies were mostly inclined towards FX risk or loss minimisation, and very few companies had adopted objectives that even considered, let alone maximise, FX gain. This is similar to the findings of previous researches. The findings of both Rawls and Smithson (1993) and Bodnar et al. (1995) indicated that most companies' FERM objectives (specifically in the US) were to minimise FX risk. Grant and Marshall (1997) also showed a similar result among large UK companies. Only a few companies, in these studies, had sought competitive advantage from FX.

4.3.4. FERM responsibility

The study focused on three selected aspects of FERM responsibility in a company. Firstly, the study recorded the number of persons who were responsible for FERM activities in a company. Secondly, it noted the degree of importance or status accorded by the company to the FERM tasks performed by the personnel responsible for FERM.

[11] Nonetheless, Abdel-Malek (1976) described the overall FERM objectives adopted by the Canadian companies in his study as "broad and simplistic". This implies that the objectives were only informal. However, the study was carried out immediately after the floatation of the Canadian dollar, when, presumably, the companies had little expertise in managing formal FERM programmes, including the adopting of formal FERM objectives.

Finally, it found out whether or not two or more departments were responsible for FERM in a company.

The first aspect is addressed by the variable (PERSONUM). Among the 35 companies that provided valid responses to this question,[12] most (19 companies, 54%) had employed two persons, in each company, to be responsible for FERM. Eight companies (23%) had three persons each, while four companies (11%) had four persons each, although three companies (9%) had only one person each, responsible for FERM activities. Only one company had more than four (actually, six) persons responsible for FERM. The relevant frequency table can be found in Appendix G. In summary, the companies employed mostly between one and four persons – typically, only two persons – in each company to be responsible for FERM activities.

The variable (FUNCTION) addressed the second aspect. Among the 65 companies that provided valid responses to this question, most (36, 55%) companies said that the FERM task was only a small component of the responsible persons' function. A significant number (24 companies, 37%) said that the FERM task constituted a major component of the persons' function. Nonetheless, only a minority (five companies, 8%) said that the FERM tasks made up the major component of the persons' function. See Appendix G for the relevant frequency table. The result reflects that in most of the companies, the persons responsible for FERM were also responsible for other tasks. In other words, these persons were often not dedicated wholly to undertaking only FERM activities. More precisely, in most companies, FERM tasks accounted for only a small portion of the responsible persons' overall functions.

To summarise, this study found that most of the companies had employed only a few persons for FERM, and the FERM tasks often only constituted a small portion of the persons' overall responsibility. This is rather compatible with the findings of Dolde (1993). He noted that in most US companies, FERM accounted for only a part of the responsibility of the persons entrusted with FERM tasks. He also noted that two thirds of the companies in his study had no professionals exclusively responsible for FERM.

[12] This question was only included in the second version questionnaire that was used in the third phase of data collection. In total, 67 companies participated in this phase. However, only 36 companies in this phase, that managed FX risk, were able to respond to this question. Still, one company did not provide any response.

The third and final aspect on FERM responsibility is addressed using the variable (JOINTRES). Among the 66 companies that provided valid responses to the relevant question in the questionnaire, only a third (22 companies) had two or more departments jointly responsible for FERM. In the other companies (67%), FERM responsibility did not involve several departments. This suggests that a majority of companies specialised by having, in each company, only one department – usually the treasury, to assume the responsibility for FERM.

4.3.5. FERM centralisation

This study also examined the extent to which the responsibility for FERM is centralised or decentralised within the company, specifically in terms of the responsibilities of the parent and subsidiary companies in dealing with the subsidiaries' FX exposures. The variable (DSUBCEN2) measured the degree of decentralisation of a company's management of its domestic subsidiaries' FX exposures. Meanwhile, (OSUBCEN2) measured the degree of decentralisation of a company's management of its overseas subsidiaries' FX exposures.

A total of 62 companies provided responses to the question on the degree of decentralisation practised in relation to domestic subsidiaries. Most (29, 47%) companies said that they (parent companies) were mainly responsible for handling their domestic subsidiaries' FX exposures. Nonetheless, a substantial number of 25 companies (40%) said that both they and their domestic subsidiaries were responsible. Only eight companies (13%) stated that their domestic subsidiaries themselves were mainly responsible for managing their own FX exposures. The relevant frequency table is presented in Appendix G.

Only 45 companies had responded to the question on the degree of decentralisation practised in relation to overseas subsidiaries because a significant number indicated that their subsidiaries did not encounter any significant FX exposures. Among these 45 companies, 17 companies (38%) said that they (parent companies) were mainly responsible for handling their overseas subsidiaries' FX exposures. However, an equal number of 17 companies (38%) said that both they and their overseas subsidiaries were jointly responsible. Apart from that, 11 companies (24%) reported that their overseas

subsidiaries were mainly responsible for managing their own FX exposures. The above data are presented in frequency table format, again, in Appendix G.

The findings above, on the whole, indicate that most of the companies in this study had centralised their FERM at least to some extent. This is because the subsidiaries' FX exposures were mostly handled by the parent companies, or jointly by the subsidiaries and their parent companies. Only a few companies gave full autonomy to their subsidiaries to handle their own FX exposures.[13] This is generally consistent with previous research findings. Mathur (1982), Collier and Davis (1985), Belk and Glaum (1990) reported high numbers of companies that centralised FERM, in the US and UK. In fact, Bodnar et al. (1995) reported that all companies in that study had centralised financial risk management but 15% had decentralised only the execution (or implementation) aspect of the risk management tasks. Soenan (1986) and Dolde (1993), on the other hand, had found that at least some aspects of FERM tasks were centralised among the companies in their respective studies.

The data above appear to show that the degree of FERM centralisation, in terms of frequency distribution, is more evenly distributed across the three possibilities – centralisation, joint management, and decentralisation – for overseas, compared to domestic, subsidiaries. However, to examine if this observed difference is statistically significant, a non-parametric test, Wilcoxon matched-pairs signed-ranks test[14] was performed. This particular test is presented in Appendix H-2. This test was based upon 43 pairs of data given by 43 companies that indicated the degree of FERM centralisation of both their domestic and overseas subsidiaries. The test statistic indicated that although a company's overseas subsidiaries were more likely to be decentralised, compared to its domestic subsidiaries, this was not statistically significant. Therefore, this study could not conclude that domestic subsidiaries were subjected to greater degrees of centralisation than overseas subsidiaries. Instead, this then implies that

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[13] From another perspective, the number of companies that fully centralised their subsidiaries' FX exposure management was distinctly greater than the number of companies that fully decentralised their subsidiaries' FX exposure management. In other words, there were more companies that handled their subsidiaries' exposure than those that allowed their subsidiaries to handle the exposures.

[14] Kinnear and Gray (1994), pp.74-75, recommend the use of this test for comparing the means of ① ordinal level data of ② two ③ related samples (or rather the same sample, but under repeated or comparable measures). Notably, the test is based upon the rankings of the differences of these repeated or comparable measures. The attributes, in comparing the two variables, (DSUBCEN2) and (OSUBCEN2), match the preceding requisites, and therefore, the Wilcoxon matched-pairs signed rank test has been used. Howitt and Cramer (2000), pp.180-182, briefly describe this test.

companies were generally consistent in exercising central control in managing FX exposures arising from both their domestic and overseas subsidiaries. In other words, companies that practised greater centralisation (or decentralisation) of their domestic subsidiaries' FERM, generally also practised similar centralisation (or decentralisation) of their overseas subsidiaries' FERM. This is, however, contrary to the observations made by Abdel-Malek (1976), Collier and Davis (1985), and Belk and Glaum (1990). Their results implied that overseas subsidiaries (of companies, namely, in Canada and the UK) were more autonomous (decentralised) in their FERM, compared to domestic subsidiaries.[15]

4.3.6. FERM policies and procedures

The study examined several aspects associated with a company's FERM policies and procedures. They include FERM policies of ① recognising FX exposures, ② managing significant FX exposures, ③ allowing time flexibility for hedging, ④ undertaking partial cover, ⑤ writing currency options, and ⑥ undertaking uncovered FX deals. Apart from these, they also include FERM procedures of ⑦ using forecast (FX and interest) rates, and ⑧ using internal FX rates. The findings associated with these aspects are described below.

Recognising FX exposures

The first aspect is concerned with a company's FX exposure recognition policy. These are addressed by four main variables. The variable (EXINLIKE) recorded whether or not a company recognised likely (uncertain) cash inflows denominated in foreign currencies as FX exposures. Likewise, (EXOTLIKE) noted whether or not uncertain cash outflows in foreign currencies were recognised as exposures. On the other hand, (EXINLONG) identified whether or not a company recognised long-term (i.e., more than 12-month forward) cash inflows in foreign currencies as FX exposures. Similarly, (EXOTLONG) noted whether or not long-term cash outflows in foreign currencies were recognised as

[15] However, these studies did not establish the statistical significance of the difference in the decentralisation of FERM between overseas and domestic subsidiaries.

exposures. The data associated with these variables are described next.[16]

Among the 36 companies that provided valid responses to the relevant question in the questionnaire, 24 companies (67%) did not recognise uncertain cash inflows denominated in foreign currencies as FX exposures. In other words, they only recognised certain inflow FX exposures. This also means that only a third (12) of the companies recognised uncertain inflow FX exposures. Likewise, 25 companies (69%) did not recognise uncertain cash outflows denominated in foreign currencies as FX exposures. Therefore, only less than a third of companies recognised uncertain outflow FX exposures. Appendix G presents the relevant data in frequency table format. These results indicate that only about a third of companies recognised uncertain FX exposures, regardless of whether the exposures were inflows or outflows.

On the other hand, among the 36 companies, 18 companies (50%) did not recognise, as FX exposures, cash inflows denominated in foreign currencies that materialise or mature after 12 months. Therefore, this means that they only recognised short-term inflow FX exposures, i.e., those that materialise in less than 12 months. Nonetheless, this also means that the other one-half of the companies recognised long-term inflow FX exposures. On the other hand, 21 companies (58%) did not recognise, as FX exposures, cash outflows in foreign currencies that materialise after 12 months. Consequently, only 15 companies (42%) recognised long-term outflow FX exposures. Again, Appendix G provides the above data in frequency tables. These results reflect that, on the whole, slightly less than half of the companies recognised long-term FX exposures. However, the results appear to imply that there was comparatively slightly greater willingness among the companies to recognise long-term FX exposures arising from inflows, rather than outflows. Nonetheless, this was not statistically significant, as described below later.

[16] These data are based on the responses to the questions in the second version questionnaire only. This means that only 36 companies that had used the second version questionnaire, and managed FX risk, provided the data for these variables. The relevant questions in the first version had been modified to become simpler and more straightforward in the second version, and because the responses in each version were very different, they could not be combined logically. The data from the first version are not reviewed here although these are presented in Appendix G. See the frequency tables for (EXINFLOW) and (EXOTFLOW) variables.

On the whole, the companies that participated in this study appeared to be moderate (rather than aggressive or conservative) in their exposure recognition policies because only less than a third of the companies recognised uncertain FX exposures, although up to half of the companies recognised long-term FX exposures. Moreover, it is difficult to conclude one way or the other (i.e., aggressive or conservative) as the number of companies that provided the data is rather small.

As seen above, among the companies, there does not seem to be any discrepancy in the FX exposure recognition of uncertain cash inflows, compared to outflows, denominated in foreign currencies. The Wilcoxon matched-pairs signed-ranks test (described earlier), based upon the data pairs taken from the variables (EXINLIKE) and (EXOTLIKE), reinforced this observation. See Appendix H-3 for the results of this test. The test statistic is not significant. Indeed, this means that there was no significant difference between inflows and outflows in the companies' recognition of uncertain FX exposures. A second Wilcoxon matched-pairs signed-ranks test based upon the data pairs taken from the variables (EXINLONG) and (EXOTLONG), see Appendix H-4, similarly indicated that there was no significant difference between inflows and outflows in the companies' recognition of long-term FX exposures.

In short, the results above do not indicate the presence of any discrepancy between inflows and outflows in the companies' overall FX exposure recognition policies. Instead, they suggest that the companies were consistent, on aggregate, in recognising FX exposures from both cash inflows and outflows denominated in foreign currencies. Notwithstanding this, it must be noted, again, that this finding is based upon only a small number of companies that provided the relevant data. Further, previous empirical works have not investigated this particular aspect of FERM policy, and therefore, offer no comparable findings. Nonetheless, Soenan (1986) reported that most of the companies in his study felt that forecasts of cash outflows were more accurate than the forecasts of cash inflows. This then implies that companies would have been more able to recognise outflow, rather than inflow, FX exposures. However, the evidence from this study does not suggest this.

Managing significant FX exposures

The second aspect of corporate FERM policies and procedures, investigated in this study, is concerned with company policy on managing, or hedging (covering), only significant FX exposures. Namely, two variables have been used for this purpose. The variable (SIGNIFIC) identified whether or not a company hedged or covered only FX exposures that were significant, while (SIGVOLUM) measured the FX exposure size (threshold) used by a company to determine if an individual FX exposure is significant.

Among the 67 companies that managed FX risk, a considerable majority (48 companies, 72%) managed or covered only significant FX exposures. In other words, these companies allowed less significant exposures to remain uncovered. Nonetheless, a significant minority (19 companies, 28%) managed all exposures regardless of their size or significance. Consequently, these results imply that almost three-quarters of the companies, in this study, assumed some non-significant FX exposures, although more than a quarter of the companies were exposure-averse, and therefore, covered all exposures.

Prior empirical works have not investigated this particular aspect of corporate FERM policy extensively. Nonetheless, Abdel-Malek (1976) found a small minority of Canadian companies in his study that managed FX risk had assumed (i.e., without hedging) FX exposures that were below specific "threshold" levels. This suggests that the practice of managing only significant FX exposures might have been limited to a small minority of companies. However, Soenan (1986) identified that most of the UK companies in his study had undertaken "selective" hedging. This later study indicates that the practice of selective hedging is widespread among companies that manage FX risk. Therefore, it is likely that the practice of managing only significant FX exposures is also widely practised since it is compatible with the practice of selective hedging.

Only 40 companies, out of the 48 that managed only significant FX exposures, were willing to disclose the threshold sizes used by the companies to determine significant individual FX exposures.[17] A quarter of the companies (10 companies) indicated that they would consider an individual FX exposure as significant if it was less than RM100,000. However, 12 companies (30%) indicated that they would consider an

[17] This question appears to have been one of the most unpopular in the questionnaire.

exposure as significant if it was equal to or greater than RM100,000 but less than RM1 million. Further, 14 companies (35%) indicated that they would consider an exposure as significant if it was equal to or greater than RM1 million but less than RM10 million. Finally, the remainder, 4 companies (10%), stated that they would consider an exposure that is equal to or greater than RM10 million as significant. Appendix G presents the preceding data in a frequency table, and also provides some descriptive statistics. Notably, the distribution of threshold sizes of significant FX exposures is highly positively skewed. This means that there were only a small number of companies that used unusually high threshold sizes, whereas most companies had used very low threshold sizes, to determine significant exposures. However, since only a small number of companies provided data about the threshold size for ascertaining exposure significance, it is difficult to be confident about the finding.

Allowing time flexibility for hedging

The third aspect of corporate FERM policies and procedures examined by this study is associated with company policy on allowing time flexibility for hedging an identified FX exposure. Notably, this aspect had not been investigated previously by prior studies. However, this research has used two variables to investigate this aspect. The first variable, (LAPSE), identified whether or not a company allowed time flexibility for hedging an identified FX exposure. The second variable, (LAPSTIME), measured the time (in number of days) normally allowed by the company before an identified FX exposure was hedged.

Among the 65 companies that provided valid responses for (LAPSE), 34 companies (52%) allowed time flexibility for hedging, while the other 31 companies (48%) did not. This means that just slightly more than half of the companies allowed FX exposures to be uncovered, at least temporarily, by adopting time flexibility for hedging, while the rest hedged FX exposures immediately after identifying the exposures. In short, the results indicate that slightly more than half the companies assumed FX exposures, at least temporarily.

Only 27 companies, from the 34 companies that stated they allowed time flexibility for hedging, disclosed the time they normally allowed for an individual FX exposure between its identification and its eventual hedging.[18] Only five companies (19%) allowed less than a week (up to five days) to hedge an exposure after it is identified, whereas, 10 companies (37%) allowed one or two weeks for hedging an identified exposure. There were eight companies (30%) that allowed between half and one month for hedging an exposure. The rest, four companies (15%) allowed more than a month. These data in a frequency table and some descriptive statistics can be found, again, in Appendix G. Yet again, the distribution is positively skewed, implying that most companies allowed only short times for hedging identified exposures, but a very few companies had allowed unusually long times. Again, it is difficult to be confident about the finding as it is based on only a small amount of data.

Undertaking partial cover

The fourth aspect of FERM policies and procedures examined in this study is concerned with company policy on undertaking partial cover of an exposure. The variable (PROPORT) identified whether or not a company undertook partial cover of an individual FX exposure. Among the 67 companies that managed FX risk, 50 (75%) sometimes undertook partial covers of FX exposures. The rest, 17 companies (25%) indicated that they never undertook partial covers. In other words, three-fourths of the companies partially hedged their FX exposures, and thereby, assumed some of the exposures, i.e., without hedging. Previous researches too presented similar findings. Collier and Davis (1985) noted that about half of the UK companies in their study had partially hedged ("actively managed") FX exposures. As mentioned earlier, Soenan (1986) identified that most UK companies had undertaken selective hedging. Likewise, Batten et al. (1993) found that about 70% of Australian companies partially hedged their exposures.

Writing currency options

The fifth aspect of FERM policies and procedures is about company policy on the writing of currency options. The variable (OPTIONS) identified whether or not a company sometimes wrote currency options. Writing currency options limits the potentially unlimited FX gains (upside risk) in exchange for small up-front revenues (or

[18] This appears to have been another of the most unpopular questions in the questionnaire.

premiums), but it still carries potentially unlimited FX losses (downside risk).[19] Therefore, writing currency options does not seem particularly suited for limiting or reducing FX losses. In fact, it is more focused on profiting from the small up-front premiums when the buyers do not exercise the options. In other words, writing a currency option, on its own, is inadequate to cover (or protect) the company from adverse exchange rate movements. To serve as an adequate cover, a written currency option has to be used in conjunction with other hedging techniques, at least. Certainly, writing currency options as part of a hedging strategy requires a great degree of sophistication, knowledge, and skill.

Prior studies have not investigated this particular aspect of FERM policy. However, in this study, among the 66 companies that provided valid responses to this question, an overwhelming majority (60 companies, 91%) had not written currency options at all, although a small minority (six companies, 9%) revealed that they had written currency options. This probably indicates that the vast majority of companies in this study were either risk-averse, i.e., disinclined to seek profits from up-front premiums in writing options, or not adequately sophisticated to use the strategy of writing currency options in FERM.

Undertaking uncovered FX deals

The sixth aspect examined in this research is associated with company policy on undertaking uncovered FX deals. The variable (UNOFFSET) identified whether or not a company sometimes undertook FX deals that are not offset by underlying commercial or operating FX exposures. Such FX deals are known as *naked* or uncovered FX deals. This is another aspect of corporate FERM policy that had not been examined by prior empirical researches. However, in this research, among the 67 companies that managed FX risk, 57 companies (85%) said that they did not undertake any uncovered FX deals, while a small minority (10 companies, 15%) conceded that they did sometimes undertake uncovered FX deals. This is rather interesting because uncovered FX deals are not normally allowed by Bank Negara Malaysia, the central bank in Malaysia. The central bank closely monitors local companies that take out FX deals to ensure that the deals are for genuine hedging, and not speculative, purposes. However, it is

[19] Conversely, buying currency options limits the potentially unlimited FX losses in exchange for small up-front costs (premiums) but it still incorporates potentially unlimited FX gains.

conceivable that at least some of these companies may have been able to obtain special permissions to undertake uncovered FX deals, perhaps based on expected exposures or contracts. Nonetheless, the findings clearly indicate that most companies were disinclined to accept additional FX exposures.

Using forecast rates

The seventh aspect of FERM policies and procedures examined here is regarding company procedure on using forecast rates to make FERM decisions. The variable (EXRATE1) identified whether or not a company used forecast interest and exchange rates, more often than not, in making FERM decisions. Although previous empirical works have investigated companies' methods for forecasting FX rates, they have not particularly examined whether or not the companies used, or the companies' extents of use of, forecast rates in hedging decisions. Among the 66 companies that provided valid responses for this question, 49 companies (74%) said that they had used forecast rates, more often than not, in making their FERM decisions. The remaining 17 companies (26%) did not use forecast rates (more often than not) in their FERM decisions. In essence, this finding indicates that almost three-quarters of the companies had adopted flexible and contingent approaches to FERM because their decisions were based upon exchange and interest rate forecasts (rather adopting an approach that hedged all exposures under all circumstances). Nonetheless, a significant minority appeared to have adopted more passive approaches to FERM because they used forecast rates less frequently to inform their decisions.

Using internal FX rates

The last aspect of FERM policies and procedures examined in this study is about company procedure on using internal FX rates. The variable (INRATE) recorded whether or not a company used internal FX rates in planning and budgeting. Internal FX rates are usually forecast exchange rates used by companies in translating expected revenues and costs denominated in foreign currencies into home currency (Ringgit). The internal FX rates, therefore, serve as reference, benchmark, or target, rates that help in defining the actual FX gains and losses achieved by a company in FX transaction settlements, due to movements in exchange rates. In other words, with these internal FX rates, changes in costs and revenues (that have foreign currency components) due to exchange rate changes can be monitored and attributed accordingly. Otherwise, these changes

then will be merely reflected as operating gains or losses and not as FX gains or losses.

Again, this is an aspect of corporate FERM procedures that had not been studied previously. However, in this study, among the 36 companies that provided valid responses to this question,[20] 28 companies (78%) indicated that they used internal FX rates, while the others (8 companies, 22%) said that they did not use internal FX rates. In essence, this indicates that slightly more than a fifth of the companies in the study did not use internal FX rates, and therefore, these companies were not able to formally monitor their FX losses or gains, despite managing FX risk. On the other hand, this also implies that most of the companies did use internal FX rates, and thereby, had the rudimentary feature for monitoring and evaluating their FERM programmes. Then again, it is difficult to be confident about this particular finding because only a very small number of companies had provided data.

4.3.7. FERM techniques

It must be noted that there is a no exchange-traded derivative available in Malaysia for the purpose of corporate hedging of FX risk, although there are equity index futures and options being traded in the Kuala Lumpur Options and Financial Futures Exchange (KLOFFE). There has been a plan to introduce trading in both standard currency futures and options contracts in the Commodity and Monetary Exchange of Malaysia (COMMEX). However, at present, only commodity futures are being traded. Nevertheless, companies in Malaysia can buy exchange-traded derivative contracts available in other countries for the purpose of hedging genuine underlying exposures, with the approval from the central bank, Bank Negara Malaysia. Moreover, there are several over-the-counter hedging instruments offered by both the local and foreign players. Broadly, currency forwards and swaps contracts are offered by commercial banks, or more particularly, licensed FX brokers (held primarily by commercial banks). Their activities are monitored and regulated by the central bank. According to the

[20] Actually, this question was not included in the first version questionnaire, and therefore, only the 36 companies, that used the second version questionnaire and managed FX risk, provided valid data for this variable.

statistics provided by the central bank,[21] the transaction volume is largest in the Ringgit-Dollar, followed by Dollar-Singapore dollar, Dollar-Yen, Dollar-Sterling, and Dollar-Euro. However, the transactions in all these currencies, except for the Ringgit-Dollar, are very thin. In fact, even in the trading of Ringgit-Dollar, the present volume has reduced to roughly almost a third of the levels prior to the pegging of the Ringgit to the Dollar in September 1998. Apart from forwards and swaps, companies sometimes also deal in currency options also offered by the commercial banks. More recently, since 1993, foreign derivative houses have also been active in selling their derivatives, mainly exotic swaps, to Malaysian companies (see Koh, 1995) for the purpose of hedging FX risk.[22] Besides these, again, Malaysian companies also can apply for approval from the central bank, to purchase over-the-counter derivatives or instruments offered by players in other countries. They need not restrict themselves to tools available only in Malaysia. Of course, on the other hand, they can use internal hedging techniques to manage their FX risks. Next, the study presents the findings regarding the extents of use of specific FERM techniques, by Malaysian public-listed multinational companies, in managing each of the three FX exposure types.

The extent of use of each FERM technique was measured in terms of the proportion of a given type of FX exposure that was managed or covered, in a company, using the specified technique. Table 4.3 summarises the relevant information. Note that the data have been aggregated from 31 individual variables – each measuring the proportion of a given type of FX exposure managed using a particular FERM technique. These variables have been listed in Appendix B-1.[23] The strategies and instruments used by the companies to manage accounting, economic, and transaction exposures are described next.

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[21] Bank Negara Malaysia. (2001). *Monthly Statistical Bulletin*, January, Kuala Lumpur: Bank Negara Malaysia, p.76.

[22] Koh, A. (1995). Derivatives: A Solution in Search of a Problem? *Treasury Management International*, February, 41-43.

[23] Actually, the appendix lists only 25 variables. These variables represent the strategies and instruments that were used by at least one of the companies in the study, to manage a given type of FX exposure. Therefore, six techniques (i.e., variables), that were not used by any company to manage a given FX exposure type, have been omitted.

Table 4.3: The extent of use of FERM techniques

(Note: The table provides the numbers of companies that managed the indicated proportions of specific types of FX exposure using the following strategies and instruments)

		Types of FX exposure								
		Accounting			Economic			Transaction		
	Strategies or instruments	% exposure		Total	% exposure		Total	% exposure		Total
		≤60%	>60%		≤60%	>60%		≤60%	>60%	
1	Forward contract	17	8	25	12	9	21	29	23	52
2	Do nothing	11	6	17	12	4	16	24	10	34
3	Balance sheet hedge	14	2	16	-	-	-	-	-	-
4	Money market hedge	-	-	-	-	-	-	15	1	16
5	Matching	-	-	-	9	0	9	5	0	5
6	Back-to-back loan	2	1	3	4	3	7	3	0	3
7	Income statement hedge	13	0	13	-	-	-	-	-	-
8	Netting	-	-	-	-	-	-	13	0	13
9	Leading & lagging	1	0	1	1	0	1	9	1	10
10	Currency option	0	0	0	2	0	2	5	1	6
11	Diversifying financing	-	-	-	7	1	8	-	-	-
12	Diversifying operation	-	-	-	8	0	8	-	-	-
13	Risk sharing agreement	-	-	-	0	0	0	5	0	5
14	Currency swap	2	0	2	0	0	0	1	0	1
15	Currency futures	0	0	0	0	0	0	0	0	0

Techniques for managing accounting exposure

In terms of the number of companies that used each technique, the most used techniques for managing accounting exposure, in descending order, were forward contract (25 companies), do-nothing strategy (17 companies), balance sheet hedge (16 companies), and income statement hedge (16 companies). However, only the forward contract and do-nothing strategy were the most intensively used techniques because more companies had used them to cover or manage more than 60% of a company's accounting exposure. These findings imply that a typical company was likely to use mainly forward contracts and the do-nothing strategy (by leaving some exposure uncovered) to manage substantial portions of its total accounting exposure. Balance sheet hedges and income statement hedges were used but were likely only to cover smaller portions of the total accounting exposure.

However, to establish statistically that the various techniques were used by the companies to different extents in managing accounting exposure, the non-parametric test, Friedman's two-way ANOVA was used.[24] For this purpose, seven variables that measured companies' use of seven techniques (on an ordinal scale) were simultaneously compared. Appendix H-5 presents the results of this test. The chi-square statistic was very significant. This indicates that not all the strategies and instruments were used by the companies to the same extent to manage accounting exposure. In other words, this implies that the companies used some techniques more than other techniques, in managing accounting exposure. The mean rank of a particular technique (given in Appendix H-5) indicates the relative extent of its use. The mean ranks confirm that the most used techniques for managing accounting exposure were, as enumerated above, in descending order: forward contract, do-nothing strategy, balance sheet hedge, and income statement hedge.

Techniques for managing economic exposure

In terms of the number of companies that used each technique, the most used strategies and instruments for managing economic exposure, in descending order, were forward contract (21 companies), do-nothing strategy (16 companies), matching (nine companies), diversifying financing (eight companies), diversifying operations (eight companies), and back-to-back loan (seven companies). Nonetheless, again, only the forward contract and do-nothing strategy were the most intensively used among all the techniques (see Table 4.3). These findings imply that a typical company was likely to use mainly forward contracts and the do-nothing strategy to manage considerable portions of its total economic exposure. Other techniques, e.g., matching, diversifying financing and operations, or back-to-back loan, were likely to be used to manage only smaller portions of the total economic exposure.

[24] Kinnear and Gray (1994), pp.74-75, recommend the use of this test for comparing the ① ordinal level data of ② several (three or more) ③ related samples (or rather the same sample which provides repeated or comparable measures). Since the attributes, of comparing the various variables that measure the company's use of various techniques for managing a given FX exposure type, match the preceding requisites, the Friedman two-way ANOVA has been used here. See Howitt and Cramer (2000), pp.448-449, for a simple step-by-step description of performing the test.

As above, the Friedman's two-way ANOVA was again used to simultaneously compare the eight separate techniques used by the companies for managing economic exposure (see Appendix H-6). As above, the resultant chi-square statistic was very significant. This indicates that not all the techniques were used to the same extent by the companies to manage economic exposure. The most used techniques for managing economic exposure, as enumerated above, are reinforced by the mean ranks of these techniques. To recapitulate, the most used techniques for managing economic exposure, in descending order, were forward contract, do-nothing strategy, matching, diversifying financing, diversifying operations, and back-to-back loan.

Techniques for managing transaction exposure

The most used techniques for managing transaction exposure, in terms of the number of companies that used each technique, in descending order, were forward contract (52 companies), do-nothing strategy (34 companies), money market hedge (16 companies), netting (13 companies), as well as, leading and lagging (10 companies). Nonetheless, again, only the forward contract and do-nothing strategy were the most intensively used of all the techniques because more companies had used these two (compared to other) techniques to manage or cover more than 60% of their transaction exposures (see Table 4.3). Again, the findings imply that a company typically was likely to use mainly forward contracts and the do-nothing strategy to handle significant portions of its total transaction exposure. Other techniques, e.g., money market hedge, netting, or leading and lagging, were likely to be used to manage only smaller portions of the company's total transaction exposure.

Again, the Friedman's two-way ANOVA was used to simultaneously compare the ten techniques used by the companies for managing transaction exposure (see Appendix H-7). Yet again, the resultant chi-square statistic was very significant. This too indicates that not all the techniques to manage transaction exposure were used to the same extent by the companies. The most used techniques for managing transaction exposure, as enumerated above, are confirmed by the mean ranks of the strategies and techniques. To restate, the most used strategies and instruments for managing transaction exposure, in descending order, were forward contract, do-nothing strategy, money market hedge, netting, and leading and lagging.

Overall, the above findings indicate that forward contract was the most used technique to manage all FX exposure types. This is congruent with the findings from other studies. Almost all studies, overwhelmingly, point out that forward contract was the most widely or extensively used technique in managing FX risk. Mathur (1982), Soenan (1986), Glaum and Belk (1992), Rawls and Smithson (1993), Batten et al. (1993), Bodnar et al. (1995), Phillips (1995), and Marshall (2000), all provided evidence to this effect.

Previous studies had not focused particularly or directly on the use of the do-nothing strategy by companies. Nevertheless, some previous researches found that many companies had often left some of their exposures uncovered, or many had hedged only a portion of their exposures, indicating implicitly that the do-nothing strategy was indeed used, e.g., Collier and Davis (1985), Soenan (1986), Dolde (1993), Batten et al. (1993). However, this study was able to establish that it was the second most extensively used technique among Malaysian companies that managed FX risk. This indicates that a substantial portion of each FX exposure type was merely left uncovered in a typical company.

This study's findings also showed that not all techniques were used to the same extent in managing a given FX exposure type. In fact, the findings also implied that FERM techniques, other than the forward contract and do-nothing strategy, appeared to be used specifically for managing particular (rather than all) FX exposure types. In fact, Geczy et al. (1997) indicated that a company's decisions on whether to use currency derivatives and which derivative types to use depends upon the source of FX exposure. The results from this study appear to support this.

Until recently, most empirical works had not differentiated the techniques used for managing different types of FX exposure. In fact, almost all prior empirical studies were about managing FX risk, and not about managing specific types of FX exposure. Soenan (1986) found that forward contract, money market hedge, and leading and lagging, in that descending order, were the most used hedging tools. This is similar to the findings from this study about techniques used for managing transaction exposure. Rawls and Smithson (1993), noted that forward contracts, currency swaps, currency options and futures, in that declining order, were the most used tools for FX management in the US. Marshall (2000), likewise, showed that among the external

techniques for managing transaction exposure, forward contracts, currency swaps, and currency options were (in that order) the most used, by multinationals in the US, UK, and Asia-Pacific. However, Glaum and Belk (1992) noted, specifically, that none of the small number of UK companies in their study had used currency futures. Likewise, in this study, none of the 67 companies that managed FX risk had used currency futures. Furthermore, Bodnar et al. (1995) observed that options were more used than swaps, although Grant and Marshall (1997) found that standard derivatives (forwards, swaps, plain options, and futures) were more popular than specialised derivatives. In short, previous findings, especially from the more recent studies, indicate that currency options and currency swaps are extensively used, but in this study, both currency options and swaps were used only very sparingly.

4.4. Review and discussion of company FERM practices

This fourth and final part of this chapter reviews and discusses, in greater depth, the major findings about the FERM practices of Malaysian public-listed multinational companies. In other words, it reviews and discusses the key findings presented in the preceding part. More minor findings, particularly those associated with small numbers of valid cases or responses have been omitted here, although these have been presented in the previous part. The discussions are now re-grouped according to five categories of FERM practices, rather than the seven categories used earlier. This is done merely to consolidate and simplify the findings. The regrouped categories of FERM practices are as follows; ① management of FX risk and specific FX exposure types, ② FERM objective, ③ FERM policies and procedures, ④ FERM responsibility and centralisation, and finally, ⑤ FERM techniques. Where applicable, the FERM practices in Malaysia are compared to those in other major Western countries where such studies have been conducted prior to this study, particularly the US, Canada, UK, and Australia. Both similarities and differences have been found, and these are noted where necessary.

4.4.1. Management of FX risk and specific FX exposure types

This research indicated that less than two-thirds of Malaysian public-listed multinational companies managed FX risk. Some comparable previous researches[25] indicated that broadly similar proportions of companies managed FX risk in some of the developed Western countries like the US, and Australia. Actually, a lower proportion of companies that managed FX risk was expected from this study. This is because Malaysian companies are, in general, ① smaller than the companies in the West, e.g., the US, UK, and Australia. Malaysian companies also have ② less experience and skills in FX matters because they have only recently started becoming more involved in FX. Therefore, generally, Malaysian companies have less capacity to manage FX risk. Moreover, Malaysia uses a less volatile exchange rate system, compared to the US, UK, and Australia.[26] In other words, companies in Malaysia generally ③ face less FX risk, and consequently, have less need to manage FX risk. In short, the arguments imply that Malaysian companies have both less capacity and need to manage FX risk. Conversely, despite this, the proportion of companies that manages FX risk appears to be about the same in Malaysia as in the West. Therefore, this then implies that Malaysian companies are generally more risk-averse, in that, they perceive they have greater need, and are more willing, to manage FX risk, compared to companies in the West. Figure 4.1 presents the preceding arguments in a diagram. The findings from Marshall (2000) lent some support for this view because multinationals in Asia-Pacific were found to place greater importance on FERM compared to those in the UK or US.

Both this study and prior studies clearly show transaction exposure to be the most managed type of FX exposure, whereas accounting and economic exposures are less managed, among companies not only in Malaysia but also in the US, UK, and Australia. Therefore, this is probably also true for the companies around the world. However, Marshall (2000) found that Asia-Pacific multinationals placed greater importance on translation (accounting) and economic exposures compared to UK or US multinationals. However, the present study's findings did not indicate this. Nonetheless, the Asia-

[25] These are studies that focused on large or public companies, and those that used obtrusive means of data collection, e.g., mail questionnaires.

[26] Prior to September 1998, Malaysia had maintained a managed-float exchange rate system. However, since September 1998, Malaysia has fixed the Ringgit's exchange rate to the US dollar. In contrast, the US, UK, and Australia, have maintained more free-floating exchange rate systems.

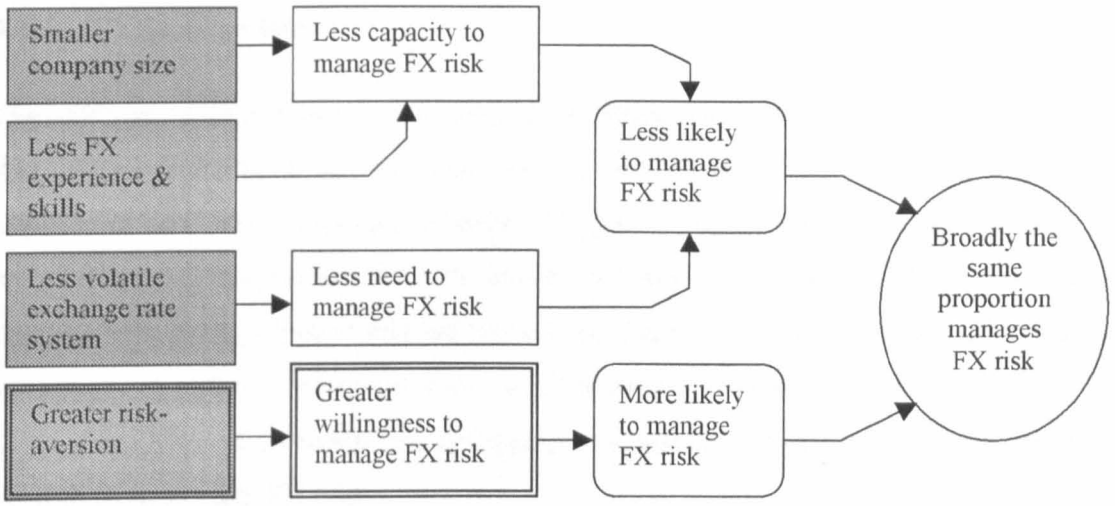


Figure 4.1: Factors that might underlie the similar proportions of companies that manage FX risk in Malaysia and in developed Western countries.

Pacific region is non-homogeneous, and in Marshall (2000), it covered more developed countries in the region, particularly, Australia, Hong Kong, Singapore, and South Korea. Therefore, it is difficult to equate the findings from the current study with those of Marshall (2000). Anyhow, the empirical findings are rather contradictory to the theoretical or normative prescriptions in the literature. Economic exposure is generally espoused to be the most important and critical, and therefore, the literature suggests that this exposure should be managed. On the other hand, accounting exposure is generally said to reflect paper (as opposed to real) losses or gains on FX, and therefore, managing accounting exposure is not recommended. Instead, the empirical findings show that some companies still manage accounting exposure, while many do not manage economic exposure. In the real world, with imperfect capital markets and information asymmetry, accounting exposure may have valuation and cash flow implications as debt conditions, and management compensation, are often drawn based on accounting ratios and measures that are affected by translation risk (or accounting exposure). On the other hand, economic exposure was less widely managed probably because its recognition, measurement, and management are very complex. In contrast, transaction exposure is the most managed probably because it, unlike accounting exposure, has direct cash flow implications, and, unlike economic exposure, is also easier to measure and manage.

4.4.2. FERM objective

The findings of this research and some prior researches indicate that most companies that manage FX risk, in Malaysia and the US, appear intent on minimising FX risk or losses, and very few companies consider FX gains. Again, this is likely to be true for most companies that manage FX risk, around the world. In other words, the companies seem to have an asymmetric attitude towards managing FX risk – they appear willing to incur costs in order to reduce FX risk, but unwilling to increase FX risk in search of FX gains. This also indicates that the companies are generally risk-averse, rather than risk-neutral, in managing FX risk.

In this study, a high proportion of companies that managed FX risk had no formal FERM objective. However, in prior studies, a significant but distinctly smaller proportions of companies that managed FX risk, namely in the US, and UK, had no formal FERM objective. This then implies that companies that manage FX risk in Malaysia, compared to those in the developed Western countries, generally are less likely to adopt formal FERM objectives. As argued above, in general, Malaysian companies ① are smaller, ② have less experience and skills in FX matters, and ③ face less FX risk, compared to companies in the West. Therefore, Malaysian companies appear to have less capacity and need to adopt formal FERM programmes, including FERM objectives. This also suggests that Malaysian companies are less sophisticated in their FERM practices. Figure 4.2 illustrates the above relationships pictorially.

4.4.3. FERM policies and procedures

This research and some prior researches found that most companies that managed FX risk, in Malaysia and in the West, undertook partial cover (or partial hedge). Therefore, these companies assumed some portions of their FX exposures (i.e., without hedging). Further, most companies, in Malaysia (as shown by this study) and probably also in other countries (as implied by a previous study), managed only significant FX exposures. Consequently, these companies assumed non-significant exposures.[27] These

[27] Besides, in this study, about half of the Malaysian companies allowed time flexibility for hedging. Therefore, this too reflects that the companies assumed FX exposures – at least temporarily.

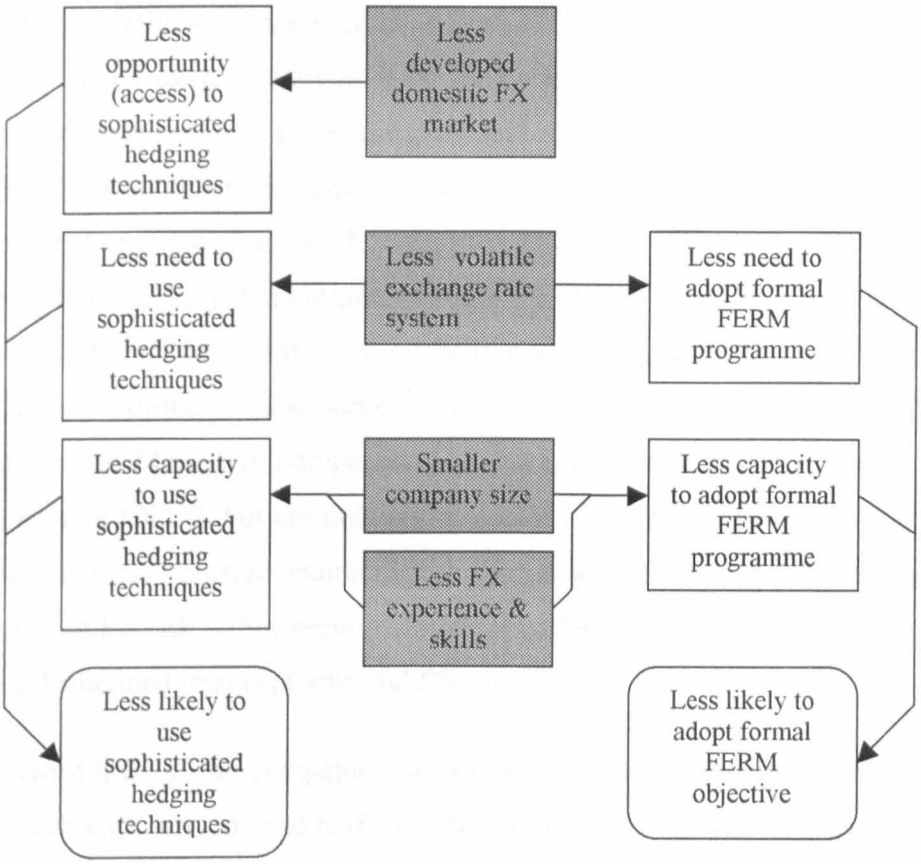


Figure 4.2: Factors that might explain the lack of sophistication in the FERM practices of companies in Malaysia compared to the practices of companies in developed Western countries.

findings appear to be applicable, again, to most companies that manage FX risk, in all countries. These findings imply that most companies that manage FX risk assume at least some of their own FX exposures or FX risks.[28] Notably, since these exposures arise from the companies' natural operating or commercial obligations, they are also called operating or *natural* FX exposures. The risk arising from natural FX exposure is called natural FX risk. The findings, therefore, indicate that most companies that manage FX risk assume at least some of their natural FX risk.

On the other hand, this study found a vast majority of Malaysian companies that did not undertake uncovered FX deals. This particular aspect had not been investigated by prior empirical works. Nonetheless, uncovered FX deals are often undertaken with the intent of purposely seeking FX gains. The deals culminate in the deliberate increase of a company's FX exposure, and since these exposures are not natural FX exposures that

[28] This is rather ironic because earlier it was noted that most companies that manage FX risk have FERM objectives that seem intent on minimising FX risk or losses.

arise from the underlying operational or commercial obligations of the company, the exposures are also known as additional or *artificial* FX exposures. Correspondingly, the risk arising from artificial FX exposure is called artificial FX risk. Consequently, the finding of this study implies that companies that manage FX risk, in Malaysia at least, generally do not increase their FX exposure (FX risk) artificially. In other words, they do not seem to accept additional or artificial FX risk in search of FX gains. However, it was noted above that most companies, including Malaysian companies, that manage FX risk, assume at least some of their natural FX risk. These two findings together imply that Malaysian companies that manage FX risk are likely to assume at least some *natural* FX risk but are unlikely to accept *artificial* FX risk. This appears to reflect Malaysian public-listed multinational companies' asymmetric attitude towards different types of FX risk – they seem inclined (or perhaps compelled) to assume natural FX risk, but disinclined to accept artificial FX risk.[29]

More than two-thirds of the companies, in this study, did not recognise uncertain FX exposures, although up to one-half of the companies recognised long-term FX exposures. Besides that, this study did not find any difference between outflow and inflow exposures in the companies' FX exposure recognition policies. However, these findings have been based on rather small numbers of valid cases. Moreover, there is no comparable finding from prior studies because these aspects of FX exposure recognition have not been investigated previously. Nonetheless, on aggregate, the findings seem to indicate that Malaysian public-listed multinational companies, at least, are generally moderate in recognising FX exposures, and are consistent in recognising both inflow and outflow FX exposures.

Almost three-fourths of the companies in this study had used (more often than not) exchange rate and interest rate forecasts to make FERM decisions. Again, there is no comparable finding from previous researches. Therefore, the finding from this study implies that most companies that manage FX risk, in Malaysia at least, seem to adopt broadly flexible and contingent approaches to FERM, rather than using a fixed (or passive) hedging decision for all exposures and circumstances. In other words, FERM decisions, by Malaysian public-listed multinational companies, appear to be informed

[29] This research also found that a vast majority of Malaysian companies did not write currency options. In general, this implies that most Malaysian companies that manage FX risk are not particularly focused upon deriving profits from FX.

by expected exchange and interest rates.

4.4.4. FERM responsibility and centralisation

This study found that only a few persons were responsible for FERM in a typical company that managed FX risk. Moreover, it also found that the FERM tasks generally accounted for only a small portion of the persons' overall responsibilities. One prior study, based upon US companies, had found similar findings too. These then suggest that the findings are true for most companies that manage FX risk in all countries. Consequently, the findings imply that FERM responsibility in most companies is generally not very prominent.

Further, this study found that, in two-thirds of companies that managed FX risk, each company had placed the responsibility for FERM with only one department, usually the treasury. Again, this is another aspect that had not been investigated by previous studies. Nonetheless, the findings of this study then implies that, at least among Malaysian public-listed multinational companies that manage FX risk, FERM responsibility is generally specialised or handled by mainly one department. This is because specialisation, in general, allows a company to acquire and hone the necessary skills in FERM, and it could lead to a reduction in (per unit) operating costs.

In this study, the subsidiaries' FX exposures were handled mostly by, either their parent companies, or jointly by the subsidiaries and their parent companies. Previous studies had also found that FERM, among the US and UK companies, on the whole, was generally centralised. Therefore, this is probably true for companies in all countries. Consequently, the findings imply that, universally, FERM is generally centralised, at least to some extent. Broadly speaking, centralisation enables more efficient netting of company-wide exposures. It also allows the company to obtain cheaper access to external hedging instruments, e.g., narrower spread on forward contract, by pooling company-wide exposures to undertake one rather than several hedging deals. As with specialisation, centralisation too enables a company to acquire and hone FERM expertise. More directly, centralisation reduces a company's operating costs of FERM by avoiding duplication of functions at parent company and subsidiary company levels. On the other hand, centralisation might also involve indirect costs such as subsidiary

alienation, resentment, or conflict with parent company over the subordination of subsidiary company's interests.

Previous studies conducted in the UK and Canada implied that domestic subsidiaries generally were subjected to greater FERM centralisation, compared to overseas subsidiaries. This is likely to be the same in other developed Western countries. Since overseas subsidiaries often operate in a different environment, characterised by different exchange rate and regulatory systems from that of the parent company, it is conceivably more difficult to centralise the management of the subsidiaries' FX exposures. However, this study did not find any difference in the extent of FERM centralisation between Malaysian companies' domestic and overseas subsidiaries. It is unlikely that companies in Malaysia, compared to those in the West, impose greater centralisation on their overseas subsidiaries' FERM. Therefore, the above results then imply that companies in Malaysia, compared to those in the West, allow greater autonomy (decentralisation) to their domestic subsidiaries to manage their own FX exposures. This is thought to be plausible because there is greater incidence of cross-ownership of equity between parent companies and their domestic subsidiaries in Malaysia than in other countries.[30] Generally, it is more difficult to centralise FERM given the situation of cross-ownership between domestic subsidiaries and parent company. This study, however, did not include measures of equity cross-ownership, and therefore, has not been able to verify or establish this as a fact. This is an issue that ought to be taken up by further research.

4.4.5. FERM techniques

Forward contract had been consistently found to be the most popular instrument used to manage or hedge FX risk in Malaysia and the US, UK, and Australia, by this research as well as prior researches. Therefore, this is probably also true in all other countries as well. In fact, this study found forward contract to be the most used hedging technique, among Malaysian companies, to manage each of the three types of FX exposure. In

[30] Equity cross-ownership is probably less common between Malaysian parent companies and their overseas subsidiaries. Further, equity cross-ownership is also probably less common in developed Western countries.

short, these findings imply that forward contract is the most used (or popular) instrument for managing (or hedging) FX risk. This is probably because the forward contract is comparatively easy to understand, use, record (or account for), and monitor, compared to other hedging techniques.

Several previous studies, and especially the more recent ones, indicated that companies in the US, UK, and Australia, had used fair shares of sophisticated hedging instruments like the currency swap and currency option to manage FX risk. This is probably representative of companies' use of sophisticated hedging techniques in other developed Western countries as well. However, this study indicated that companies in Malaysia had used these hedging instruments only very sparingly. Therefore, this implies that companies that manage FX risk in Malaysia, compared to those in the West, are generally less inclined to use sophisticated hedging instruments like the currency swap and option. This is because, as seen previously, generally Malaysian companies ① are smaller, ② have less experience and skills in FX matters, compared to companies in more developed countries. Therefore, they seem to have less capacity to use sophisticated hedging techniques. Further, Malaysian companies also ③ face less FX risk, and therefore, have less need to use sophisticated hedging tools. Moreover, Malaysia's FX market is generally less developed, and therefore, Malaysian companies, in general, ④ have less access to sophisticated hedging instruments. Consequently, they appear to have less opportunity to use sophisticated hedging techniques. In short, Malaysian companies, compared to Western companies, seem to have less capacity, need, and opportunity to use sophisticated hedging techniques. Please refer back to Figure 4.2 for a diagrammatic presentation of the preceding arguments. In contrast, Marshall (2000) found that multinationals in Asia-Pacific, compared to those in the UK and US, were more inclined to use exchange-traded derivatives to manage transaction exposure, and use sophisticated tools to manage translation (accounting) exposure. However, as explained earlier, it is inappropriate to equate Malaysia with the countries included to represent Asia-Pacific in Marshall (2000).

This study found that the do-nothing strategy was the second most used hedging technique, after the forward contract. In fact, the do-nothing strategy was the second most used technique for managing each of the three types of FX exposure. This actually reflects the extent to which the companies, in this study, had assumed their FX exposures by doing nothing or by leaving the exposures uncovered. Prior researches

implied that many companies, in other countries, had used the do-nothing strategy, but the studies did not directly investigate the use or the extent of use of the do-nothing strategy. Nevertheless, this research's findings indicate that, at least among Malaysian public-listed multinational companies, the do-nothing strategy is the next most used technique, after forward contract, to handle all the three types of FX exposure.

Finally, this study discovered that companies used FERM techniques – notwithstanding the forward contract and do-nothing strategy – to manage specific, rather than all, types of FX exposure.[31] For example, balance-sheet hedging and income-statement hedging were used mostly for managing accounting exposure; matching, diversifying financing and operations, and back-to-back loan seemed to be used mostly for managing economic exposure; while money market hedging, netting, and leading and lagging appeared to be used mostly for managing transaction exposure. Previous empirical studies were mostly about the management of FX risk rather than the management of specific types of FX exposure, and therefore, they were unable to differentiate the techniques used to manage different FX exposure types. The findings of this study, nonetheless, imply that hedging techniques (except for the forward contract and do-nothing strategy), at least among Malaysian public-listed multinational companies, are used typically to manage specific rather than all FX exposure types.

SUMMARY

This chapter presented the key findings associated with ① the non-response bias in the data, ② the predictor variable data, and finally, ③ the research variable data. First, the tests for non-response bias indicated that there were slight differences between the respondent and the non-respondent companies in this study. However, this is not serious because: ① the differences were significant only in two – total assets and government-held equity – out of the seven chosen characteristics; ② the difference in total assets was only marginally significant; ③ government-held equity seems to have only very limited influence on companies' inclinations to undertake FERM activities; and finally, ④ these differences are unlikely to affect the predictors' influences on

[31] Besides this, the study also established that the companies did not use all techniques to the same extent to manage a given FX exposure type. However, this finding is rather expected, and not very remarkable.

companies' inclinations to undertake FERM activities.

The predictor variable data in this research are about some selected characteristics and attributes of the participating companies. The key findings about company characteristics and attributes can be clustered into five groups: ① company size, ② listing board and sector, ③ intra-company transactions, ④ FX exposure and currency characteristics, and ⑤ perceived FX risk attributes. Next, the main findings are recapitulated below.

Company size. Overall, the companies' size values were highly positively skewed. This implies that only very few companies in the study were extremely large in size, while most companies were small.[32]

Listing board and sector. ❶ About three-fourths of companies that participated in this study were listed on the main board of the KLSE, while the rest were listed on the second board of the stock exchange. ❷ The highest numbers of participant companies were listed in the following sectors of the KLSE, in descending order: ① trading and services, ② industrial, ③ consumer, ④ construction, ⑤ property, ⑥ plantation, ⑦ mining, and ⑧ hotel.

Intra-company transactions. The scale of intra-company transactions for a typical Malaysian public-listed multinational company appears to be rather limited.

FX exposure and currency attributes. ❶ Almost half of Malaysian public-listed multinational companies seem to have substantial FX exposures. ❷ More of these companies appear to have substantial FX exposure in purchases rather than in sales. However, only a small number of these companies seem to have substantial FX exposure in financing. ❸ The FX problem encountered by these companies does not appear to be very complex because they generally seem to contend with only a few currencies. ❹ These companies' FX exposures seem to be denominated in foreign currencies that reflect the currencies of Malaysia's main trading partners, and those used for trade in the region, namely, (in descending order), Dollar, Yen, Singapore dollar,

[32] This characteristic was consistently found in all variables that measured company size, i.e., total assets, total sales, total market capitalisation, and number of subsidiaries. Actually, apart from company size, some other predictor variables too were highly positively skewed. These include total debt, government-held equity, and number of overseas subsidiaries.

Pound, Australian dollar, and Mark.

Perceived FX risk attributes. ❶ On aggregate, Malaysian public-listed multinational companies seem to perceive that they have only small total FX exposures. ❷ The companies generally appear to expect their FX exposures to increase only slightly in the future. ❸ Moreover, the companies do not seem to expect their FX exposure patterns to change drastically. ❹ Nonetheless, the companies appeared to feel that the exchange rates were volatile (at the time of the currency crisis). ❺ Despite this, the companies, on aggregate, appear to perceive that they have only low levels of FX risk.

The research variable data are about the FERM practices of companies involved in this study. The findings about company FERM practices can be presented, according to the five categories, seen earlier: ① management of FX risk and specific FX exposure types, ② FERM objective, ③ FERM policies and procedures, ④ FERM responsibility and centralisation, and ⑤ FERM techniques. Finally, the key (important) findings about company FERM practices, particularly those practised by Malaysian public-listed multinational companies, are abridged below. Figure 4.3 encapsulates all these findings in a diagram.

Management of FX risk and specific FX exposure types. ❶ Transaction exposure is generally the most managed type of FX exposure, followed by accounting exposure, and economic exposure. ❷ Companies in Malaysia, compared to those in developed Western countries, in general, appear more (risk-averse) willing to manage FX risk.

FERM objective. ❶ Companies that manage FX risk generally seem more intent on minimising FX risk or losses, rather than even consider FX gains. ❷ However, companies that manage FX risk in Malaysia, compared to those in the West, in general, appear less likely to adopt formal FERM objectives.

FERM policies and procedures. ❶ Companies that manage FX risk generally seem to assume at least some natural FX risk. ❷ However, Malaysian public-listed multinational companies that manage FX risk, in general, do not appear to accept

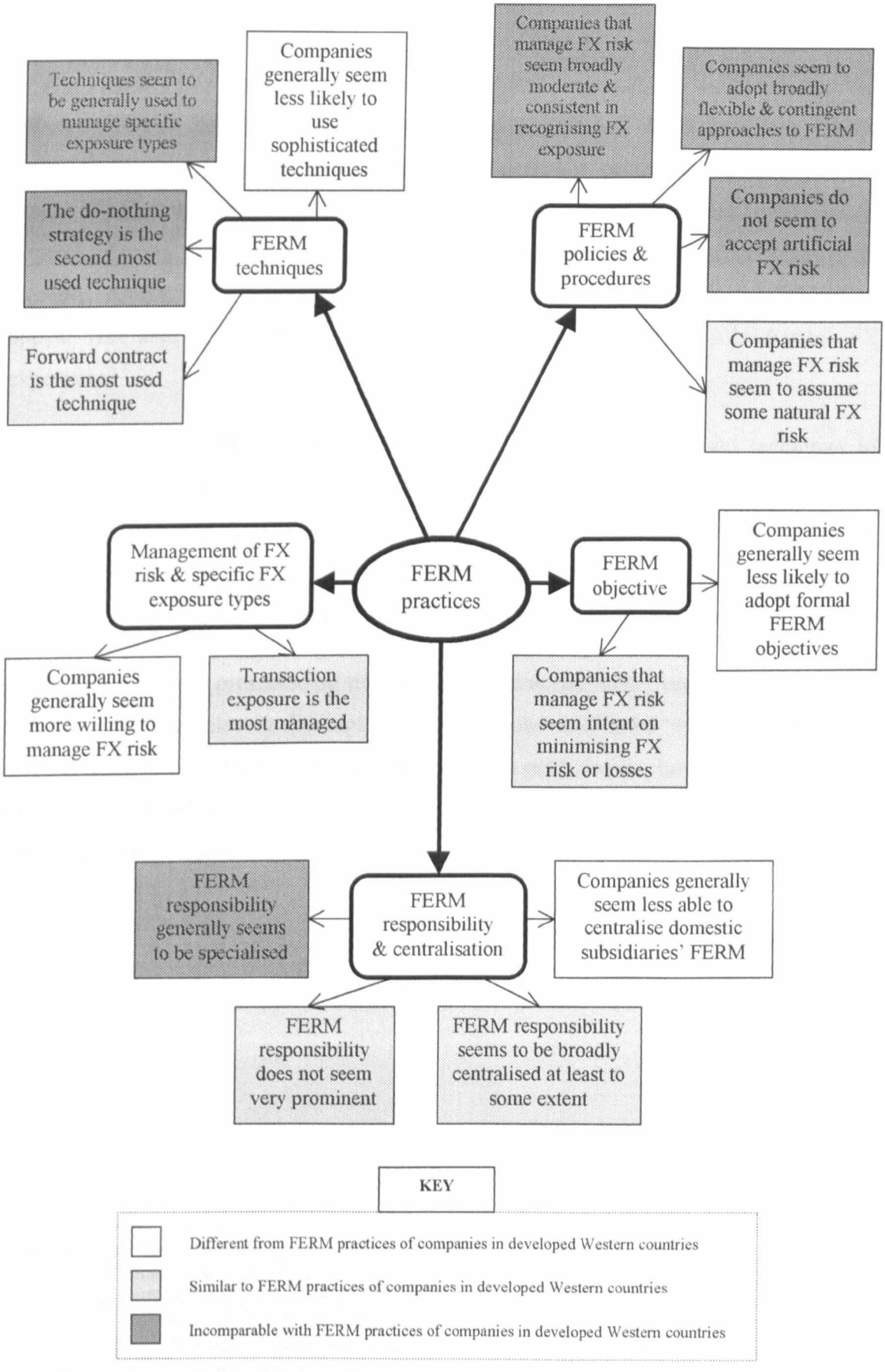


Figure 4.3: Summary of findings about Malaysian companies' FERM practices.

artificial FX risk.[33]

FERM responsibility and centralisation. ❶ FERM responsibility in companies that manage FX risk generally does not seem very prominent. ❷ Nonetheless, FERM responsibility in these companies appears to be generally centralised, at least to some extent. ❸ FERM responsibility in Malaysian public-listed multinational companies, in general, appears to be specialised – handled by one department in each company. ❹ Broadly, companies in Malaysia, compared to those in developed Western countries, appear less able to centralise the management of their domestic subsidiaries' FX exposures.

FERM techniques. ❶ Forward contract is, in general, the most used technique to manage FX risk. ❷ Among Malaysian public-listed multinational companies, after forward contract, the do-nothing strategy generally is the next most used technique for dealing with FX risk. ❸ Companies in Malaysia, compared to those in developed Western countries, generally seem less likely to use sophisticated hedging instruments.[34]

In short, this chapter presented all the data collected in this study, and further described and discussed the relevant findings and implications associated with the first broad research question – corporate FERM practices. The next chapter, however, presents the findings concerned with the second broad research question – predictors that seem to influence specific corporate FERM activities.

[33] Besides these, the study findings also imply the following. First, Malaysian public-listed multinational companies generally seem moderate in recognising FX exposures, and consistent in recognising inflow and outflow FX exposures. Second, these companies broadly appear to adopt flexible and contingent approaches to FERM. However, these implications are not very remarkable.

[34] Apart from these, the study's finding also suggests that, among Malaysian public-listed multinational companies, all techniques, apart from forward contract and the do-nothing strategy, seem to be generally used to manage specific rather than all types of FX exposure. As above, this implication too is not very remarkable.

Chapter 5

Predictors of FERM activities

INTRODUCTION

One of the two objectives of the study is to determine how Malaysian public-listed multinational companies manage FX risk, and therefore, learn about the FERM practices of these companies. The previous chapter presented and discussed the findings concerned with the companies' FERM practices. However, the other more critical objective is to determine why Malaysian public-listed multinational companies manage FX risk, and therefore, identify factors that might explain the companies' inclination to undertake specific FERM activities. Consequently, this chapter is dedicated mainly to presenting the findings about predictors that seem to influence the companies' likelihood of undertaking specific FERM activities. However, this is done in the second part of the chapter. In the first part, the analysis method used in identifying the predictors that influence company FERM activities, i.e., logistic regression analysis, is explained. In short, the first part of this chapter discusses the procedure for undertaking logistic regression analysis. The second part, on the other hand, presents the findings arising from the analyses of the logistic regression models that have been fitted in this study. This chapter ends with a summary of these findings.

5.1. Logistic regression analysis

The reasons for using logistic regression analyses in attempting to achieved the second research objective has been described in detail in Chapter 3. This first part of the chapter, however, discusses several aspects of the procedure for undertaking logistic regression analysis. The presentation here generally reflects the sequence in which such analyses were actually carried out in this study. The key steps in the analysis procedure are depicted in the diagram in Figure 5.1, and are enumerated next. ① Ascertain that a fitted logistic regression model involves an adequate number of cases. ② Assess the overall effect of the set of predictors on the dependent variable. ③ Assess individual predictor effects on the dependent variable. ④ Examine the fitted model for potential problems, e.g., multicollinearity, zero cells, and complete separation. Further, inspect the residuals arising from the imperfectly fitted model, against the observed data.

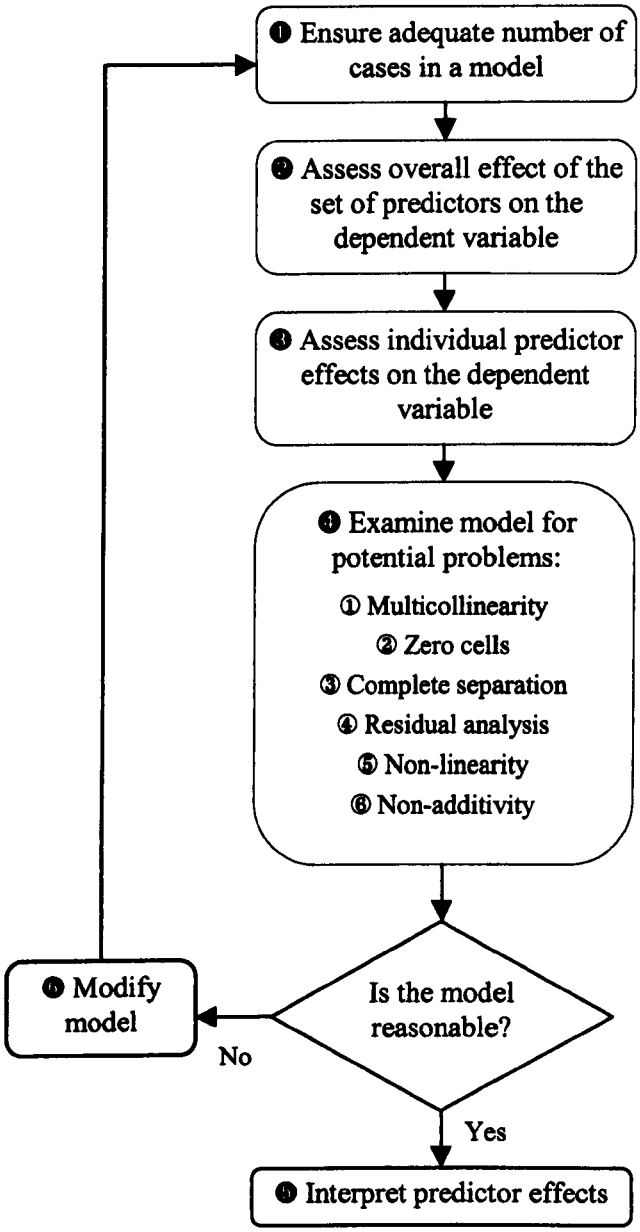


Figure 5.1: The general procedure for undertaking logistic regression analysis.

Finally, test the model for non-linearity and non-additivity. ⑤ Modify the model if major problems are identified in the above process of assessment. This adjusted model should then be re-evaluated through the same process. This iterative process should be undertaken until a satisfactory model is attained. Following that, finally, ⑥ interpret the predictor effects on the dependent variable based upon the fitted model. All these steps are explained and discussed in greater detail next.

5.1.1. Number of cases

One of the first steps in logistic regression analysis is to ensure that a model uses an adequate number of cases. DeMaris (1992, p.78) suggests that the rule of thumb that is often applied for linear regression models could also be used for logistic regression models. That is, a model should have at least 15 cases for each predictor included in the model. If a model fails to meet this criterion, the asymptotic properties of the maximum likelihood estimators might not be applicable. This means that the inferences from the statistical results might not be reliable as they are derived from too few cases (or a small sample), and therefore, might not reflect the true (population) relationships.

Ensure that: $N + k \geq 15$

where, N = number of cases
k = number of predictors

However, the number of cases in this study is rather small, relative to the number of predictors. Besides that, as explained previously, the literature in this area, due to the lack of theories and empirical evidence, generally do not specify predictors that ought to be incorporated into a model. Incorporating all the predictors into a model would culminate in the model being saturated, resulting in the analysis unable to fit a unique and plausible set of predictor coefficients, apart from not meeting the above rule-of-thumb set out by DeMaris (1992). To avoid this problem, some of the predictors should be eliminated from the model. Of course, it is impossible instead to increase the number of cases in the study or model. The stepwise elimination (and addition) procedure, i.e., an iterative trial-and-error method, has been adopted. Initially, generally all possible and relevant predictors are included in a model, and later predictors that are not statistically significant are removed, one by one, especially if the removal does not

worsen the model fit significantly. Sometimes, a predictor removed earlier is re-included in a later iteration if its inclusion improves the model significantly. This iterative procedure is sustained until the most reasonable model is identified. Admittedly, this procedure is not ideal for two reasons.

First, it renders the accompanying statistical tests less meaningful. More succinctly, only a small proportion of all possible conventionally fitted predictor effects can be statistically significant due to chance. However, since the procedure adopted in this study actively searched for statistically significant results, the fitted statistically significant results found in this research might be due to random sampling errors or chance, rather than due to true underlying relationships. However, since this study's intention is to identify potential predictors, rather than establish the hypothesised predictors, the procedure is acceptable. Nonetheless, as implied previously, the results (predictor effects) from this study should be treated as tentative rather than conclusive.

Second, the procedure (removal of predictors) could lead to the missing variable problem, which in turn, may lead to biased estimates or coefficients. However, this is not a serious problem in this study because, as mentioned above, there are insufficient formalised theories, in the corporate FERM literature, that specify variables (factors or predictors) that need be included in predicting specific dependent variables (i.e., FERM activities). Consequently, the removal of predictors is acceptable, in this study.

5.1.2. Overall effect

The next step is to assess the overall effect of predictors in the model. That means to evaluate the overall relationship between the set of predictors and the dependent variable of a model. In a logistic regression model, this relationship can be gauged using two different measures. The first, called ① model fit, establishes the relationship between predictors and the dependent by assessing the extent to which the model fits the observed data. The second measure, known as ② predictive efficiency, establishes the relationship by assessing the accuracy of prediction or classification of the cases into the observed categories based on the fitted model. Although the conclusions from the two different measures should be consistent, sometimes they are not. Therefore, both these measures should be used, as in this study, to evaluate more comprehensively the fitted

model's overall effect.

Model fit

Although in linear regression, the evaluation of model fit is based upon the concept of goodness-of-fit, in logistic regression, the evaluation of model fit is based upon a concept likened to 'badness-of-fit' (Menard, 1995, p.22). There are several measures of model fit in logistic regression analysis. However, two measures are centrally important, and these two have been used in this study. They are the ① model chi-square, and ② proportional reduction in log likelihood. Below, these measures are described further.

Model chi-square

The log likelihood, D_0, is one of the first statistics provided by the logistic regression analysis output in SPSS. The statistic is referred to as "-2 log likelihood", and can be assumed to measure the badness-of-fit of the model with only the constant, i.e., without the set predictors, given the observed data. This statistic has the *asymptotic* chi-square distribution[1] with N-1 degrees of freedom, where N, again, is the number of cases in the model. Menard (1992, p.20) explains that the larger this statistic, the worse the prediction of the dependent variable by the model (with only the constant). Following this, SPSS also provides another statistic, the deviance chi-square, D_M, which is also referred to as "-2 log likelihood". However, this is a measure of the badness-of-fit of the full model, which includes all the predictors as well as the constant. This statistic too has the asymptotic chi-square distribution, but with N-k-1 degrees of freedom, where k is again the number of predictors in the model. As with D_0, the larger the value of D_M, the worse the prediction of the dependent variable by the full model.

The model chi-square statistic, G_M, is also automatically provided by logistic regression analysis in SPSS. It measures the magnitude of reduction in the badness-of-fit of a full model, with all the predictors incorporated, compared to a model without the predictors (Menard, 1995, p.36). In other words, it is simply the difference between D_0 and D_M, which means that $G_M = D_0 - G_M$. Therefore, this statistic also has an asymptotic chi-square distribution, but with k degrees of freedom. When the model chi-square is large, and more importantly, significant (p-value less than 0.05), the reduction in the badness-

[1] This simply means that, in a large sample, this statistic assumes the chi-square distribution.

of-fit of the model, due to the inclusion of the set of predictors, is considered to be statistically significant. On the other hand, the model chi-square statistic also tests the null hypothesis that none of the predictors in a model is important in explaining the dependent variable, i.e., that the predictors simultaneously have parameter estimates that are zero.

$$H_o: \beta_1 = \beta_2 = ... = \beta_k = 0$$

where, β_i = parameter estimates for predictor i
$i = 1, 2, ..., k$

Therefore, when the model chi-square statistic is large and statistically significant, there are two parallel conclusions. First, at least one of the parameter estimates is non-zero, and therefore, is important in explaining the dependent variable. Second, the reduction in the badness-of-fit of the model due to the inclusion of the predictors is statistically significant. In other words, it establishes that the reduction in the badness-of-fit of the model is more than due to random sampling variation. Nonetheless, both these conclusions mean that the set of predictors is important in explaining the dependent variable. In other words, a large and statistically significant model chi-square clearly establishes the relationship between the set of predictors and the dependent variable.

Proportional reduction in log likelihood

The second measure of model fit, R_L^2, measures the proportional reduction in the log likelihood (badness-of-fit) of the model due to the incorporation of the set of predictors. Menard (1995, p.36) explains that the model chi-square, G_M, measures the statistical significance of the reduction in the badness-of-fit of the model due the inclusion of the predictors. Conversely, R_L^2 measures the substantive significance (as opposed statistical significance) of the reduction in the badness-of-fit of the model with the incorporation of the predictors. Therefore, the higher the value of R_L^2, the greater the substantive significance, and therefore, the stronger the relationship between the set of predictors and the dependent variable. Unlike G_M, R_L^2 is not automatically provided by SPSS. This measure, however, can be readily calculated as it is derived from using the two statistics discussed above (see formula below).

$$R_L^2 = G_M + D_0$$

Ideally, a model should yield both substantive and statistical significance of the reduction in the badness-of-fit due to the incorporation of the set of predictors.[2] Substantive significance establishes that the relationship between the set of predictors and the dependent variable is considerable (as opposed to trivial). Whereas, statistical significance establishes the confidence in that relationship, by implying that it reflects the true underlying relationship, and not what appears to be a relationship that is due to random sampling variation in the data. Therefore, both statistical and substantive significance are essential to establish that there is a relationship between the set of independent variables and the dependent variable.

Predictive efficiency

As explained above, apart from model fit, the overall effect or the relationship between the set of predictors and the dependent variable in a logistic regression model, can also be assessed by measuring the predictive efficiency.[3] Actually, predictive efficiency can be measured in several ways (see DeMaris, 1992, pp.53-56). However, in this study, only two related measures have been used: ① the proportional reduction (change) in the number of prediction errors as a result of using the model, and ② the binomial statistic. Basically, the two refer to substantive significance and statistical significance, respectively, of the proportional reduction in prediction errors from the incorporation of the set of predictors in the model. These two measures are described in greater detail next.

Proportional reduction in prediction error

The proportional reduction in prediction error, λ_p, measures the difference between the expected number of prediction errors, without the model, and the number of prediction errors with using the model, as a proportion of the expected number of prediction errors without the model (refer to the formula below). In essence, it measures the reduction (change) in the number of errors in the prediction of cases due to the use of the model.

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[2] It is possible that a model, in terms of model fit, has statistical significance but not substantive significance. This might occur in models that have large numbers of cases (Menard, 1995, p.19). This is because statistical tests are generally more sensitive and powerful for larger samples (cases). On the other hand, it is also possible to have a model that has substantive significance but not statistical significance. This might happen in a model that is based on a small sample. This is simply because, in general, it is difficult to establish statistical significance with only a small number of cases.

[3] This measure is also known as predictive efficacy by DeMaris (1992).

Therefore, the higher the value of this measure, the greater the proportional reduction in error, and consequently, the stronger the relationship between the dependent variable and the set of predictors. In this study, the expected number of prediction errors by chance (or without the model), C_e, is assumed to be the lower of the two category frequencies of the dichotomous dependent variable.[4]

$$\lambda_p = (C_e - M_e) \div C_e$$

where, C_e = expected number of prediction errors by chance without the model (chance errors)
M_e = number of prediction errors arising from the use of the model (model errors)

Binomial statistic

To reinforce, λ_p, measures the substantive significance of the proportional reduction in prediction errors due to the inclusion of the set of predictors in the model. In other words, it also measures the substantive significance of the relationship between the set of predictors and the dependent variable. However, the statistical significance of this relationship, or more precisely, the statistical significance of the proportional reduction in prediction errors, is measured by the binomial statistic, d. However, this statistic is not readily provided by SPSS. It has to be computed using the formula provided below. The binomial statistic should approximately have the standard normal distribution (Menard, 1992, p.30). Therefore, generally, a value of d greater than 2 (p-value less than 0.05) would mean that the proportional reduction in prediction error, arising from the use of the model is statistically significant.

[4] However, Menard (1995, p.25) explains that the determination of C_e should depend on the nature of the model and the dependent variable. He specifies three types of models – prediction, classification, and selection. In the first type of model, all the cases may belong to the same category of the dependent variable. In other words, the population, in terms of its attribute to the dependent variable can be homogeneous. The characteristics of the models in this study comply with this condition. Then, C_e is equivalent to the lower of the two category frequencies of the dichotomous dependent variable, since without the benefit of a model, the best prediction is to classify all cases to belong to the category with the greater observed number of cases. However, for classification or selection models, the methods for determining C_e are different. See Menard (1995), pp.25-26, for the characteristics of these models, and the different methods for determining C_e. Another reason for using the prediction model method of determining C_e, in this study, is that it provides the lowest C_e, compared to the methods in classification or selection models (Menard, 1992, p.29). Consequently, this lowest C_e results in the most conservative (lowest) measure of predictive efficiency, λ_p, of a logistic model, in most circumstances.

$$d = (C_e - M_e) + \sqrt{[C_e(N - C_e)+N]}$$

where C_e = number of chance errors
M_e = number of model errors
N = total number of cases

5.1.3. Predictor effects

After having assessed the overall relationship between the set of predictors with the dependent variable, the next step is to evaluate the relationship between each individual predictor and the dependent variable. As with the assessment of the relationship between the set of predictors and the dependent variable, the evaluation of the relationship between a particular predictor and the dependent variable also depends upon the statistical and substantive significance of the relationship. The statistical significance of the relationship between a particular predictor and the dependent variable in a model can be ascertained using two different measures: ① the Wald statistic, and ② the likelihood ratio test. These are explained below.

Wald statistic

The importance of individual predictors in explaining the dependent variable can be assessed using the Wald statistic, W_i^2. The Wald statistic is automatically given as part of the standard logistic regression analysis output, in SPSS. Simply, Wald statistic is the squared ratio of the parameter coefficient divided by the standard error of the coefficient. The Wald statistic has an asymptotic chi-square distribution,[5] and the square root of the Wald statistic, W_i, has a standard normal distribution. Therefore, when the corresponding p-value of the Wald statistic is less than 0.05, then the predictor can be accepted to be statistically significant in explaining the dependent variable. This means that the relationship between the particular predictor and the dependent variable is statistically significant. This also reflects that the particular predictor effect on the dependent variable is statistically significant.

[5] The degree of freedom is usually one except for categorical predictors. For categorical predictors, the degree of freedom is equal to the number of categories for the predictor variable minus one.

However, the Wald statistic is not very accurate. This is because the estimated standard error of the coefficient is large (by design) for predictors that have large coefficient values. Thus, the resulting Wald statistic is depressed, and therefore, the corresponding p-value of the statistic is greater than 0.05. Therefore, when the coefficient of a predictor is large, the null hypothesis, by default, cannot be rejected. This would indicate that the predictor is not significant in explaining the dependent variable, even if this is not actually true. In order to overcome this, the more accurate, likelihood ratio test should be used. This is explained next.

Likelihood ratio test

If the Wald statistic (or rather its p-value) indicates that a predictor is not significant, then the result of the likelihood ratio test, ΔG_M, on the predictor must be consulted. This test is available optionally from the logistic regression analysis output in SPSS if the backward stepwise (LR) method is chosen. The test is more accurate than the Wald statistic (Menard, 1995, p.38). It measures the change (reduction) in the model chi-square statistic resulting from the removal of a particular predictor. Therefore, if the corresponding p-value of this test is less than 0.05, then the removal of the particular predictor has caused a statistically significant reduction in the model chi-square statistic, and consequently, it can be concluded that the predictor is significant in explaining the dependent variable. This then also means that the predictor effect on the dependent variable, and therefore, the relationship between the particular predictor and the dependent variable, are statistically significant.

Standardised coefficient

Having ensured that the relationships between the individual predictors in a model and the dependent variable are statistically significant, it is then important to ensure that the relationships are also substantively significant. For this purpose, the standardised coefficient of each predictor is useful. Menard (1995, p.44) implies that the standardised coefficient reflects the substantive significance of the relationship between

a particular predictor and the dependent variable in a model.[6] Standardised coefficient, unlike normal unstandardised coefficient, reflects the relative magnitude of the effect of a predictor on the dependent variable without being masked by the unit of measure used for measuring the predictor. However, standardised coefficients are not readily available from the standard logistic regression analysis mode in SPSS. Some additional requisite information is needed to calculate these coefficients (refer to formula below).

$$\beta_i^* = (\beta_i)(S_i)(R)+(S_{logit(\hat{Y})})$$

where, β_i^* = standardised coefficient of predictor i
β_i = unstandardised coefficient of predictor i
S_i = standard deviation of predictor i[7]
R = square root of the coefficient of determination
$S_{logit(\hat{Y})}$ = standard deviation of the *estimated* values of logit(Y)
Y = the dependent variable

The coefficient of determination, R^2, is a statistic normally used in the ordinary least squares linear regression analysis. The R^2 measures the proportion of variance of the dependent variable explained by the set of independent variables. This measure is not available in the logistic regression analysis mode in SPSS. It must be obtained from the linear regression mode instead. In order to obtain this measure, first, the predicted values of the dependent variable, arising from the fitted logistic regression model, must be saved as a new variable. This variable is automatically assigned the prefix label, PGR_, by SPSS. In this study, the predicted values refer to the values of cases – either one (the first category) or two (second category) of the dependent variable. These values are then used as the independent variable, while the original observed values (from the dependent variable) are retained as the dependent variable in a linear regression analysis.[8] The resulting output from the linear regression analysis in SPSS would automatically provide the required coefficient of determination statistic, R^2.

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[6] Menard (1995, pp.44-49) strongly recommends the use of standardised coefficients in logistic regression analysis, seemingly for three primary reasons. These are ① to establish the (substantive) extent of a predictor's effect on a given dependent variable, ② to rank different predictors of the same model, on the basis of their relative impact on the dependent variable, and ③ to detect symptoms of underlying problems in a model. Generally, when a standardised coefficient is greater than one, it may indicate the presence of problems, e.g., multicollinearity, zero cells, or complete separation. In this study, consistent with its objective, standardised coefficients have been used only to identify if a predictor has substantively significant effect on the dependent variable.

[7] The standard deviation of predictor i, S_i, should be obtained by using the cases that were actually used in the logistic regression. That means that the cases that were omitted in the logistic regression (due to missing values in the predictor variables, or the dependent variable) should be deselected in computing the standard deviation.

[8] Actually, as there are only two variables involved, the variables could be defined interchangeably as the R^2 would be the same regardless of which variable is defined as dependent or independent.

However, for calculating the standardised coefficients, the square root of this coefficient, i.e., R, is needed.

Logit is an abbreviation for the natural logarithm (log) of the odds (of an event of interest occurring). In this study, given that Y is the dichotomous dependent variable representing the undertaking of a particular FERM activity, and Y = 2 if the activity is undertaken, but Y = 1 otherwise, then logit(Y) refers to the log of the odds of undertaking (as opposed to not undertaking) a specific FERM activity. Therefore, the standard deviation of the *estimated* (or fitted) values of logit(Y), i.e., $S_{logit(\ddot{Y})}$, in the formula above, refers to the standard deviation of the estimated logit values of undertaking a specific FERM activity. To determine this, first, the estimated probabilities of undertaking the specific FERM activity, P(Y=2), based on the fitted logistic regression model, for all the cases involved in the model, are required. These estimated probabilities are optionally available in the logistic regression analysis in SPSS, and these need to be saved as a new variable. SPSS automatically assigns the prefix label, PRE_, to this new variable. Then, these estimated probabilities should be transformed to obtain the estimated logit values (based on the formula below). Following that, these values need to be saved as yet another new variable. These variables have been given the prefix label, LOGIT, by the researcher.

$$\text{logit}(\ddot{Y}) = \ln\{P(Y=2) + [1 - P(Y=2)]\}$$

where, $\text{logit}(\ddot{Y})$ = estimated values of logit(Y)
$P(Y=2)$ = estimated probability that Y=2
ln ~ natural logarithm

Consequently, with all the requisite information, the standardised coefficients of each predictor can then be computed. Broadly, the value of a standardised coefficient refers to the number of standard deviations of change, on aggregate, in the estimated logit(Y) as a result of a one standard deviation change in the value of the particular predictor. For a predictor effect to be considered as substantively significant, in this study, a one standard deviation change in the predictor should at least have a change of 5% of one standard deviation in the estimated logit of the dependent variable.[9] Therefore, a predictor that has a standardised coefficient greater than 0.05 is accepted to have a

[9]A more rigorous condition, say at least 10% of one standard deviation change, could have been applied. However, since the objective of the study was to identify possible predictors rather than to establish the effects of the predictors, a less rigorous rule has been used.

substantively significant relationship with, and effect on, the dependent variable.

5.1.4. Potential problems

The next step is to check for potential problems in the model. The model must be tested to see if ① multicollinearity is present. The model should also be examined to see if the problems of ② zero cells or ③ complete separation are present. Apart from these, the ④ residuals from the fitted model should also be analysed to see if the residuals indicate the presence of systematic problems. The model should also be investigated for ④ non-linearity and ⑤ non-additivity. These are explained further below.

Multicollinearity

Multicollinearity is a condition where at least one of the predictors in a model is linearly and highly correlated to one or more of the other predictors in the model. Multicollinearity reduces the efficiency of coefficient estimates (i.e., increases standard error of the estimates), although it does not increase the bias of the estimates (i.e., does not significantly affect the value of the coefficient estimates). To check for multicollinearity in a logistic regression model, the same dependent variable and the set of predictor variables are used, but this time, in a linear regression analysis. The level of multicollinearity in the model is inferred from the tolerance statistic. This statistic is provided when the collinearity diagnostics output option is selected in the linear regression mode in SPSS. When the tolerance statistic is less than 0.20 (Menard, 1992, p.66), the problem of multicollinearity is thought to be serious.[10]

Menard (1992) explains that although detecting is easy, correcting and solving for multicollinearity is very difficult and not clear-cut. He mentions three possible remedies. The first option is to simply delete the predictors that contribute to the multicollinearity problem. However, this would pose the risk of omitted variable bias. The second option is to combine the collinear variables into a single variable (e.g., by means of factor analysis). However, this may imply that the construction of the model

[10] Often, standardised coefficients that are large, say greater than 1, are symptomatic of the presence of multicollinearity in a model. Nonetheless, a model ought to be generally checked for multicollinearity even if its presence is not suggested by the standardised coefficients. This is because in some cases of multicollinearity, the standardised coefficients may seem 'normal'.

(based on theory) and the measurement of data are faulty. The third option is to use ridge regression that yields slightly biased but considerably more efficient estimates. However, even this technique may not be able to get rid of the problem of multicollinearity. Moreover, this method may be difficult to defend methodologically. Finally, Menard (1992) suggests that it is probably best to focus on the combined effects of all the predictors in the model (as this is not affected by the presence of multicollinearity) but not rely on the individual predictor effects (Menard, 1992, p.67). In this study, the presence of multicollinearity is noted but it has not been resolved using any of the options discussed above. Nonetheless, whenever multicollinearity was present in a model, the results of the model have been treated with greater caution, and reviewed with reference to previous study results and theoretical rationale.

Zero cells

The problem of zero cells arises when all cases in a particular category of a nominal predictor have the same values for the dichotomous dependent variable in a model. Due to the invariability in the cases' values, the estimated standard error of the coefficient of the predictor would be extremely large, by design. Therefore, the nominal (or categorical) predictor will appear to be not significant, although in truth it may be otherwise. Therefore, when the estimated standard error of a categorical predictor is unusually large, it may indicate the presence of the problem of zero cells.

Menard (1992, pp. 68-69) suggests three remedies for zero cells. The first option is to add a small constant to each cell of the contingency table to eliminate the zero cells. Actually, this is automatically done by SPSS for zero cells. However, the problem may not be solved because although the standard error of the estimate can be calculated with this remedy, the value would be too large – still resulting in an inefficient estimate. The second option is to recode the categorical predictor variable in order to avoid the invariability of the dependent variable. Essentially, this involves collapsing two or more categories into a single category. However, this may only be attempted when the categories to be merged have an underlying conceptual link, and when these categories appear to have similar distribution patterns of the dependent variable. Otherwise, combining the categories may bias the coefficient estimate towards zero. Moreover, this option is simply unavailable when the nominal predictor variable has only two categories. The third option is to merely accept the high estimated standard error and

the uncertainty about the value of the coefficient. The overall fit of the model, i.e., the overall relationship of the dependent variable with the set of independent variables, is not affected by the problem of zero cells.

Complete separation

Complete separation occurs when the model predicts the dependent variable with perfect, or almost perfect, accuracy. Although perfect accuracy is what is aspired in all models, it must be remembered that it is never achieved in practice. Therefore, when a model yields perfect accuracy, more than likely, it poses a problem. Actually, perfect complete separation is very rare in practice, although, quasi-complete separation is more common. Nevertheless, in practice, quasi-complete separation is also often referred to as complete separation.

Large G_M and R_L^2 (close to one), and extremely large estimates, and standard error of estimates, of the predictor coefficients in a model are often symptoms of complete separation problem. The classification plot of the observed values against predicted values of the dependent variable (available in SPSS) may provide graphical evidence of the existence of complete separation. These plots, entitled 'Observed Groups and Predicted Probabilities', can be seen, in each of the Appendices J-1 to J-14. The following characteristics in the plot should indicate the presence of the complete separation problem. ① Almost all cases with observed higher (dichotomous) dependent variable value (Y=2) have estimated (fitted) probabilities of assuming the higher dependent variable value (Y=2) that are above 0.5, and distributed close to 1. ② Almost all cases with observed lower dependent variable value (Y=1) have fitted probabilities of assuming the higher dependent variable value (Y=2) that are below 0.5, and distributed close to 0.

Complete separation may indicate that the model is close to being saturated, i.e., the number of predictors are close to being the same as the number of cases. It may also indicate that there are some other problems with the data. Again, as with multicollinearity and zero cells, although the detection is easy, solving for the problem is very difficult. The problem of saturated models can only be overcome with additional cases – but this is often not practical or possible. Therefore, results from models in which complete separation is present may have to be dismissed as unreliable.

Residual analysis

The analysis of residuals from a fitted logistic regression model should be carried out for two objectives. First, to identify cases that do not fit the present model well (ill-fitting cases). Second, to identify cases that have disproportionate (higher than normal) influence on the parameters of the model. There are several measures that could be used in the analysis of residuals of a logistic regression model. Menard (1995, pp.71-79) recommends the use of at least four measures in the analysis of residuals. They are ① standardised residual, ② leverage statistic, ③ standardised Cook's distance, and ④ studentised residual. In addition, this study has also used ⑤ deviance chi-square change, and ⑥ Pearson chi-square change. These measures are described next.

Standardised residual

Generally, the standardised residual, Z_j, reflects the extent of departure of a particular case j from the fitted model. In other words, it indicates how poorly the case fits the model. The standardised residuals are optionally available in the logistic regression analysis mode in SPSS. When chosen, SPSS saves the standardised residuals as a new variable, and automatically labels it with the prefix, ZRE_. Generally, a negative Z_j means that the particular case j has been overestimated, i.e., its observed probability is less than its predicted probability of assuming the higher (dichotomous) dependent variable value (Y=2). Likewise, a positive Z_j means that the particular case j has been underestimated. The standardised residuals have the standard normal distribution, and therefore, absolute values greater than 2 indicate that the relevant cases do not fit the model well. In this study, cases that had absolute standardised residuals greater than 2, had been selected for further inspection.

Leverage statistic

The leverage statistic, h_j, basically, expresses the level of influence a particular case j, on aggregate, has on the parameters of the model. Leverage statistics too are optionally available in the logistic regression analysis mode in SPSS. If selected, SPSS saves these statistics as a new variable, and automatically labels it with the prefix, LEV_. The range of possible values of h_j is between 0 (meaning the case has no influence on the parameter estimates) and 1 (suggesting the case has complete influence). However, the expected (average) value of h_j is equal to (k+1)/N, i.e., the number of predictors plus

one, divided by the number of cases. Therefore, when h_j is greater than (k+1)/N, then the case j is accepted to be an influential case, i.e., it has more than the proportionate share of influence on the parameter estimates of the model. Generally, small values of leverage statistics are not seen as problematic but larger values are. In this study, cases with leverage statistics greater than twice the expected value, i.e., 2(k+1)/N, were subjected to closer scrutiny.

Standardised Cook's distance

The standardised Cook's distance statistic, $Dbeta_j$, on the other hand, indicates the standardised aggregate change in the regression coefficients if a particular case j is removed from the model. However, unlike the two previous statistics, this is not directly available in the logistic regression mode of SPSS.[11] Nonetheless, $Dbeta_j$ can be easily computed because it is a function of the standardised residual and leverage statistic (see formula below). In this study, these statistics were computed and saved as a new variable with the label prefix, DBETA.

$$Dbeta_j = Z_j^2 \, h_j + (1 - h_j)^2$$

Although the range of possible values for $Dbeta_j$ is between zero and infinity, values greater than one are considered to be abnormal. To recap, the value of $Dbeta_j$ is analogous to an index of the magnitude of overall change in the regression coefficients if the case j is deleted from the model. Therefore, the larger the value, the greater the impact of the particular case on the predictor effects on the dependent variable. In this study, cases with $Dbeta_j$ greater than one were chosen for further examination.

Studentised residual

The studentised residual, S_j, measures the standardised change in the deviance chi-square, D_M, (or badness-of-fit) of the model, due to the deletion of a particular case j. The studentised residuals are optionally available in the logistic regression analysis mode in SPSS. When opt for, SPSS saves the studentised residuals as a new variable, and automatically labels it with the prefix label SRE_. Studentised residuals ought to

[11] Nonetheless, the change in a specific predictor coefficient due to the deletion of a particular case is provided by SPSS, and the variable that comprises these measures has the label prefix, DFBETAX_ (where X refers to a particular predictor). However, as these measures are relevant only for further and more incisive analysis of residuals, they have not been used in this study.

have the standard normal distribution. Therefore, cases that have absolute studentised residual values greater than two are those that most affect the model fit. In other words, the removal of these cases from the model would affect the model fit considerably. However, it must be noted that the signs, either negative or positive, of these values are the same as that of the standardised residuals. In this study, cases that had absolute studentised residuals greater than two had been inspected further.

Deviance chi-square change

The change in the deviance chi-square statistic, ΔD_j, measures the change in the deviance chi-square (badness-of-fit) of the model due to the removal of the particular case j. Although this measure is not readily available in SPSS, it can be easily computed because it is simply the square of the studentised residual, i.e., $\Delta D_j = (S_j)^2$. In this study, these statistics have been computed and saved, by the researcher, as a new variable with the prefix label, DMCH. Nonetheless, this residual measure does not provide additional utility as the information is already contained in the studentised residual.

Pearson chi-square change

The change in Pearson chi-square statistic, $\Delta\chi^2_j$, measures the change in the goodness-of-fit of the model due to the deletion of a particular case j. However, this measure too is not provided directly by the logistic regression mode in SPSS. Nonetheless, it can be computed using the standardised residual and the leverage statistic (see formula below). In this study, these statistics have been computed and saved as a new variable with the label prefix, CHISCH. However, this residual measure also does not provide much additional information because the change in Pearson chi-square is almost equivalent to the square of standardised residual.

$$\Delta\chi^2_j = Z_j^2 + (1\text{-}h_j)$$

After obtaining the different types of residual measures and saving them as new variables, the next step is to list the cases that do not fit the model well (based upon standardised residual) and those that have disproportionate influences on the model (based upon leverage statistic, standardised Cook's distance, and studentised residual). Broadly, the cases that fulfil the following criteria ought to be listed. ① Absolute

standardised residual greater than two. ② Leverage statistic greater than 2(k+1)/N. ③ Standardised Cook's distance greater than one. ④ Absolute studentised residual greater than two. These abnormal or unusual cases have been listed in Appendices J-1 to J-14, at the end of the thesis. All the above discussed residual statistics of these abnormal cases are listed in the appendices. In addition, the case characteristics, i.e., the cases' values for each predictor included in the model, have also been listed for further inspection. This might help uncover systematic problems in the data that were not captured by the model. In short, those listed indicate cases that do not fit the model well, as well as, those that have disproportionate influence on the model parameters.

Non-linearity

Two problems that may be reflected in the residual analysis, are non-linearity and non-additivity of the predictors in the model. These two problems can cause the residuals to have systematic patterns. Therefore, the presence of these problems should be investigated, especially if there are some systematic patterns among residuals for particular cases for which the model does not fit well. First, the testing for non-linearity is discussed.

It is generally recommended that all predictors (except categorical predictors) in a model should be checked to ensure that they are linearly related to the (logit of the) dependent variable. Menard (1995, pp.60-61) suggests that linearity could be tested on a bivariate basis between the dependent variable and the particular predictor. On the other hand, DeMaris (1992, pp.49-51) explains that the test should be done with all the other predictors in the model held constant. In other words, the other predictors should also be incorporated or retained (to control for their effects). This study has adopted this latter method because a relationship between a predictor and a dependent variable that appears to be non-linear on a bivariate basis may appear to be linear when controlled for the effects of other predictors. Moreover, knowledge of a predictor's conditional effect on the dependent variable is generally deemed to be of greater utility than its corresponding unconditional effect.

The predictor to be tested for linearity needs to be transformed, first. However, only one predictor should be transformed at any one time. All other predictors in the model should be retained in their original forms. The transformation method depends on the type of predictor that is to be tested. An ordinal or interval predictor, with not too many

categories, should be considered as a nominal variable, with each category (except for the reference or base category) being treated as a separate dummy (or dichotomous) predictor. On the other hand, an interval or ratio predictor, with large ranges and numbers of possible values, should be divided into groups based upon its quartiles. And then, each group should be modelled as a separate dummy predictor (except for the group representing the first quartile).

Afterwards, the transformed nominal predictor (or a set of dummy variables) should replace the original predictor in the (revised) model with all other predictors retained (as they were in the original model). The fitted coefficients of the new set of predictors (that replaced the single coefficient of the predictor prior to transformation) should be examined to see if they display a linear trend in the value of the coefficients (or logit). More precisely, the underlying values of the original predictor (for ordinal predictors), or the underlying mean values of the quartile groups (for interval or ratio predictors), could be plotted against their corresponding new coefficient estimates (or logit values) to see if the relationship between the predictor and the logit of the dependent variable is indeed linear. These plots are illustrated as graphs at the end of each of the Appendices J-1 to J-14.

If the relationship between a predictor and the dependent variable appears to be non-linear, the model specification needs to be changed to incorporate the non-linear relationship into a linear form. Quadratic, cubic, and other forms of the original predictor can be incorporated to see if the model is improved. After incorporating the new variable as an additional predictor, the revised model should be compared against the original model. If the improvement, relative to the increase in the degree of freedom (due to increased number of predictors in the model), is significant, then the new predictor should be retained. Otherwise, the additional predictor should be removed. The method used in this study for testing the non-linearity of predictors' relationships with the dependent variable is as discussed above. Often, the relationship between a predictor and a dependent variable is not strictly linear. However, incorporating for non-linearity sometimes does not significantly improve the model. Therefore, the relationship then, although not really linear, can be assumed to be linear for the sake of parsimony.

Non-additivity

When the effect of a predictor on the logit of the dependent variable depends upon the value of the same predictor, this is termed as non-linearity. On the other hand, when the effect depends upon the value of other predictors, this is termed as non-additivity. However, unlike non-linearity, non-additivity cannot be easily detected. Non-additivity requires the incorporation of interaction terms of two (or more) predictors in a model. Such interactions are easily incorporated if the need for such interaction terms is indicated or suggested by the existing literature or theory, or if the rationale for the interaction term is intuitively identified. However, these are often not possible especially in this study because the theoretical and empirical literature in this area is less developed. Moreover, as there did not appear to be any need or reason for testing non-additivity, this study has avoided this test.

If any of the problems discussed above are identified, the fitted model needs to be modified, and then the revised model must be re-assessed, using the same procedures described earlier. This logistic analysis process of assessment, refining and re-evaluation should be carried out until the revised model meets all the specified requirements above, and where the remaining problems can be deemed to be acceptable or reasonable.

5.1.5. Interpreting predictor effects

Having identified or achieved a satisfactory model, the next step is to interpret the effects of the individual predictor on the dependent variable, based upon the parameter estimates (coefficients) of the logistic regression model. Generally, the coefficients indicate the conditional effect each predictor has on the logit of the (dichotomous) dependent variable assuming the higher value (Y=2). Specifically, in this study, the coefficients indicate the effect each predictor, on aggregate, has on the logit of a company undertaking a specific FERM activity, with all other predictors held constant. However, a more precise interpretation of the effect depends on whether, or not, the predictor is a categorical variable.

For a *categorical* predictor, the coefficient refers to the *difference* between the average logit of cases in a particular category of the predictor compared to the average logit of cases in the base (or reference) category of the same predictor, with all other predictors held constant. Therefore, in this study, the coefficient indicates the difference in the average logit of undertaking a specific FERM activity between companies that belong to a particular category, and companies that belong to the base category, of the same predictor, with all other predictors unchanged. For a *non-categorical* predictor, however, the coefficient refers to the mean *change* in the logit of a typical case, due to a one-unit change in the value of the predictor, with all other predictors held constant. Consequently, in this study, the coefficient provides the average change in a typical company's logit of undertaking a specific FERM activity due to a one-unit change in the value of the predictor, with all other predictors unchanged.

The predictor effect in the logit term can be transformed to refer to the odds (rather than logit) of the dependent variable assuming the higher value (Y=2). The transformation formula is given below. As the concept of odds is closer to the concept of probability, it is generally easier to understand, compared to the concept of logit.[12] However, in this study, the predictor effects have been interpreted based on the concept of logit (and not odds) for two reasons. First, the coefficients fitted by the model are provided in logit terms, and therefore, interpreting them in logit terms appeared more appropriate. Second, only one means of interpretation, i.e., in terms of logit, was adopted to avoid complexity and confusion.

$$\text{Effect, in terms of odds} = \exp(\beta_i)$$

where, β_i = coefficient estimate of a predictor i
$\exp(\beta_i)$ ~ base of the natural log, 2.7183, raised to the power β_i

The concepts of probability and odds are very similar. Notwithstanding this, interpreting predictor effects in terms of probability, even though possible, is disadvantageous because the effect magnitude in terms of probability is not constant for all values of the predictor. It changes with the value of the predictor. In other words,

[12] For a *categorical* predictor, the effect in terms of odds refers to the *ratio of the odds*, on average, for cases in a particular category of the predictor compared to those in the base category of the same predictor, with all other predictors held constant. For a *non-categorical* predictor, on the other hand, it simply refers to the mean *change* in the odds of a typical case, due to a one-unit change in the value of the predictor, with all other predictors unchanged.

the predictor effect on the dependent variable in terms of probability is not linear. Therefore, in this study, and specifically in this chapter, the interpretation of predictor effects refers only to the effects in terms of logit (not probability), because the interpretation also needs to address the magnitude of the effects. Nonetheless, in the ensuing chapters, for the purposes of summarising and concluding these predictor effects, without reference to the magnitude of the effects, the concept of probability is broadly implied. This is acceptable because the predictor effects, in terms logit, odds, and probability, are all consistent in terms of the direction (although not the magnitude) of the effects.

The procedure adopted in this study for logistic regression analysis have been outlined and explained above. The major steps in the analysis procedure are summarily repeated here. First, ascertain the adequacy of the number of cases in a model. Second, assess the relationship between the set of predictors and the dependent variable by evaluating the model fit and predictive efficiency of the model. Third, evaluate the relationships between individual predictors and the dependent variable in the model. Table 5.1 summarises the key measures of substantive and statistical significance for assessing the relationship between the set of predictors and the dependent variable (model fit, and predictive efficiency), as well as, the relationships between individual predictors and the dependent variable (predictor effects). Fourth, examine the model for potential problems like multicollinearity, zero cells, and complete separation. Problems can also be identified by analysing residuals. Test also the non-linearity and non-additivity of predictors in the model. Fifth, revise the model if a major problem is identified, and re-assess the modified model – going through the above steps again. And finally, interpret the individual predictor effects on the dependent variable once an acceptable or reasonable model is achieved.

Table 5.1: The major measures for assessing logistic regression models

Assessment of:		*Statistical Significance*	*Substantive Significance*
1	Model fit	Model chi-square, G_M	Proportional reduction in log likelihood, R_L^2
2	Predictive efficiency	Binomial statistic, d	Proportional reduction in prediction error, λ_p
3	Predictor effects	Likelihood ratio test, ΔG_{Mi}	Standardised coefficients, β_i^*

5.2. Findings from logistic regression analyses

To recap, this study revolves around seven categories of research variables measuring company FERM activities or characteristics. From the seven categories of FERM activities and characteristics, the study attempted to identify predictors for 16 particular FERM activities. However, the study managed to find predictors only for 14 of these FERM activities.[13] These activities are depicted pictorially in Figure 5.2. The FERM activities are: (1) managing FX risk, (2) managing accounting exposure, (3) managing economic exposure, (4) managing transaction exposure, (5) managing all three types of FX exposure, (6) adopting formal FERM objective, (7) sharing FERM responsibility, (8) fully decentralising domestic subsidiaries' FERM, (9) fully decentralising overseas subsidiaries' FERM, (10) allowing time flexibility for hedging, (11) undertaking partial cover, (12) undertaking uncovered FX deals, (13) using forward contracts, and finally, (14) using forward contracts extensively.

In this second part of the chapter, the ensuing sections identify the potential predictors, and their influences (effects) on companies' inclination to undertake the particular FERM activities. Each of the 14 sections is dedicated to one specific FERM activity, and discusses the findings from the modelling of that particular activity (dependent variable) using the logistic regression analysis. However, in all sections, these findings are presented using a common structure. This structure is illustrated diagrammatically in Figure 5.3. Each section is headed by ❶ a brief description of the dependent variable (FERM activity) of the model. This is followed by ❷ a description of the relevant predictors in that model. Then, ❸ the fitted model is specified mathematically. Following this, ❹ the findings about the significance of each predictor's aggregate effect on a typical company's inclination to undertake the particular FERM activity is presented. Next, ❺ the predictor effect is interpreted. Finally, ❻ the key findings from the overall assessment of the model are presented – in this context, only extraordinary findings have been described. Appendix I summarises the major characteristics of all the fitted logistic regression models in this study.

[13]The study did not find any predictor that explained the companies' likelihood of ① managing only significant FX exposures, and ② using forecast rates in FERM decisions.

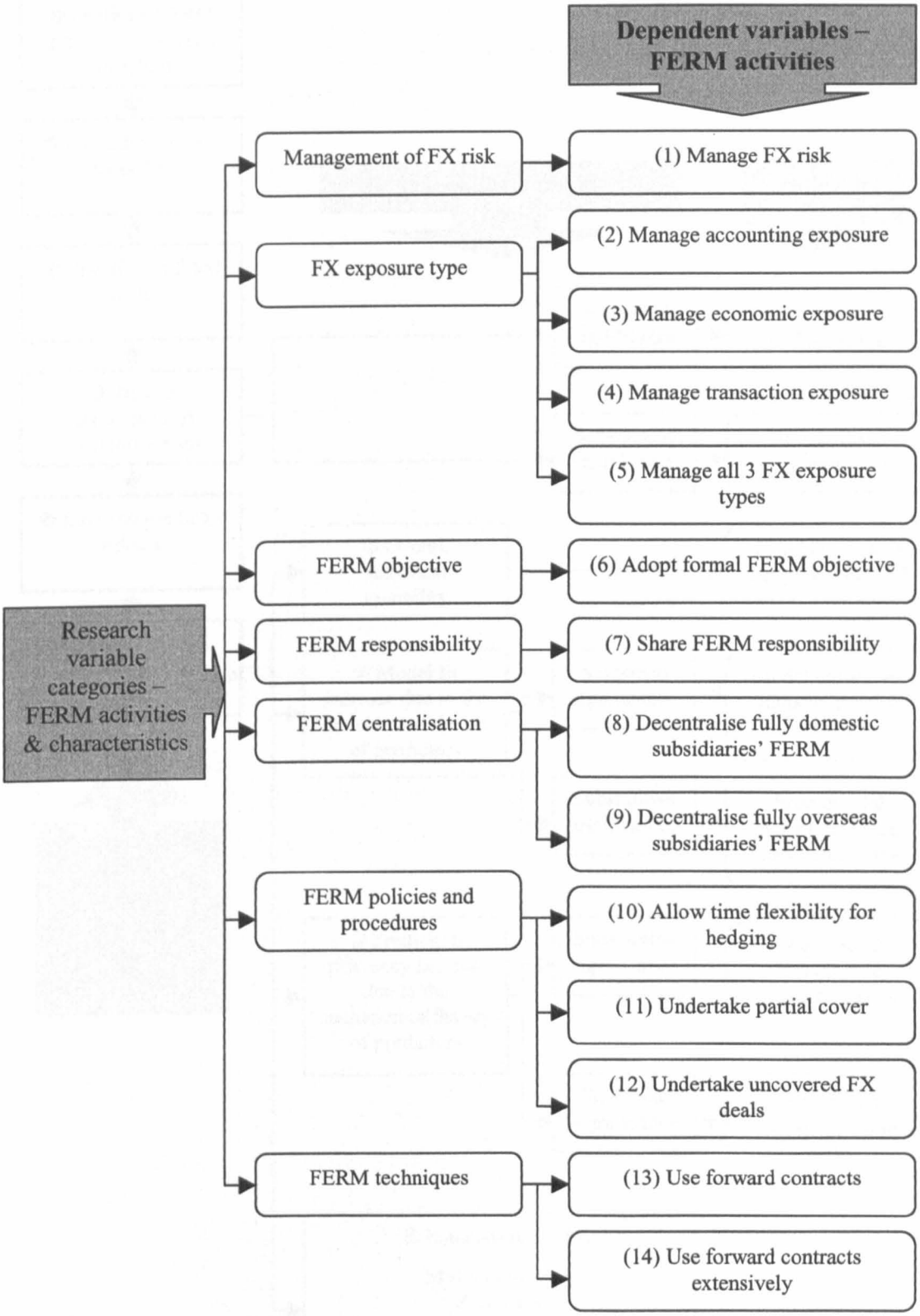


Figure 5.2: FERM activities for which predictors have been identified, and their links to the categories of research variables.

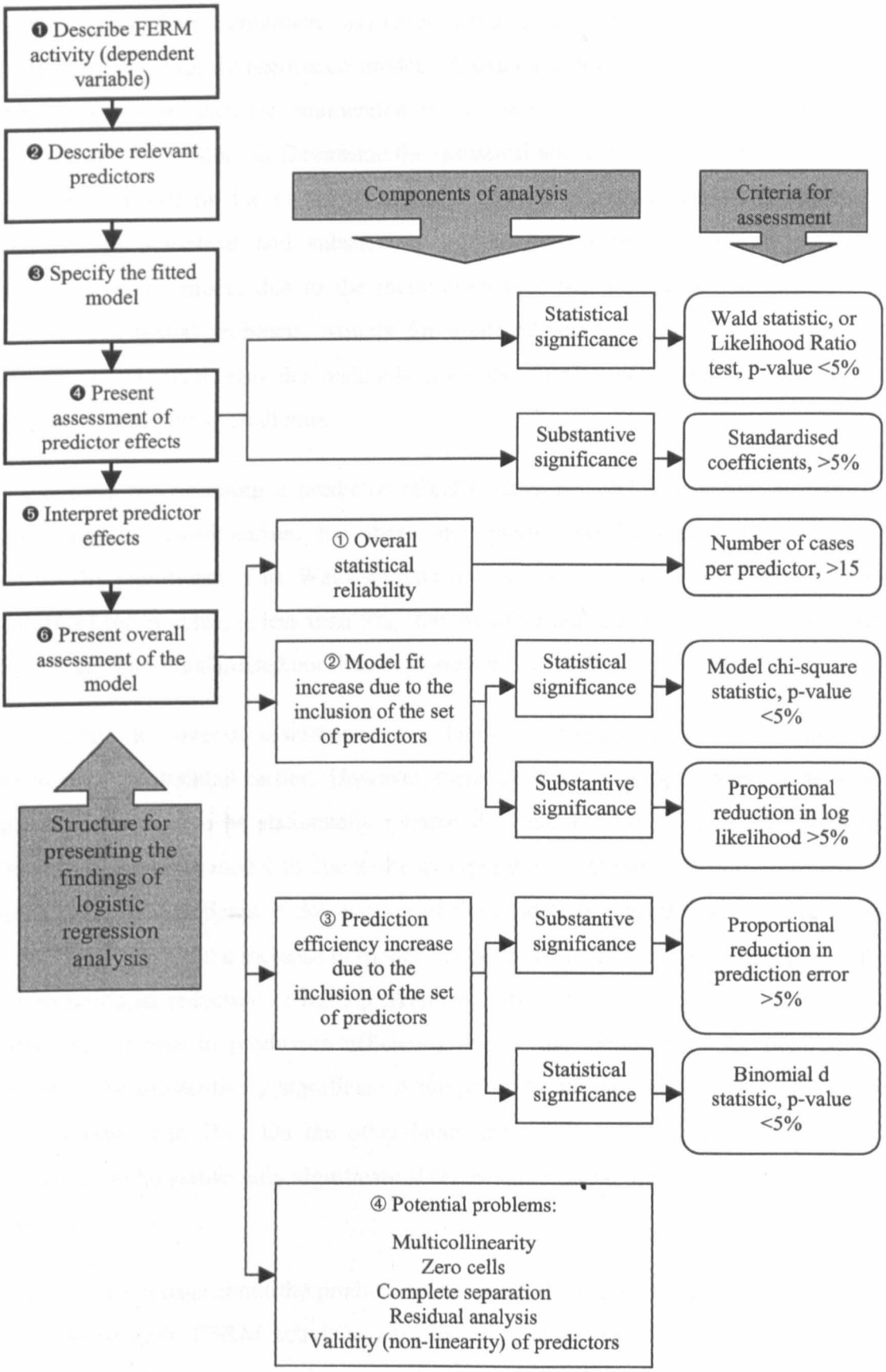


Figure 5.3: The structure for presenting the findings of, as well as the components and the criteria for, logistic regression model analysis.

In this study, four component activities were undertaken to perform the overall assessment of a logistic regression model. These have been specified in some breadth earlier. However, they are enumerated briefly here. ① Assess the overall statistical reliability of the model. ② Determine the statistical and substantive significance of the increase in model fit due to the inclusion of the set of predictors in the model. ③ Evaluate the statistical and substantive significance of the increase in prediction efficiency of the model due to the incorporation of the predictors. ④ Examine the model for potential problems, namely for multicollinearity, zero cells, and complete separation. Analyse also the residuals from the fitted model, and test the validity (linearity) of the fitted predictors.

The criteria for assessing a predictor effect's statistical and substantive significance have been discussed earlier, but these are restated briefly here. A predictor is statistically significant if its Wald statistic p-value, or more accurately, its likelihood ratio (LR) test p-value, is less than 5%. On the other hand, a predictor is substantively significant if its standardised coefficient is greater than 0.05.

The criteria for overall assessment of a logistic regression model have also been discussed in great detail earlier. However, these are briefly recapped here. Generally, a model is accepted to be statistically reliable if it has at least 15 cases per predictor. Then, the increase in model fit due to the incorporation of the predictors is considered to be statistically significant if the p-value of the model chi-square statistic, G_M, is less than 5%. However, the increase in model fit is deemed to be substantively significant if the proportional reduction in the log likelihood, R_L^2, of the model is greater than 5%. Next, the increase in prediction efficiency due to the inclusion of the predictors is viewed to be substantively significant if the proportional reduction in prediction error, λ_p, is greater than 5%. On the other hand, the increase in prediction efficiency is considered to be statistically significant if the p-value of the binomial d statistic is less than 5%.

In short, the findings about the predictors and their effects on companies' inclination to undertake specific FERM activities are presented based upon the structure described above, in the subsequent sections. Each section is dedicated to a particular FERM activity, and these sections are presented in the sequence of FERM activities enumerated earlier, as seen in Figure 5.2. The description in these sections, notably,

includes only limited results or output of statistical analyses. The full results and output of statistical analyses for each logistic regression model can be found in each of the 14 appendices, in Appendices J-1 to J-14. These results are also briefly summarised into a table format in Appendix I, at the end of the thesis.

5.2.1. Managing FX risk

The first logistic regression model attempts to predict the likelihood of managing FX risk amongst Malaysian public-listed multinational companies. Actually, this model attempts to identify predictors that appear to influence a company's likelihood of managing FX risk. The dependent variable, (MANAGE), measures whether or not a company managed FX risk.

This model employs three predictors. The first variable, (ASSETS_B), measures a company's total assets in billions of Ringgit. The second predictor, (FOREIGN3), a dichotomy, measures whether or not a company had more than 30% of its total transactions denominated in foreign currencies. More specifically, (FOREIGN3) = 0 if a company had up to 30% of its total transactions denominated in foreign currencies, but (FOREIGN3) = 1 if more than 30% of its transactions is denominated in foreign currencies. The third and final predictor is (VOLAT1). It measures a company's perception of exchange rate uncertainty or volatility. Values of this predictor range from 0, when the exchange rate is perceived to be certain, to 3, when it is perceived to be very uncertain.[14] The fitted model is presented below:

$$\text{Logit(MANAGE)} = -2.28 + 0.85(\text{ASSETS_B}) + 1.94(\text{FOREIGN3}) + 0.76(\text{VOLAT1})$$

Appendix J-1 contains the statistical and analyses results of the fitted model. Each of the three predictors in the model was found to be both statistically and substantively significant in its impact on the logit on (MANAGE). All the predictors had Wald statistics that were significant, i.e., their p-values were less than 5%. Besides that, all the

[14]Actually, (VOLAT1) is re-coded from another variable, (VOLAT). The original variable, (VOLAT), also measures perceived exchange rate uncertainty, but the values range from 1, when the exchange rate is perceived to be very certain, to 5, when it is perceived to be very uncertain. The re-coded predictor, (VOLAT1), was used instead of the original variable, (VOLAT), because the former improved model attributes better than the latter. Notably moreover, no case (company) had perceived that the exchange rates were very certain.

predictors also had standardised coefficients that were greater than 5%. In other words, each predictor was significant, both statistically and substantively, in explaining the companies' likelihood of managing FX risk. Based upon the standardised coefficients, the predictors, in descending order of impact on the companies' likelihood of managing FX risk, or the companies' logit on (MANAGE), are (ASSETS_B), (FOREIGN3), and (VOLAT1). Next, the effect of each predictor, in turn, is described.

A RM 1 billion increase in total assets of a company, on average, with other predictors held constant, increased the company's logit of managing FX risk by 0.85. In other words, this increase in total assets increased the company's odds on managing FX risk by 2.34.[15] Generally, the greater the total assets of a company, the more likely the company is to manage FX risk.

Companies that had high levels of FX exposure (more than 30% of total transactions denominated in foreign currencies) had logit of managing FX risk that was greater by 1.94, on average, compared to companies that had low levels of FX exposure, with other predictors unchanged. This means that companies that have high levels of FX exposure have greater inclination to manage FX risk compared to companies that have low levels of FX exposure.

A one level increase in a company's perception of the level of exchange rate uncertainty (or volatility) increased the company's logit of managing FX risk by 0.76, on average, with other predictors held constant. This means that the greater a company's perceived volatility of exchange rates, the greater its likelihood of managing FX risk.

Having discussed the effects of the predictors on the logit of managing FX risk above, next, the overall model is discussed. The number of cases per predictor used in fitting this model was adequately large, i.e., 33.33, and therefore, the statistical analyses arising from this model are expected to be reliable. The inclusion of the three predictors increased model fit significantly, both statistically and substantively. The inclusion of the three predictors reduced badness-of-fit, and therefore, increased model fit, by about 27.46%, compared to the model with only a constant but no predictors.

[15]This is obtained by raising the base of the natural logarithm, e or 2.7183, to the power of 0.85 (the estimated coefficient). However, in the following discussions, reference will be made only to the effect on the logit (the estimated coefficient) rather than to the effect on the odds.

The three predictors also increased prediction efficiency significantly, again substantively, as well as statistically. The predictors reduced the number of prediction errors, and therefore, increased prediction efficiency, by about 38.89%, compared to the number of prediction errors (or inversely, the prediction efficiency) that is expected by chance alone. This increase in prediction efficiency was also statistically significant. The model did not have any symptom of problems such as multicollinearity, zero cells or complete separation.

Analysis of the residuals indicated that the effect of (VOLAT1) was dependent on one single case, case 81. The removal of this case reduced both the effect and statistical significance of the predictor. However, there were two other cases that had the same attributes in relation to the values of (VOLAT1) and (MANAGE). The removal of either of these cases did not produce similar results as the removal of case 81. This implies that case 81's other attributes, e.g., its values on (ASSETS_B) and (FOREIGN3), rather than the case's predictor value on (VOLAT1), are responsible for the drastic change in the effect and significance of (VOLAT1) by the removal of the case. Although mathematically critical, there is no logical reason or argument for the removal of this particular case. Therefore, the effect of predictor (VOLAT1) on the logit on (MANAGE) ought to be accepted.

The effects of fitted predictors, (ASSETS_B) and (VOLAT1), on the logit on (MANAGE) appear to be reasonably similar, respectively, with the effects of equivalent categorised predictors, (ASSET4), and (VOLAT), on the logit on (MANAGE). See Graphs 1A and 1B at the end of Appendix J-1. This implies that the relationships between the fitted predictors and the logit of managing FX risk appear to be valid. In short, all the above points seem to show that this model is reliable.

5.2.2. Managing accounting exposure

This model tries to predict the inclination to manage accounting exposure among Malaysian public-listed multinational companies that manage FX risk. This model actually tries to identify predictors that appear to influence a company's likelihood of managing accounting exposure, given that the company manages FX risk. This means that only companies that managed FX risk were included in the analysis. In other

words, companies that did not manage FX risk were omitted.[16] The dependent variable is (ACCTEXP), and it measures whether or not a company managed accounting exposure

This model employs four predictors. Again, as in the previous model, the first is (ASSETS_B), which measures a company's total assets. The second predictor is (DEBT_B). This measures a company's total debt. The third predictor, (DEBT23_4), a dichotomy, is derived from the second predictor. The value of (DEBT23_4) = 1 if (DEBT_B) is greater than RM 70 million but less more than RM 700 million, and (DEBT23_4) = 0 if (DEBT_B) is less than RM 70 million or greater than RM 700 million. Actually, RM 70 million is the cut-off point between the first and the second quartiles of the total debt values of all valid cases included in the model, whereas RM 700 million is the corresponding cut-off point between the third and final quartiles. In a sense, the variable (DEBT23_4) measures whether or not a company has a moderate level of debt. The fourth and last predictor, (OSUBNUM), measures a company's number of overseas subsidiaries. The fitted model is summarised mathematically below:

$$\text{Logit(ACCTEXP)} = 1.04 - 1.67(\text{ASSETS_B}) + 2.20(\text{DEBT_B}) - 1.56(\text{DEBT23_4}) \ldots + 0.07(\text{OSUBNUM})$$

Appendix J-2 provides the statistical and analyses results for this fitted model. All the predictors were both substantively and statistically significant in terms of their impact on the companies' likelihood of managing accounting exposure or the companies' logit on (ACCTEXP). All the predictors had Wald statistics that were significant, and standardised coefficients that were substantive. In terms of standardised coefficients, the predictors, in descending order of impact on the companies' inclination to manage accounting exposure, are (ASSETS_B), (DEBT_B), (OSUBNUM), and (DEBT23_4). Next, the effect of each predictor, in turn, is described.

A RM 1 billion increase in total assets of a company, on average, decreased the company's logit of managing accounting exposure by 1.67, with other predictors held constant. The greater the total assets of a company, the lower the company's inclination

[16]Therefore, the number of cases included in fitting this model, and the following models – unless specified otherwise, is considerably less than the number used in the first model. Naturally, the undertaking of other FERM activities would depend on whether or not a company managed FX risk (the first FERM activity). Therefore, the predictors that were found to be useful in predicting a company's likelihood of managing FX risk, were likely to be identified repeatedly in predicting the company's likelihood of undertaking other subsequent activities. This may confound the underlying evidence and may jeopardise the identification of other useful predictors. Consequently, to avoid this, cases (companies) that did not manage FX risk were excluded from this and the following models.

to manage accounting exposure.

On the other hand, a RM 1 billion increase in total debt of a company, on average, appeared to increase the company's logit of managing accounting exposure by 2.20. However, companies that had moderate levels of total debt, i.e., between RM 70 million and RM 700 million, on average, seemed to have 1.56 less logit of managing accounting exposure, compared to companies that had either high or low levels of debt, with other predictors remaining constant. Generally, these two results imply that ① an increase in debt increases a company's likelihood of managing accounting exposure, and ② a company that has a moderate level of debt (i.e., within the inter-quartile range of total debt values) is less likely to manage accounting exposure compared to a company that has a high, or low, level of debt.

On average, an additional overseas subsidiary increased the company's logit of managing accounting exposure by 0.07, with other predictors being unchanged. This means that the greater the number of overseas subsidiaries of a company, the greater the company's probability of managing accounting exposure.

Having described the predictor effects the fitted model is evaluated next. The number of cases per predictor used in the model was only slightly greater than the rule-of-thumb minimum of 15. Nonetheless, the statistical analyses from this model are generally expected to be reliable. The inclusion of the four predictors in the model improved model fit significantly – both statistically and substantively. The predictors increased model fit by about 22.21%. The predictors also improved the prediction efficiency significantly, also substantively and statistically. The predictors increased prediction efficiency by about 33.33%. This improvement in prediction efficiency was also statistically significant.

However, the model suffers from multicollinearity due to the high positive correlation between the two predictors, (ASSETS_B) and (DEBT_B). Predictors incorporated into a model that has multicollinearity would be expected to be statistically insignificant. Nonetheless, this damaging effect is not evident in the fitted model. In fact, the predictor coefficients were statistically significant. Furthermore, although (ASSETS_B) and (DEBT_B) are positively correlated, their coefficients in the model are, respectively, negative and positive. Therefore, although multicollinearity is present in the model, its

effect is possibly not very damaging.

Furthermore, the analysis of residuals showed that the effect of (DEBT_B), on the logit on (ACCTEXP) appeared to be dependent on case 85, and likewise, the effect of (OSUBNUM) seemed to be dependent on case 96. The removal of these cases, respectively, reduced the predictors' effects and significance drastically. However, case 85's values on (DEBT_B) and (ACCTEXP) were not particularly singular. Nonetheless, case 96's value on (OSUBNUM) was extreme, i.e., it had the highest number of overseas subsidiaries, and the next highest value was considerably smaller than this. Therefore, the unique condition of case 96 casts doubt on the reliability of the effect of (OSUBNUM) on the logit on (ACCTEXP), although the effect of (DEBT_B) should be accepted.

The fitted predictor effects of (ASSETS_B) and (OSUBNUM) on the logit on (ACCTEXP) appear to be reasonably similar, respectively, to the effects of comparable categorised predictors, (ASSET4) and (OSUB4), on the logit on (ACCTEXP). See Graphs 2A and 2B at the end of Appendix J-2. This implies that the relationships between these fitted predictors and the logit of managing accounting exposure appear to be valid. However, the fitted predictor effects of (DEBT_B) and (DEBT23_4) on the logit on (ACCTEXP) do not appear very representative when compared to the effect of the comparable categorised predictor, (DEBT4). However, the categorised predictor, (DEBT4), appears to deteriorate the model characteristics compared to the fitted predictors (DEBT_B) and (DEBT23_4). Therefore the latter predictors appear to be more representative than the former. See Graph 2C at the end of Appendix J-2. Therefore, there is no sound reason to reject the fitted effects of total debt on the logit of managing accounting exposure. Consequently, this model appears to be satisfactory except perhaps for the problem of multicollinearity, and the doubt about the reliability of the effect of the number of overseas subsidiaries on a company's likelihood of managing accounting exposure.

5.2.3. Managing economic exposure

This model attempts to predict the probability of Malaysian public-listed multinational companies managing economic exposure, given that they manage FX risk. In other words, this model tries to identify the predictors that explain a company's tendency to manage economic exposure, given that the company manages FX risk. Again, this

analysis excludes companies that did not manage FX risk. The dependent variable is (ECONEXP). It measures whether or not a company managed economic exposure.

This model uses three predictors. The first predictor, (PERFIN3), is a dichotomy, and it measures whether or not a company had more than 25% of its financing transactions denominated in foreign currencies. Therefore, (PERFIN3) = 1 when a company had more than 25% of its financing denominated in foreign currencies, while (PERFIN3) = 0 otherwise. The second predictor is (ASSETS_B). This was already encountered in the two previous models. It measures a company's total assets in billions of Ringgit. The third and final predictor is (VSIZE3). This measures a company's perception of its FX exposure size. The values range from 1, when a company perceives its FX exposure to be very small, and 2, when it perceives the exposure to be small or moderate, to 3, when it perceives the exposure to be large or very large.[17] The fitted model is given below:

Logit(ECONEXP) = –2.09 +2.58(PERFIN3) –0.28(ASSETS_B) +0.92(VSIZE3)

Appendix J-3 presents all the statistical and analyses results for this model. All the three predictors were both statistically, and substantively, significant. All the predictors had significant Wald statistics, and substantive standardised coefficients. Based upon the standardised coefficients, the predictors, in descending order of impact on the companies' probability of managing economic exposure, or the companies' logit on (ECONEXP), are (PERFIN3), (ASSETS_B), and (VSIZE3). The effect of each predictor is enumerated below.

Companies that had more than 25% of their financing denominated in foreign currencies, compared to companies that had less financing in foreign currencies (i.e., up to 25%), had 2.58 higher logit of managing economic exposure, on average, with other predictors held constant. Thus, companies that have high levels of financing exposure, compared to companies that have low levels of financing exposure, are more likely to manage economic exposure.

[17]Actually, this predictor was re-coded from another variable, (VSIZE), the values of which range from 1, when the exposure volume is perceived to be very small, to 5, when the exposure volume is perceived to be very large. The re-coded predictor, (VSIZE3), was used rather than the original variable, (VSIZE), because the former provided a better model than the latter.

A RM 1 billion increase in a company's total assets, on average, decreased the company's logit of managing economic exposure by 0.28, with other predictors being unchanged. This means that the greater a company's total assets, the lower the company's likelihood of managing economic exposure.

A one level increase in a company's perception of its FX exposure size, increased the company's logit of managing economic exposure by 0.92, on average, with other predictors held constant. However, it must be noted that this linear increase is only applicable when the fitted predictor (VSIZE3) is used. This rule cannot be applied if the original predictor (VSIZE) is used. More precisely, there appears to be no increase in the logit of managing economic exposure when there is an increase in the perceived size of FX exposure from small to moderate, or from large to very large. See Graph 3B, at the end of Appendix J-3. In spite of this, the overall implication remains – the greater a company's perception of its FX exposure size, the greater the company's inclination to manage economic exposure.

After having described the predictor effects above, next, the overall soundness of the fitted model is evaluated and explained. The number of cases per predictor used in fitting this model is adequately large. Therefore, the statistical analyses arising from this model are expected to be reliable. The inclusion of the three predictors improved model fit, both statistically and substantively. The predictors increased model fit by about 13.57%. Although substantive, this increase is generally considered to be rather poor, since it is less than 20%. The inclusion of the three predictors increased prediction efficiency significantly, both substantively and statistically. The predictors increased prediction efficiency by about 28.57%, and this increase is also statistically significant.

The model did not seem to have problems of multicollinearity, zero cells, or complete separation. However, the residual analysis revealed that the removal of a particular case, case 102, drastically reduced the predictor effect and significance of (ASSETS_B). Case 102's value on (ASSETS_B) was extreme. It had the largest total assets value. Thus, the unique condition of this case casts doubt on the reliability of the effect of (ASSETS_B) on the logit on (ECONEXP). Besides that, the effect and significance of (VSIZE3) is similarly dependent on a single case, case 76. However, this case was not unique. In other words, there were several other cases that had the same values on

(VSIZE3) and (ECONEXP) as case 76. Nonetheless, there is no compelling reason for removing either of the above cases from the model. Therefore, the effect of (VSIZE3) on the logit on (ECONEXP) cannot be rejected, although the residual analysis did cast some doubt on the reliability of the effect of (ASSETS_B) on the logit on (ECONEXP).

The fitted predictor effect of (ASSETS_B) on the logit on (ECONEXP) showed some differences when compared to the effect of comparable categorised predictor, (ASSET4), on the logit on (ECONEXP). However, the categorised predictor worsened the model characteristics when compared to the fitted predictor. Therefore, the fitted predictor appears more favourable than the categorised predictor. See Graph 3A at the end of Appendix J-3. On the other hand, the effect of (VSIZE3) on the logit on (ECONEXP) seems to closely trace the effect of comparable categorised predictor, (VSIZE), on the logit on (ECONEXP). This is disclosed by Graph 3B. These indicate that the fitted predictor effects, (ASSETS_B) and (VSIZE3), on the logit of managing economic exposure can be accepted to be valid.

Overall, the model appears to be satisfactory. Although the predictors did not increase model fit a great deal, they did increase the prediction efficiency rather considerably. Nonetheless, there is some doubt about the reliability of the effect of total assets on a company's likelihood of managing economic exposure.

5.2.4. Managing transaction exposure

This model tries to predict the likelihood of managing transaction exposure by Malaysian public-listed multinational companies that manage FX risk. In other words, this model attempts to identify predictors that seem to influence a company's likelihood of managing transaction exposure, given that the company manages FX risk. This model too omits cases that did not manage FX risk from analysis. The dependent variable is (TRANEXP), and it measures whether or not a company managed transaction exposure.

This model uses only two predictors. The first predictor is (STABLE1). It is a dichotomy that measures whether or not a company perceived its exposures were stable, i.e., unvarying from one year to the next. Therefore, (STABLE1) = 1 if a company felt that its

exposures were stable, and (STABLE1) = 0 otherwise.

The second and final predictor, (RISK3), measures a company's perception of its FX risk level. The values of this predictor range from 1, when a company perceives its level of FX risk to be very low, to 3, when a company perceives the level of risk to be moderate or higher.[18] The fitted model is given below:

Logit(TRANEXP) = –4.75 +4.59(STABLE1) +2.24(RISK3)

The statistical and analyses results for this fitted model are found in Appendix J-4. Both predictors were substantively as well as statistically significant in relation to their impact on the companies' probability of managing transaction exposure, or rather the companies' logit on (TRANEXP). However, it may be noted that the predictor effect of (RISK3) was statistically significant based upon the more accurate Likelihood Ratio (LR) test but not based upon the Wald statistic. Nevertheless, this observation does not change the conclusion – both predictors are important in modelling the companies' inclination to manage transaction exposure. Based upon standardised coefficients, the predictors, in descending order of impact on the logit on (TRANEXP), are (STABLE1), followed by (RISK3). Next, each predictor effect is, in turn, briefly outlined.

Companies that expected their exposures to be stable, compared to companies that did not expect their exposures to be stable, had 4.59 higher logit of managing transaction exposure, on average, with the other predictor held constant. This means that companies that perceive stable FX exposures are more likely to manage transaction exposure, compared to companies that perceive unstable or varying patterns of FX exposure.

A one level increase in a company's perception of its level of FX risk, as measured by (RISK3), increased the company's logit of managing transaction exposure, on average, by 2.24, with the other predictor held constant. However, it must be noted that this rule is not applicable when the original predictor, (RISK), is used. In particular, there is no increase in the fitted logit on (TRANEXP) when the perceived level of risk increases from moderate to high or from high to very high as measured by (RISK). See Graph 4A at the

[18]This predictor was re-coded from another variable, (RISK), the values of which range from 1, when the level of risk is perceived to be very low, to 5, when the level of risk is perceived to be very high. The re-coded predictor was used rather than the original variable because the former provided a better model than the latter.

end of Appendix J-4. Despite this, the overall effect remains – the greater a company's perception of its FX risk level, the greater the company's likelihood of managing transaction exposure.

Having described the predictor effects above, next, the fitted model is evaluated. The number of cases per predictor was adequately large, i.e., 32, and therefore, the statistical analyses from this model are expected to be reliable. The inclusion of the two predictors in the model improved the model fit significantly, both statistically and substantively. The predictors also increased model fit quite remarkably, by about 41.95%.

However, these predictors did not change the prediction efficiency of the model at all. This is mainly due to the fact that almost all cases (companies) that managed FX risk, except for four, managed transaction exposure. In other words, the dependent variable, (TRANEXP), had insufficient variance. This problem is aggravated further by the fact that the predictors in the model are categorical or quasi-categorical. Although predictor, (RISK3), is treated as a continuous predictor in the model, it is more akin to a categorical predictor because it can only assume three discrete values. Therefore, in a model with these attributes, the criterion of model fit is more valid than the criterion of prediction efficiency in assessing a model. Since the two predictors increased model fit significantly, both statistically and substantively, the predictors are accepted to be important in explaining a company's likelihood of managing transaction exposure, given that the company managed FX risk.

The model did not suffer from multicollinearity. Apparently, the model did not reveal symptoms of the problems of zero cells or complete separation. The residual analysis revealed that when any one among cases 100, 30 or 44, is removed from the model, the effect and significance of (RISK3) is reduced drastically. Actually, these cases are three of the only four that did not manage transaction exposure. The removal of these critical cases drastically affects the parameter estimates but this in itself does not indicate anything amiss about the model except perhaps for the insufficient variance of the dependent variable.

Further, the fitted predictor of (RISK3) on the logit on (TRANEXP) appears not very representative when compared to the comparable categorised predictor of (RISK) on the logit on (TRANEXP). However, the categorised predictor, (RISK), worsens the model

attributes, compared to the fitted predictor, (RISK3). See Graph 4A at the end of Appendix J-4. Thus, the fitted predictor (RISK3) appears to be more reasonable than the alternative, (RISK). Thus, the effect of a company's perceived level of FX risk on the company's likelihood of managing transaction exposure cannot be rejected.

Overall, the insufficient variance of the dependent variable, (TRANEXP), appears to have caused some problems, specifically in terms of prediction efficiency and residual analysis of the model. Although this particular problem appears to show that the model is inadequate, notwithstanding this, the fitted predictors seem to be reliable and correct.

5.2.5. Managing all three FX exposure types

This model tries to predict the inclination to manage all three types of FX exposure among Malaysian public-listed multinational companies. This model actually tries to identify predictors that appear to influence a company's likelihood of managing all the three types of FX exposure. Notably, this analysis incorporates all valid cases, including those cases (companies) that did not manage FX risk. The dependent variable is (USE3). It measures whether or not a company managed all three types of FX exposure, i.e., accounting, economic and transaction exposures.

This model employs four predictors. The first is (VSIZE), which measures a company's perception of its FX exposure size. The values of this predictor range from 1, when a company perceives its exposure to be very small, to 5, when it perceives its exposure to be very large. The second predictor is (PERFIN3), and briefly, it measures whether or not a company had high financing exposure. This predictor was also used in a previous model to explain the logit on (ECONEXP), and has been described in that section. The third predictor is (STABLE1), and briefly, it measures whether or not a company perceived its exposures were stable. This predictor was used and explained in the previous section that deals with modelling the logit on (TRANEXP). The fourth and last predictor, (ASSETS_B), measures a company's total assets. This predictor was also used in three previous models, i.e., to explain the logits on (MANAGE), (ACCTEXP), and (ECONEXP). The fitted model can be mathematically summarised as follows:

$$\text{Logit(USE3)} = -7.15 + 0.91(\text{VSIZE}) + 3.38(\text{PERFIN3}) + 2.87(\text{STABLE1}) - 0.39(\text{ASSETS_B})$$

Appendix J-5 provides the relevant statistical and analyses results for this model. All the predictors are both statistically and substantively significant in terms of their impact on the likelihood of managing all three types of FX exposure or the logit on (USE3). In terms of standardised coefficients, the predictors, in descending order of impact on companies' inclination to manage all three FX exposure types, are (VSIZE), (PERFIN3), (STABLE1), and (ASSETS_B). Next, the effect of each predictor is described, one by one.

A one level increase in a company's perception of its FX exposure size, increased the company's logit of managing all three FX exposure types by 0.91, on average, with other predictors held unchanged. This means that the greater a company's perception of its FX exposure size, the greater the company's tendency to manage all three FX exposure types.

Companies that had more than 25% of their financing transactions denominated in foreign currencies, compared to companies that had less financing in foreign currencies (i.e., up to 25%), had 3.38 higher logit of managing all three types of exposure, on average, with other predictors held constant. Thus, companies that have high levels of financing exposure, compared to companies that have low levels of financing exposure, are more likely to manage all three FX exposure types.

Companies that perceived their exposures were stable, compared to companies that did not perceive their exposures were stable, had 2.87 higher logit of managing all three types of FX exposure, on average, with other predictors unchanged. This means that a company that perceives it has more stable FX exposure pattern is more likely to manage all three FX exposure types, compared to a company that perceives it has more unstable pattern of FX exposure.

A RM 1 billion increase in total assets of a company, on average, decreased the company's logit of managing all three FX exposure types by 0.39, with other predictors maintained constant. This implies that the greater the total assets of a company, the lower its inclination to manage all three FX exposure types.

Having described the predictor effects, next, the fitted model is evaluated. The number of cases per predictor used in the model is adequately greater than 15. Therefore, the statistical analyses from this model are expected to be reliable. The inclusion of the four predictors in the model improved model fit and prediction efficiency significantly –

both statistically and substantively. The predictors increased model fit by about 29.75%, and prediction efficiency by 40.00%.

The model does not suffer from multicollinearity. The analysis of residuals from the fitted model revealed that the effect of (ASSETS_B), on the logit on (USE3) appeared to be dependent on case 82, and similarly, the effect of (STABLE1) seemed to be dependent on cases 29 and 48. However, none of these cases were singular. In other words, there were other cases that had similar values on (ASSETS_B) and (USE3) or (STABLE1) and (USE3). Moreover, there is no compelling reason for removing any of these cases. Therefore, all the fitted predictor effects appear reliable.

Generally, the predictor effects of (ASSETS_B) and (VSIZE) on the logit on (USE3) appear to be reasonably representative when compared to the effect of the comparable categorised predictors, (ASSET4), and (VSIZE), respectively, on the logit on (USE3). See Graphs 5A and 5B at the end of Appendix J-5. This implies that the relationships between the fitted predictors and the logit of managing all three types of FX exposure seem valid. Consequently, generally, the model appears to be rather sound.

5.2.6. Adopting formal FERM objective

This model predicts the inclination to adopt formal FERM objectives among Malaysian public-listed multinational companies that manage FX risk. In other words, the model attempts to identify predictors that appear to influence a company's probability of adopting a formal FERM objective, given that the company manages FX risk. Thus, this model excludes cases (companies) that did not manage FX risk. The dependent variable is (OBJTYPE1). It measures whether or not a company adopted a formal objective for managing FX risk.

This model uses four predictors. The first predictor, (DEBT_B), as seen earlier in the model that predicts the logit on (ACCTEXP), measures a company's total debt. The second predictor is (ASSETS_B), and as seen earlier, measures a company's total assets. The third predictor is a dichotomy named as (MINTRACO). It measures whether or not a company had a moderate level of intra-company transactions, i.e., that which accounted for between 20% to 40% of the total transactions of that company. Therefore, (MINTRACO) = 1 when the intra-company transactions account for between 20% and

40% of total transactions of that company, and (MINTRACO) = 0 if the intra-company transactions constitute less than 20%, or more than 40%, of total transactions. The final predictor is (SALES_B). This measures a company's total sales in billions of Ringgit. Below, the fitted model is specified:

Logit(OBJTYPE1) =	–2.50 –2.17(DEBT_B) +1.13(ASSETS_B) –7.70(MINTRACO) ... +1.44(SALES_B)

Appendix J-6 presents the statistical and analyses results of this fitted model. Each of the four predictors was both statistically and substantively significant in relation to its impact on the companies' probability of adopting formal FERM objective, or the companies' logit on (OBJTYPE1). However, it may be noted that (MINTRACO) was statistically significant based upon the Likelihood Ratio (LR) test and not upon the Wald statistics.[19] However, this does not alter the conclusion that all predictors, including (MINTRACO), are important in modelling the companies' likelihood of adopting formal FERM objectives. Based upon the standardised coefficients, the predictors, in descending order of impact on the logit on (OBJTYPE1), are (DEBT_B), (ASSETS_B), (MINTRACO), and (SALES_B). These effects, in turn, are outlined briefly below.

An increase, of RM 1 billion, in a company's total debt, reduced the company's logit of adopting formal objectives in managing FX risk by 2.17, on average, with other predictors being constant. Generally, this implies that the greater the debt of a company, the less likely the company is in adopting a formal FERM objective.

On the other hand, an increase, of RM 1 billion, in a company's total assets, increased the company's logit of adopting formal objectives in managing FX risk by 1.13, on average, with other predictors held constant. Generally, this implies that the greater the total assets of a company, the greater the company's inclination to adopt a formal FERM objective.

[19]In this case, this is observed because there is only one case (company) which had a moderate level of intra-company transactions among those that had adopted formal objectives. Thus, the coefficient, and standard error estimates are large and this affects the Wald statistic adversely. This is an example of a situation close to the problem of zero cells.

Companies that had moderate levels of intra-company transactions (between 20% to 40%) had, on average, 7.70 lower logit of adopting formal FERM objectives, compared to companies that had low (up to 20%) or high (more than 40%) levels of intra-company transactions, with other predictors unchanged. This means that companies that have moderate levels of intra-company transactions are less likely to adopt formal objectives for managing FERM, compared to companies that have either high or low levels of intra-company transactions.

Finally, an increase, of RM 1 billion, in a company's total sales, increased the company's logit of adopting formal objectives in managing FX risk by 1.44, on average, with other predictors being constant. Generally, this implies that the greater a company's total sales, the more likely the company is in adopting a formal FERM objective.

Having described the predictor effects above, next, the fitted model is assessed for overall soundness. The number of cases per predictor in the model was only very slightly more than the required minimum. Nonetheless, the statistical analyses arising from this model are expected to be generally reliable. The four predictors, that are included in the model, increased model fit, as well as, prediction efficiency significantly, both substantively and statistically. The predictors increased model fit by about 43.22%, whereas they increased prediction efficiency by about 57.14%. These are substantive and rather remarkable.

However, this model has the problem of multicollinearity due to the presence of two highly positively correlated predictors, (ASSETS_B) and (DEBT_B). As with the model on the logit on (ACCTEXP), the predictors were statistically significant despite the presence of multicollinearity. Again, the coefficients of (ASSETS_B) and (DEBT_B) were respectively, positive and negative, although the two variables were highly positively correlated with one another. Therefore, although multicollinearity is present in the model, its impact possibly is not very damaging.

The residual analysis, nonetheless, revealed several cases with unusual residual measures. The effect and significance of predictor (DEBT_B) were dependent on case 82. This case's value on (DEBT_B) was extreme, i.e., it had the highest total debt value. Predictor (ASSETS_B) was similarly dependent on cases 82 and 102. Case 102's value on (ASSETS_B) was similarly extreme as it had the highest value for total assets. The

singular conditions of these two cases cast doubt about the reliability of the effect of the two predictors, (ASSETS_B) and (DEBT_B) on the logit on (OBJTYPE1). Likewise, (MINTRACO) was dependent on cases 80 and 82, and (SALES_B) was dependent on case 92. However, these cases were not singular, and therefore, the effects of these two predictors, (MINTRACO) and (SALES_B) cannot be rejected as unreliable.

The fitted predictor effects of (ASSETS_B) and (SALES_B) on the logit on (OBJTYPE1) did not appear to be very representative when compared to their respective comparable categorised predictors, (ASSET4), and (SALES4). However, the categorised predictors generally worsened the model attributes, when compared to the model attributes with the fitted predictors. See Graphs 6A and 6B at the end of Appendix J-6. On the other hand, the fitted predictor effects of (DEBT_B) and (MINTRACO) on the logit on (OBJTYPE1) appeared to be rather similar when compared to their respective comparable effects of categorised predictors, (DEBT4), and (INTRACO3). These results imply that all the fitted predictor effects on a company's likelihood of adopting a formal FERM objective seem to be valid. Overall, the fitted model can be said to be rather reasonable, except perhaps for the problem of multicollinearity, and the doubt about the reliability of the effects of total assets and total debt on a company's likelihood of adopting a formal FERM objective.

5.2.7. Sharing FERM responsibility

This model predicts the likelihood among Malaysian public-listed multinational companies that manage FX risk to share responsibility for managing FX risk among two or more departments. Actually, this model tries to identify predictors that seem to influence a company's inclination to have joint responsibility across departments for managing FX risk, provided that the company manages FX risk. This model too omits cases (companies) that did not manage FX risk. The dependent variable is (JOINTRES). It measures whether or not a company shared FERM responsibility among two or more departments, or inversely, placed the responsibility with only one department.

This model uses three predictors. The first predictor, (MKTVAL_B), measures a company's total market capitalisation (book value of total debt plus market value of equity) in billions of Ringgit. Next, (SECTOR3) is a three-category nominal variable.

Actually, this is re-coded from another variable (SECTOR), which identifies the sector category onto which a company has been listed in the KLSE. Thus, companies listed onto the industrial, trade and services, and plantation sectors were re-coded as 1, while those listed onto the consumer sector were re-coded as 2, and finally all others were re-coded as 3. The last category includes property, and construction sector companies. It must be noted that although this is a single three-category nominal variable, the logistic regression model accepts this as two separate dichotomous predictors, (SECTOR3(1)) and (SECTOR3(2)).[20] Thus, these two predictors are therefore, second and third predictors in the model. The fourth and final predictor is labelled (VSIZE), and has been explained earlier, in the model on the logit on (USE3). Briefly, this measures a company's perception of its FX exposure size. The fitted model is specified mathematically as:

Logit(JOINTRES) =	−2.84 −0.18(MKTVAL_B) −2.22(SECTOR3(1)) +2.68(SECTOR3(2)) ... +0.18(VSIZE)

The statistical and analyses results from this model are found in Appendix J-7. All predictors were clearly both statistically and substantively significant in relation to their impact on the companies' likelihood of sharing FERM responsibility among two or more departments, or the companies' logit on (JOINTRES). In fact, although (MKTVAL_B) and (SECTOR3(1)) had Wald statistics that were not statistically significant, their Likelihood Ratio (LR) tests were significant. Therefore, all predictors, including (MKTVAL_B), are important in modelling the companies' likelihood of each company sharing FERM responsibility with two or more departments. Based upon the standardised coefficients, the predictors, in descending order of impact on the logit on (JOINTRES), are (MKTVAL_B), (SECTOR3(2)), (VSIZE), and (SECTOR3(1)). These effects are outlined briefly below.

An increase, of RM 1 billion, in a company's total market capitalisation, reduced the company's logit of sharing FERM responsibility among two or more departments by 0.18, on average, with other predictors being constant. Generally, this implies that the greater the market capitalisation of a company, the lower the company's likelihood of having joint responsibility across departments for managing FX risk. In other words, it also means that a company with greater market capitalisation is more likely to place

[20]Under this arrangement, the constant in the model refers to the base, i.e., industrial, trade and services, and plantation sector companies. Then, (SECTOR3(1)) refers to the consumer sector companies, whereas SECTOR3(2) refers to the property and construction sector companies.

FERM responsibility with only one department.

Companies listed on the property and construction sectors, compared to companies listed on the industrial, trade and services, or plantation sectors, had, on average, 2.68 higher logit of sharing FERM responsibility among two or more departments, with other predictors remaining constant. This means that property or construction sector companies are more likely to share FERM responsibility among two or more departments for managing FX risk, compared to industrial, trade and services, or plantation sector companies.

On the other hand, companies listed on the consumer sector, compared to companies listed on the industrial, trade and services, or plantation sectors, had, on average, 2.22 lower logit of sharing FERM responsibility among two or more departments, with other predictors kept constant. This means that consumer sector companies are more likely to place FERM responsibility with one department, compared to industrial, trade and services, or plantation sector companies.

A one level increase in a company's perception of its FX exposure size, on average, increased, by 0.80, the company's logit of sharing FERM responsibility among two or more departments, with other predictors remaining unchanged. In other words, the greater a company's perception of its FX exposure size, the greater the tendency of the company to have joint responsibility across departments for managing FX risk.

Having described the predictor effects briefly above, next, the overall soundness of the model is assessed and discussed. The number of cases per predictor was only slightly greater the required minimum. Nonetheless, this implies that the statistical analyses from this model are expected to be generally reliable. The four predictors included in the model increased model fit, as well as, prediction efficiency significantly, both substantively and statistically. In fact, the inclusion of these predictors improved model fit by about 31.68%, and prediction efficiency by around 38.10%.

This model did not suffer from the problem of multicollinearity, zero cells, or complete separation. The residual analysis showed that predictor (MKTVAL_B) appeared to be dependent on a single case, case 92. However, this case was not particularly unique as there appeared to be other cases with similar values on both (MKTVAL_B) and (JOINTRES). This implies that all the predictor effects on the logit on (JOINTRES),

including that of (MKTVAL_B), appear to be reliable.

The predictor effects of (VSIZE) and (SECTOR3), on the logit on (JOINTRES), seem very similar to the effects of comparable categorised predictors, respectively, (VSIZE) and (SECTOR_R), also on the logit on (JOINTRES). See Graphs 7B and 7C, at the end of Appendix J-7. However, the predictor effect of (MKTVAL_B) on the logit on (JOINTRES) seems dissimilar to the effect of comparable categorised predictor, (MKTVAL4), on the logit on (JOINTRES). Nonetheless, this categorised predictor worsens the model attributes compared to the fitted predictor. Therefore, all the fitted predictor effects on a company's likelihood of sharing FERM responsibility among two or more departments appear valid. Consequently, the fitted model generally seems to be very reasonable.

5.2.8. Decentralising fully domestic subsidiaries' FERM

This model predicts the likelihood among Malaysian public-listed multinational companies that manage FX risk to decentralise fully their domestic subsidiaries' FERM. More directly, this model tries to identify predictors that seem to influence a company's inclination to allow full autonomy to its domestic subsidiaries for managing their own FX exposures, given that the company manages FX risk. This model too omits cases (companies) that did not manage FX risk. The dependent variable is (DCEN2), and it measures whether or not a company decentralised fully its domestic subsidiaries' FERM, or in other words, allowed full autonomy to its domestic subsidiaries for managing FX risk.

This model uses three predictors. The first predictor, (PDEBT4_4), is a dichotomy which measures whether or not a company had debt ratio (total debt divided by total assets) in excess of 59.50%. The value of (PDEBT4_4) = 1 if a company's debt ratio is greater than 59.50%, and (PDEBT4_4) = 0 otherwise. The debt ratio of 59.50% is actually the cut-off point between the third and final quartile of debt ratio values of all valid cases in this model. The second predictor, (HINTRACO), is also a dichotomy. It measures whether or not a company had a high level of intra-company transactions (more than 40% of total transaction volume). Therefore, (HINTRACO) = 1 when the intra-company transactions account for more than 40% of total company transactions, or otherwise (HINTRACO) = 0. The third and final predictor, (PERCAP3), is again a dichotomy, and it

measures whether or not a company had more than 25% of its total capital investment transactions denominated in foreign currencies. Therefore, (PERCAP3) = 1 if a company had more than 25% capital investment denominated in foreign currencies and (PERCAP3) = 0 otherwise. Below, the fitted model is mathematically presented.

Logit(DCEN2) = –2.91 –2.95(PDEBT4_4) +3.33(HINTRACO) +2.11(PERCAP3)

Appendix J-8 provides all the relevant statistical and analyses results associated with this fitted model. All predictors were clearly both statistically and substantively significant in relation to their impact on the companies' likelihood of decentralising fully their domestic subsidiaries' FERM, or the companies' logit on (DCEN2)). Although (PDEBT4_4) had a Wald statistic that was not statistically significant, its Likelihood Ratio (LR) test was significant.[21] Therefore, all predictors, including (PDEBT4_4), are important in modelling the companies' inclination to decentralise fully their domestic subsidiaries' FERM. Based upon the standardised coefficients, the predictors, in descending order of impact on the logit on (DCEN2), are (PDEBT4_4), (HINTRACO), and (PERCAP3). These effects are interpreted briefly below.

Companies that had debt ratios that were higher than 59.50%, compared to companies that had lower debt ratios, had, on average, 2.95 lower logit of decentralising fully its domestic subsidiaries' FERM, with other predictors being constant. Generally, this implies that companies that use high debt ratios are less likely, than companies that use lower debt ratios, to allow full autonomy to their domestic subsidiaries for managing their own FX exposures.

Companies that had high levels of intra-company transactions (more than 40% of total transactions), compared to companies that had moderate or low levels of such transactions, had 3.33 higher logit of decentralising fully their domestic subsidiaries' FERM, on average, with other predictors kept unchanged. This means that companies with high intra-company transactions are more likely to allow full autonomy to their domestic subsidiaries to manage their own FX exposures, compared to companies with lower intra-company transactions.

[21]This is because there is only one case (company) which had high debt ratio that had allowed full autonomy to its domestic subsidiaries for FERM. Thus, the coefficient, and standard error estimates are large and these affect the Wald statistic adversely. Again, this is an example of a situation close to the problem of zero cells.

Companies that had more than 25% of their capital investment transactions denominated in foreign currencies, compared to companies that had lower capital investment transactions denominated in foreign currencies, had 2.11 higher logit of decentralising fully its domestic subsidiaries' FERM, on average, with other predictors remaining unchanged. In other words, companies with high capital investment exposures are more likely to allow full autonomy to their domestic subsidiaries for managing their own FX exposures, compared to companies with low capital investment exposures.

Having described the predictor effects in brief above, next, the overall soundness of the model is assessed and discussed. The number of cases per predictor was greater than the required minimum. This implies that the statistical analyses from this model are expected to be generally reliable. The three predictors, included in the model, increased model fit significantly, both statistically and substantively. The inclusion of the three predictors increased model fit by about 30.16%. However, although the predictors increased prediction efficiency substantively, by 14.29%, the increase was not statistically significant. In other words, the binomial d statistic's p-value was greater than 5%. This is partially due to the fact that there were only seven cases (companies) that had decentralised fully its domestic subsidiaries' FERM. Moreover, all the predictors in the model were categorical, i.e., dichotomous. However, as pointed out earlier, in a model with these characteristics, the criterion of model fit is more valid than the criterion of prediction efficiency in assessing a model. Therefore, in this case, the three predictors are accepted to be important because they improved the model fit significantly, although they did not improve prediction efficiency significantly.

This model did not suffer from the problem of multicollinearity, and it did not have problems of zero cells or complete separation. The residual analysis showed that the predictor (PDEBT4_4) was dependent on cases 68 and 95. The removal either of these cases reduced the effect and significance of the predictor, (PDEBT4_4). However, these cases are not singular because there are several other cases that have the same values on (PDEBT4_4) and (DCEN2) as these two cases. Moreover, there is no reason for the removal of these cases. Therefore, the fitted effects appear to be acceptable.

The predictors, (PDEBT4_4) and (HINTRACO), seem to have been reasonably fitted because their effects appear to be similar to the effects of comparable categorised predictors, respectively, (PERDEBT4), and (INTRACO3). See Graphs 8A and 8B at the end of Appendix J-8. Consequently, the fitted model appears to be rather sound on the whole, despite the lack of variance in the dependent variable (DCEN2) – only a few companies had decentralised fully their domestic subsidiaries' FERM.

5.2.9. Decentralising fully overseas subsidiaries' FERM

This model predicts the likelihood among Malaysian public-listed multinational companies that manage FX risk to decentralise fully their overseas subsidiaries' FERM. Actually, this model attempts to determine predictors that appear to influence a company's inclination to allow full autonomy to its overseas subsidiaries for managing their own FX exposures, given that the company manages FX risk. This model also omits cases (companies) that did not manage FX risk. The dependent variable is (OCEN2). It measures whether or not a company decentralised fully its overseas subsidiaries' FERM.

This model uses three predictors. The first predictor is (MKTVAL_B). This was used earlier in the model that attempted to predict the logit on (JOINTRES). Briefly, this predictor measures the market capitalisation of a company in billions of Ringgit. The second predictor, (HINTRACO), was used in the previous model. It measures whether or not a company had a high level of intra-company transactions (more than 40% of total transactions). The third and final predictor is (VCHANGE). It measures a company's perception of its FX exposure increment in the future. The values of this predictor range from 1, when a company perceives or expects its exposures to decrease rapidly in the future, to 5, when a company perceives its exposures to increase rapidly in the future. Below, the fitted model is mathematically represented as:

$$\text{Logit(OCEN2)} = 4.56 - 0.13(\text{MKTVAL_B}) + 7.07(\text{HINTRACO}) - 1.83(\text{VCHANGE})$$

All the relevant statistical and analyses results about this model are found in Appendix J-9. All predictors were both statistically and substantively significant in relation to their impact on the companies' likelihood of decentralising fully their overseas

subsidiaries' FERM, or the companies' logit on (OCEN2). Although (MKTVAL_B) had a Wald statistic that was not statistically significant, its Likelihood Ratio (LR) test was significant. Therefore, all predictors, including (MKTVAL_B), are important in modelling the companies' inclination to decentralise fully their overseas subsidiaries' FERM. Based upon the standardised coefficients, the predictors, in descending order of impact on the logit on (OCEN2), are (MKTVAL_B), (HINTRACO), and (VCHANGE). These effects are outlined briefly below.

A RM 1 billion increase in market capitalisation of a company reduced the logit of decentralising fully its overseas subsidiaries' FERM by 0.13, on average, with other predictors held constant. Generally, this implies that a company with higher market capitalisation is less likely to allow full autonomy to its overseas subsidiaries for managing their own FX exposures.

Companies that had high levels of intra-company transactions (more than 40% of total transactions), compared to companies that had moderate or low levels of such transactions, had 7.07 higher logit of decentralising fully their overseas subsidiaries' FERM, on average, with other predictors unchanged. This means that companies with high intra-company transactions are more likely to allow full autonomy to their overseas subsidiaries for managing their own FX exposures, compared to companies with lower intra-company transactions.

A one-level increase in a company's perception of its FX exposure increment in the future, reduced the company's logit of decentralising fully its overseas subsidiaries' FERM, on average, by 1.83, with other predictors held constant. In other words, the higher a company's perception of its FX exposure increment in the future, the lower the company's likelihood of allowing full autonomy to its overseas subsidiaries to manage their own FX exposures.

Having described the predictor effects in brief above, next, the overall model is assessed. The number of cases per predictor, 14, was slightly less than the required minimum of 15. This implies that the statistical analyses from this model may be potentially unreliable. The three predictors, included in the model, increased model fit and prediction efficiency significantly, both statistically and substantively. The increase in model fit was about 30.42% while the increase in prediction efficiency was 50%.

This increase in prediction efficiency was also statistically significant.

This model did not suffer from the problems of multicollinearity, zero cells, or complete separation. The residual analysis revealed that predictor (HINTRACO) was dependent on case 89. However, greater examination reveals that the case is not particularly singular and that this symptom is partially due to the lack of variance in the values of the predictor, (HINTRACO) – very few cases (companies) had high levels of intra-company transactions. Therefore, all the predictor effects, including that of (HINTRACO), on the logit on (OCEN2), appear to be reliable.

The fitted predictors, (HINTRACO) and (VCHANGE), seem to have been reasonably fitted because their effects seem similar to the effects of their respective comparable categorised predictors, (INTRACO3) and (VCHANGE). See Graphs 9B and 9C at the end of Appendix J-9. However, the effect of fitted (MKTVAL_B) on the logit on (OCEN2) appeared rather dissimilar when compared to the effect of comparable categorised predictor (MKTVAL4) on the logit on (OCEN2). However, the model attributes with the categorised predictor was worse when compared to the model attributes with the fitted predictors. See Graph 9A at the end of Appendix J-9. Therefore, the fitted predictor appeared to be more acceptable than the categorised predictor. This then implies that all the fitted predictors appear to be acceptable. Consequently, the fitted model appears to be rather sound, notwithstanding the lack in the number of cases (per predictor) used in the model.

5.2.10. Allowing time flexibility for hedging

This model predicts the inclination among Malaysian public-listed multinational companies that manage FX risk to allow time flexibility for hedging an identified FX exposure. In other words, the model tries to identify the predictors that may explain a company's tendency to allow time flexibility for hedging. Again, this model excludes the cases (companies) that did not manage FX risk. The dependent variable is (LAPSE), and it measures whether or not a company allowed time flexibility in hedging.

The model uses only two predictors. The first predictor, (VSIZE3), measures a company's perception of its FX exposure size. Here, (VSIZE3) = 1 when the company perceives its exposure to be very small, while (VSIZE3) = 2 when the company perceives

its exposure to be small, moderate or large, and (VSIZE3) = 3 when the company perceives its exposure to be very large.[22] The second predictor is (FOREIGN3). This is a dichotomy that measures whether or not a company has a high level of FX exposure (more than 30% of its transactions denominated in foreign currencies). This predictor had been used in previously in the model on the logit on (MANAGE). The fitted model can be specified mathematically as found below:

Logit(LAPSE) = 3.28 –2.54(VSIZE3) +2.73(FOREIGN3)

Appendix J-10 presents all the necessary statistical and analyses results related to this fitted model. Both the predictors were clearly both statistically and substantively significant in relation to their impact on the companies' likelihood of allowing time flexibility for hedging an identified FX exposure or the companies' logit on (LAPSE). The Wald statistics of both predictors were significant. Based upon the standardised coefficients, the predictors, in descending order of impact on the logit on (LAPSE), are (VSIZE3), followed by (FOREIGN3). These effects are outlined briefly below.

A one level increase in a company's perception of its FX exposure size – as measured by (VSIZE3) – on average, decreased by 2.54, the company's logit of allowing time flexibility for hedging an identified FX exposure, with other predictors held constant. However, this rule is not applicable if the original variable, (VSIZE), is used. In fact, an increase in a company's perception of its FX exposure size from small to moderate, or high, does not appear to reduce the logit on (LAPSE). See Graph 10A, at the end of Appendix J-10. Notwithstanding this, the overall conclusion remains – the greater a company's perception of its FX exposure size, the lower its inclination to allow time flexibility for hedging.

Companies that had more than 30% of their transactions denominated in foreign currencies, compared to companies that had less transactions denominated in foreign currencies, on average, had 2.73 higher logit of allowing time flexibility for hedging an identified FX exposure, with the other predictor unchanged. This means that companies that had high levels of FX exposures were more likely to allow time flexibility for

[22]This predictor is, however, different from the predictor with the same label that was used to predict the logit on (ECONEXP) earlier. Nonetheless, this predictor too is re-coded from the original variable, (VSIZE), which was explained in the previous model. This predictor (VSIZE3) was fitted rather than the original variable (VSIZE), because the former increased model fit and improved other model characteristics better than the latter.

hedging an identified FX exposure, compared to companies that had low levels of FX exposure.

The predictor effects were briefly described above. Next, the overall model is assessed and discussed. The number of cases per predictor was very much greater than the required minimum. This implies that the statistical analyses from this model are reliable. The two predictors included in the model increased model fit, as well as, prediction efficiency significantly, both substantively and statistically. The predictors increased model fit by about 23.83% and prediction efficiency by about 48.28%, and these increases were also statistically significant.

This model did not suffer from multicollinearity. There is also no evidence of the problems of zero cells or complete separation. The residual analysis did not reveal any abnormal cases although there were some cases with unusual residual measures. Further, the fitted predictor effect of (VSIZE3) on the logit on (LAPSE) appeared to be similar when compared to the effect of comparable categorised predictor (VSIZE) on the logit on (LAPSE). See Graph 10A at the end of Appendix J-10. Consequently, the fitted predictor appears to be valid, and this model seems to be very reasonable on the whole.

5.2.11. Undertaking partial cover

This model predicts the inclination among Malaysian public-listed multinational companies that manage FX risk to undertake partial covers of FX exposures. This means also that the model attempts to identify predictors that may explain a company's likelihood of undertaking a partial cover of a FX exposure, given that it manages FX risk. This model also excludes cases (companies) that did not manage FX risk. The dependent variable is (PROPORT), and it measures whether or not a company undertook partial covers of FX exposures.

This model uses three predictors. The first predictor is a dichotomy, (HIFEQUTY), and it measures, whether or not, more than 10% of a company's equity is held by foreigners. It must be noted, however, that as the study is based upon Malaysian companies, by design, all the companies in the study, had at least 50% of their equity held by Malaysians. Therefore, when (HIFEQUTY) = 1, the proportion of equity of a company held by foreigners is more than 10% (but less than 50%), whereas, when (HIFEQUTY) =

0, the proportion of equity held by foreigners is only up to 10%. The second predictor is (FOREIGN3). This has been explained earlier in the previous model. Briefly, this measures whether or not a company had high FX exposure (more than 30% of transactions denominated in foreign currencies). The third and final predictor is (XPREDICT). This predictor measures a company's perception of its FX exposure unpredictability. Its values range from 1, when a company perceives its exposure to be very predictable, to 5, when a company perceives it to be very unpredictable. The fitted model is specified mathematically below.

$$\text{Logit(PROPORT)} = -5.85 + 3.83(\text{HIFEQUTY}) + 3.88(\text{FOREIGN3}) + 1.00(\text{XPREDICT})$$

The relevant statistics and analyses results of this fitted model are provided in Appendix J-11. All predictors were clearly both substantively and statistically significant in relation to their impact on the companies' probability of undertaking partial covers of FX exposures, or the companies' logit on (PROPORT). Although (XPREDICT) had a Wald statistic that was not statistically significant, its Likelihood Ratio (LR) test was significant. Therefore, all predictors, including (XPREDICT), are important in modelling the companies' inclination to undertake partial cover. Based upon the standardised coefficients, the predictors, in descending order of impact on the logit on (PROPORT), are (HIFEQUTY), (FOREIGN3), and finally, (XPREDICT). The effect of each is outlined briefly below.

Companies in which more than 10% of equity is held by foreigners (non-Malaysians) had, on average, 3.83 higher logit of undertaking partial cover, compared to companies in which less than 10% of equity is held by foreigners, with other predictors held constant. In other words, companies with higher foreign-held equity, compared to companies with less foreign-held equity, are more likely to undertake partial covers of FX exposures.

Companies that had more than 30% of their transactions denominated in foreign currencies, compared to companies that had less transactions denominated in foreign currencies, on average, had 3.88 higher logit of undertaking partial cover, with other predictors remaining unchanged. This means that companies that have high levels of FX exposure are more likely to undertake partial covers, compared to companies that have low levels of exposure.

A one level increase in a company's perceived exposure unpredictability, on average, increased, the company's logit of undertaking partial covers of FX exposures by 1.00, with all other predictors held constant. In other words, the greater a company's perceived FX exposure unpredictability, the greater the company's tendency to undertake partial cover.

Having described the predictor effects briefly above, next, the fitted model is evaluated. The number of cases per predictor was greater than the required minimum. This implies that the statistical analyses from this model are expected to be reliable. The three predictors incorporated into the model increased model fit as well as prediction efficiency significantly, both substantively and statistically. The model fit increase was about 38.98%, whereas the prediction efficiency increase was 46.00%. Both these increases were statistically significant.

This model did not have the problem of multicollinearity, neither the problems of zero cells nor complete separation. The residual analysis showed that the effect and significance of (XPREDICT) depended on case 79. However, this particular case is not singular as there are several other cases that have the same values on (XPREDICT) and (PROPORT). Moreover, there is no reason to remove the case. Therefore, all the fitted predictor effects, including (XPREDICT), on the logit on (PROPORT) appear to be reliable.

The fitted predictor effect of (HIFEQUTY) on the logit on (PROPORT) appear to be reasonably similar to the effect of comparable categorised predictor, (EQMSIAN4), on the logit on (PROPORT). See Graph 11B, at the end of Appendix J-11. However, the effect of fitted predictor (XPREDICT) did not appear to be very similar when compared to the effect of comparable categorised predictor, (XPREDICT).[23] However, the categorised predictor failed to provide better model attributes when compared to the fitted predictor. See Graph 11A, also at the end of Appendix J-11. This implies that the fitted effects, of both (HIFEQUTY) and (XPREDICT), on the logit of undertaking partial cover of FX exposure, are valid. Therefore, overall, the fitted model seems to be rather sound.

[23]This is due to the problem of zero cells – among cases (companies) that perceived their exposures were very unpredictable, and among those that perceived their exposures were very predictable, there were no case that did not undertake partial cover. This naturally increased the coefficient (and standard error) estimates for the categorised predictor, and resulted in the wide disparity between the fitted and the categorised logits.

5.2.12. Undertaking uncovered FX deals

This model predicts the inclination among Malaysian public-listed multinational companies to undertake uncovered (or naked) FX deals, given that the companies manage FX risk. The model, in other words, tries to identify predictors that may explain a company's likelihood of undertaking uncovered FX deals, given that the company manages FX risk. This model also omits cases that did not manage FX risk. The dependent variable is (UNOFFSET). It measures whether or not a company undertook uncovered FX deals.

This model uses five predictors. The first predictor, (PERSAL3), is a dichotomy that measures whether or not more than 25% of a company's total sales is denominated in foreign currencies. Thus, when more than 25% of a company's total sales is denominated in foreign currencies, (PERSAL3) = 1, otherwise (PERSAL3) = 0. The second predictor, (PERPUR3), also a dichotomy, measures whether or not more than 25% of a company's purchases is denominated in foreign currencies. Similarly, (PERPUR3) = 1 when more than 25% of purchases is denominated in foreign currencies, otherwise, (PERPUR3) = 0. The third predictor is (OSUBNUM). As seen earlier in the model on the logit on (ACCTEXP), the predictor measures the number of overseas subsidiaries owned by a company. The fourth predictor is (EQGOVT), and it measures the proportion of company equity that is held by government and government agencies. The fifth and final predictor is (STABLE1). This had been used earlier, in the models on the logit on (TRANEXP) and (USE3). Briefly, it is a dichotomy that measures whether or not a company expects its future exposures to be stable. Below, the model incorporating the five predictors is specified:

$$\text{Logit(UNOFFSET)} = 3.23 - 6.97(\text{PERSAL3}) - 5.02(\text{PERPUR3}) + 0.20(\text{OSUBNUM}) \ldots + 12.82(\text{EQGOVT}) + 5.83(\text{STABLE1})$$

Appendix J-12 presents all the necessary statistics and analyses results associated with the model. Each of the five predictors was both substantively and statistically significant in relation to its impact on the companies' probability of undertaking uncovered FX deals, or the companies' logit on (UNOFFSET). Every predictor's Wald statistic was significant. Based upon the standardised coefficients, the predictors, in descending order of impact on the logit on (UNOFFSET), are (PERSAL3), (PERPUR3), (OSUBNUM), (EQGOVT) and (STABLE1). These effects, in turn, are interpreted briefly

below.

Companies that had more than 25% total sales denominated in foreign currencies had, on average, 6.97 lower logit of undertaking uncovered FX deals, compared to companies that had less proportion of sales denominated in foreign currencies, with other predictors kept unchanged. This means that companies that have high levels of sales exposure are less likely to undertake uncovered FX deals, compared to companies that have low levels of sales exposure.

Similarly, companies that had more than 25% total purchases denominated in foreign currencies had, on average, 5.02 lower logit of undertaking uncovered FX deals, compared to companies that had less proportion of purchases denominated in foreign currencies, with other predictors remaining constant. This means that companies that have high levels of purchases exposure are less likely to undertake uncovered FX deals, compared to companies that have low levels of purchases exposure.

An additional overseas subsidiary increased the company's logit of undertaking uncovered FX deals, on average by 0.20, with other predictors held constant. Generally, this implies that the greater the number of overseas subsidiaries of a company, the greater the company's likelihood of undertaking uncovered FX deals.

Hypothetically, a 100% increase in a company's equity proportion held by government, increased the logit of undertaking uncovered FX deals, by 12.82 on average with other predictors held constant. This essentially means that the greater a company's proportion of equity held by government, the greater the company's inclination to undertake uncovered FX deals.

Companies that had perceived they had stable FX exposures or exposure patterns had, on average, 5.83 lower logit of undertaking uncovered FX deals, compared to companies that had perceived they had unstable exposure patterns, with other predictors remaining unchanged. This means that a company that perceives it has more stable FX exposure is less likely to undertake uncovered FX deals, compared to companies that perceives it has unstable exposures.

The predictor effects were briefly described above. Next, the fitted model is assessed for overall soundness. The number of cases per predictor in the model was very low, lower than the required minimum. Thus, the statistical analyses arising from this model

could be unreliable. Nonetheless, the five predictors included in the model increased model fit as well as prediction efficiency significantly, both substantively and statistically. The inclusion of the five predictors increased model fit by around 49.77% and prediction efficiency by 60%. These are in themselves quite remarkable. Further, these increases were also statistically significant.

There is no multicollinearity in the model. There were also no apparent symptoms of zero cells or complete separation problems. The residual analysis identified a few cases with unusual residual measures. The predictor (PERPUR3) appears to be dependent on case 68, whereas (OSUBNUM) seems to be dependent on case 22. However, neither of these cases appeared to be singular because there were other cases that had similar values on (PERPUR3) and (UNOFFSET), or (OSUBNUM) and (UNOFFSET). Therefore, all the predictor effects in this model seem reliable.

The effects of fitted predictors (OSUBNUM) and (EQGOVT), on the logit on (UNOFFSET), appear to be reasonably representative of the effects of comparable categorised predictors, respectively, (OSUB3) and (EGOVT4). See Graphs 12A and 12B, at the end of Appendix J-12. This implies that these fitted effects on the logit on (UNOFFSET) are valid. Finally, despite the small number of cases (per predictor) used in the model, the fitted model appears to be rather sound.

5.2.13. Using forward contracts

This model predicts the likelihood of using forward contracts to manage transaction exposure among Malaysian public-listed multinational companies. In other words, the model tries to identify the predictors that may explain a company's inclination to use forward contracts to manage transaction exposure. Notably, this and the next model exclude cases (companies) that did not manage transaction exposure. The dependent variable is (FORCON1), and it measures whether or not a company used forward contracts to manage transaction exposure.

This model uses three predictors. The first predictor is (ASSETS_B), and as seen earlier, it measures a company's total assets in billions of Ringgit. The second predictor is (PERFIN3). This has been explained earlier in the sections that deal with the models on the logit on (ECONEXP) and (USE3). Briefly, this measures whether or not a company

had a high level of financing exposure (more than 25% of financing transactions denominated in foreign currencies). The third and final predictor is (FOREIGN3). This predictor too had been used a few times earlier. Briefly, this measures whether or not a company had a high level FX exposure (more than 30% of transactions denominated in foreign currencies). The fitted model is represented mathematically below.

$$\text{Logit(FORCON1)} = 0.82 + 0.48(\text{ASSETS_B}) - 3.82(\text{PERFIN3}) + 2.60(\text{FOREIGN3})$$

All the relevant statistical and analyses results of this fitted model are given in Appendix J-13. All predictors were clearly both substantively and statistically significant in relation to their impact on the companies' likelihood of using forward contracts to manage transaction exposure, or the companies' logit on (FORCON1). Although (ASSETS_B) had a Wald statistic that was not statistically significant, its Likelihood Ratio (LR) test was significant. Therefore, all predictors, including (ASSETS_B), are important in modelling the companies' likelihood of using forward contracts to manage transaction exposure. Based upon the standardised coefficients, the predictors, in descending order of impact on the logit on (FORCON1), are (ASSETS_B), (PERFIN3), and finally, (FOREIGN3). The effect of each is outlined, in turn, briefly below.

An increase of RM 1 billion in total assets of a company increased the company's logit of using forward contracts to manage transaction exposure, on average, by 0.48, with other predictors held constant. In other words, the greater a company's total assets, the greater the company's likelihood of using forward contracts to manage transaction exposure.

Companies that had more than 25% of their financing transactions denominated in foreign currencies, compared to companies that had less financing denominated in foreign currencies, had 3.82 lower logit of using forward contracts to manage transaction exposure, on average with other predictors remaining unchanged. In other words, companies that have high levels of financing exposure are less likely to use forward contracts to manage transaction exposure, compared to companies that have low levels of financing exposure.

Companies that had more than 30% of their transactions denominated in foreign currencies, compared to companies that had less transactions denominated in foreign currencies, on average, had 2.60 higher logit of using forward contracts for managing transaction exposure, with other predictors unchanged. This means that companies that had high levels of FX exposure were more likely to use forward contracts to manage transaction exposure, compared to companies that had low levels of exposure.

Having described the predictor effects briefly above, next, the fitted model is evaluated. The number of cases per predictor was greater than the required minimum. This implies that the statistical analyses from this model are expected to be reliable. The three predictors that were included increased model fit significantly, both statistically and substantively. The increase in model fit as a result of the inclusion of the predictors was about 28.55%. However, the predictors failed to increase prediction efficiency significantly. The increase in prediction efficiency was only about 14.29%, and furthermore, this was not statistically significant. This was probably due to the fact that only seven cases (companies), out of the 56 valid cases in the analysis, had not used forward contracts. In other words, the variance in the values of (FORCON1) was very low. Under such circumstances, as explained earlier, the criterion of model fit is superior to the criterion of prediction efficiency in assessing the model or the usefulness of the group of predictors. Since the three predictors increased model fit significantly, the predictors can be considered to be important.

Besides that, the model is not affected by multicollinearity. The residual analysis did not reveal anything abnormal. Moreover, the fitted predictor (ASSETS_B) appeared reasonably representative of the comparable categorised predictor (ASSET4). See Graph 13A, at the end of Appendix J-13. This implies that the fitted effect of total assets on the logit of using forward contracts to manage transaction exposure seems to be valid. Consequently, on the whole, the fitted model seems to be rather reliable, despite the lack of variance in the dependent variable, (FORCON1).

5.2.14. Using forward contracts extensively

This final model predicts the likelihood, among Malaysian public-listed multinational companies, of using forward contracts extensively to manage transaction exposure. Actually, the model tries to identify the predictors that may explain a company's inclination to use forward contracts extensively to manage transaction exposure. Again, this model excludes the cases (companies) that did not manage transaction exposure. The dependent variable is (FORCON2). It measures whether or not a company used forward contracts extensively. When a company uses forward contracts to manage or hedge more than 60% of its transaction exposure volume, the company is defined to use forward contracts extensively.

This model uses only two predictors. The first predictor is (PERFIN3). It is a dichotomy that had been used in the previous model. It measures whether or not a company had a high level of financing exposure (more than 25% financing transactions denominated in foreign currencies). The second predictor is (BOARD). This is a dichotomy that measures whether or not a company is listed in the second board of the KLSE. Thus, (BOARD) = 1 if a company is listed on the second board, or otherwise (BOARD) = 0, when the company is listed on the main board. The fitted model can be specified mathematically as found below.

$$\text{Logit(FORCON2)} = 0.22 - 9.30(\text{PERFIN3}) - 1.73(\text{BOARD})$$

Both the predictors were clearly substantively and statistically significant in relation to their impact on the companies' likelihood of using forward contracts extensively for managing transaction exposure, or the companies' logit on (FORCON2). Although (PERFIN3) had a Wald statistic that was not statistically significant, its Likelihood Ratio (LR) test was significant.[24] Therefore, both predictors are important in modelling the likelihood of companies using forward contracts extensively to manage transaction exposure. Based upon the standardised coefficients, the predictors, in descending order of impact on the logit on (FORCON2), are (PERFIN3), followed by (BOARD). These effects are interpreted briefly below.

[24]This is because of the problem of zero cells – among cases (companies) that had more than 25% financing transactions denominated in foreign currencies, none had used forward contracts extensively. This caused the coefficient and standard error estimates to be extraordinarily large, and therefore, affected the Wald statistic of (PERFIN3).

Companies that had more than 25% of their financing transactions denominated in foreign currencies, compared to companies that had less financing denominated in foreign currencies, had 9.30 lower logit of using forward contracts extensively to manage transaction exposure, on average, with other predictors held constant. In other words, companies that have high levels of financing exposure are less likely to use forward contracts extensively to manage transaction exposure, compared to companies that have low levels of financing exposure.

Companies listed on the second board of the KLSE, compared to those listed on the main board, on average, had 1.73 lower logit of using forward contracts extensively, with other predictors remaining unchanged. This means that second board companies are less likely to use forward contracts extensively to manage transaction exposure, compared to main board companies.

The predictor effects were briefly described above. Next, the overall model is assessed and discussed. The number of cases per predictor was adequately greater than the required minimum. This implies that the statistical analyses from this model are reliable. The two predictors included in the model increased model fit significantly, both statistically and substantively. The predictors increased model fit by about 21.22% and this increase was statistically significant.

However, the predictors increased prediction efficiency by only 18.18% and this increase was not statistically significant. Although the variance in the values on (FORCON2) was not low, both the predictors included in the model were dichotomies. Therefore, under such circumstances, using the criterion of model fit is often better than the criterion of prediction efficiency in assessing the usefulness of the group of predictors in a model. As the two predictors increased model fit significantly, the predictors can be accepted to be important. Besides that, the model did not suffer from multicollinearity, and the residual analysis did not reveal any abnormal cases. Therefore, overall, this model seems to be reasonable despite the poor improvement in prediction efficiency.

SUMMARY

As mentioned earlier, Appendix I provides a summary of the major attributes and characteristics of all models discussed in this chapter. Apart from that, Table 5.2 presents all the predictor effects in a single table. This clearly indicates the direction of the effects and enables cross-comparison of effects for different FERM activities. These points are the bases of the discussions in the next chapter. The following points constitute a summary of the findings presented in this chapter. These indicate the aggregate, conditional, effects between a given dependent variable (a particular FERM activity) and the relevant predictor variables. Notice that the effects are conditional on the provision that the other predictors are constant.

1. A company was more likely to manage FX risk if the company had: ① greater total assets, ② a high level of FX exposure, rather than a low level of exposure, and ③ perceived higher exchange rate volatility. This model appears to be quite reliable.

2. A company was more likely to manage all three FX exposure types, i.e., accounting, economic, and transaction exposures, if the company had: ① perceived it had greater FX exposure, ② a high level of financing exposure, rather than a low level of financing exposure, ③ perceived its FX exposures were stable, rather than unstable, and ④ lower total assets. This model too appears to be quite reliable.

The findings below are based only on companies that managed FX risk. Therefore, the findings below ought to be interpreted as effects between a particular FERM activity and the relevant predictors, given the condition that the company managed FX risk.

3. A company was more likely to manage accounting exposure if the company had: ① lower total assets, ② greater total debt, ③ total debt that was either low or high, rather than moderate, and ④ a greater number of overseas subsidiaries. This model seems reliable despite the presence of multicollinearity involving two predictors, total assets, and total debt, of a company. Apart from that, the effect of the number of overseas subsidiaries appears doubtful as the effect seems to rest on a single extreme case.

4. A company was more likely to manage economic exposure if the company had: ① a high level of financing exposure, rather than a low level of financing exposure, ② lower total assets, and ③ perceived it had greater FX exposure. The increase in model fit as a result of the inclusion of the predictors was statistically significant and substantive but it

Table 5.2: Summary of predictor effects on specific FERM activities

	Predictor	FERM activity	Manage FX risk	Manage accounting exposure	Manage economic exposure	Manage transaction exposure	Manage all three FX exposure types	Adopt formal FERM objective	Share FERM responsibility	Decentralise fully domestic subsidiaries' FERM	Decentralise fully overseas subsidiaries' FERM	Allow time flexibility for hedging	Undertake partial cover	Undertake uncovered FX deal	Use of forward contracts	Use forward contracts extensively
1	Total assets		+	--	+		--	+							+	
2	Total market capitalisation								--		--					
3	Total sales							+								
4	Total debt			+^				+								
5	Debt ratio *									--						
6	Foreign-held equity *												+			
7	Government-held equity													+		
8	Listing (main) board *															+
9	Property or construction sectors # *								+							
10	Consumer sector # *								--							
11	FX exposure *		+									+	+		+	
12	Sales exposure *													--		
13	Purchases exposure *													--		
14	Capital investment exposure *									+						
15	Financing exposure *				+		+								--	--
16	Number of overseas subsidiaries			+										+		
17	Moderate level of intra-company transactions *							--								
18	Intra-company transactions *									+	+					
19	Perceived FX exposure size				+		+		+			--				
20	Perceived exchange rate volatility		+													
21	Perceived FX risk level					+										
22	Perceived FX exposure increment										--					
23	Perceived FX exposure unpredictability												+			
24	Perceived FX exposure stability *					+	+							--		

KEY

+ Positive effect

-- Negative effect

^ Non-linear effect

* Dichotomous predictor

Effect seems unreliable

...compared to industrial, trade/services, or plantation, sectors

was rather small. Further, there is some doubt about the reliability of the effect of total assets as it appears to rest on one extreme case.

5. A company was more likely to manage transaction exposure if the company had: ① perceived its FX exposures were stable, rather than unstable, and ② perceived it had higher FX risk level. This model suffers severely from the lack of variance in the dependent variable – very few companies that managed FX risk did not manage transaction exposure. Therefore, there is not much variance in the dependent variable to be explained by the model. Nonetheless, the two identified predictors appear to be rather reliable in terms of their impact on a company's likelihood of managing transaction exposure.

6. A company was more likely to adopt a formal FERM objective if the company had: ① lower total debt, ② greater total assets, ③ either a low or high level of intra-company transactions, rather than a moderate level of intra-company transactions, and ④ greater total sales. This model seems satisfactory in spite of the presence of multicollinearity, again, involving the total assets and total debt of a company. However, apart from that, the reliability of the effects of total assets and total debt on a company's likelihood of adopting a formal FERM objective appear to rest respectively on two singular extreme cases.

7. A company was more likely to share FERM responsibility among two or more departments if the company had: ① lower total market capitalisation, ② been listed on the property or construction sectors, rather than the industrial, trade and services, or plantation sectors, or ③ been listed on the industrial, trade and services, or plantation sectors, rather than the consumer sector, and ④ had perceived it has greater FX exposure. This model appears to be reliable.

8. A company was more likely to decentralise fully its domestic subsidiaries' FERM if the company had: ① a low level of debt ratio (debt to total assets), rather than a high level of debt ratio, ② a high level of intra-company transactions, rather than a low or moderate level of intra-company transactions, and ③ a high level of capital investment exposure, rather than a low level of capital investment exposure. This model is affected by the lack of variance in the dependent variable – very few companies has allowed full autonomy to their domestic subsidiaries to manage their own FX exposures. Partly due to this, the predictors included in the model failed to increase prediction efficiency

significantly. However, as the increase in model fit is adequately significant and substantive, the predictors can be accepted to be relevant and important.

9. A company was more likely to decentralise fully its overseas subsidiaries' FERM if the company had: ① lower total marker capitalisation, ② a high level of intra-company transactions, rather than a low or moderate level of intra-company transactions, and ③ perceived it had a lower FX exposure increment in the future. This model appears satisfactory despite the number of cases per predictor used in the analysis being a little less than the rule-of-thumb. However, this does not seem to pose any problem.

10. A company was more likely to allow time flexibility for hedging if the company had: ① perceived it had greater FX exposure, and ② a high level of FX exposure, rather than a low level of exposure. This model appears to be very satisfactory.

11. A company was more likely to undertake partial cover of FX exposures if the company had: ① a high proportion of its equity held by foreigners, rather than a low proportion, ② a high level of FX exposure, rather than a low level of exposure, and ③ perceived it had greater FX exposure unpredictability. This model appears to be quite reasonable.

12. A company was more likely to undertake uncovered FX deals if the company had: ① a low level of sales exposure, rather than a high level of sales exposure, ② a low level of purchases exposure, rather than a high level of purchases exposure, ③ a higher number of overseas subsidiaries, ④ a greater proportion of its equity held by the government, and ⑤ perceived its FX exposures were unstable, rather than stable. The number of cases per predictor used in the analysis was very small. However, this did not appear to have caused any apparent problem in the model.

The following findings are based only upon companies that managed transaction exposure. Therefore, the findings below ought to be interpreted as effects between the given FERM activity (use of forward contracts) and the relevant predictors, given the condition that the company managed transaction exposure.

13. A company was more likely to use forward contracts to manage transaction exposure, if the company had: ① greater total assets, ② a low level of financing exposure, compared to a high level of financing exposure, and ③ a high level of FX exposure, compared to a low level of FX exposure. The lack of variance in the

dependent variable seems to be the major problem – very few companies that managed transaction exposure had not used forward contracts to manage transaction exposure. This is partly the cause for the non-significant increase in prediction efficiency. However, as the model fit increase is significant and substantive, the predictors and the model on the whole seem reliable.

14. A company was more likely to use forward contracts extensively to manage transaction exposure if the company: ① had a low level of financing exposure, rather than a high level of financing exposure, and ② been listed on the main board, rather than the second board, of KLSE. The predictors in this model failed to increase prediction efficiency significantly. This is possibly due to the use of only two dichotomous predictors in the model. The possible combinations of values involving dichotomous predictors are finite. This makes it difficult to increase prediction efficiency. However, model fit increase is both significant and substantive, and therefore, the predictors and the model seem to be acceptable.

In short, this chapter was dedicated to identifying predictors that seem to influence companies' inclinations to undertake specific FERM activities. In the next chapter, these findings are further discussed, synthesised, and aggregated, in order derive the relevant conclusions in the following chapter. To recap, these are attempts to address the second broad research question – why do companies' manage FX risk, or more specifically, what predictors influence the companies' inclinations to undertake specific FERM activities.

Chapter 6

Discussion of Predictor Effects on FERM Activities

INTRODUCTION

This chapter is dedicated to exploring why certain predictors might influence particular FERM activities as found in the previous chapter. In other words, it provides rationales and justifications that explain the findings presented in the previous chapter. In exploring the rationales and justifications, the chapter also considers the relevant findings from prior studies. Therefore, this chapter brings together the findings from Chapter 5 and Chapter 2. However, the findings about predictor effects on corporate FERM activities are numerous and diverse, as seen in the previous chapter. Consequently, this chapter also attempts to synthesise, aggregate, and condense these findings, primarily to enable the study to draw a few succinct and meaningful conclusions about predictor effects on corporate FERM, which is attempted in the next chapter. Therefore, there are two parts to this chapter. The first part explores the justifications and rationales for the predictor effects found in the previous chapter. The second part synthesises and condenses these findings.

6.1. Explaining predictor effects

In this first part of the chapter, the findings (predictor effects) presented in the previous chapter are explained. More precisely, rationales and justifications that might explain these observed findings are explored. The discussion in this part is organised along the same structure used to present the findings in the last chapter, i.e., based upon the following sequence of 14 dependent variables or specific FERM activities: (1) managing FX risk, (2) managing accounting exposure, (3) managing economic exposure, (4) managing transaction exposure, (5) managing all three FX exposure types, (6) adopting formal FERM objective, (7) sharing FERM responsibility, (8) decentralising fully domestic subsidiaries' FERM, (9) decentralising fully overseas subsidiaries' FERM, (10) allowing time flexibility for hedging, (11) undertaking partial cover, (12) undertaking uncovered FX deals, (13) using forward contracts, and (14) using forward contracts extensively. The discussions revolve around the findings from this study, but where relevant, comparable findings from prior empirical researches are also reviewed in the sections below.

6.1.1. Managing FX risk

This study found that a company was more likely to manage FX risk, with all other predictors constant, when the company had ❶ greater total assets, ❷ a high level of FX exposure, and ❸ perceived higher exchange rate volatility. The reasons that might underlie the effect of each predictor on companies' inclination to manage FX risk are discussed below. Besides, there are also some relevant findings by several prior empirical studies that tried to identify factors that influence companies' inclination to manage FX risk, or companies' use of derivatives. These findings are also reviewed, where relevant, below.

Total assets

This study indicated that a company that had greater total assets was more likely to manage FX risk, with other predictors held constant. Firstly, FERM requires personnel with the necessary skills and knowledge to deal in FX. Secondly, the initial costs of setting-up and the fixed costs of administering the FERM programme are rather high. Therefore, a company that has greater total assets, i.e., a larger company, generally has greater resources or greater access to resources to employ persons with the necessary expertise, and to meet the cost needs of the programme. Moreover, larger companies are often offered better spreads on FX deals and cheaper access to foreign currency borrowing, and therefore, they encounter lower costs of using hedging tools. In short, a larger company has greater capacity to manage FX risk. In the words of Nance et al. (1993), larger companies have greater "informational and transactional scale economies" in managing FX risk compared to smaller companies. The effect of company size on a company's inclination to manage FX risk was the most enduring among the many effects found in previous studies. Almost all studies found that larger companies were more likely to hedge, use derivatives, or manage financial or FX risks. Batten et al. (1993), Dolde (1993), Bodnar et al. (1995), and Phillips (1995) all found similar results, while Nance et al. (1993), Berkman and Bradbury (1996), and Mian (1996) had provided robust evidence that established this fact.

FX exposure

Companies that had high levels of FX exposure (more than 30% of total transactions denominated in foreign currencies), compared to those with low levels of FX exposure (up to 30%), were more likely to manage FX risk, with other predictors unchanged. This result is hardly surprising as companies with larger FX exposures, or larger FX involvement, have greater need to manage these exposures. However, the results from previous studies were not as robust as would have been expected. In fact, only Berkman and Bradbury (1996) had included companies' FX involvement, among other predictors, to see its impact on the companies' likelihood and extent of using derivatives. The impact was weak and not statistically significant. Only the unconditional effect, i.e., the impact without controlling for the effects of other factors, was significant in that study. Apart from that, Abdel-Malek (1976) also provided similar unconditional effect of FX involvement. Therefore, the result of this study is important in advancing the importance of this predictor, companies' FX exposure, in influencing the companies' inclination to manage FX risk.

Perceived exchange rate volatility

Generally, a company that perceived higher exchange rate volatility was more likely to manage FX risk, with other predictors kept constant. This finding makes intuitive sense. Companies that feel exchange rates are more volatile are probably more sensitive towards FX risk, and are more averse to FX risk. Therefore, these companies are more likely to manage FX risk to reduce or control this risk. This concept or predictor, however, was not formally used or measured in previous researches. Therefore, this study highlights the possible importance of companies' perception of exchange rate volatility in influencing their inclination to manage FX risk.

However, this study did not include three predictors that have been found to be robust, in prior studies, in predicting companies' likelihood of hedging FX risk, or using derivatives. These predictors are ① dividend payout, ② asset liquidity, and ③ tax shield. Apart from these, this study also omitted other predictors that had been used previously but were significant in only one study or were only weakly significant. These predictors include ④ long-term debt (ratio of long term debt over total debt), and ⑤ interest coverage. Therefore, due to the omission of these predictors, the relevant findings from this study cannot be taken as conclusive. Nonetheless, the effects of total

assets (company size) and FX exposure, found in this study, appears to be quite reliable because there have been corroborative evidence from prior studies. Consequently, it can be confidently stated that a company's ① total assets and ② level of FX exposure positively influenced the company's likelihood of managing FX risk. The effect of a company's perception of exchange rate volatility, however, is less dependable because of the omission of predictors described above.

6.1.2. Managing accounting exposure

This study found that a company was more likely to manage accounting exposure, given that it managed FX risk, with all other predictors held constant, when the company had ❶ lower total assets, ❷ greater total debt, but ❸ a low or high (rather than moderate) level of total debt, and ❹ a greater number of overseas subsidiaries. The possible rationales for these conditional predictor effects are discussed below.[1] Notably, there is no parallel finding from previous studies because they did not investigate the factors that influence companies' inclination to manage accounting exposure.

Total assets

In general, a company that had greater total assets, given that it managed FX risk, was less likely to manage accounting exposure, with other predictors remaining unchanged. This is a rather unexpected finding, but this may reflect that larger companies are better able to assume the translation risk arising from uncovered accounting exposure. In the academic literature, accounting exposure or risk is generally accepted to merely reflect paper (as opposed to real) loss or gain in FX. Therefore, the management of accounting exposure is broadly seen to be less important. However, there are some arguments that suggest accounting exposure might have real implications especially in an inefficient market with information asymmetry. Particularly, it might be valuable for a company to manage accounting exposure to ensure that the reported translation FX loss does not undermine the perceived company value in the eyes of investors and creditors. However, it might be more necessary for smaller companies to manage this exposure because they might have less access to external financing resources, impeded by greater

[1] The assessment of the fitted model in the previous chapter found the presence of multicollinearity problem in the model. However, as argued earlier, the problem did not appear serious.

information asymmetry. In short, a larger company seems to have greater capacity to assume the risk arising from not managing accounting exposure, mainly because a larger company encounters less market inefficiency, and therefore, has less need to manage accounting exposure to protect its reported (paper) net-worth from the fluctuations in exchange rates.

Total debt

The greater a company's debt, the greater was the company's likelihood of managing accounting exposure, given that it managed FX risk, with other predictors remaining unchanged. Generally, having greater debt implies that a company has greater dependence on debt to expand operations or to replace maturing debt (i.e., to maintain its capital structure). Often, creditors impose restrictions and debt agreement conditions based upon accounting ratios that might be adversely affected by translation due to exchange rate changes. Consequently, the company that has greater debt might have greater need to manage accounting exposure to ensure that its FX translation losses do not adversely affect the company's compliance with debt agreement conditions and its chances of obtaining further debt financing in the future.

However, among companies that managed FX risk, companies that had moderate levels of total debt (between RM 70 million and RM 700 million), compared to those that had either low or high levels of total debt, were less likely to manage accounting exposure, with other predictors remaining constant. As implied above, accounting exposure can affect a company's consolidated financial statements, and thereby, creditors' perception of the company's value, and in turn, its debt capacity. Broadly, a company that has a moderate level of debt is probably less concerned about expanding or defending its debt capacity simply because it already has an established level of debt capacity – close to the average level of debt based on the levels of total debt used by other companies. Further, the cost of debt is generally lowest at the moderate level of debt.[2] First, there is *lumpiness* in the issuance of debt. This means that companies would not be able to issue debt for very small amounts or they would find such debt to be very expensive. Second, there is a fixed cost component in issuing debt. This reflects that the cost of

[2] Furthermore, there appears to be general acceptance in the financial literature that the weighted average cost of capital for a company is lowest at the moderate level of debt. For an excellent compilation and review of the arguments regarding this, see Brealey and Myers (1996), specifically, pp.475-505.

debt (as a percentage of debt issued) decreases with the increase in the amount of debt. These two points imply that the cost of debt when the amount of debt is small (as opposed to moderate) could be comparatively higher. On the other hand, when the amount of debt is high, indebted companies face greater financial distress and risk of default (bankruptcy), and therefore, encounter higher costs of debt. Consequently, consistent with these arguments, a company that has a moderate level of debt, and already enjoys low cost of debt, is less likely to be sensitive about managing accounting exposure.

Number of overseas subsidiaries

Given that a company managed FX risk, the greater the number of its overseas subsidiaries, the greater was its likelihood of managing accounting exposure, with other predictors remaining constant. Translation risk arises due to the need to periodically consolidate financial statements of various overseas operating units (or subsidiaries). Companies that have greater numbers of overseas subsidiaries might, therefore, probably be more sensitive to accounting exposure because the appearance of their consolidated financial statements has greater chances of being adversely affected by exchange rate movements. Consequently, it is not surprising that companies with larger numbers of overseas subsidiaries were more likely to manage this translation risk that arises from accounting exposure. However, in the previous chapter, it was noted this predictor effect, the number of overseas subsidiaries, on the companies' inclination to manage accounting exposure relied heavily on a singular extreme case. This characteristic casts doubt on the reliability of this effect. In other words, it is difficult to state with confidence that the number of overseas subsidiaries of a company influenced its likelihood of managing accounting exposure. Nonetheless, the other predictor effects (discussed above) appear reliable.

6.1.3. Managing economic exposure

In this study, a company was more likely to manage economic exposure, given that it managed FX risk, with all other predictors remaining invariant, when the company had ❶ a high level of financing exposure, ❷ lower total assets, and ❸ perceived it had greater FX exposure. The explanations for the three predictor effects are explored

below.[3] As with the activity of managing accounting exposure above, prior empirical studies did not investigate factors that influence companies' inclination to manage economic exposure, and therefore, they provided no relevant finding.

Financing exposure

Among companies that managed FX risk, those with high levels of financing exposure (more than 25% of financing transactions denominated in foreign currencies), compared to those with low levels of financing exposure (up to 25%), were more likely to manage economic exposure, with other predictors remaining unchanged. This implies that the greater a company's financing exposure, the greater was the company's likelihood of managing economic exposure. Generally, the processes of obtaining financing in foreign currencies are more elaborate compared to making sales and purchases in foreign currencies. Further, rescheduling of payment obligations in financing exposures is broadly more inflexible compared to that in sales or purchases exposures. Besides that, the individual exposures from financing (or borrowing) are usually larger in size compared to individual exposures from sales or purchases. Moreover, financing exposures tend to be for longer terms compared to sales or purchases exposures. Therefore, a company that has greater financing exposure is generally exposed to greater FX risk, compared to another company with the same amount of total FX exposure but less financing component exposure. Consequently, managing financing exposures could be more crucial, compared to managing sales or purchases exposures. However, hedging financing exposure is more difficult. Indeed, conventional hedging instruments are either unsuitable or simply unavailable to cover long-term financial exposures. Therefore, the company with greater financing exposure might have to manage the exposure by attempting to hedge company-wide exposures from a longer-term perspective using multi-departmental operational strategies, rather than using purely financial hedging instruments. These strategies are very congruent with the strategies used for managing economic exposure. Therefore, it is possible that the company with greater financing exposure was more likely to manage economic

[3] The assessment of the fitted model in the previous chapter showed that this model did not provide a good level of fit, although the model fit was statistically and substantively significant. This implies that the set of included predictors explained only a small portion of the companies' inclination to manage economic exposure. In other words, it suggests the need to include other important factors or predictors that have not been examined in this study.

exposure, partly in order to manage its longer-term and more critical exposures.

Total assets

In general, a company with greater total assets, given that it managed FX risk, was less likely to manage economic exposure, with other predictors remaining unchanged.[4] This is similar to the effect of companies' total assets on the companies' likelihood of managing accounting exposure, seen above. Again, this probably implies that larger companies have greater capacity to assume the risk arising from not managing the exposure. Alternatively, it is also possible that larger companies tend to specialise their functions, and are less likely to manage economic exposure that ideally requires greater co-ordination and co-operation among several departmental functions in the company. In short, a larger company that manages FX risk seems less inclined to manage economic exposure because it has ① greater capacity to assume the risk from not managing the exposure, and ② greater inhibition to cross-functional co-operation that is required to effective economic exposure management.

Perceived FX exposure size

A company that perceived it had greater FX exposure was more likely to manage economic exposure, given that the company managed FX risk, with all other predictors being constant. A company that perceives it has greater exposure probably feels it has greater need to manage the exposures using perspectives that focus on the company-wide, longer-term, and competitive (or dynamic) exposures, and not to merely focus on the management of contractual transaction exposures. Of course, the former is the primary attribute of economic exposure management. Therefore, a company that perceives it has greater FX exposure size is more likely to manage economic exposure.

[4] However, the analysis of residuals in the previous chapter indicated that the effect of a company's total assets on its inclination to manage economic exposure depended crucially on a singular extreme case. This undermines the reliability of this particular predictor effect. However, the finding on a related effect of a company's total assets on its inclination to manage all three FX exposure types (seen later) implies that this present effect is also likely to be reliable. In other words, despite the results of the residual analysis, this predictor effect can be accepted to be reliable.

6.1.4. Managing transaction exposure

The study found that a company was more likely to manage transaction exposure, given that it managed FX risk, with the other predictor kept constant, when the company had ❶ perceived it had stable FX exposures, and ❷ perceived it had greater FX risk. The justifications for the two effects identified in this study are discussed below.[5] Again, as with the previous two FERM activities, prior researches did not attempt to identify factors that influence companies' inclination to manage transaction exposure. Therefore, prior researches provide no comparable finding.

Perceived FX exposure instability

Among companies that managed FX risk, those that perceived they had stable FX exposure patterns, compared to those that perceived they had unstable FX exposure patterns, were more likely to manage transaction exposure, with the other predictor being constant. This means that a company that perceived that it had a more stable FX exposure pattern was more inclined to manage transaction exposure. To recap, in this study, a company is defined to perceive it has a stable FX exposure pattern when the company felt that its exposures had not changed drastically over time. Possibly, companies that perceived they had stable FX exposures were more convinced of setting up the programme to manage these exposures. Understandably, companies that believed they had unstable FX exposures were less willing to invest in, and dedicate resources for, the transaction exposure management programme, because they had expected the exposure patterns to change every year.

Perceived FX risk

Broadly, a company that perceived it had a higher level of FX risk, given that it managed FX risk, was more likely to manage transaction exposure, with the other predictor held constant. This result is unsurprising. Companies that perceive they have higher levels of FX risk, naturally, would be more inclined to manage transaction

[5] In the previous chapter, the evaluation of the fitted model revealed that the model did not improve predictive efficiency at all (compared to chance), although it provided good fit. However, this was mainly due to the lack of variance in the dependent variable and the nature of predictor variables used. Nonetheless, the primary criterion, model fit, was good, and given these conditions, this implies that the two predictors are important in explaining companies' inclination to manage transaction exposure.

exposure to address their risk. Moreover, as pointed out earlier in Chapter 4, transaction exposure appears to be the prime focus among most companies that managed FX risk.

6.1.5. Managing all three FX exposure types

This research indicated that a company was more likely to manage all three FX exposure types, with all other predictors held constant, when the company had ❶ perceived it had greater FX exposure, ❷ a high level of financing exposure, ❸ lower total assets, and ❹ perceived it had stable FX exposures. The reasons for the observed predictor effects of this study are explored below. However, yet again, prior research works do not provide comparable findings because they did not attempt to identify predictors that influence this particular corporate FERM activity.

Perceived FX exposure size

Generally, a company that perceived it had greater FX exposure was more likely to manage all three FX exposure types, with other predictors remaining constant. This finding is not surprising. Conceivably, a company that feels it faces greater FX exposure is probably more concerned and sensitive about its overall risk, and therefore, is more inclined to manage all three types of FX exposure to reduce the potential risk arising from not managing these exposures.

Financing exposure

Companies with high levels of financing exposure (more than 25% of financing transactions denominated in foreign currencies), compared to those with low levels of financing exposure (up to 25%), were more likely to manage all three types of exposure, with other predictors held unchanged. Broadly, a company that has greater financing exposure is probably exposed to higher risk because, as pointed out earlier, exposures from financing transactions are often more critical (stricter repayment obligation), larger (individual exposure size), and longer-term, compared to exposures from sales or purchases transactions. Therefore, a company that had greater financing exposures probably had greater need to manage all three types of FX exposure to reduce this higher risk.

Total assets

A company with greater total assets was generally less likely to manage all three FX exposure types, with other predictors remaining constant. This also means that a smaller company was more likely to manage all the exposure types, but was less likely to manage two or less exposure types. Smaller companies, in general, have less capacity to assume the risk arising from not managing the exposures. Although smaller companies generally have lower resources or access to resources to manage FX risk, those that manage FX risk seem more inclined (than larger companies) to manage all three types of FX exposure. Larger companies generally have greater capacity to assume the risk, and therefore, are less inclined to manage all types of FX exposure. As seen earlier, a larger company was less inclined to manage accounting and economic exposures. In short, a larger company seems to have greater capacity to assume the risk arising from not managing all three FX exposure types.

Perceived FX exposure instability

Companies that perceived they had stable FX exposures, had greater likelihood of managing all three types of exposures, compared to those that perceived they had unstable exposure, with other predictors held invariant. This probably indicates that companies that felt they had unstable FX exposure patterns might have felt that managing all FX exposure types could have been potentially wasteful since the exposure patterns were expected to change every year. Therefore, companies that perceived they had stable FX exposures would have had greater inclination to invest and dedicate resources for the setting-up and running of the programme to manage all three types of FX exposure.

6.1.6. Adopting formal FERM objective

In this research, a company was more likely to adopt a formal FERM objective, given that the company managed FX risk, with all other predictors remaining fixed, when the company had ❶ lower total debt, ❷ greater total assets, ❸ a low or high level of intra-company transactions, and ❹ greater total sales. Below, the possible justifications for the predictor effects on the adoption of formal FERM objectives by companies that

manage FX risk are explored.[6] One previous study had provided comparable findings, and these findings are also discussed where relevant.

Total debt

Broadly, a company with greater total debt, given that it managed FX risk, was less likely to adopt a formal FERM objective, with other predictors remaining constant. This means that companies that had greater debt were less inclined to adopt formal FERM objectives. This finding is rather unexpected. A company with greater debt, and therefore, greater financial risk, is expected to be more likely to adopt a formal objective as part of a formal FERM programme to reduce uncertainty and risk. Nonetheless, there are three alternative justifications that may explain this finding. ① Greater debt can be seen as greater drain of funds to meet debt-servicing costs, and therefore, this would mean lower resources available for a formal system of FERM. ② Using greater debt can also be seen as having greater ability to borrow. Then a company that has greater debt, i.e., greater ability to borrow, would have less need to reduce risks, and therefore, would be less inclined to adopt a formal objective. This contention might be reasonable since the company's total assets (company size) has been controlled or held constant. In other words, greater debt – controlling for assets – possibly means greater borrowing ability. ③ It is also possible that more prudent companies are less inclined to use greater debt, and at the same time, are more inclined to adopt formal FERM objectives. This would then indicate an association between the amount of debt and the adoption of formal FERM objectives, even though there is no direct link between the two. However, the residual analysis from the fitted model in the previous chapter revealed that the effect of total debt on companies' inclination to adopt formal FERM objectives was crucially reliant on a singular extreme case. This undermines the reliability of this particular fitted predictor effect.

[6] The assessment of the fitted model in the previous chapter showed the presence of multicollinearity, but it did not seem serious.

Total assets

A company that had greater total assets, given that it managed FX risk, was more likely to adopt a formal FERM objective, with other predictors remaining constant.[7] Mathur (1982) provided supporting evidence, and found that a company's likelihood of adopting a formal FERM objective was higher when the company was larger. This means that larger companies had greater likelihood of adopting formal FERM objectives. This was probably due to the companies having greater access to resources to fund and conduct FERM in a formal manner, including adopting formal objectives. In short, a larger company appears to have greater capacity to adopt a formal FERM objective.

Intra-company transactions

Among companies that managed FX risk, those that had moderate levels of intra-company transactions (more than 20%, and up to 40%, of total transactions) were less likely to adopt formal FERM objectives, compared to companies that had either low (up to 20%) or high (more than 40%) levels of intra-company transactions. Broadly, the adoption of a formal FERM objective in a company with a considerable level of intra-company transactions should provide benefits by reducing ambiguity in resolving intra-company conflicts. Generally, the higher the level of intra-company transactions, the greater the benefits of adopting a formal objective. However, correspondingly the direct costs involved in adopting a formal objective are also likely to be higher (due to the greater complexity). Moreover, the adoption of a formal objective is likely to serve the best interest of the (parent) company rather than the subsidiaries. Therefore, a company that adopts a formal objective has to also contend with subsidiary disenchantment, an indirect cost. The finding above suggests that the costs, in adopting a formal objective, associated with resolving intra-company conflicts and subsidiary disenchantment, and overcoming the complexity, are probably low when the intra-company transaction level is low, but high when the intra-company transaction level is moderate. However, these costs are possibly only slightly higher when the intra-company transaction level is high, than when the intra-company transaction level is moderate. In other words, these costs

[7] However, the residual analysis in the previous chapter indicated that this predictor effect of total assets on companies' inclination to adopt formal FERM objectives depended on a singular extreme case. This casts doubt about the reliability of this predictor effect. Nonetheless, the evidence from a prior study supports the predictor effect found in this study, and therefore, redeems its reliability.

should increase in a 'S-shaped' curve pattern against the level of intra-company transactions. On the other hand, the benefits to the company from adopting a formal objective possibly increase linearly with the increase in the level of intra-company transactions. The above conditions would then imply the following. ① When the level of intra-company transactions is low, the adoption of formal FERM objective is probably cheap and easy to execute. Therefore, the company is likely to adopt a formal objective. ② When the level of intra-company transactions is moderate, the costs of resolving the intra-company conflicts, in adopting the objective, are considerably high and moreover, the benefits are possibly inadequate. Consequently, the company is unlikely to adopt a formal FERM objective. ③ When the level of intra-company transactions is high, the costs are also high, but the benefits from resolved intra-company conflicts are even higher, and therefore, the company is likely to adopt a formal FERM objective. To summarise, a company is less likely to adopt a formal FERM objective when it has a moderate (rather than low or high) level of intra-company transactions because the benefits from resolving the intra-company conflicts are outweighed by the costs of dealing with the complexity, conflicts and subsidiary disenchantment.

Total sales

A company with greater total sales was more likely to adopt a formal FERM objective, with other predictors remaining constant. This effect is very similar to the effect of total assets. This indicates that companies that have greater sales simply have greater revenues to fund and conduct a formal FERM programme, including the adoption of a formal FERM objective. In other words, a company with greater sales seems to have greater capacity to adopt a formal FERM objective.

Previously, Mathur (1982) had also found that a company's likelihood of adopting a formal FERM objective was higher when the company had greater FX involvement. However, this study did not find that companies with greater FX exposure (or FX involvement) were more inclined to adopt formal FERM objectives. Nonetheless, the correlation found by Mathur (1982) was unconditional, as it did not control for the effects of other factors, particularly, company size. Moreover, the result in Mathur (1982) was based on all companies, both those that managed and those that did not manage FX risk, whereas this study included only companies that managed FX risk. It

is possible that, in Mathur (1982), the adoption of formal FERM objectives could have inadvertently served as a proxy for the management of FX risk. In short, the finding in Mathur (1982) seems less convincing, and therefore, the absence of a corresponding finding from the present study does not cast doubt on the reliability and soundness of its other findings.

6.1.7. Sharing FERM responsibility

This study showed that a company was more likely to share FERM responsibility, given that it managed FX risk, with all other predictors held constant, when the company had ❶ lower market capitalisation, ❷ been listed under the property or construction sectors (but not the consumer sector) in the KLSE, and ❸ perceived it had greater FX exposure. The possible explanations for the identified predictor effects in this study are discussed below. Notably, previous researches offer no comparable findings because they did not attempt to identify factors that influence companies' inclination to share the responsibility for managing FX risk.

Market capitalisation

Generally, the greater a company's market capitalisation, the lower was its likelihood of sharing FERM responsibility among two or more departments, with other predictors remaining unchanged. Actually, an alternative model with the predictor, total assets, rather than the predictor, total market capitalisation, yielded similar results, although the model chi-square statistic was lower. This meant that total assets and market capitalisation broadly measured the same thing – company size. Therefore, the finding indicates that a larger company was less inclined to share FERM responsibility but instead was more inclined to specialise by placing FERM responsibility with one department. This probably reflects that a larger company has greater resources, or greater access to resources, to meet the high cost requirement of setting-up a separate and independent department specialising in dealing with FERM.

Listing sector

Among companies that managed FX risk, those listed on the property or construction sectors of the KLSE, compared to those on the industrial products, trade and services, or plantation sectors, were more likely to share FERM responsibility among two or more departments in each company – with other predictors kept constant. On the other hand, companies listed on the consumer products sector, compared to those listed on the industrial products, trade and services, or plantation sectors, were less likely to share FERM responsibility, but were more likely to specialise by placing the responsibility with only one department. In short, the inclinations to share FERM responsibility among the companies in the three categories of listing sectors were significantly different. This is probably due to the differences in the nature and type of FX exposures encountered by the companies in these sectors. ① Broadly, in the construction and property sectors, companies mostly face main FX exposures from purchasing capital equipment, e.g., heavy machinery, denominated in foreign currencies. The individual exposures encountered by the companies are often irregular and sometimes non-permanent in nature, small in number but large in volume. These types of exposure are usually more difficult to manage. Moreover, the exposure attributes are not conducive for a company to allow a particular department to specialise by assuming full responsibility for FERM, and therefore, the expertise for dealing with FERM often cannot be found in a particular department. Consequently, such a company might have to share the responsibility among several departments, say those responsible for operations, purchases, and finance functions. This is to increase accountability, pool expertise among, and apportion the responsibility to, several departments in dealing with FERM. ② On the other hand, companies in the consumer products sector mainly face individual FX exposures that are regular, large in number but small in volume, and they constitute a permanent feature of the companies' operations. Therefore, these companies are more inclined to have separate departments, specialising in the management of these exposures. Notably, the management of these exposures is relatively straightforward, and therefore, companies do not need to have several departments jointly responsible for managing these exposures.

Perceived FX exposure size

Generally, a company that perceived it had greater FX exposure was more likely to share FERM responsibility among two or more departments, with other predictors remaining unchanged. In other words, a company that felt it faced greater FX exposure was more inclined to share the responsibility for managing the exposure among two or more departments. As implied above, this might have been undertaken with the intention of increasing accountability and pooling expertise among various departments, in handling the exposures, as well as to apportion the responsibility for dealing with the exposures that are felt to be excessive.

6.1.8. Decentralising fully domestic subsidiaries' FERM

The study found that a company was more likely to decentralise fully its domestic subsidiaries' FERM, given that the company managed FX risk, with all other predictors held invariant, when the company had ❶ a high level of intra-company transactions, ❷ low debt ratio, and ❸ a high level of capital investment denominated in foreign currencies. The reasons for the identified predictor effects are discussed in detail below.[8] Although prior studies provided comparable findings, the studies did not distinguish between domestic and overseas subsidiaries in identifying the predictors that influence the decentralisation of FERM. These prior findings are reviewed in the next section, after discussions on this study's findings on the predictor effects on the corporate inclination to decentralise fully overseas subsidiaries' FERM.

Intra-company transactions

Among companies that managed FX risk, those with high levels of intra-company transactions (more than 40%, of total transactions) were more likely to decentralise fully their domestic subsidiaries' FERM, compared to those with low or moderate levels of intra-company transactions (up to 40%) – with all other predictors remaining unchanged. This implies that a company that has a higher level of intra-company

[8] In the previous chapter, it was noted that this fitted model did not yield statistically significant predictive efficiency (compared to chance). Again as with a previous model, this was due to the nature of the dependent variable (lack of variance) and the predictor variables (all dichotomies). Nonetheless, the primary criterion, model fit, was sound, and therefore, the fitted predictor effects seem to be reliable.

transactions is more inclined to allow full autonomy to its domestic subsidiaries to manage their own FX exposures. Generally, centralisation should afford the company greater efficiency by cutting costs from reducing or avoiding duplication of functions at both subsidiary and centre levels. More particularly, the centralisation of subsidiaries' FX exposure management in a company with a high level of intra-company transactions should provide greater benefits because there is a greater possibility for netting of exposures, and thereby, saving on the cost (spread) of hedging externally. Moreover, it should also enable the company to pool exposures and undertake single rather than multiple hedges, saving on the fixed cost (e.g., commission or fee) of hedging. However, there are also costs associated with centralisation of subsidiaries' FX exposure management. In general, it is more complex and difficult, and therefore costlier, to centralise when the level of intra-company transactions is higher. Moreover, centralisation is likely to serve the best interest of the (parent) company rather than the subsidiaries. Therefore, a company that centralises subsidiaries' FX exposure management has to contend with potential subsidiary resentment, and this is an indirect cost for the company. This cost is also likely to be higher when the level of intra-company transactions is higher. Consequently, the finding above indicates that, when the level of intra-company transactions is high, the costs in centralising subsidiaries' FX exposure management is possibly higher than the benefits, and therefore, the company would be less inclined to centralise the management of its subsidiaries' FX exposures.

Debt ratio

Among companies that managed FX risk, those with high debt ratios (total debt divided by total assets, greater than 59.50%), compared to those with low debt ratios, were less likely to decentralise fully its domestic subsidiaries' FERM, with other predictors kept unchanged. This implies that a company with a higher debt ratio was generally less likely to allow full autonomy to its domestic subsidiaries for managing their own FX exposures. Generally, a company that has a higher debt ratio faces greater financial risk – greater financial distress and bankruptcy costs. Conceivably, such a company would have greater need to centralise its operations to gain greater central control of the risk. Therefore, a company that centralises its operations is likely to also centralise the management of its domestic subsidiaries' FX exposures. In short, it is contended that an increase in a company's debt ratio increases the company's inclination to centralise operations, including the management of its domestic subsidiaries' FX exposures.

Capital investment in foreign currency

Among companies that managed FX risk, those with high levels of capital investment denominated in foreign currencies (more than 25% of total capital investment) were more likely to decentralise fully their domestic subsidiaries' FERM, compared to those with low levels of capital investment in foreign currencies (up to 25%), with other predictors remaining fixed. This implies that a company with a higher level of foreign currency capital investment is more inclined to allow full autonomy to its domestic subsidiaries to manage their own FX exposures. Normally, investment opportunities are identified and handled by the business units or subsidiaries rather than the parent company. Generally, corporate investment activities are more decentralised, compared to other activities, say financing. Therefore, companies that invest more abroad, i.e., in foreign currencies, are more likely to allow full autonomy to their domestic subsidiaries in managing their own FX exposures because that would be consistent with the decentralised structure used by the company for selecting investment opportunities.

6.1.9. Decentralising fully overseas subsidiaries' FERM

Further, the study also found that a company was more likely to decentralise fully its overseas subsidiaries' FERM, given that it managed FX risk, with all other predictors being constant, when it had ❶ lower total market capitalisation, ❷ a high level of intra-company transactions, and ❸ perceived it had lower FX exposure increment. The justifications for these predictor effects are discussed below.[9] As mentioned earlier, findings from previous studies about factors associated with companies' inclination to centralise FERM are reviewed at the end of this section.

Market capitalisation

Generally, given that a company managed FX risk, the greater the company's market capitalisation, the lower was its likelihood of decentralising fully its overseas subsidiaries' FERM, with other predictors remaining unchanged. As with a previous

[9] It was noted, in the previous chapter, that this fitted model had slightly less number of cases per predictor than required by the rule-of-thumb. In spite of this, the other model attributes indicated that the fitted predictor effects were sound and reliable.

model, the predictor, total assets, served as a sound substitute for the predictor, total market capitalisation. The substitution produced similar results, although the model chi-square statistic was lower. This means that market capitalisation (or total assets) here measured company size. Therefore, the finding indicates that larger companies were less inclined to allow full autonomy to its overseas subsidiaries for managing their own FX exposures. This probably implies that larger companies have greater resources and greater access to resources to meet the high fixed costs of centralising FERM, and therefore, are less inclined to decentralise FERM.

Intra-company transactions

Among companies that managed FX risk, those with high levels of intra-company transactions (more than 40%, of total transactions) were more likely to decentralise fully their overseas subsidiaries' FERM, compared to those with low or moderate levels of intra-company transactions (up to 40%) – with all other predictors remaining unchanged. This is very similar to the effect seen above, in the case of domestic subsidiaries. This implies that a company with a higher level of intra-company transactions is more inclined to allow full autonomy to its overseas subsidiaries to manage their own FX exposures. As pointed out earlier, when the level of intra-company exposures is high, companies might be more compelled to allow full autonomy to its overseas subsidiaries to manage their own FX exposures, because the costs of centralisation of FERM are likely to outweigh the benefits. The costs are mainly associated with the complexity in centralising, and subsidiary resentment and conflicts arising from centralisation, when the level of intra-company transactions is high.

Perceived FX exposure increment

Generally, a company that perceived it had a higher FX exposure increment, given that the company managed FX risk, was less likely to decentralise fully its overseas subsidiaries' FERM, with other predictors held invariant. This means that a company that expects its future FX exposure to increase at a higher rate is more inclined to centralise FERM or rather to avoid fully decentralising its overseas subsidiaries' FERM. Broadly, a company that expects its FX exposure to increase at a higher rate in the future, conceivably, would have greater need for central control of the management of

its current FX exposures, in anticipation of the increased exposure and risk.

Prior researches have also identified a few factors that appeared to be associated with companies' inclination to centralise FERM. However, the researches did not distinguish between domestic and overseas subsidiaries. The findings have been discussed and presented in Chapter 2, but below these are considered together with the findings from this study. ① Batten et al. (1993) indicated that foreign-owned companies were more centralised in their FERM, compared to locally owned (Australian-owned) companies. However, this research did not incorporate foreign-owned companies as it focused on only Malaysian-owned companies, and therefore, is not able to provide comparable findings. Nonetheless, this study took into account the Malaysian companies' extent of foreign-owned equity, but this predictor did not seem to influence the companies' inclination to decentralise FERM. In other words, it did not find that a company with greater foreign-owned equity was less inclined to decentralise fully its subsidiaries' FERM. However, had foreign-owned companies been included, this study might have found evidence to support the findings of Batten et al. (1993). On the other hand, the findings in Batten et al. (1993) could have possibly been misleading because the study did not control for the effects of other predictors, among others, debt and company size. ② Batten et al. (1993) also found that public companies were more centralised in their FERM compared to private companies. Again, this study is unable to verify this simply because it did not include private companies. Instead, it focused on only public-listed companies.[10]

[10] Besides these, ① Abdel-Malek (1976), Collier and Davis (1981), and Belk and Glaum (1990), all indicated that a company's overseas subsidiaries were generally accorded greater autonomy in FERM, compared to its domestic subsidiaries. However, as already seen in the Chapter 4, this study did not find similar evidence among Malaysian companies. ② Collier and Davis (1985) found that companies that "actively managed" their exposures were more likely to centralise their FERM, compared to companies that "closed-out" their exposures. Broadly, this implies that companies that undertook partial cover were more likely to centralise their FERM, compared to companies that undertook full cover. This study did not verify this because links between two research variables – FERM policy and FERM centralisation, in this case – are beyond the scope of this study. The study's goal is to identify predictor variables that predict the selected research variables (or rather dependent variables), rather than explaining relationships among research variables.

6.1.10. Allowing time flexibility for hedging

This research found that a company was more likely to allow time flexibility for hedging, given that the company managed FX risk, with the other predictor remaining unchanged, and the company had ❶ perceived it had lower FX exposure, but ❷ a high level of FX exposure. The justifications for these predictor effects are explored below. However, it should be noted that previous empirical works did not investigate factors that influence companies' inclination to undertake this particular FERM activity, and therefore, they do not provide comparable findings.

Perceived FX exposure size

In general, a company that perceived it had greater FX exposure was less likely to allow time flexibility for hedging, given that it managed FX risk, with the other predictor held constant. This also means that a company that felt it had smaller FX exposure was more inclined to allow time flexibility between the identification and the hedging of an exposure. This simply implies that the company was less anxious about the level of exposure, and therefore, perceived less need to adopt a policy to hedge exposures immediately after these exposures were identified. In other words, they probably felt that they could afford to assume the exposures temporarily whilst monitoring the market for favourable rates to execute the hedging.

FX exposure

Among companies that managed FX risk, those with high levels of FX exposure (more than 30% of total transactions denominated in foreign currencies), compared to those with low levels of FX exposure, were more likely to allow time flexibility for hedging, with the other predictor held constant. This means that a company with greater FX exposure is more inclined to allow time flexibility between the identification and the hedging of an exposure. Companies with greater FX exposure would have greater chance to net some of their own exposures with allowing time flexibility, and save on the external costs of external hedging (spread, commission, and fees). Moreover, companies with greater FX exposures usually have more experience to deal with FX exposures and seek favourable rates for hedging, and therefore, could afford to assume the exposures temporarily. Furthermore, companies with greater FX exposure are

probably used to, or familiar with, the exposure, and consequently, are less anxious or sensitive about extending time flexibility for hedging.[11]

6.1.11. Undertaking partial cover

In this study, a company was more likely to undertake partial cover, given that the company managed FX risk, with all other predictors being invariant, when the company had ❶ a high proportion of foreign-held equity, ❷ a high level of FX exposure, and ❸ perceived it had greater FX exposure unpredictability. The explanations for these predictor effects on companies' inclination to undertake partial cover are explored below. Notably, prior empirical studies have also attempted to identify factors associated with companies' likelihood of undertaking partial cover, and these are also reviewed at the end of this section.

Foreign-held equity

Among companies that managed FX risk, those with high levels of foreign-held equity (more than 10% of company equity held by foreigners) were more likely to undertake partial cover, compared to those with low levels of foreign-held equity (up to 10%), with other predictors held constant. This implies that a company with higher foreign-held equity was more inclined to undertake partial cover. Typically, foreign investors that hold Malaysian company equity probably also hold company equity in several other countries, unlike Malaysian investors whose equity holdings are less internationally diversified. In other words, foreign investors are more diversified, and therefore, have probably greater capacity to assume some risks. Consequently, companies that have greater foreign-held equity might have greater ability to assume at least some of the exposures.

[11] It is interesting to note that the two relevant predictor variables – level of FX exposure and perceived FX exposure size – are highly positively correlated. Companies that had a high level of FX exposure also perceived that they had greater FX exposure. However, companies that had high levels of FX exposure were more inclined, but those that perceived they had greater FX exposure were less inclined, to allow time flexibility for hedging. On first impression, these effects seem inconsistent. Nonetheless, it appears that companies with high levels of actual FX exposure – controlling for their perceived level of FX exposure – were more inclined to allow time flexibility. On the other hand, companies that perceived they had greater FX exposure – controlling for the level of FX exposure – were less inclined to allow time flexibility. These intuitively make sense, and are explored further later.

FX exposure

Among companies that managed FX risk, those with high levels of FX exposure (more than 30% of total transactions denominated in foreign currencies), compared to those with low levels of FX exposure (up to 30%), were more likely to undertake partial cover, with other predictors being invariant. This means that a company that has greater FX exposure was more inclined to undertake a partial cover of an exposure. This may initially seem strange, but as implied earlier, the greater a company's FX exposure, the greater is the company's ① opportunity for netting some of the exposure, as well as ② competence (expertise to consider and select), and ③ tolerance, for assuming some FX exposure. Therefore, the company with greater FX exposure has greater opportunity and capacity to assume some net, or uncovered, FX exposure.

Perceived FX exposure unpredictability

Generally, a company that perceived it had greater FX exposure unpredictability, given that it managed FX risk, was more likely to undertake partial cover, with other predictors remaining constant. This also means that a company that feels it faces greater FX exposure unpredictability is more inclined to undertake partial cover. Although partial covers do not offset exposures or risks completely, they can reduce the company's exposure value-at-risk, and therefore, reduce its overall risk – compared to doing nothing. Therefore, given unpredictable exposures, partial covers may actually reduce or limit the company's overall risk.

Previous empirical studies generally did not focus on this particular dependent variable, companies' inclination to undertake partial cover. Nonetheless, a few researches investigated another related dependent variable, the proportion of exposure hedged by companies. The relevant findings have been presented in Chapter 2, but next, these are reviewed with the findings from this study. ① Dolde (1993) found that, among companies that had views on the future exchange rate movement, those that were smaller had hedged a greater proportion of their exposure. This clearly implied that smaller companies were less inclined to assume uncovered exposures, even when they had clear views on future exchange rate movements. However, the present study did not find congruent findings to support this. More precisely, smaller companies were not found to be less (or more) likely to undertake partial cover. Nonetheless, it must be noted that the dependent variable used in Dolde (1993) and the one used in this study

are different. The former was measured on a continuous scale whereas the latter is a dichotomy. Moreover, the variable values are not directly compatible, although the values are, by conception, negatively correlated. Perhaps, it might have been possible to find a similar result as found in Dolde (1993) had a continuous-scaled dependent variable been used in this research. However, the finding in Dolde (1993) is not very reliable because it did not control for the effects of other predictors, particularly, level of FX exposure. ② Collier and Davis (1985) and Collier et al. (1990) found that companies that had greater levels of risk were less likely to undertake partial cover. The present study did not account for a company's level of risk because it is a difficult concept to measure. In fact, even in Collier and Davis (1985), only a subjective measure of risk level was instituted. Nonetheless, the present study used FX involvement, or more specifically, FX exposure, and found that companies that had high levels of FX exposure were more likely to undertake partial cover. This appears to contradict the prior findings. However, it must be noted that in the previous study, the predictor was the company's overall level of risk, not specifically FX exposure, while the predictor in this study was the company's FX exposure size (in proportion). Therefore, the difference in the findings could have been due to the differences in concepts and measurement.[12]

[12] Besides these, ① Soenan (1986) found that UK companies in the industrial sector, compared to those in the trading sector, had hedged a greater proportion of their exposures. This implies that industrial sector companies were less inclined to undertake partial cover. This suggests that industrial sector companies may have faced greater FX risk. However, parallel findings were not forthcoming from this study. Particularly, it did not find that companies in particular sectors were more likely to undertake partial cover, especially when other predictors were controlled for. In other words, this effect might have been nullified had Soenan (1986) controlled for the company's level FX exposure or FX risk. ② Dolde (1993) also implied that companies that had "views" on future FX rates, compared to those that had no such "view", hedged a relatively smaller proportion of their own exposures. This then implies that companies that have views on future FX rates would be more inclined to undertake partial cover. This study did not include a predictor that measured whether or not a company had a "view" about future FX rates. Instead, it included a predictor that measured a company's perceived exchange rate volatility. However, the study did not find that a company that perceived exchange rates were more volatile (and presumably, less inclined to have a view on future FX rates) was less (or more) inclined to undertake partial cover. In other words, the findings from this study did not seem to support the findings of Dolde (1993). Nonetheless, it must be noted that the predictors used in the prior study and this study are essentially different concepts, and therefore, the difference in the findings could have been due to this. Moreover, the finding in Dolde (1993) was not statistically significant, and therefore, could have been unreliable.

6.1.12. Undertaking uncovered FX deals

The research found that a company was more likely to undertake uncovered FX deals, given that the company managed FX risk, with all other predictors kept fixed, when the company had ❶ a low level of sales exposure, ❷ a low level of purchases exposure, ❸ a greater number of overseas subsidiaries, ❹ greater government-held equity, and ❺ perceived it had unstable FX exposures. The possible reasons that might underlie the preceding predictor effects are discussed in greater detail next.[13] However, it should be noted there are no comparable findings from prior researches as they did not try to identify factors that influence companies' inclination to undertake uncovered FX deals.

Sales exposure

Among companies that managed FX risk, those with high levels of sales exposure (more than 25% of total sales and other revenues denominated in foreign currencies), compared to those with low levels of that exposure (up to 25%), were less likely to undertake uncovered FX deals, with other predictors held unchanged. This implies that a company that had a higher level of FX exposure from sales was less inclined to undertake uncovered FX deals. This probably indicates that the company with high sales exposure is especially sensitive or averse towards accepting additional FX exposures from undertaking uncovered FX deals. The exposures from uncovered FX deals do not offset the company's commercial or operating, i.e., *natural*, FX exposures, and therefore, are termed here as *artificial* FX exposures. These artificial exposures are usually undertaken with the intention of making profits from the activities of arbitrage or speculation in FX. On the other hand, as implied, natural exposures are exposures arising from the company's genuine underlying commercial or operating transactions denominated in foreign currencies.

Purchases exposure

Likewise, among companies that managed FX risk, those with high levels of purchases exposure (more than 25% of total purchases and other expenditures denominated in foreign currencies), compared to those with low levels of that exposure (up to 25%),

[13] The fitted model assessment in the previous chapter revealed that the number of cases per predictor was very small, smaller than the adopted rule-of-thumb. However, in spite of this, there was no serious problem in the fitted model, and the predictor effects seem reliable.

were less likely to undertake uncovered FX deals, with other predictors held unchanged. As with sales exposure above, a company that had a higher level of FX exposure from purchases was also less inclined to undertake such deals. These findings imply that companies with greater FX exposures, particularly from sales and purchases, are more concerned about protecting their cash flows in foreign currencies, and are less inclined to seek profit from the movement of exchange rates. In other words, the companies are probably seeking to avoid FX risk (rather than seeking to make FX profit), and therefore, are less inclined to undertake uncovered FX deals that may increase their exposures and risk. They may deal in FX deals to offset or reduce an underlying commercial or operational exposure, but are disinclined to undertake uncovered FX deals, in the hope of making profit from expected favourable movements in the exchange rates.

Number of overseas subsidiaries

The greater the number of overseas subsidiaries of a company, given that the company managed FX risk, the higher was the company's likelihood of undertaking uncovered FX deals, with other predictors remaining invariant. In other words, a company with a greater number of overseas subsidiaries was more inclined to undertake uncovered FX deals. Generally, Bank Negara Malaysia, the central bank, closely monitors corporate involvement in FX deals, and it prohibits the undertaking of uncovered FX deals to reduce speculative activity on the value of Ringgit. As the undertaking of FX deals are closely monitored by, and must be justified to, the central bank, companies with larger numbers of overseas subsidiaries are probably better able to provide justification. The companies can always use some of their many intra-company transactions, or transactions that involve their subsidiaries and third-parties, that could easily be changed (by leading or lagging) for the purposes of showing the need for undertaking the FX deal to the authorities. Apart from this, companies with greater numbers of overseas subsidiaries, conceivably, are better able to pool information from wide overseas sources that may be useful for the purpose of undertaking uncovered FX deals. Therefore, these companies may have greater chances of profiting from favourable exchange rate movements. In short, a company that has a greater number of overseas subsidiaries probably has greater capability and opportunity for undertaking uncovered FX deals.

Government-held equity

Generally, a company with greater government-held equity, given that the company managed FX risk, was more likely to undertake uncovered FX deals, with other predictors remaining constant. This means that a company in which the government held a higher proportion of equity was more inclined to undertake uncovered FX deals. Greater government ownership of a company's equity might enhance the company's reputation and implied solvency (or credit position) which, in turn, might increase the company's ability to assume risks. Consequently, the company may be more inclined to undertake uncovered FX deals. Besides, as noted above, the central bank normally prohibits the undertaking of uncovered FX deals. However, conceivably, on certain occasions, special permission could be obtained to undertake such deals. Having greater government equity participation might be useful for a company in obtaining the required permission.

Perceived FX exposure instability

Among companies that managed FX risk, those that perceived they had stable FX exposures, compared to those that perceived they had unstable FX exposures, were less likely to undertake uncovered FX deals, with other predictors held unchanged. This implies that a company that felt it had a more unstable FX exposure pattern was more inclined to undertake uncovered FX deals. This finding is rather unexpected. Nonetheless, it probably implies that companies that face unstable (or changing yearly patterns of) FX exposure are more inclined to undertake uncovered FX deals in anticipation of a possible exposure arising in the future. In other words, for these companies, uncovered FX deals might be able to offset their unexpected natural FX exposures, and thereby, reduce their overall FX risk.

6.1.13. Using forward contracts

The current study indicated that a company, given that it managed transaction exposure, was more likely to use forward contracts to manage transaction exposure, with all other predictors constant, and the company had ❶ greater total assets, ❷ a low level financing

exposure, and ❹ a high level of FX exposure. These probable justifications for these fitted predictor effects are explored below.[14] One previous study has also attempted to identify factors associated with companies' inclination to use forward contracts. The relevant finding from that study is also reviewed below.

Total assets

The greater a company's total assets, the higher was the company's likelihood of using forward contracts to manage transaction exposure, given that the company managed transaction exposure, and with other predictors held constant. This implies that a larger company, given that it managed transaction exposure, was more inclined to use forward contracts to manage transaction exposure. Bodnar et al. (1993) had also previously indicated that larger companies were more likely to use OTC hedging products, including forward contracts. More recently, Geczy et al. (1997) found that a larger company (with greater economies-of-scale) was more likely to use currency derivatives. That result is likely to be applicable to forward contracts as well. Forward contracts involve credit risks. Larger companies normally have better credit risks, and therefore, are given greater access through higher counter-party limits, and cheaper access through lower costs (or narrower spread), to forward contracts. Besides that, using external hedging instruments like forward contracts involves high direct and indirect fixed costs. Generally, larger companies have greater resources, or greater access to resources to use forward contracts. To sum up, a larger company appears to have greater capacity to use forward contracts.

Financing exposure

Among companies that managed transaction exposure, those with high levels of financing exposure (more than 25% of financing transactions denominated in foreign currencies) were less likely to use forward contracts to manage transaction exposures, compared to companies with low levels of financing exposure (up to 25%), with the other predictors kept invariant. This implies that, a company was less inclined to use forward contracts to manage transaction exposure (given that it managed transaction

[14] The evaluation of the fitted model in the previous chapter found that the model did not yield statistically significant prediction efficiency. However, this was mainly due to the lack of variance in the value of the dependent variable. As with two previous models under similar conditions, the more crucial model fit criterion was good. Therefore, despite the lack of prediction efficiency, the fitted model appears sound, and the predictor effects seem to be reliable.

exposure) when the company had a higher level of financing exposure. ① On the one hand, a company's greater financing exposure could reflect that the company's exposures were mainly from financing or borrowing. Financing exposures are normally very large long-term exposures that often cannot be hedged using forward contracts. Indeed, long term forward contracts are usually unavailable, and if available, they are costly and the market for these contracts is illiquid or very shallow. Therefore, the finding could mean that a company that has greater financing exposure is less inclined to use forward contracts (to manage its transaction exposures arising mainly from financing transactions) because forward contracts are inappropriate to hedge these exposures. ② On the other hand, a company's greater financing exposure could also possibly reflect the company's greater access to financing facilities in foreign currencies. Companies that have greater access to these financing (borrowing) facilities would probably also have greater access to deposit facilities in foreign currencies. These facilities could be used to hedge transaction exposure by the means of the money market hedging technique, instead of forward contract. Essentially, companies that are long on a foreign currency could borrow the currency and sell it at spot to the home currency, allowing the foreign currency receipt later to pay off the borrowing. Companies that are short on a foreign currency, on the other hand, could buy the currency at spot, and deposit it in a foreign currency account until the payment becomes due. Usually, a company that has such facilities would use them, rather than forward contracts, because the former would normally be cheaper – given that the company has already got the financing and deposit facilities in the foreign currencies. Consequently, the finding above could also mean that a company that has greater financing exposure, is less inclined to use forward contracts because it has greater access to money market hedging technique. There is some support for this contention from Geczy et al. (1997). That study indicated that foreign denominated debt could serve as a substitute for the use of currency derivatives, for hedging foreign operations. Analogously, in this study, foreign financial facility (from financing exposure) could have served as a substitute for forward contracts in managing transaction exposure.

FX exposure

Among companies that managed transaction exposure, those with high levels of FX exposure (more than 30% of total transactions denominated in foreign currencies) were more likely to use forward contracts to manage transaction exposures, compared to

companies with low levels of FX exposure, with other predictors remaining unchanged. This implies that a company was more inclined to use forward contracts to manage transaction exposure (given that it managed transaction exposure) when the company had a higher level of FX exposure. Simply, a company with greater FX exposure has greater need to use forward contracts to cover the exposures. This is because forward contracts are the most used and understood instruments for hedging FX exposures.

6.1.14. Using forward contracts extensively

Further, the research showed that a company, given that it managed transaction exposure, was more likely to extensively use forward contracts to manage transaction exposure, with the other predictor kept fixed, and the company had ❶ a low level financing exposure, and ❷ been listed on the main board of the KLSE. To recap, extensive use of forward contracts means more than 60% of a company's transaction exposures was covered using forward contracts. The possible explanations for the preceding predictor effects are explored below.[15] Previous studies have also found factors associated with companies' extent of use of forward contracts. The relevant findings from previous studies are also reviewed where relevant below.

Financing exposure

Among companies that managed transaction exposure, those with high levels of financing exposure (more than 25% of financing transactions denominated in foreign currencies) were less likely to extensively use forward contracts to manage transaction exposures, compared to companies with low levels of financing exposure (up to 25%), with the other predictor being constant.[16] This effect is the same as that seen previously – on the companies' inclination to use forward contract. Again, this means that a company was less likely to use forward contracts extensively to manage transaction

[15] In the previous chapter, the evaluation of the fitted model revealed that the prediction efficiency was not statistically significant. This was mainly due to both the predictor variables in the model being dichotomies. However, the more crucial model fit criterion proved that the fitted model was sound.

[16] This predictor effect has the problem of zero cells, but this does not undermine the reliability of the predictor or the predictor's effect on companies' inclination to use forward contracts extensively. More precisely, the magnitude, but not the direction, of the fitted predictor effect on the dependent variable is contentious given the presence of zero cells problem. Therefore, for the purposes of this study, this predictor is reliable.

exposure (given that it managed transaction exposure) when the company had a higher level of financing exposure. As discussed earlier, a company that has greater financing exposure, possibly has ① less number of appropriate non-financing exposures that can be suitably hedged with forward contracts, or ② better access to foreign currency borrowing and deposit facilities that encourage the use of money market hedging. Therefore, the company is less inclined to use forward contracts extensively, or in other words, it is less dependent on forward contracts.

Listing board

Among companies that managed transaction exposure, those that were listed on the KLSE second board were less likely to extensively use forward contracts to manage transaction exposure, compared to those listed on the main board, with the other predictor remaining invariant. This means that companies on the KLSE main board, compared to those on the KLSE second board, have greater inclination to use forward contracts extensively to manage transaction exposure. This is an unexpected finding. This effect was significant even after controlling for the effect of company size (total assets) – because companies in the second board are generally smaller than the companies in the main board. Second board companies, therefore, were expected to be more dependent on the use of forward contracts. It is possible that although these companies have greater need to use forward contracts extensively, their weaker reputation (compared to main board companies) makes their access to forward contracts more difficult, and hence, less desirable. For example, banks may set lower counter-party limit, and charge higher spread, when quoting forward rates to the second board companies. Therefore, these companies may have ended up using other means to manage their transaction exposures, e.g., by using internal hedging techniques, or by simply absorbing some of the risks.

① Mathur (1982) identified that companies with greater levels of FX involvement had used forward contracts to a lesser extent. However, the evidence from this study failed to show this. Notably, in this study, companies that had high levels of FX exposure were more likely to use forward contracts, as seen above, but were not less (or more) likely to use them extensively. Nonetheless, the finding of Mathur (1982) is rather doubtful because it did not control for the effects of other predictors, particularly, company size, and financing exposure. ② Batten et al. (1993) found that, in Australia,

public companies used forward contracts to a lesser extent, compared to private companies. This study, as explained before, did not include private companies, and therefore, is unable to provide evidence to support, or refute, this claim. However, the study found companies listed on the main board of the KLSE, compared to those listed on the second board, were more likely to extensively use forward contracts. Should main board companies be interpreted as '*more public*' than the second board companies, this finding would then suggest that main board (more public) companies use forward contracts more extensively, which contradicts the findings of Batten et al. (1993). However, it is incorrect to interpret this so, essentially because companies listed on the main board are not more public than those listed on the second board. Both categories of companies are public (or public-listed) companies, but those listed on the main board meet more stringent listing requirements, and therefore, have greater prominence, reputation, and possibly perceived credit capacity.[17]

6.2. Review of the predictor effects

The preceding part discussed possible rationales and justifications for the predictor effects on companies' inclinations to undertake specific FERM activities found in this study. Appendix K lists all the predictor effects and the rationales or justifications for these effects. On the other hand, Table 6.1 presents a revised summary of all the predictor effects, similar to Table 5.2 seen in the previous chapter, but it also includes relevant predictor effects found in prior studies. As illustrated by these two tables, the findings or predictor effects are many and varied to the extent that it is difficult to see the overall picture. Therefore, this second part of the chapter attempts to reduce the complexity associated with the findings by consolidating similar FERM activities and predictors, and then reviews the findings (seen earlier) for common and contrasting predictor effects.

[17] Besides these, Mathur (1982) found ① companies that managed transaction exposure, and ② those that centralised their FERM, used forward contracts to greater extents. This study, however, is unable to verify these two findings. The first, because this study only included companies that managed transaction exposure for this analysis. The second, because it involves investigating the link between two research variables – FERM centralisation and FERM techniques, and as explained earlier, this is beyond the scope of this study.

Table 6.1: Review of predictor effects on specific FERM activities

	Predictor / FERM activity	Manage FX risk	Manage accounting exposure	Manage economic exposure	Manage transaction exposure	Manage all three FX exposure types	Adopt formal FERM objective	Share FERM responsibility	Decentralise fully domestic subsidiaries' FERM	Decentralise fully overseas subsidiaries' FERM	Allow time flexibility for hedging	Undertake partial cover	Undertake uncovered FX deal	Use of forward contracts	Use forward contracts extensively
1	Total assets	+	--	--		--	+							+	
2	Total market capitalisation							--		--					
3	Total sales						+								
4	Total debt		+^				--								
5	Debt ratio *								--						
6	Foreign-held equity *											+			
7	Government-held equity												+		
8	Listing (main) board *														+
9	Property or construction sectors # *							+							
10	Consumer sector # *							--							
11	FX exposure *	+									+	+		+	
12	Sales exposure *												--		
13	Purchases exposure *												--		
14	Capital investment exposure *								+						
15	Financing exposure *			+		+								--	--
16	Number of overseas subsidiaries		+										+		
17	Moderate level of intra-company transactions *						--								
18	Intra-company transactions *								+	+					
19	Perceived FX exposure size			+		+		+			--				
20	Perceived exchange rate volatility	+													
21	Perceived FX risk level				+										
22	Perceived FX exposure increment									--					
23	Perceived FX exposure unpredictability											+			
24	Perceived FX exposure stability *				+	+							--		

KEY

+ Positive effect

-- Negative effect

^ Non-linear effect

* Dichotomous predictor

\# ...compared to industrial, trade/services, or plantation, sectors

Unreliable effect

Effect compatible with prior studies

Effect found only in prior studies

The steps in consolidating the FERM activities are explained first. This is depicted pictorially in Figure 6.1. The activities of managing FX risk (or managing at least one FX exposure type) and managing all three FX exposure types are grouped and reviewed together. The FERM activities of managing economic and transaction exposure are omitted because these are subsumed in the FERM activity of managing all three types of FX exposure, but more importantly, the predictors that influenced the former FERM activities were generally already represented by those that influenced the latter FERM activity. However, the FERM activity of managing accounting exposure is considered separately because it seems to be influenced by a unique set of predictors.

Further, the FERM activities of allowing time flexibility for hedging and undertaking of partial cover are grouped together because both activities are functionally related. On a broader level, these activities result in the companies assuming at least some of their own natural FX exposures. The former results in them assuming natural FX exposures at least temporarily, while the latter results in them assuming portions of their own natural FX exposures. Another FERM activity, the undertaking of uncovered FX deals, on the other hand, results in the companies accepting additional artificial FX exposures. Therefore, these three FERM activities are grouped and reviewed together for common and contrasting predictor effects.

The FERM activities of decentralising fully domestic, and overseas, subsidiaries' FERM are also, naturally, grouped together. Similarly, the FERM activities of using, and extensively using, forward contracts are also grouped together. In short, the 14 specific FERM activities investigated in this study are regrouped into seven categories of FERM activities, in order to uncover common and contrasting predictor effects. The seven categories of FERM activities are: ❶ managing FX risk and all three FX exposure types; ❷ managing accounting exposure; ❸ adopting formal FERM objective; ❹ assuming natural, and accepting artificial, FX exposures; ❺ sharing FERM responsibility; ❻ decentralising fully subsidiaries' FERM; and, ❼ using forward contracts.

Apart from the FERM activities, the predictor variables are also consolidated, to reduce the complexity of the findings. This involves omission, renaming, and regrouping of predictors. These are illustrated by Figure 6.2. The variables, total assets, total sales, and total market capitalisation were highly positively correlated with one another, and

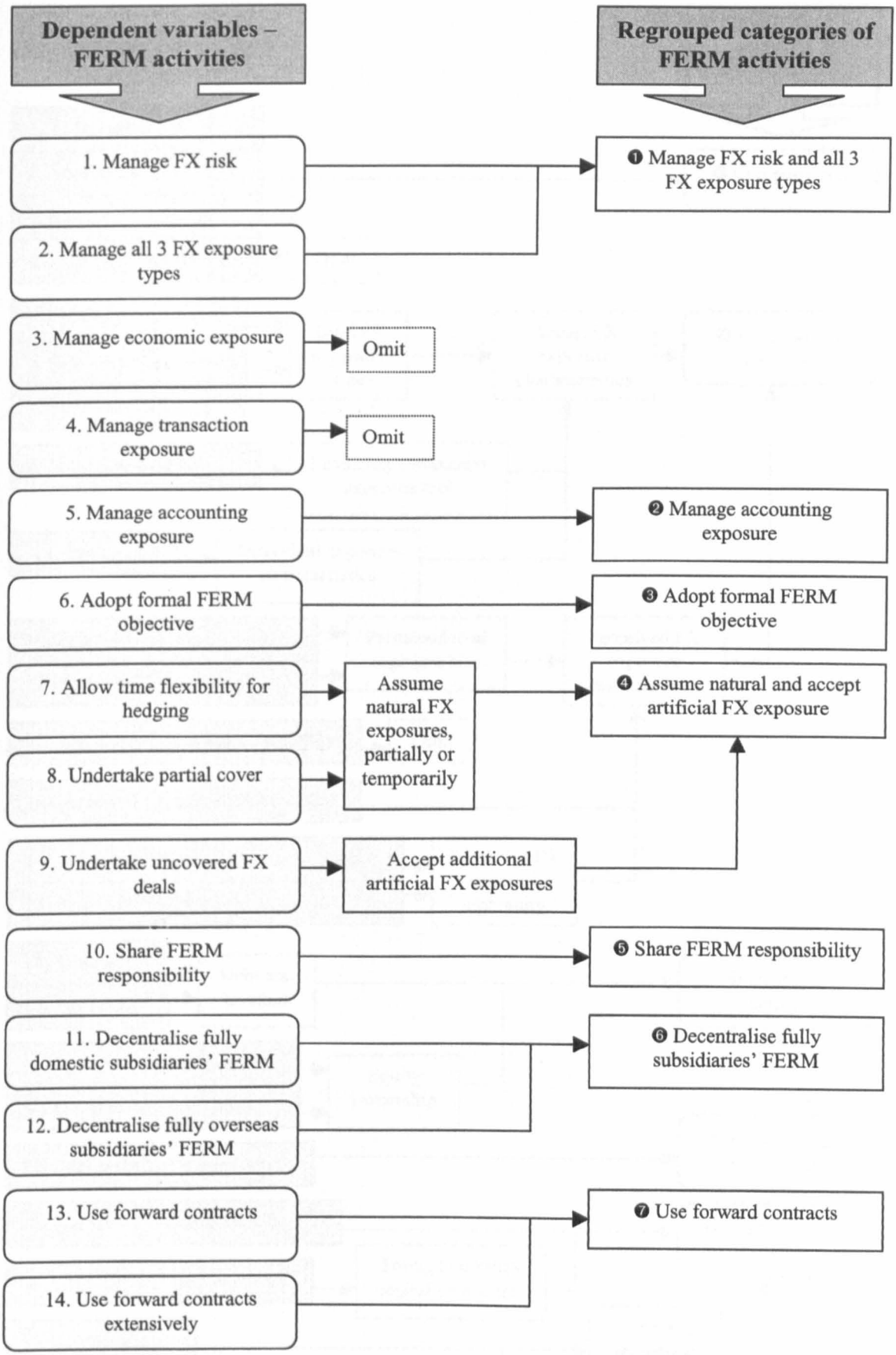


Figure 6.1: Regrouping of FERM activities for consolidating the findings of this study.

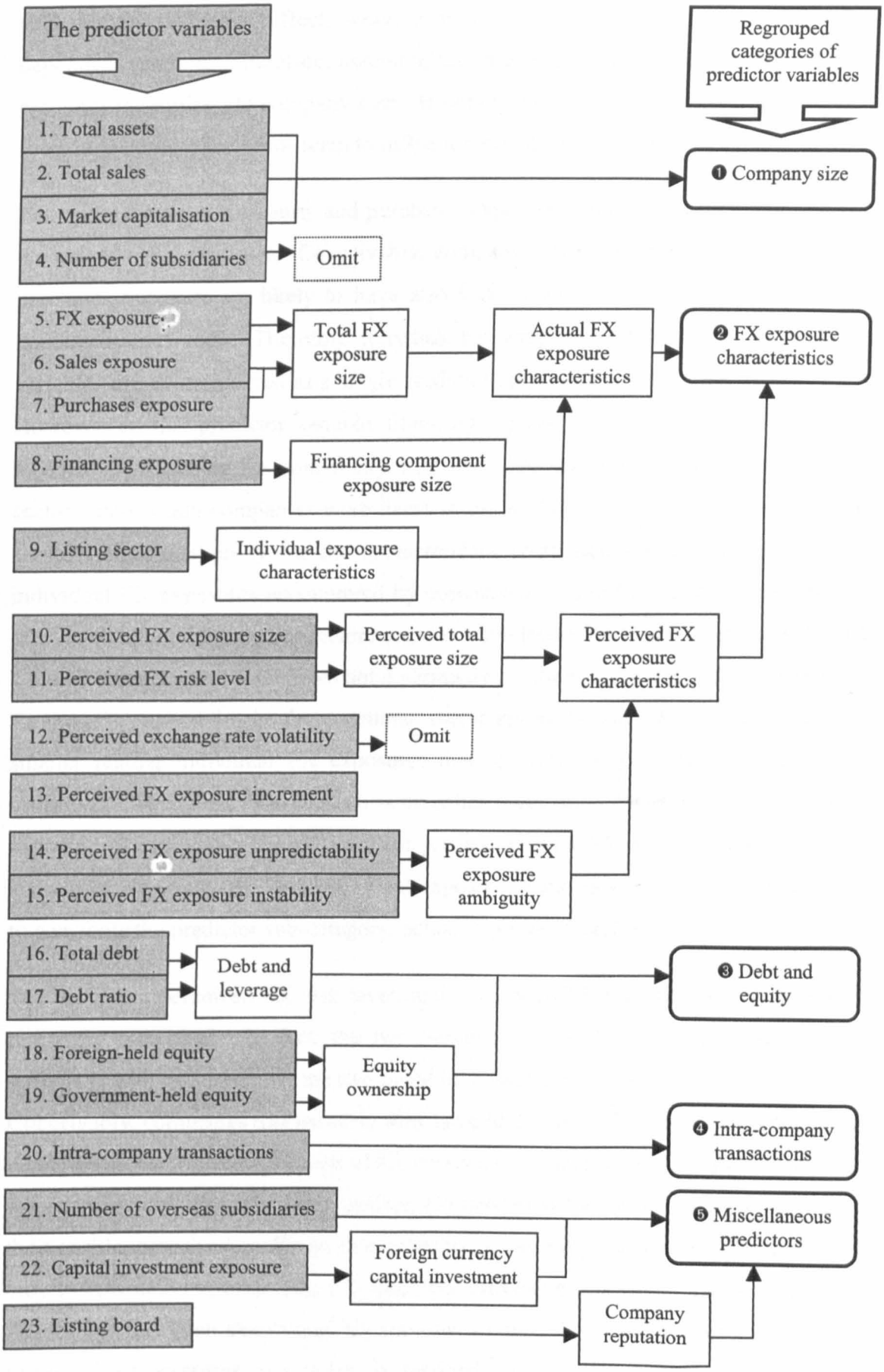


Figure 6.2: Regrouping of predictors for consolidating the findings of this study.

each yielded a similar effect, when it was substituted for another, on any given dependent variable. Therefore, hereafter, the three variables are considered as a single predictor measuring (1) company size. However, the variable, number of subsidiaries, is omitted because it did not seem to influence any of the dependent variables.

The variables, sales exposure, and purchases exposure, were positively correlated with the variable, FX exposure. Conceivably, companies that have high levels of sales and purchases exposure are likely to have also high levels of FX exposure, although not necessarily vice-versa. Therefore, to reduce the complexity of the findings, these three variables are all considered as a single predictor measuring, (2) *total* FX exposure *size*. However, another predictor variable, financing exposure, is renamed and considered to measure (3) financing *component* exposure *size*. The variable, listing sector, noted the sectors onto which companies were listed in the KLSE. However, it appears to have served rather as a proxy for the characteristics (particularly size and regularity) of individual FX exposures encountered by companies. More particularly, companies in the construction and property sectors seem to have fewer but larger irregular individual FX exposures that are sometimes not a permanent feature of the companies' operations. Conversely, companies in the consumer sector appear to have higher frequencies of smaller regular individual FX exposures that are often a permanent feature of the operations. Therefore, this predictor is hereafter accepted to measure (4) *individual* FX exposure characteristics. The last three predictors, total FX exposure size, financing component exposure size, and individual exposure characteristics, are grouped together to constitute the predictor sub-category, actual exposure characteristics.

The variables, perceived FX risk level, and perceived FX exposure size, were highly positively correlated. In fact, the two variables returned a high Cronbach's alpha statistic (0.89), and therefore, the two could be considered to measure the same concept. Conceivably, companies that perceive they have high levels of FX risk are likely to also perceive that they have high levels of FX exposure. Consequently, the two variables are considered to measure a single predictor, (5) perceived total exposure *size*. However, the variable, perceived exchange rate volatility, is omitted because its influence on the only FERM activity, managing FX risk, was unreliable due to the omission of some factors that had been determined by previous studies. Nonetheless, the predictor, (6) perceived FX exposure *increment*, is retained without any change. However, the inverse of the predictor variable, perceived FX exposure *stability*, i.e., (7) perceived FX

exposure *instability*, is used for further discussions. This and another predictor, (8) perceived FX exposure *unpredictability*, are grouped together, and are thought to broadly measure perceived FX exposure ambiguity. Here, the term exposure ambiguity is used to encompass both exposure instability (drastic change in the yearly exposure pattern) and exposure unpredictability (uncertainty in determining the timing and size of individual FX exposures). The last four predictors, perceived total exposure size, perceived FX exposure increment, perceived FX exposure unpredictability, and perceived FX exposure instability, are grouped together to constitute the predictor sub-category, perceived FX exposure characteristics. Both sub-categories, *actual* FX exposure characteristics (seen above) and *perceived* FX exposure characteristics, make up the predictor category, FX exposure characteristics.

The predictors, (9) total debt, and (10) debt ratio, constitute the debt and leverage sub-category, whereas, the predictors, (11) foreign-held equity, and (12) government-held equity, form the equity ownership sub-category. Both these sub-categories make up the debt and equity predictor category. Nonetheless, the variable, (13) intra-company transactions, is retained as a separate predictor.

The predictor, (14) number of overseas subsidiaries, was initially expected to measure FX involvement. However, the findings indicated that it rather reflected a company's ability to pool useful information from a network of subsidiaries, and its opportunity to justify the execution of uncovered FX deals to the central bank. Therefore, this predictor has been kept separate and not grouped together with predictors that measured FX exposure characteristics. Likewise, the variable, capital investment exposure, was anticipated to measure the extent of exposure in capital investment transactions. However, the findings suggested that it reflected the inability of a company to exercise greater central control over its domestic subsidiaries that do not normally receive foreign currency capital investment from the company. Therefore, this predictor is renamed as (15) foreign currency capital investment to reflect this. The variable, listing board, noted the board (main or second) onto which companies were listed in the KLSE. However, it seems to have been a proxy for company reputation instead. Generally, companies listed on the main board fulfill more stringent listing requirements, and therefore, have greater status and reputation, compared to those listed on the second board. Consequently, this predictor is accepted to measure (16) company reputation. Finally, the three predictors, number of overseas subsidiaries, foreign currency capital

investment, and company reputation, make up the final category of miscellaneous predictors.

In short, the 23 original predictor variables are reduced to 16 predictors as described above, and are regrouped into five broad categories. They are ❶ company size, ❷ FX exposure characteristics, ❸ debt and equity, ❹ intra-company transactions, and ❺ miscellaneous predictors. See Figure 6.2 for an overview of the reorganisation of predictor variables described above.

6.2.1. Review of predictor effects from the perspective of FERM activities

In this section, the findings or predictor effects are reviewed from the perspective of consolidated FERM activities, to reduce the complexity of the findings, as well as to uncover common and contrasting effects. In the next section, the predictor effects are re-examined from the perspective of consolidated predictors for the same purposes. The discussions in this section are organised in the order of the regrouped categories of FERM activities seen earlier. It is probably worth reminding that the predictor effects discussed below refer to average conditional effects, and therefore, based on the premise that all other predictors are held constant.

Managing FX risk and all three FX exposure types

Here, the predictor effects associated with the FERM activities of managing FX risk and managing all three FX exposure types are reviewed. It was found that a larger company was more inclined to manage FX risk. This also means that a larger company was more inclined to manage at least one FX exposure type because, by definition, managing FX risk must mean managing at least one type of FX exposure. As described earlier, a larger company has greater capacity to manage FX risk, because it has greater resources, or greater access to resources, to fund and conduct FERM programmes, and also because it usually encounters lower costs of using external hedging instruments. However, the study found that a larger company was less inclined to manage all three FX exposure types (accounting, economic, and transaction, exposures). This is because a larger company also has greater capacity to assume FX risk arising from not managing all three types of FX exposure. Actually, a larger company, given that it managed FX risk, was found to be less inclined to manage economic and accounting exposures.

Therefore, this implies that, given that a company manages FX risk, an increase in the company's size reduces its inclinations to manage accounting and economic exposures, and therefore, increases its inclination to focus solely on managing transaction exposure. In other words, a larger company has greater capacity to be discerning about the exposure types it manages. In short, these indicate that a larger company has greater capacity to manage FX risk but, given that it manages FX risk, a larger company has greater capacity to assume some FX risk (arising from not managing all three FX exposure types).

The study implied that a company that had greater FX exposure was more inclined to manage FX risk. This is simply because a company with greater FX exposure has greater need for managing FX risk, or managing at least one FX exposure type. However, notably, a company that had greater FX exposure was not more (or less) inclined to manage all three FX exposure types. This then implies that a company with greater FX exposure does not have greater (or lower) need for managing all three FX exposure types. In short, these imply that a company with greater FX exposure has greater need to manage FX risk or manage at least one FX exposure type, although it does not seem to have greater (or lower) need for managing all three FX exposure types. Nonetheless, a company that had greater financing exposure was implied to be more inclined to manage all three FX exposure types. This indicates that a company that has greater financing exposure has greater need for managing all three types of FX exposure. This is probably because exposures from financing component are often more critical, larger, and longer-term, than exposures from other components. In other words, financing exposure poses higher risk than other exposure components. However, as seen above, a company with greater FX exposure was not more (or less) inclined to manage all three FX exposure types. Therefore, these findings mean that, given that a company manages FX risk, an increase in financing *component* exposure in particular, rather than the increase in *total* FX exposure, increases the company's need to manage all three types of FX exposure.

This research showed that a company that perceived it had greater FX exposure was more inclined to manage all three FX exposure types. This suggests that a company that perceives it has greater FX exposure is more sensitive and concerned about its overall risk, and therefore, would perceive that it has greater need to manage all three FX exposure types. On the other hand, above it was noted that a company with greater FX

exposure was not more (or less) inclined to manage all three FX exposure types. Consequently, these mean that, given that a company manages FX risk, an increase in the company's *perception* of its FX exposure size, rather than the increase in *actual* FX exposure size, increases the company's need to manage all three FX exposure types.

Finally, a company that perceived it had greater FX exposure *instability* (more changeable yearly exposure pattern) was less inclined to manage all three FX exposure types. As implied previously, this is probably because the company feels that it is less worthy to invest and dedicate resources for managing all FX exposure types when the exposure pattern is expected to vary widely from one year to the next. Conversely, as seen earlier, a company that perceived it had greater FX exposure (size) was more inclined to manage all three FX exposure types. These findings then indicate that, although both greater exposure size and instability are broadly thought to characterise greater FX risk, each exposure dimension (i.e., size and instability) has a different effect on companies' inclination to manage all FX exposure types. An increase in a company's perception of its FX exposure *size* increases, but an increase in the company's perception of its FX exposure *instability* reduces, the company's need to manage all three FX exposure types.

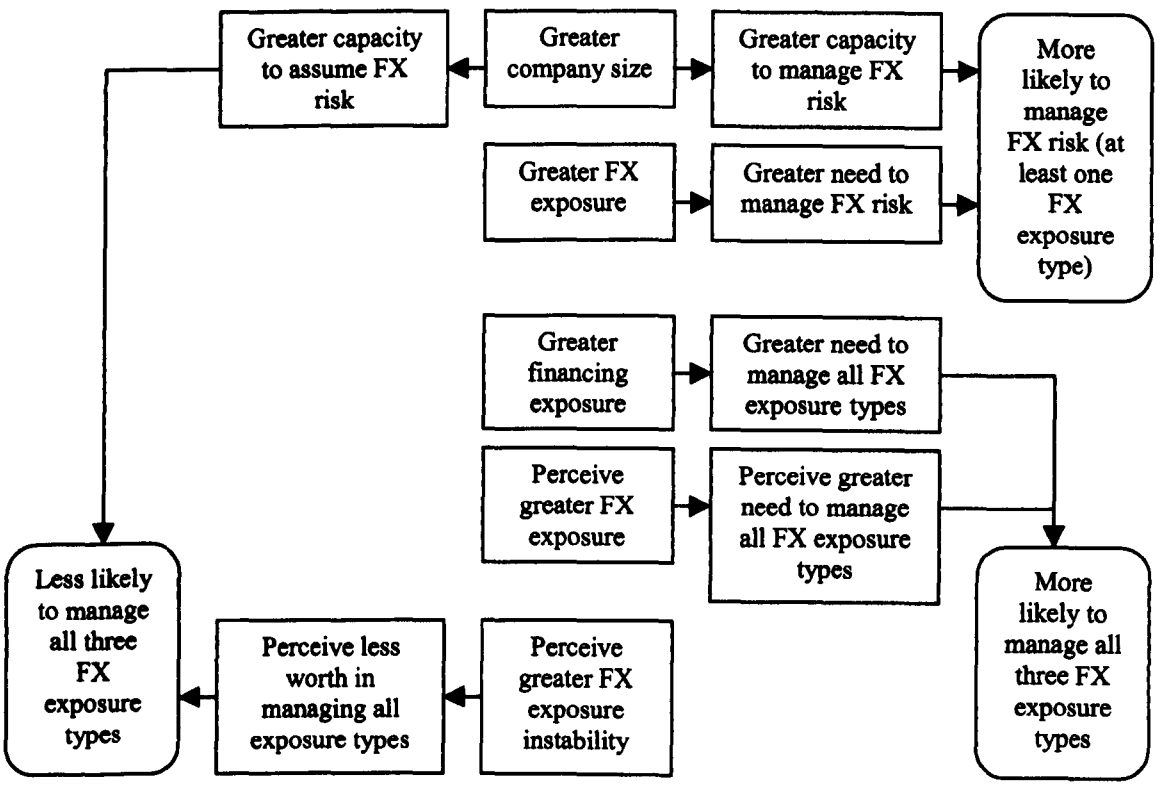


Figure 6.3(a): Predictor effects on companies' inclinations to manage FX risk (manage at least one FX exposure type) and to manage all three FX exposure types.

The above discussions are summarised in a diagram in Figure 6.3(a). To summarise, a company is more likely to manage FX risk when it ① is larger, and ② has greater FX exposure. However, given that a company manages FX risk, the company is more likely to manage all three FX exposure types when it ① is smaller, ② has greater financing exposure, and ③ perceives it has greater FX exposure, but ④ perceives it has more stable FX exposure.

First, the above discussions highlight that a company's inclination to manage all three FX exposure types is not merely a linear extension of the company's inclination to manage FX risk (or manage at least one FX exposure type). For example, an increase in company size increases the company's inclination to manage FX risk, but then, given that the company manages FX risk, the increase in company size reduces the company's inclination to manage all three FX exposure types. Further, an increase in a company's FX exposure increases the company's inclination to manage FX risk, but it does not increase the company's inclination to manage all three FX exposure types.

Second, they also highlight the importance of different FX exposure characteristics in influencing companies' inclinations to all three FX exposure types, and the differences in their influences. The characteristics include component exposure and total exposure; perceived exposure and actual exposure; as well as exposure instability and exposure size. An increase in a company's *total actual* FX exposure size does not increase its inclination to manage all three FX exposure types. However, increases in the company's financing *component* exposure size, and the company's *perception* of its FX exposure size, increase the company's inclination to manage all three FX exposure types. Apart from that, an increase in a company's perception of its FX exposure *size* increases, but an increase in the company's perception of its FX exposure *instability* reduces, the company's inclination to manage all three FX exposure types.

Managing accounting exposure

The predictor effects associated with the FERM activity of managing accounting exposure have already been examined in the first part of the chapter. Here, the findings are briefly reviewed. It was found that a larger company, given that it managed FX risk, was less inclined to manage accounting exposure. As explained earlier, this is probably because a larger company has greater capacity to assume the risk arising from not

managing accounting exposure because the company encounters less market inefficiency.

The study indicated that a company that used greater debt, given that the company managed FX risk, was more inclined to manage accounting exposure. This is because a company with greater debt probably has greater need to ensure that translation losses do not adversely affect the company's credit position and compliance with its debt agreement conditions. However, the study also indicated that a company that used a moderate (compared to low or high) level of debt, given that it managed FX risk, was less inclined to manage accounting exposure. Possibly, this is because a company that uses a moderate level of debt, and already has an established and optimum level of debt capacity, is less concerned about expanding or defending its debt capacity, and therefore, is less sensitive about accounting exposure. These two findings imply that the effect of debt on companies' inclination to manage accounting exposure is non-linear. The above discussions are represented pictorially in Figure 6.3(b). In short, a company that manages FX risk is more likely to manage accounting exposure when it ① is smaller, ② has greater total debt, but ③ does not have a moderate level of total debt.

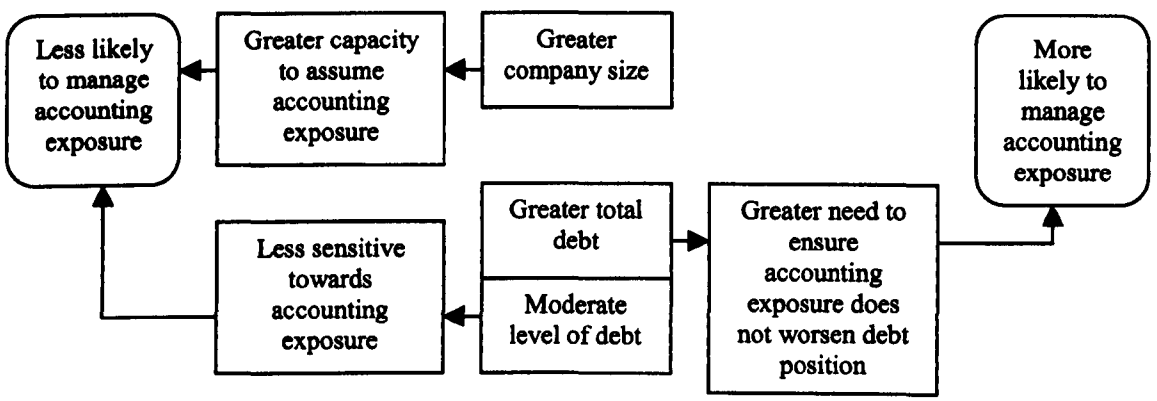


Figure 6.3(b): Predictor effects on companies' inclination to manage accounting exposure.

Adopting formal FERM objective

The predictor effects associated with this FERM activity have also been examined in great detail earlier. Here, the findings are only briefly reviewed. The study showed that a larger company (both in terms of total assets and total sales), given that it managed FX risk, was more inclined to adopt a formal FERM objective. This is again because a

larger company has greater capacity to fund and conduct a formal or systematic FERM programme.

Further, this research indicated that a company that had a moderate (compared to low or high) level of intra-company transactions, given that it managed FX risk, was less inclined to adopt a formal FERM objective. This is possibly due to the high costs (of dealing with complexity, conflicts, and subsidiary disenchantment) and inadequate benefits (from resolved conflicts) from adopting a formal objective when the level of intra-company transactions is moderate. In other words, it seems generally less worthy to adopt a formal FERM objective when the level of intra-company transactions is moderate, rather than low or high. This implies that the effect of intra-company transactions of a company on the company's inclination to adopt a formal FERM objective is non-linear. Figure 6.3(c) encapsulates the above discussions in a diagram. To summarise, a company that manages FX risk is more likely to adopt a formal FERM objective when it ① is larger, and ② does not have a moderate level of intra-company transactions.

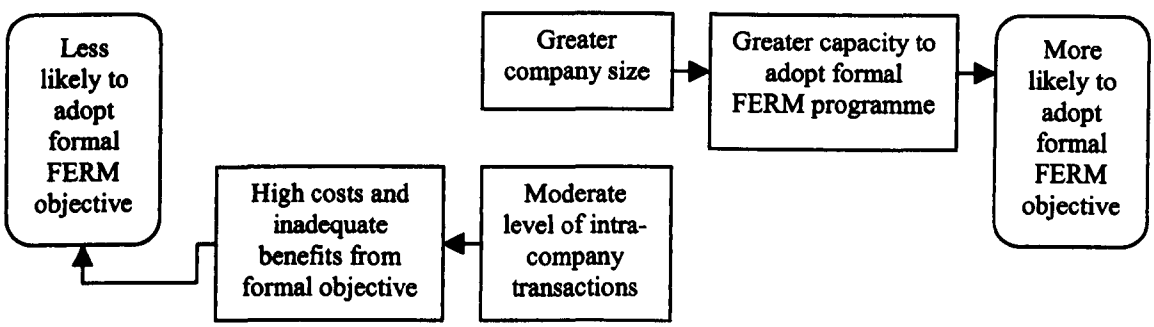


Figure 6.3(c): Predictor effects on companies' inclination to adopt formal FERM objectives.

Assuming natural and accepting artificial FX exposures

Here, the predictor effects associated with the FERM activities of ① allowing time flexibility for hedging, ② undertaking partial cover, and ③ undertaking uncovered FX deals are reviewed. As indicated earlier, a company assumes natural FX exposure, at least temporarily, or partially, when the company allows time flexibility for hedging, and undertakes partial cover. Conversely, a company accepts additional artificial FX exposure when it undertakes uncovered FX deals.

The study implied that a company that had greater FX exposure, given that it managed FX risk, was more inclined to assume at least some of its natural FX exposure. More particularly, the company was more inclined to allow time flexibility for hedging and undertake partial cover. As explained before, this is probably because a company with greater FX exposure has ① greater opportunity for naturally netting some of its exposures, ② greater capacity (experience and competence) for partially or temporarily assuming the exposures, and ③ greater familiarity with the exposures. Therefore, the company is less sensitive or anxious towards assuming some of its own natural exposure. However, the study also indicated that the company with greater FX exposure, given that it managed FX risk, was less inclined to accept additional artificial FX exposure. More precisely, the company was less inclined to undertake uncovered FX deals. This, as mentioned earlier, reflects that a company with greater FX exposure is more sensitive or averse towards accepting additional artificial FX exposure, or in other words, less inclined to deliberately increase its FX exposure in search of FX gain. These findings imply that a company with greater FX exposure, given that the company manages FX risk, is less averse about assuming its own existing natural exposures, but more averse against accepting additional artificial exposures.

The study suggested that a company that *perceived* it had greater FX exposure, given that it managed FX risk, was less inclined to assume some natural FX exposures. More particularly, the company was less inclined to allow time flexibility for hedging. This suggests that a company that perceives it has greater FX exposure is more averse against assuming some natural FX exposures.[18] Above, it was noted that a company that has greater FX exposure is, on the contrary, less averse towards assuming natural FX exposures. Consequently, these imply that, given that a company manages FX risk, an increase in the company's *actual* FX exposure size reduces, whereas an increase in the company's *perception* of its FX exposure size seems to increase, the company's aversion to assuming some natural FX exposures.

[18] However, this argument is rather weak because the company that perceived it had greater FX exposure was not less inclined to undertake partial cover. Besides, neither was the company that perceived it had greater FX exposure less inclined to undertake uncovered FX deals. Nonetheless, these observations could imply that a company's perception of its FX exposure size is inadequate to affect its decisions to undertake partial cover or uncovered FX deals, although it is sufficient to influence its decision to allow time flexibility for hedging.

The research indicated that a company that perceived it had greater FX exposure unpredictability, given that the company managed FX risk, was more inclined to assume natural FX exposure, or more precisely, undertake partial cover. Given greater exposure unpredictability, assuming a portion of the exposures (by means of partial cover) reduces the exposure value-at-risk and, thereby, the overall FX risk, as explained earlier. This indicates that a company that perceives it has more unpredictable exposures might feel that it has greater need to undertake partial covers to reduce the value-at-risk of the exposures, thereby, reducing its potential FX losses (and gains). However, above, it was noted that a company that perceives it has greater FX exposure (size) seems to be less inclined to assume natural FX exposures. Consequently, these findings imply that, given that a company manages FX risk, an increase in the company's perception of its FX exposure *size* increases, whereas an increase in the company's perception of its FX exposure *unpredictability* decreases, the company's inclination to assume some natural FX exposures.

Moreover, a company that perceived it had greater FX exposure instability (i.e., varying yearly exposure pattern), given that it managed FX risk, was more inclined to accept artificial FX exposure, or more precisely, undertake uncovered FX deals. As implied formerly, given greater exposure instability, accepting artificial exposures (by means of uncovered FX deals) could potentially offset unexpected natural (or operating) exposures, and consequently, reduce the overall FX risk. This suggests that a company that perceives it has more unstable exposures might feel that it has greater opportunity to undertake uncovered FX deals to serve as potential covers for unanticipated exposures. Above, it was noted that a company that perceives it has greater FX exposure unpredictability is more inclined to assume natural FX exposures. In short, these two findings imply that a company that (manages FX risk and) perceives it has greater FX exposure ambiguity (unpredictability and instability) is more inclined to assume natural FX exposure or accept artificial FX exposure. This is because the company feels it has greater need and opportunity to reduce its overall FX risk by assuming natural, or accepting artificial, exposures.

The study implied that a company that had greater foreign-held equity, given that it managed FX risk, was more inclined to assume some natural FX exposure. More particularly, the company was more inclined to undertake partial cover. As indicated previously, foreign investors, compared to domestic investors, are usually more

internationally diversified. Therefore, a company that has greater foreign-held equity has greater capacity to assume some natural FX exposure. On the other hand, this study found that a company that had a greater government-held equity, given that it managed FX risk, was more inclined to accept artificial FX exposures, or in other words, undertake uncovered FX deals. This is possibly because, as previously explained, a company that has greater government-held equity has greater reputation, as well as implied solvency and better credit risk, and therefore, greater capacity to accept additional FX exposures. Further, as uncovered FX deals are restricted in Malaysia, a company's greater government-held equity might indicate the company's greater access to special permission from the central bank to undertake such deals. In short, a company that (manages FX risk and) has greater foreign- or government-held equity appears to have greater capacity and opportunity to assume natural, or accept artificial, FX exposure.

Finally, the study showed that a company that had a higher number of overseas subsidiaries, given that it managed FX risk, was more inclined to undertake uncovered FX deals. This is probably because a company with a higher number of overseas subsidiaries has ① greater ability to gather relevant information using its wider information network of overseas subsidiaries, and ② greater opportunity to use the intra-company transactions involving its overseas subsidiaries as justifications, for undertaking uncovered FX deals.

Figure 6.3(d) summarises the above discussions in a diagram. In short, a company that manages FX risk is more likely to assume some natural FX exposure when the company ① has greater FX exposure, ② perceives it has smaller FX exposure, ③ perceives it has greater FX exposure unpredictability, and ④ has greater foreign-held equity. On the other hand, the company is more likely to accept artificial FX exposure when it ① has smaller FX exposure, ② perceives it has greater FX exposure instability, ③ has greater government-held equity, and ④ has a higher number of overseas subsidiaries.

First, the discussions above underscore that FX exposure size has different (opposite) influences a company's inclinations, to assume natural FX exposure, and to accept artificial FX exposure. To recap, given that a company manages FX risk, an increase in the company's FX exposure increases its inclination to assume natural FX exposure, but decreases its inclination to accept artificial FX exposure.

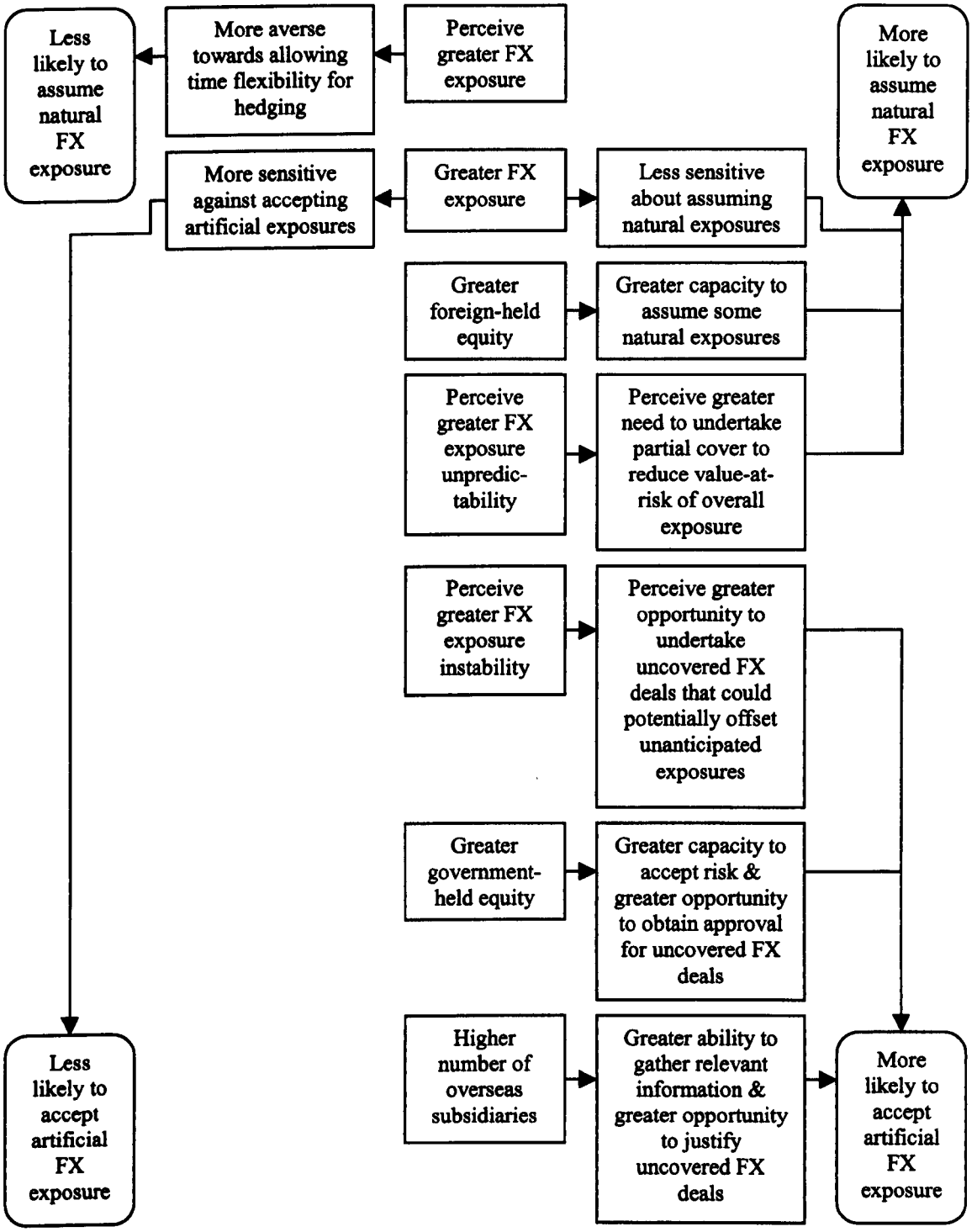


Figure 6.3(d): Predictor effects on companies' inclinations to assume natural FX exposures, and to accept artificial FX exposures.

Second, they also show that different FX exposure characteristics have different influences on companies' inclination to assume natural FX exposure. For example, given that a company manages FX risk, an increase in the company's *actual* FX exposure size appears to increase, but an increase in the company's *perception* of its FX exposure size reduces, the company's inclination to assume natural FX exposure. Moreover, an increase in a company's perception of its FX exposure *ambiguity* (particularly, exposure unpredictability) increases its inclination to assume natural FX exposure, although, as noted formerly, an increase in the company's perception of its FX exposure *size* seems to reduce that inclination.

Sharing FERM responsibility

The predictor effects associated with the FERM activity of sharing FERM responsibility among more than one department in a company have already been examined earlier. Here, the findings are briefly recapped. This research found that a larger company, given that it managed FX risk, was more inclined to specialise by placing FERM responsibility with one department. This is again because a larger company has greater capacity to meet the fixed high cost requirement of funding the setting-up and running of a specialised department to handle FERM.

A company that perceived it had greater FX exposure, given that it managed FX risk, was found to be more inclined to share FERM responsibility among two or more departments. This portrays that a company that perceives it has greater FX exposure perceives it has greater need for increasing accountability and pooling expertise among, and apportioning the responsibility to, several departments in dealing with the exposures.

The study implied that a company that had a larger number of smaller, and more regular, individual FX exposures, given that it managed FX risk, was more inclined to specialise by placing FERM responsibility with one department. As mentioned earlier, companies listed on the consumer sector are likely to have individual FX exposures with the above characteristics. Given these characteristics, it is more conducive for the company to allow one department to specialise in dealing with FERM. The study, therefore, also implied that a company that had a smaller number of larger but more irregular, individual FX exposures, given that it managed FX risk, was more inclined to share the FERM responsibility among more than one department. As noted previously,

companies listed in the property and construction sectors are more likely to face individual exposures with these characteristics. Given these characteristics, a company probably has greater need for increasing accountability and pooling expertise among, and apportioning the responsibility to, several departments in dealing with the exposures, because the exposures are more difficult to manage.

Figure 6.3(e) presents the above discussions in a diagram. To summarise, a company that manages FX risk is more likely to share FERM responsibility among two or more departments when the company ① is smaller, ② perceives it has greater FX exposure, and ③ has a smaller number of larger but more irregular individual FX exposures.

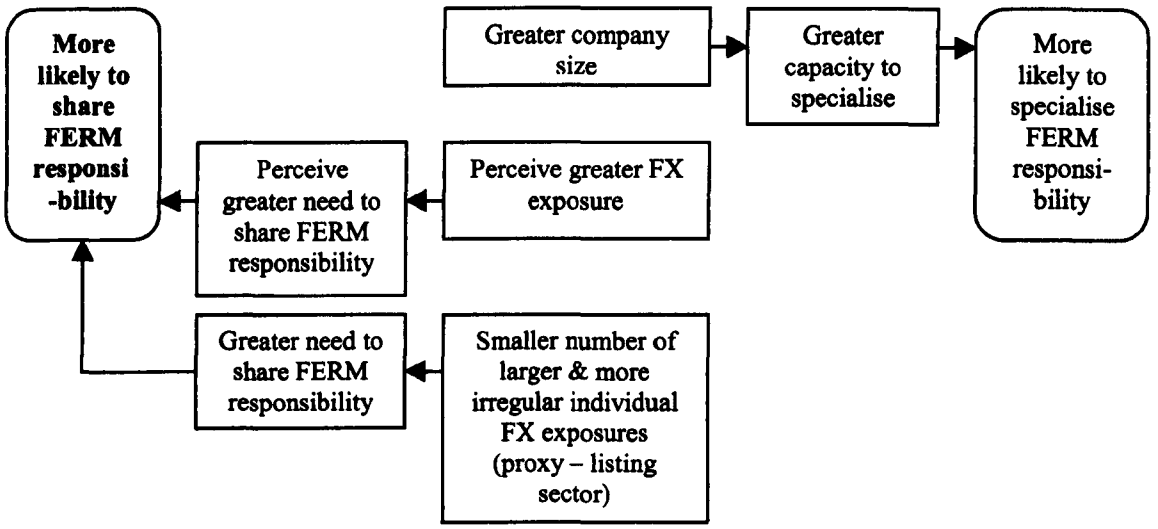


Figure 6.3(e): Predictor effects on companies' inclination to share FERM responsibility among two or more departments.

Decentralising fully subsidiaries' FERM

Here, the predictor effects associated with the FERM activities of decentralising fully, ① domestic, and ② overseas, subsidiaries' FERM are reviewed. The study implied that a company that had a higher level of intra-company transactions, given that it managed FX risk, was more inclined to fully decentralise its subsidiaries' FERM. This effect was noted for the decentralisation of both domestic and overseas subsidiaries' FERM. This indicates that, when the level of intra-company transactions is high, FERM centralisation involves costs (of dealing with complexity and subsidiary resentment) that are greater than the benefits (of reduced duplication of function and hedging costs).

This research found that a larger company, given that it managed FX risk, was less inclined to decentralise fully its overseas subsidiaries' FERM. This is because a larger company, again, has greater capacity to fund FERM centralisation. However, a larger company was not less (or more) inclined to decentralise fully its domestic subsidiaries' FERM. This is because overseas subsidiaries often contribute the bulk of a company's FX exposure. Therefore, a company that has the capacity to centralise FERM tends to focus on centralising (or rather avoid fully decentralising) overseas rather than domestic subsidiaries' FERM.[19] In short, this implies that a larger company, given that it manages FX risk, has greater capacity to undertake centralisation, but it appears to focus on centralising overseas, rather than domestic, subsidiaries' FERM.

It was found that a company that perceived it had a higher FX exposure increment, given that the company managed FX risk, was less inclined to decentralise fully its overseas subsidiaries' FERM. In other words, a company that perceived its FX exposures to increase at a higher rate in the future was less likely to allow full autonomy to its overseas subsidiaries to manage their own FX exposures. This is possibly because a company that perceives it has greater FX exposure increment feels it has greater need to centrally control the FX risk, in anticipation of the increased exposure and risk. However, a company that perceived it had a higher FX exposure increment was not less (or more) inclined to decentralise fully its domestic subsidiaries' FERM. Again, this might be due to the overseas subsidiaries contributing the bulk of a company's FX exposure. Consequently, a company that perceives it has greater need for centralising FERM tends to focus on centralising (or rather avoid fully decentralising) overseas subsidiaries' FERM.[20] In short, this implies that a company that perceives it has a higher FX exposure increment, given that it manages FX risk, perceives it has greater need to undertake FERM centralisation, but the company appears to focus on centralising overseas, rather than domestic, subsidiaries' FERM.

[19] On the other hand, it is possible that the effect of company size on companies' inclination to decentralise domestic subsidiaries' FERM could have been masked (moderated) by the cross-ownership of equity between parent companies and their domestic subsidiaries.

[20] Again, the effect of a company's perception of its FX exposure increment on its inclination to decentralise its domestic subsidiaries' FERM could have been moderated by the cross-ownership of equity between the parent company and its domestic subsidiaries.

This study implied that a company that had a higher debt ratio, given that it managed FX risk, was less inclined to decentralise fully its domestic subsidiaries' FERM. This is probably because the company with a higher debt ratio has greater financial risk, and therefore, would have greater need to centrally control (or rather avoid fully decentralising) its operations, including its domestic subsidiaries' FERM. However, a company with a higher debt ratio was not less (or more) inclined to decentralise fully its overseas subsidiaries' FERM. This observation implies that a company's debt ratio is insufficient to influence the centralisation of overseas subsidiaries' operations and FERM, although it seems to influence the centralisation of domestic subsidiaries' operations and FERM. In other words, a company that (manages FX risk and) has a higher debt ratio appears to have greater need to undertake centralisation, but it does not seem to influence the centralisation of overseas subsidiaries' operations and FERM.

Finally, the study implied that a company that had greater capital investment in foreign currencies, given that the company managed FX risk, was more inclined to decentralise fully its domestic subsidiaries' FERM. However, the company was not more (or less) inclined to decentralise fully its overseas subsidiaries' FERM. Corporate investment, including capital investment, is commonly associated with more decentralised management structures. Therefore, a company that has greater foreign currency capital investment is probably more inclined to allow full autonomy to its subsidiaries in managing their own FX exposures because that would be consistent with the general decentralised structure adopted by the company. Then again, a company is likely to impose greater central control over the subsidiaries into which it makes capital investment and, by comparison, allow greater autonomy to the subsidiaries into which it does not make capital investment. Since a company that has greater foreign currency capital investment is less likely to make the investments in domestic subsidiaries, the company is more likely to allow greater autonomy to its domestic subsidiaries to manage their own FX exposures. On the other hand, the company might impose greater central control over the overseas subsidiaries into which it makes substantial capital investment but allow greater autonomy to other overseas subsidiaries. Therefore, the aggregated effect on all overseas subsidiaries is possibly less clear. In short, these arguments imply two separate effects. ① A company with greater investment (including capital investment) is more likely to adopt a decentralised structure, and therefore, is more likely to decentralise its subsidiaries' FERM. ② A company that makes greater

capital investment in a particular subsidiary is more likely to exercise greater central control over the subsidiary, and therefore, is less likely to decentralise the subsidiary's FERM.

The above discussions are summarised and depicted in a diagram in Figure 6.3(f). To summarise, a company that manages FX risk is more likely to decentralise fully its domestic subsidiaries' FERM when the company ① has greater intra-company transactions, ② has a lower debt ratio, and ③ has greater foreign currency capital investment. Whereas, a company that manages FX risk is more likely to decentralise fully its overseas subsidiaries' FERM when the company ① has greater intra-company transactions, ② is smaller, and ③ perceives it has a lower FX exposure increment in the future.

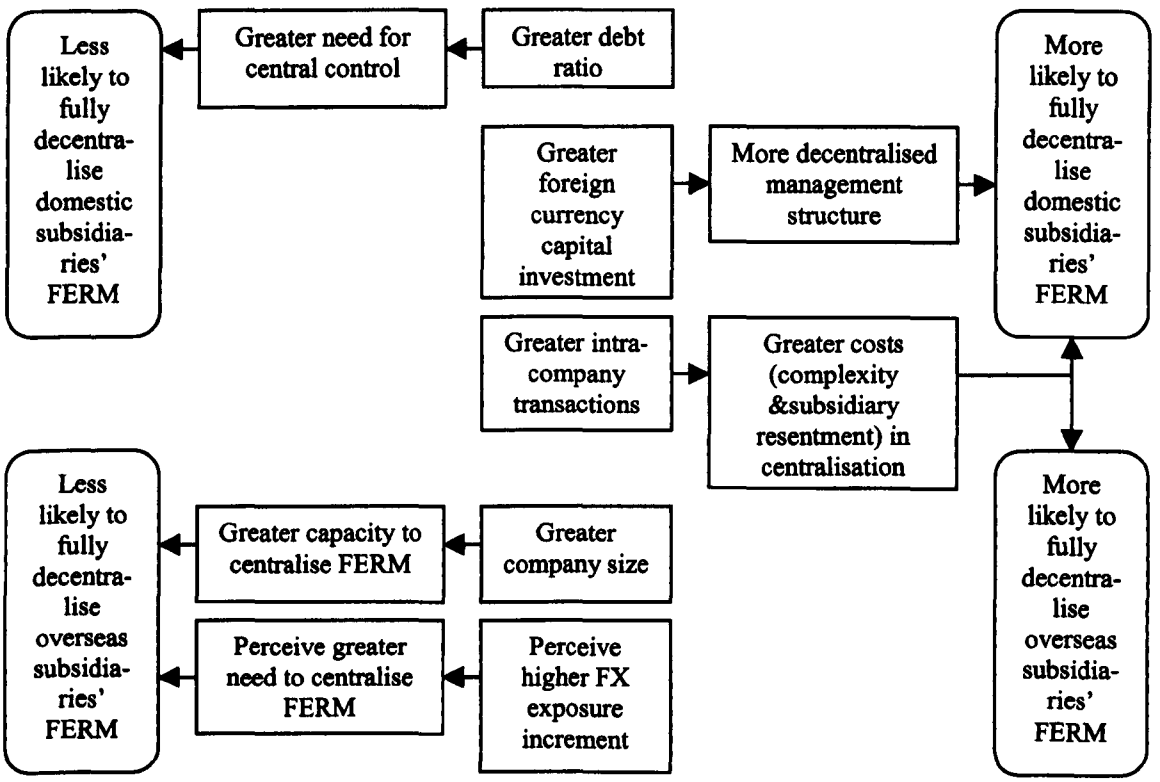


Figure 6.3(f): Predictor effects on companies' inclinations to fully decentralise domestic and overseas subsidiaries' FERM.

The above discussions seem to suggest that, with the exception of one predictor (intra-company transactions), companies' inclinations to decentralise domestic and overseas subsidiaries' FERM appear to be influenced by different sets of predictors. Broadly, a company's inclination to decentralise its domestic subsidiaries' FERM appears to reflect the extent of centralisation in the company's general management structure, which in

turn, seems to be affected by the company's financial risk (debt ratio) and level of investment. In contrast, the company's inclination to decentralise its overseas subsidiaries' FERM seems to be affected more by FERM considerations. Particularly, the company's capacity (company size) and need (expected future FX exposure size) to centralise FERM. Again, this is because overseas, rather than domestic, subsidiaries often provide the bulk of a company's FX exposure. Nonetheless, a company's inclination to decentralise its (both domestic and overseas) subsidiaries' FERM appears to be influenced by the company's level of intra-company transactions.

Using forward contracts

The predictor effects associated with the FERM activities of using, and extensively using, forward contracts to manage transaction exposure are reviewed next. The study found that a larger company, given that it managed transaction exposure, was more inclined to use forward contracts, but it was not more (or less) inclined to extensively use the hedging tools. This shows that a larger company has greater capacity to use forward contracts. More particularly, a larger company has greater resources to meet the high fixed costs of using forward contracts, and has greater and cheaper access to the hedging tools, due to its better credit risk. Notwithstanding this, it also shows that a larger company is not dependent on the use of forward contracts, probably because the company has access to other hedging tools as well.

This research also implied that a company that had greater FX exposure, given that it managed transaction exposure, was more inclined to use forward contracts, but it was not more (or less) inclined to extensively use the hedging instruments. This suggests that a company with greater FX exposure has greater need to use forward contracts. As indicated earlier, this simply reflects that forward contracts are the most used instruments for hedging FX exposures. However, it also suggests that the company is not dependent on forward contracts probably because it has greater opportunity to net some of the exposures, and has acquired greater experience and expertise to use internal hedging techniques, or use alternative external hedging instruments.

Besides that, the research implied that a company that had greater financing exposure, given that the company managed transaction exposure, was less inclined to both use, and extensively use, forward contracts. As explained previously, a company with greater financing exposure has less non-financing component exposures that are

appropriate to be hedged with forward contracts, and it has greater access to foreign funding and deposit facilities, which encourage the use of money market hedging instead. Therefore, these imply that a company with greater financing exposure has less opportunity and need to use forward contracts. However, above it was noted that a company with greater FX exposure was more inclined to use forward contracts. Consequently, these two findings indicate that, given that a company manages transaction exposure, an increase in *total* FX exposure increases the company's need to use forward contracts, but an increase in financing *component* exposure reduces the company's need and opportunity to use forward contracts.

Finally, the study implied that a company that had greater reputation (i.e., listed on the main, rather than the second, board of the KLSE), given that the company managed transaction exposure, was more inclined to extensively use forward contracts.[21] This is because a main board company has greater reputation, and therefore, has greater and cheaper access to forward contracts. Although a company with greater reputation might not be dependent on the use of forward contract, it seems to use the hedging tool extensively because it has greater and cheaper access to the hedging instrument.

Figure 6.3(g) summarises the above discussions pictorially. In short, a company is more likely to use forward contracts when it ① is larger, ② has greater FX exposure, but ③ has smaller financing exposure. On the other hand, a company is more likely to extensively use forward contracts when it ① has smaller financing exposure, and ② has greater reputation. Overall, a company's inclination to use forward contract appears to be influenced by its capacity (company size) and need (total FX exposure) to use the hedging instrument. The inclination is moreover inversely affected by the company's access (financing component exposure size) to alternative hedging technique. In addition, a company's inclination to extensively use forward contracts seems to be influenced by the company's access (company reputation) to forward contracts.

[21] However, a company that had greater reputation was not more (or less) inclined to use forward contracts. This implies that a company with lower reputation is also equally likely to use forward contract, but the company uses it less extensively, compared to a company with greater reputation. In other words, an increase in reputation does not increase a company's inclination to use forward contract, but given that it used forward contract, the increase in reputation increases the company's inclination to extensively use the hedging tool.

First, the above discussions indicate that a company's inclination to extensively use forward contracts is not a sheer linear extension of the company's inclination to use forward contracts. This is because they appear to be influenced by different sets of predictors, with the exception of one predictor (financing component exposure). As seen above, an increase in company size and FX exposure increases a company's inclination to use forward contract, but it does not increase (or decrease) the company's inclination to extensively use the hedging instrument.

Second, they also reflect that different FX exposure dimensions, i.e., component exposure and total exposure, have different (opposite) influences on companies' inclination to use forward contracts. As seen above, an increase in a company's *total* FX exposure increases, but an increase in the company's financing *component* exposure reduces, the company's inclination to use forward contracts.

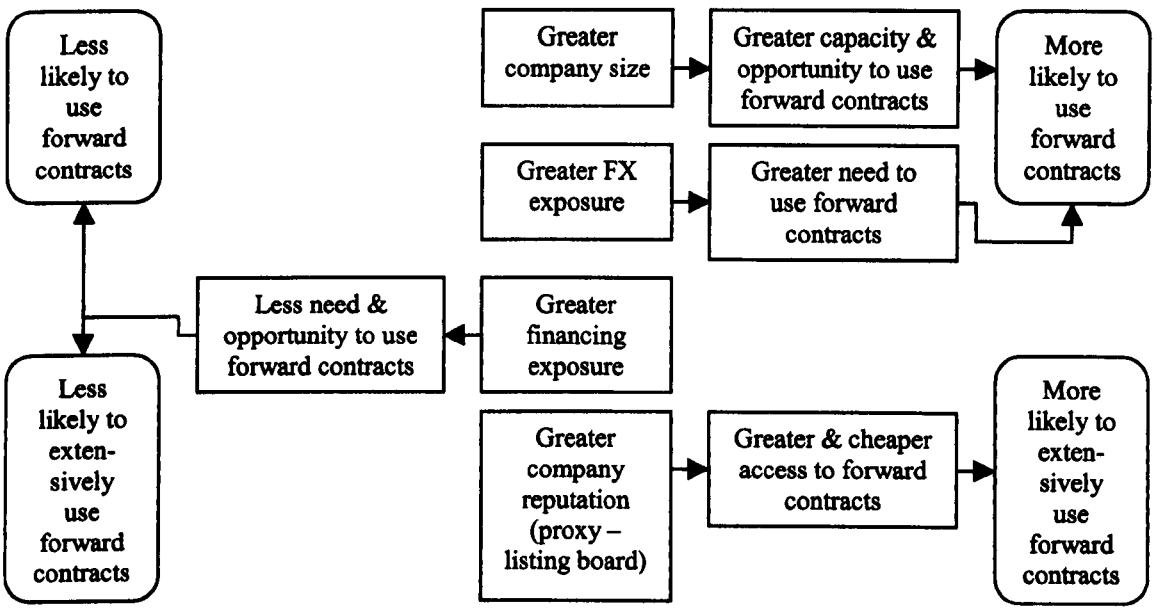


Figure 6.3(g): Predictor effects on companies' inclinations to use, and extensively use, forward contracts.

6.2.2. Review of predictor effects from the perspective of predictors

In this section, the findings or predictor effects are reviewed from the perspective of consolidated predictors, again, to reduce the complexity of the findings, as well as to uncover common and contrasting effects. As described earlier, the predictors have been regrouped into five broad predictor categories for this purpose. The predictor groups are ① company size, ② FX exposure characteristics, ③ debt and equity, ④ intra-

company transactions, and ⑤ miscellaneous predictors. These predictor groups are depicted in Figure 6.4(a). The findings or predictor effects associated with these predictor groups are examined, in the preceding order, next.

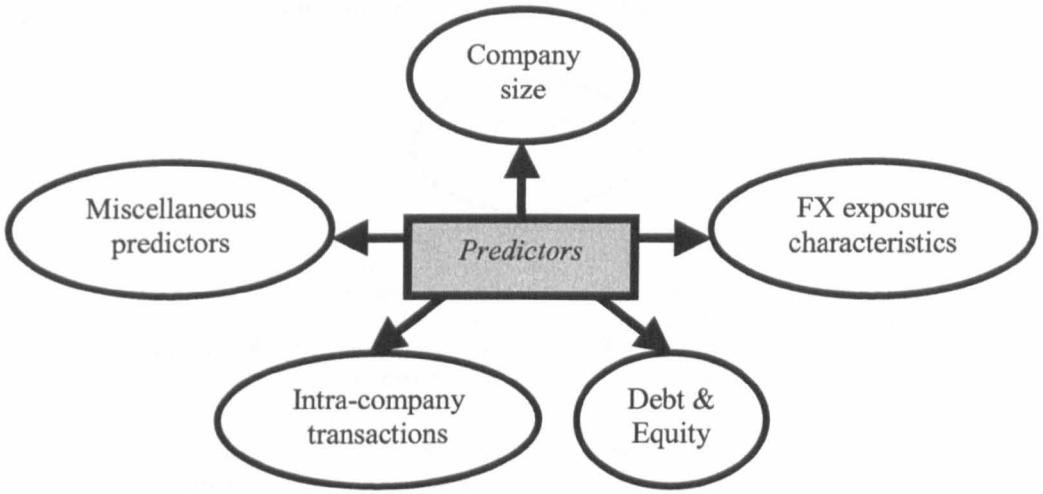


Figure 6.4(a): Five broad categories of regrouped predictors.

Company size

This study found that a larger company was more inclined to ① manage FX risk, and given that the company managed FX risk, it was more inclined to ② adopt a formal FERM objective, ③ specialise by placing FERM responsibility with only one department, ④ centralise its overseas subsidiaries' FERM,[22] and ⑤ use forward contracts.[23] These effects are illustrated in Figure 6.4(b). These findings clearly indicate that a larger company has greater capacity to undertake FERM activities that require high fixed initial and operating costs because the company has greater resources, and has greater access to external or additional resources.

However, a larger company was ⑥ less inclined to manage all three FX exposure types. This effect is also illustrated in Figure 6.4(b). In fact, as pointed out earlier, a larger company that managed FX risk was less inclined to manage accounting and economic

[22] Actually, a larger company was less inclined to decentralise fully its overseas subsidiaries' FERM. Notably however, a larger company was not less (or more) inclined to decentralise its domestic subsidiaries' FERM. This is because domestic, unlike overseas, subsidiaries do not normally account for the bulk of a company's FX exposure, and therefore, a company with greater capacity to centralise FERM tends to focus on overseas, and not domestic, subsidiaries.

[23] However, a larger company was neither less nor more inclined to extensively use forward contracts. This implies that although a larger company has greater capacity to use forward contracts, the company is not more dependent on the use of forward contracts.

exposures. These findings imply that a larger company that manages FX risk has greater capacity to assume some of the FX risk arising from not managing all FX exposure types, particularly accounting and economic exposures, and therefore, is more inclined to focus solely on managing transaction exposure.

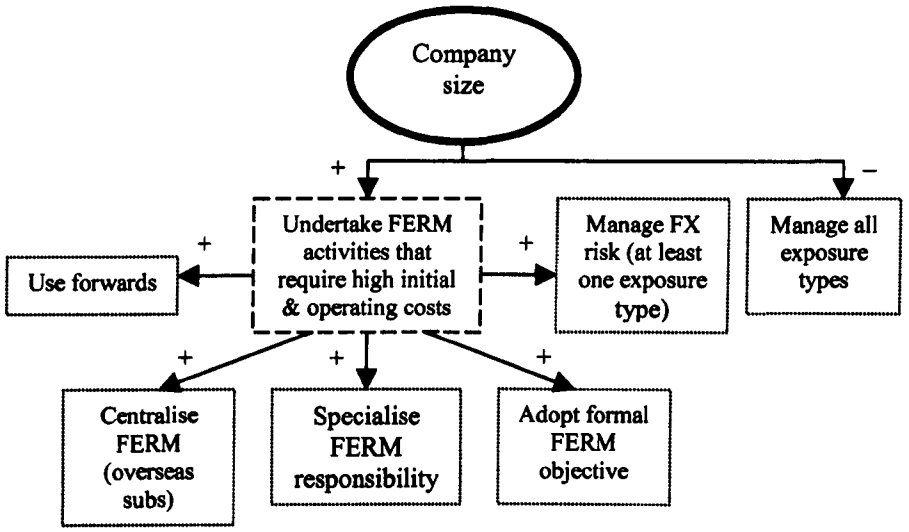


Figure 6.4(b): The effects of company size on companies' inclinations to undertake specific FERM activities.

The discussions above can be summarised into two points. ❶ A larger company seems to have greater capacity to undertake FERM activities that require high fixed initial and operating costs. ❷ Although a larger company has greater capacity to manage FX risk, given that it manages FX risk, a larger company appears to have greater capacity to assume some FX risk arising from not managing all FX exposure types. More particularly, a larger company that manages FX risk seems more inclined to focus on transaction exposure management.

FX exposure characteristics

This group encompasses several predictors associated with companies' FX exposure characteristics. This group can be divided further into two main subgroups – actual, and perceived, FX exposure characteristics. Between them, these subgroups comprise six broad or regrouped predictors, as shown in Figure 6.4(c). The predictors are ① total FX exposure size, ② financing component exposure size, ③ individual exposure characteristics, ④ perceived total exposure size, ⑤ perceived FX exposure increment, and finally ⑥ perceived FX exposure ambiguity. The effects these predictors have on companies' inclinations to undertake specific FERM activities, as found in this study,

are also presented pictorially in Figure 6.4(c). The major findings are explained below, in the order of predictors mentioned above.

Total FX exposure size

A company with greater FX exposure was ① more inclined to manage FX risk, although it was not more (or less) inclined to manage all three types of FX exposure. As mentioned earlier, this implies that a company with greater FX exposure has greater need to manage FX risk or manage at least one FX exposure type, although it does not seem to have greater (or lower) need for managing all three FX exposure types.

This research found that a company with greater FX exposure, given that it managed FX risk, was ② more inclined to assume some natural FX exposures, but ③ less inclined to accept artificial FX exposures. As pointed out earlier, a company with greater FX exposure probably has greater opportunity (in terms of netting) and capacity (competence and familiarity) to assume some of its natural exposures. However, the company seems less keen on seeking FX profits by accepting artificial exposures. All these imply that a company with greater FX exposure, given that the company manages FX risk, is less averse about assuming its own natural or operating FX exposures but is more averse about accepting additional artificial FX exposures.

It was also found that a company with greater FX exposure, given that it managed transaction exposure, was ④ more inclined to use forward contracts, although it was not more (or less) inclined to extensively use forward contracts. As seen earlier, this implies that a company with greater FX exposure has greater need to use, but is not more dependent on, forward contracts because it has greater opportunity and capacity to assume some of the exposures, or use alternative hedging techniques.

The following three points summarise the above discussions. ❶ A company with greater FX exposure has greater need to manage FX risk, or manage at least one FX exposure type, although it does not seem to have greater (or lower) need to manage all FX exposure types. ❷ Given that it manages FX risk, a company that has greater FX exposure appears to be less averse against assuming natural FX exposures, but simultaneously it seems to be more averse against accepting artificial FX exposures. ❸ A company with greater FX exposure has greater need to use forward contracts, although it is not more dependent on forward contracts.

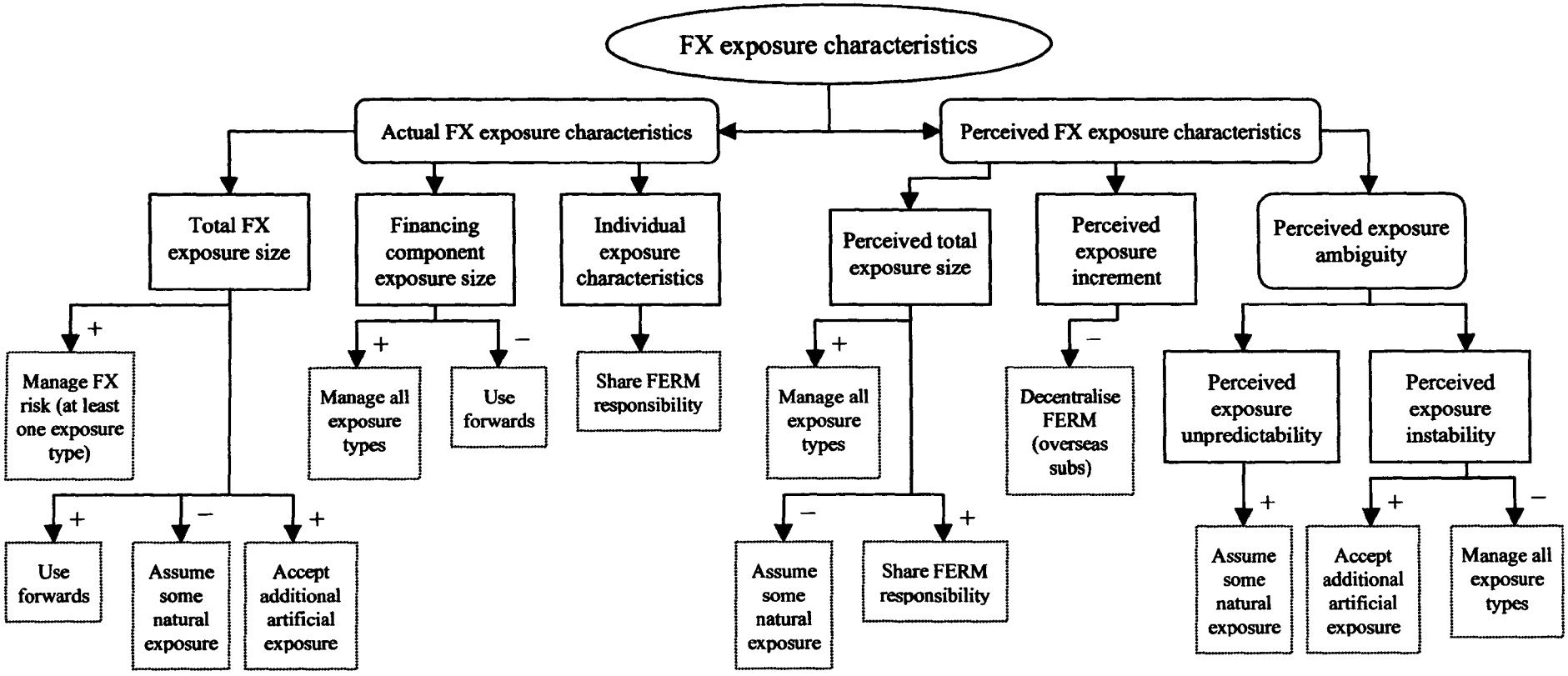


Figure 6.4(c): The effects of FX exposure characteristics on companies' inclinations to undertake specific FERM activities.

Financing component exposure size

The research indicated that a company with greater financing exposure was ① more inclined to manage all three FX exposure types. As pointed out previously, this implies that a company with greater financing exposure has greater need for managing all three FX exposure types, probably because financing exposures pose higher risk than other exposure components.

The study also indicated that a company with greater financing exposure, given that it managed transaction exposure, was ② less inclined to use forward contracts.[24] As explained before, this implies that a company with greater financing exposure has less need and opportunity to use forward contracts because the company has, respectively, greater access to money market hedging alternative, and less number of non-financing exposures that are suitable for hedging with forward contracts.

The discussions above can be summarised into two points. ❶ A company with greater financing exposure seems to have greater need to manage all three FX exposure types. ❷ Given that it manages transaction exposure, a company that has greater financing exposure appears to have less need and opportunity to use forward contracts.

Individual exposure characteristics

It was suggested that a company (listed on the consumer sector) that had a larger number of smaller, and more regular, individual FX exposures, given that the company managed FX risk, seemed more inclined to specialise by placing FERM responsibility with only one department. On the other hand, a company (listed on the property or construction sectors) that had a smaller number of larger, but more irregular, individual FX exposures, appeared more inclined to share FERM responsibility among two or more departments. As already noted, this implies that a company with a larger number of smaller, and more regular, individual FX exposures has greater opportunity to specialise FERM responsibility. On the contrary, a company that has a smaller number of larger, but more irregular, individual exposures appears to have greater need to involve several departments, to pool the expertise, increase accountability, and apportion the responsibility more widely, within the company. To summarise, a

[24] Correspondingly, the company was also less inclined to extensively use forward contracts.

company with a smaller number of larger, but more irregular, individual FX exposures, seems to have greater opportunity to specialise FERM responsibility by placing it with one department. However, a company with the inverse individual FX exposure characteristics, appears to have greater need to share FERM responsibility with several departments.

Perceived total exposure size

A company that perceived it had greater FX exposure was found to be ① more inclined to manage all three FX exposure types. As indicated before, this implies that a company that perceives it has greater FX exposure also perceives it has greater need to manage all three FX exposure types, probably because it is more sensitive or concerned about its overall FX risk.

This study indicated that a company that perceived it had greater FX exposure, given that the company managed FX risk, appeared ② less inclined to assume natural FX exposures. As implied previously, possibly, this simply reflects that a company that manages FX risk and perceives it has greater FX exposure is more sensitive and averse against assuming some of its own exposures.

The research also found that a company that perceived it had greater FX exposure, given that the company managed FX risk, was ③ more inclined to share FERM responsibility among two or more departments. As described earlier, this indicates that a company that perceives it has greater FX exposure also perceives it has greater need to share FERM responsibility among several departments, to increase accountability, pool expertise, and apportion responsibility, in dealing with the exposures.

The discussions above can be represented briefly by three points. ❶ A company that perceives it has greater FX exposure appears to perceive it has greater need to manage all three FX exposure types. ❷ Given that it manages FX risk, a company that perceives it has greater FX exposure seems to be more averse against assuming some natural FX exposure. ❸ A company that perceives it has greater FX exposure appears to perceive it has greater need to share FERM responsibility among several departments.

Perceived FX exposure increment

The study indicated that a company that perceived it had a higher FX exposure increment, given that the company managed FX risk, was less inclined to decentralise fully its overseas subsidiaries' FERM, although it was not less (or more) inclined to decentralise fully its domestic subsidiaries' FERM. As explained before, this reflects that a company perceives it has greater need to centralise (or avoid fully decentralising) FERM, when the company perceives its exposure to increase at a higher rate in the future. However, the company tends to focus on centralising overseas (rather than domestic) subsidiaries' FERM because they normally contribute the bulk of a company's FX exposure. To summarise, a company that perceives it has a higher FX exposure increment appears to perceive it has greater need to centralise FERM, and it seems to focus on centralising its overseas, rather than domestic, subsidiaries' FERM.

Perceived FX exposure ambiguity

This research implied that a company that perceived it had greater FX exposure instability was ① less inclined to manage all three FX exposure types. As explained previously, this implies that a company that perceives its exposure pattern to be more changeable from one year to another perceives that managing all three FX exposure types is less worthy.

The study also indicated that a company that perceived it had greater FX exposure instability, given that the company managed FX risk, was ② more inclined to accept artificial FX exposure. Likewise, given that a company managed FX risk, the company that perceived it had greater FX exposure unpredictability was ③ more inclined to assume natural FX exposure. As formerly explained, this implies that a company that perceives it has greater FX exposure ambiguity (unpredictability or instability) also perceives that it has greater need and opportunity to assume natural or accept artificial FX exposures, in order to, paradoxically, reduce its overall FX risk. A company that has more unpredictable exposures has greater need to assume some natural exposure, by undertaking partial cover, as that can reduce the expected value-at-risk of the exposure. Likewise, a company that has more unstable exposures (varying exposure pattern) has greater opportunity to accept artificial exposure, by undertaking uncovered FX deals, as they could potentially offset unanticipated natural exposures.

The following two points summarise the discussions above. ❶ A company that perceives it has greater FX exposure instability appears to perceive that it is less worthy to manage all three FX exposure types. ❷ Given that it manages FX risk, a company that perceives it has greater FX exposure ambiguity (unpredictability or instability) seems to perceive it has greater need and opportunity to assume natural FX exposure, or to accept artificial FX exposure.

Debt and equity

This category includes predictors associated with companies' debt and equity holding characteristics. It can be divided into two subgroups, and they are debt and leverage, and equity ownership. The findings associated with these predictor subgroups have also been represented in Figure 6.4(d). The key findings are explained next.

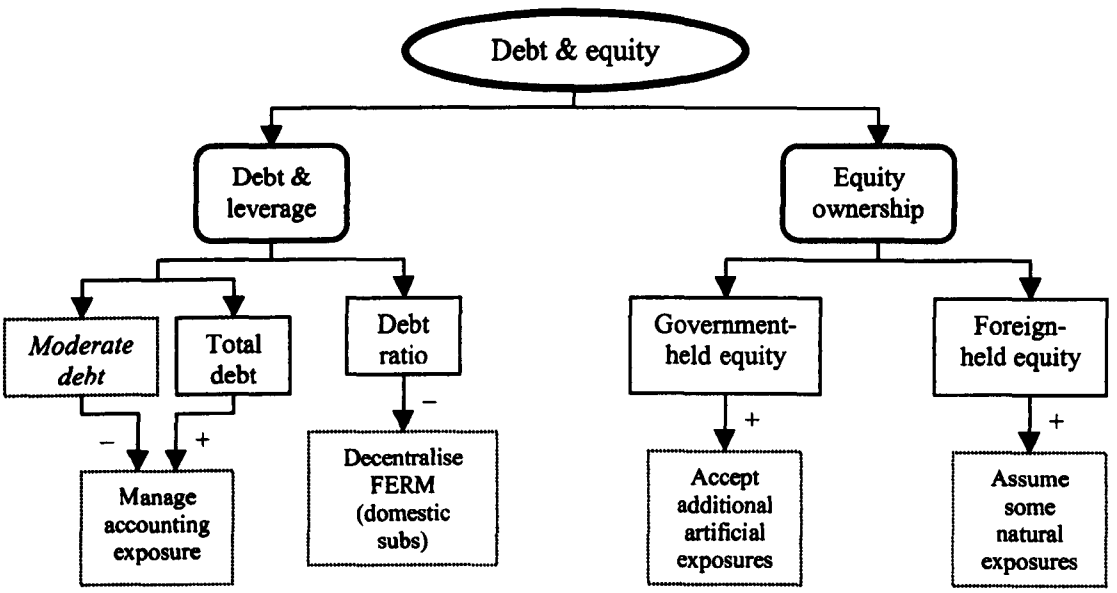


Figure 6.4(d): The effects of debt and equity characteristics on companies' inclinations to undertake specific FERM activities.

Debt and leverage

This study showed that a company that had greater total debt, given that the company managed FX risk, ① was more inclined to manage accounting exposure. As explained previously, this implies that a company that has greater debt probably has greater need to manage accounting exposure, to ensure that translation losses do not adversely affect its credit position and compliance with debt agreement conditions. However, a company that had a moderate level of debt ② was less inclined to manage accounting

exposure, compared to a company that had either a low or a high level of debt. As argued earlier, a company that has a moderate level of debt is probably less sensitive about managing accounting exposure because it already has an established and optimum level of debt.

It was implied that a company that had a higher debt ratio, given that the company managed FX risk, was ③ less inclined to decentralise fully its domestic subsidiaries' FERM, but it was notably not less (or more) inclined to decentralise fully its overseas subsidiaries' FERM. As argued, this implies that a company that has a higher debt ratio has greater need to centralise (or avoid decentralising fully) its operations, including its domestic subsidiaries' operations and FERM, because it faces greater financial risk. However, a company's debt ratio does not seem to influence the decentralisation of overseas subsidiaries' operations or FERM.

The above discussions can be summarised into two points. ❶ A company with greater total debt appears to have greater need to manage accounting exposure, but a company that has a moderate (rather than a high or low) level of debt seems to be less sensitive about managing accounting exposure. ❷ A company that has a higher debt ratio appears to have greater need to centralise its operations, including its domestic (but not overseas) subsidiaries' operations and FERM.

Equity ownership

The study implied that a company with greater foreign-held equity, given that the company managed FX risk, was ① more inclined to assume some natural FX exposure. It also found that a company with greater government-held equity, given that the company managed FX risk, was ② more inclined to accept artificial FX exposure. These findings imply, as mentioned before, that a company with greater foreign- or government-held equity has greater capacity and opportunity to assume natural, or accept artificial, FX exposures. First, a company that has greater foreign-held equity has greater capacity to assume some natural FX exposure since foreign investors are generally more internationally diversified compared to domestic Malaysian investors. Second, a company that has greater government-held equity has greater reputation, as well as implied solvency and better credit risk, and therefore, has greater capacity to accept artificial FX exposures. Furthermore, the company also seems to have greater opportunity to obtain special approvals from the central bank to undertake uncovered

FX deals. To summarise, given that it manages FX risk, a company that has greater foreign- or government-held equity appears to have greater capacity and opportunity to assume natural, or accept artificial, FX exposure.

Intra-company transactions

A company that had a moderate, compared to a low or high, level of intra-company transactions, given that the company managed FX risk, was found to be ① less inclined to adopt a formal FERM objective. This implies, as indicated earlier, when the level of intra-company transactions is moderate, adopting a formal FERM objective is less worthy because it results in comparatively inadequate benefits (from resolved conflicts), and high costs (of dealing with complexity, conflicts, and subsidiary disenchantment).

It was also implied that a company with greater intra-company transactions, given that it managed FX risk, was ② more inclined to decentralise fully its subsidiaries' FERM. As described previously, this reflects that the costs involved (i.e., dealing with complexity and subsidiary resentment) are higher than the associated benefits in centralising subsidiaries' FERM, when the level of intra-company transactions is high.

The above findings are depicted pictorially in Figure 6.4(e), and the two following points represent the above discussions. ❶ Given that it manages FX risk, a company that has a moderate level of intra-company transactions seems to find adopting a formal FERM objective to be less worthy, compared to a company with either a low or a high level of intra-company transactions. ❷ Given that it manages FX risk, a company that has greater intra-company transactions appears to encounter lower net costs in decentralising fully its subsidiaries' FERM.

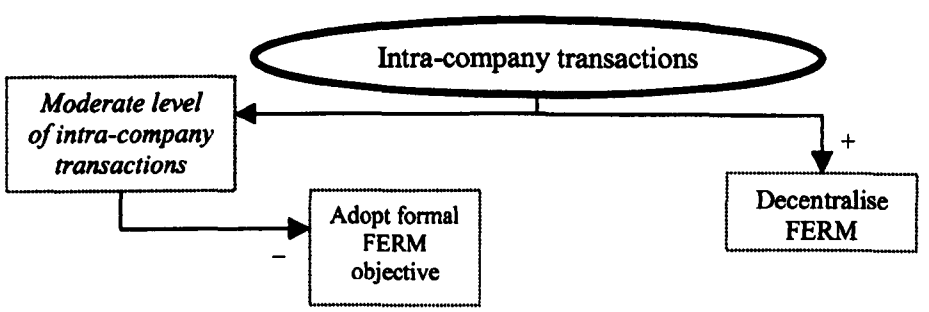


Figure 6.4(e): The effects of intra-company transactions on companies' inclinations to undertake specific FERM activities.

Miscellaneous predictors

The final group of predictors includes three separate predictors, ① number of overseas subsidiaries, ② foreign currency capital investment, and ③ company reputation. The findings or predictor effects on companies' inclination to undertake specific FERM activities have also been described earlier, but are illustrated in Figure 6.4(f). The key findings are recapped next.

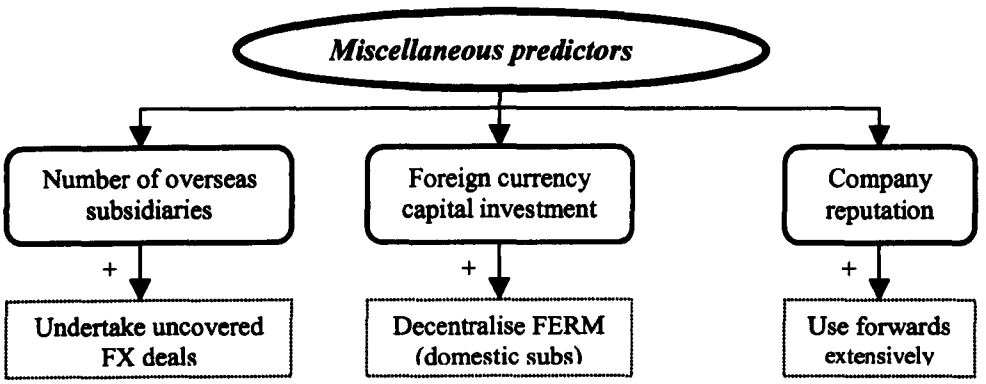


Figure 6.4(f): The effects of miscellaneous predictors on companies' inclinations to undertake specific FERM activities.

Number of overseas subsidiaries

The study found that a company that had a higher number of overseas subsidiaries, given that it managed FX risk, was more inclined to undertake uncovered FX deals. This is probably because, as explained earlier, a company with a higher number of overseas subsidiaries has greater capacity to collate relevant information using its wider network of overseas subsidiaries, and greater opportunity to use the intra-company transactions with its overseas subsidiaries as justifications, for undertaking uncovered FX deals. To summarise, given that it manages FX risk, a company that has a higher number of overseas subsidiaries appears to have greater capacity and opportunity to undertake uncovered FX deals.[25]

[25] Notably, here, the number of overseas subsidiaries serves as a proxy for the ability to gather information and the opportunity to use intra-company transactions, rather than as a measure of FX involvement per se.

Foreign currency capital investment

The research implied that a company with greater foreign currency capital investment, given that the company managed FX risk, was more inclined to decentralise fully its domestic subsidiaries' FERM, but it was not more (or less) inclined to decentralise fully its overseas subsidiaries' FERM. As argued earlier, a company with greater investment (including capital investment) is more likely to adopt a decentralised general management structure, and therefore, the company is more likely to also decentralise its subsidiaries' operations and FERM. However, the particular subsidiaries that receive greater capital investment from the parent company are, on the contrary, more likely to be centralised. Since a company that has greater foreign currency capital investment is less likely to make the investment into its domestic subsidiaries, they are more likely to be decentralised, including their FERM. In contrast, the company is more likely to make the investment into some of its overseas subsidiaries, and therefore, the overall effect on the decentralisation of all overseas subsidiaries' FERM is less clear. Nonetheless, as indicated formerly, these findings imply two underlying effects. ① A company that has greater (capital) investment, or more broadly, has a more decentralised general management structure, is more likely to also decentralise its subsidiaries' FERM. ② A company that makes greater (capital) investment in a particular subsidiary is more likely to exercise greater central control over the subsidiary, and therefore, is less likely to decentralise the subsidiary's FERM.[26]

Company reputation

Finally, the study implied that a company with greater reputation (listed on the main board, rather than the second board, of the KLSE), given that the company managed transaction exposure, was more inclined to extensively use forward contracts. This is because, as described previously, a company with greater reputation is often accorded greater and cheaper access to forward contracts. To summarise, a company with greater reputation seems to have greater and cheaper access to extensively use forward contracts.

[26] In order to establish these effects, further research might want to shift the unit of analysis from companies to the subsidiaries, and specifically measure the level of capital investment made by a parent company into the subsidiary. Also note that foreign currency capital investment here serves as a proxy for the general management structure (or level of investment) or level of capital investment, rather than as a measure of component FX exposure.

SUMMARY

This chapter explored explanations for the findings presented in the previous chapter. The findings are predictor effects on companies' inclinations to undertake fourteen selected FERM activities. Relevant findings from prior studies were also reviewed and compared. Besides that, since the findings and explanations were numerous and diverse, the chapter also attempted to aggregate and synthesise them in an attempt to reduce the complexity. Similar FERM activities and predictors were consolidated, and the associated predictor effects were reviewed to determine common and contrasting effects. The conclusions arising from this review are discussed in the next chapter, but the effects are briefly recapped below.

1. Company size. ❶ A larger company has greater capacity to undertake costly FERM activities. ❷ Although a larger company has greater capacity to manage FX risk, it has greater capacity to assume some FX risk arising from not managing all three FX exposure types.

2. FX exposure size. ❶ A company with greater FX exposure has greater need to manage FX risk (but not to manage all three FX exposure types), and to use forward contracts (but it is not more dependent on them). ❷ However, the company with greater FX exposure, that manages FX risk, seems less averse about assuming some natural FX exposure but more averse against accepting artificial FX exposure. 3. Financing exposure component size. A company with greater financing exposure has greater need to manage all three FX exposure types, but lower need and opportunity to use forward contracts. 4. Individual exposure characteristics. A company with a smaller number of larger, irregular individual FX exposures appears to have greater need to share FERM responsibility among two or more departments, whereas a company with the inverse individual exposure characteristics seems to have greater opportunity to specialise by placing the responsibility with only one department.

5. Perceived FX exposure size. ❶ A company that perceives it has greater FX exposure also perceives it has greater need to manage all three FX exposure types, and to share FERM responsibility among two or more departments. ❷ However, the company that perceives it has greater FX exposure, given that it manages FX risk, seems more averse against assuming some natural FX exposure. 6. Perceived FX exposure increment. A company that perceives it has a higher FX exposure increment appears to perceive it has

greater need to centralise FERM, specifically its overseas (but not domestic) subsidiaries' FERM. 7. Perceived FX exposure ambiguity. ❶ A company that perceives it has greater FX exposure instability also perceives that managing all three FX exposure types is less worthy. ❷ However, a company that perceives it has greater FX exposure ambiguity (instability or unpredictability), given that the company manages FX risk, seems to have greater opportunity and need to assume natural, or accept artificial, FX exposure.

8. Debt and leverage. ❶ A company with greater total debt has greater need to manage accounting exposure. However, a company with a moderate, compared to a low or high, level of debt is less sensitive about managing accounting exposure. ❷ On the other hand, a company with a higher debt ratio seems to have greater need to centralise its operations, including its domestic (but not overseas) subsidiaries' operations and FERM. 9. Equity ownership. A company with greater foreign- or government-held equity appears to have greater capacity and opportunity to assume natural, or accept artificial, FX exposure.

10. Intra-company transactions. ❶ A company that manages FX risk and has a moderate, compared to a low or high, level of intra-company transactions finds adopting a formal FERM objective to be less worthy. ❷ However, a company with greater intra-company transactions encounters greater net costs in centralising its subsidiaries' FERM.

11. Number of overseas subsidiaries. A company with a higher number of overseas subsidiaries has greater capacity and opportunity to undertake uncovered FX deals. 12. Foreign currency capital investment. A company with greater foreign currency capital investment seems more inclined to generally decentralise its subsidiaries' operations and FERM, but it appears more inclined to centralise specific (some of the overseas) subsidiaries' operations and FERM. 13. Company reputation. A company with greater reputation has greater and cheaper access to extensively use forward contracts.

Briefly, this chapter explored explanations for the fitted predictor effects on companies' inclinations to undertake specific FERM activities. It also consolidated the predictor effects and explanations, in order to prepare the discussions for the drawing of some succinct and meaningful conclusions. The conclusions are attempted in the next chapter.

Chapter 7

Conclusions and Recommendations

INTRODUCTION

This final chapter presents the conclusions of this study and advances some relevant recommendations for future research in this area, but it is divided into four parts as follows. In the first part, the conclusions are drawn. The contributions this study makes to the present body of empirical works in the area of corporate FERM are discussed in the second part. Following this, the third part describes the shortcomings of this study. The fourth and final part provides some recommendations for future research in this area. Finally, this chapter ends with a brief summary of the key points of this chapter.

7.1. Conclusions

To recapitulate, the study deals with two major research questions. The first question queries how do Malaysian public-listed multinational companies manage FX risk, whereas the second question asks what factors influence the companies' FERM activities. This first part of the chapter is about conclusions of this research, and is divided into three sections. The first section is associated with the first research question, and it describes the conclusions regarding company FERM practices. The second section, on the other hand, is related to the second question, and it reviews the findings and discussions about the factors that influence company FERM activities. Finally, the third section is concerned with deriving some broad conclusions from considering the review in the second section.

7.1.1. FERM practices

This section describes the general conclusions about the FERM practices, i.e., FERM activities and FERM characteristics, of Malaysian public-listed multinational companies. The conclusions are divided into three groups as follows. The first group includes the FERM practices that appear to be common for most companies, not only in Malaysia but also in other countries, particularly, the West. The second group

incorporates general FERM practices among companies in Malaysia that are rather different from the practices among companies in developed Western countries, e.g., the US, UK, and Australia. The third and final group encompasses FERM practices that have not been examined by previous empirical studies. Therefore, for these practices, it is not possible to compare between companies in Malaysia and those in other countries. This means that these FERM practices are applicable possibly only to the companies in Malaysia. Figure 7.1 presents a pictorial overview of all these conclusions. These conclusions are briefly presented below.

This study was able to establish six enduring FERM practices that appear to be relevant for most companies, both in Malaysia as well as in developed Western countries. ❶ Transaction exposure is, on the whole, the most managed type of FX exposure, whereas accounting and economic exposures are the less managed. This is because transaction exposure, unlike accounting exposure, has direct cash flow implications, and unlike economic exposure, is also easier to measure and manage or hedge. ❷ Broadly, companies that manage FX risk appear intent on minimising FX risk or losses, rather than consider FX gains. This highlights the companies' asymmetric attitude towards, and risk-aversion in, managing FX risk, i.e., companies appear willing to incur costs to reduce FX risk, but unwilling to increase FX risk in search of FX gains. ❸ Nevertheless, companies that manage FX risk generally seem to assume at least some of their own natural (operating) FX risk, by undertaking partial cover and selective hedging.[1] In other words, although companies that manage FX risk seem intent on reducing FX risk, they appear to be willing to assume some FX risk. ❹ Generally, FERM responsibility does not appear to be very prominent in most companies that manage FX risk. This is because typically only a few persons are responsible for FERM in each company, and the FERM tasks account for only a small portion of the persons' overall responsibilities. ❺ Nonetheless, FERM responsibility seems to be generally centralised, at least to some extent, in most companies. This reflects that for most companies, the benefits of centralisation (more efficient FERM) out-weigh the costs of centralisation (potential intra-company conflict). ❻ Finally, forward contract is, in general, the most used technique for managing FX risk. This is because the forward

[1] Apart from these, as indicated by this study, companies also assume some FX risk or exposure when they manage only significant exposures (thereby, assume non-significant exposures), and when they allow time flexibility for hedging an exposure.

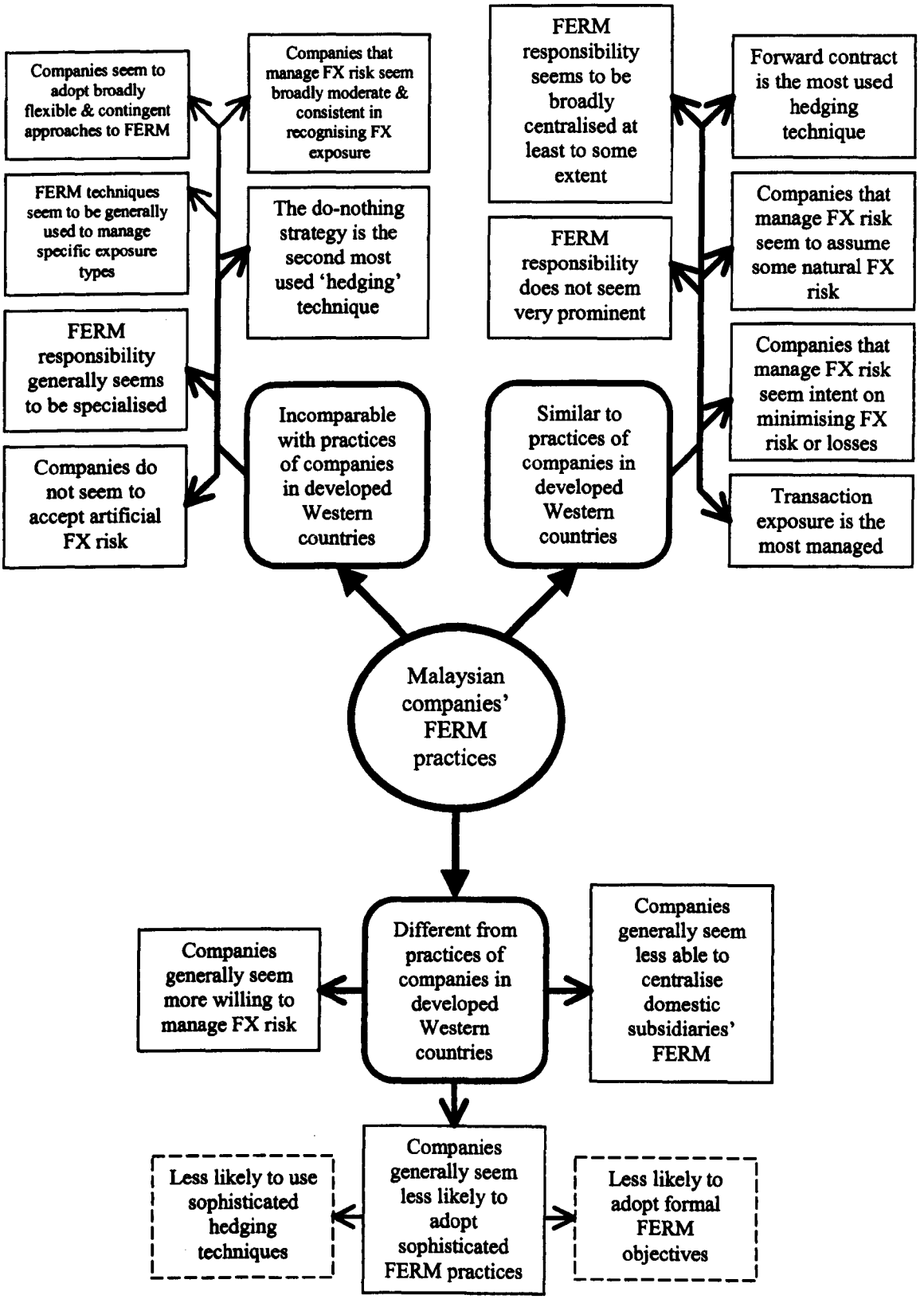


Figure 7.1: An overview of conclusions about Malaysian public-listed multinational companies' FERM practices.

contract is easier to understand, use, record (account for), and monitor, in hedging FX risk, compared to other hedging techniques.

On the other hand, this study was able to identify three major differences in the FERM practices between companies in Malaysia and those in more developed Western countries. ❶ Malaysian companies generally seem to be more willing to manage FX risk. This is implied from the proportions of companies that manages FX risk in Malaysia and in the West being about the same, although Malaysian companies appear to have less capacity and need to manage FX risk.[2] ❷ However, Malaysian companies generally seem less inclined to adopt sophisticated FERM practices. More particularly, they appear less likely to ① adopt formal FERM objectives, and ② use sophisticated hedging instruments like currency swap and option. This is because they seem to have less capacity, need, and opportunity, to adopt sophisticated FERM practices.[3] ❸ Finally, Malaysian companies generally appear less able to centralise the management of their domestic subsidiaries' FX exposures. The incidence of equity cross-ownership between domestic subsidiaries and parent companies is more common in Malaysia, and this may pose greater inhibitions on FERM centralisation.

Some FERM practices that have been investigated in this study have not been examined previously, and therefore, the conclusions about these practices could perhaps be relevant only for Malaysian public-listed multinational companies. The conclusions are as follows. ❶ Generally, the companies do not seem to accept artificial FX risk, although they appear to assume at least some natural (operating) FX risk, as very few companies appear to undertake uncovered FX deals.[4] This probably reflects the Malaysian companies' asymmetric attitude towards different types of FX risk, i.e., they seem generally inclined (or compelled) to assume some of their natural (operating) FX

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[2] Since Malaysian companies, in general, ① are smaller, and ② have less FX experience and skills (as they have only recently started becoming more involved in FX), the companies seem to have less capacity to manage FX risk. On the other hand, because Malaysia maintains a less volatile exchange rate system, the Malaysian companies generally ③ face less FX risk, and thereby, appear to have less need to manage FX risk.

[3] Again, since Malaysian companies, in general, ① are smaller, and ② have less FX experience and skills, they seem to have less capacity to adopt more sophisticated FERM practices. Moreover, because they generally ③ face less FX risk, they appear to have less need to adopt more sophisticated FERM practices. Furthermore, because Malaysia's FX market is less developed, Malaysian companies appear to ④ have less access to sophisticated hedging instruments, and therefore, seem to have less opportunity to adopt more sophisticated FERM practices.

[4] Apart from this, the companies, in general, also do not seem focused on deriving profits from FX because very few companies appear to undertake the writing of currency options.

risk but disinclined to accept artificial FX risk. ❷ In general, FERM responsibility in the companies seems to be specialised. In other words, the responsibility for FERM in a company is typically handled by only one department. ❸ The do-nothing strategy seems to be the second most used technique, after forward contract, for managing FX risk. This, again, reflects that the companies often do nothing and assume substantial portions of their FX risks.[5]

7.1.2. Predictors that influence FERM activities

This second section summarises the findings associated with the predictors that appear to be important in influencing the Malaysian public-listed multinational companies' likelihood of undertaking specific FERM activities. The several predictors used in this study have been organised into five categories as described in the latter half of the previous chapter. Recapitulating, the predictor groups are ① company size, ② FX exposure characteristics, ③ debt and equity, ④ intra-company transactions, and finally ⑤ miscellaneous predictors. As seen in some detail in the previous chapter, each predictor seems to have different effects on companies' inclinations to undertake different FERM activities, and the effects are so varied that it is very difficult to summarise them briefly. Figure 7.2 provides a diagrammatic overview of these predictor groups, predictors, and their effects.[6] Nonetheless, some broad points are noted about the general conditional effects each of the many predictors have on companies' inclinations to undertake particular FERM activities. The points are presented below, in the order of the preceding predictor categories.

[5] This study also found some less remarkable conclusions. First, among Malaysian companies, FERM techniques, other than forward contract and the do-nothing strategy, appear to be generally used to manage specific, rather than all, types of FX exposure. Second, Malaysian companies that manage FX risk seem generally moderate and consistent in recognising FX exposures. Third, they also appear to adopt flexible and contingent approaches to FERM.

[6] Note that this is an amalgamation of the diagrams found in Figure 6.4(a) to Figure 6.4(f) in the previous chapter.

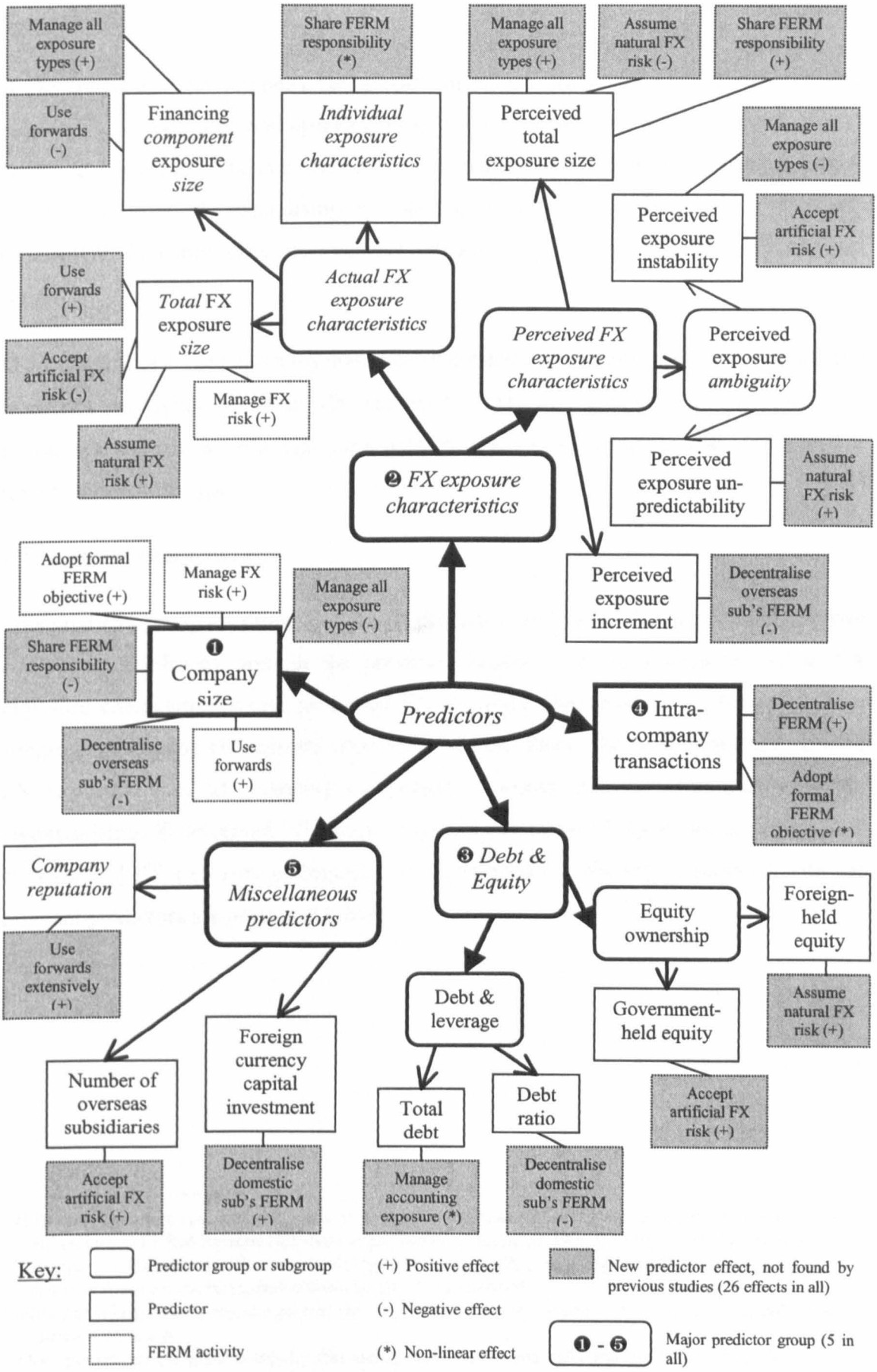


Figure 7.2: An overview of the predictor effects on a company's inclination to undertake specific FERM activities.

Company size

❶ Generally, a larger company has greater capacity to undertake FERM activities that require high fixed initial and operating costs because it has greater resources, or greater access to resources. The activities include ① managing FX risk, ② adopting a formal FERM objective, ③ specialising by placing FERM responsibility with only one department, ④ centralising its overseas subsidiaries' FERM,[7] and ⑤ using forward contracts.[8]

❷ In general, a larger company has greater capacity to assume some FX risk arising from not managing all three FX exposure types, i.e., accounting, economic, and transaction exposures,[9] although it has greater capacity to manage FX risk, or manage at least one exposure type.

FX exposure characteristics

This predictor group encompasses several predictors and can be further divided into two subgroups, as already seen in the previous chapter. The subgroups are actual FX exposure characteristics and perceived FX exposure characteristics. However, these subgroups comprise six separate predictors between them. To recap, they are: ① total FX exposure size, ② financing component exposure size, ③ individual exposure characteristics, ④ perceived FX exposure size, ⑤ perceived FX exposure increment, and ⑥ perceived FX exposure ambiguity. The key points or findings associated with the relevant predictors are presented below.

[7] However, company size does not seem to influence a company's inclination to decentralise its domestic subsidiaries' FERM because domestic subsidiaries normally account for only a small portion of a company's FX risk. In other words, a larger company, with greater capacity to centralise FERM, tends to focus on overseas, rather than domestic, subsidiaries.

[8] Although a larger company has greater capacity to use forward contracts, it is not more dependent on forward contracts.

[9] More particularly, a larger company that manages FX risk is generally less inclined to manage accounting and economic exposures, and therefore, appears more inclined to focus solely on managing transaction exposure.

Total FX exposure size

❶ Broadly, a company with greater FX exposure has greater need to manage FX risk, or manage at least one FX exposure type, but it does not appear to have greater (or lower) need to manage all three FX exposure types.

❷ A company that manages FX risk and has greater FX exposure seems to be generally less averse about assuming some natural FX exposure, because the company probably has greater ① opportunity to naturally net, and ② capacity (i.e., familiarity and expertise) to assume, some of its own exposures. However, at the same time, the company that manages FX risk and has greater FX exposure generally appears to be more averse against accepting artificial FX exposure, i.e., less keen on seeking FX profits.

❸ A company with greater FX exposure, in general, has greater need to use forward contracts, as forward contract is the most popular tool for managing FX risk. However, the company with greater FX exposure does not seem more (or less) dependent on forward contracts, probably because the company also has greater ① opportunity to net some of the exposures, and ② capacity to assume some of the exposures or use alternative hedging techniques.

Financing component exposure size

❶ Generally, a company with greater financing exposure has greater need to manage all three FX exposure types, because financing exposure often poses higher risk than other exposure components.[10]

❷ In general, a company with greater financing exposure has less need and opportunity to use forward contracts since the company is likely to have, respectively, ① greater access to money market hedging alternative, and ② less number of non-financing

[10] As noted above, a company with greater (total) FX exposure, however, does not appear to have greater (or lower) need to manage all three FX exposure types. These then signify the importance of the financing exposure component, rather than total FX exposure, in influencing a company's need to manage all three FX exposure types.

exposures that are appropriate for hedging with forward contracts.[11]

Individual exposure characteristics

Broadly, a company with a smaller number of larger, but more irregular, individual FX exposures[12] appears to have greater need to share FERM responsibility among more than one department, to increase accountability, pool expertise, and apportion responsibility more widely, within the company. On the other hand, a company with a larger number of smaller, and more regular, individual exposures[13] generally seems to have greater opportunity to place FERM responsibility with only one department, as the exposure characteristics are more conducive for specialisation.

Perceived FX exposure size

❶ A company that perceives it has greater FX exposure generally perceives it has greater need to manage all three FX exposure types.[14]

❷ A company that manages FX risk and perceives it has greater FX exposure, in general, appears to be more averse against assuming some natural FX exposure.[15]

❸ Generally, a company that perceives it has greater FX exposure also perceives it has greater need to share FERM responsibility among more than one department, to increase accountability, pool expertise, and apportion responsibility more widely, within the company.

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[11] In contrast, as noted above, a company with greater (total) FX exposure has greater need to use forward contracts. These then highlight the difference in the effects of financing exposure component and total FX exposure in influencing a company's need to use forward contracts.

[12] These are the exposure characteristics expected from companies listed on the property or construction sectors.

[13] On the other hand, these are the exposure characteristics expected from companies listed on the consumer products sector.

[14] However, as noted earlier, a company with greater (actual) FX exposure does not appear to have greater (or lower) need to manage all three FX exposure types. These highlight the importance of perceived, rather than actual, FX exposure size in influencing a company's need to manage all three FX exposure types.

[15] Conversely, as noted formerly, a company that manages FX risk and has greater (actual) FX exposure seems to be less averse about assuming some natural FX exposure. These then underscore the difference in the effects of perceived and actual FX exposure size in influencing a company's aversion towards assuming natural FX exposure.

Perceived FX exposure increment

In general, a company that perceives it has a higher FX exposure increment seems to perceive it has greater need to centralise (or avoid fully decentralising) FERM. However, the company focuses on centralising its overseas, rather than domestic, subsidiaries' FERM because overseas, and not domestic, subsidiaries usually account for the bulk of a company's FX exposure.

Perceived FX exposure ambiguity

❶ Broadly, a company that perceives it has greater FX exposure instability also perceives that managing all three FX exposure types is less worthy (or cost-effective) since it expects a more changeable yearly exposure pattern.[16]

❷ A company that manages FX risk and perceives it has greater FX exposure ambiguity (unpredictability or instability) generally appears to perceive it has greater need and opportunity to assume natural, or accept artificial, FX exposure, paradoxically, to reduce the company's overall FX risk. More particularly, a company that perceives it has greater FX exposure unpredictability possibly perceives it has greater need to assume some natural FX exposure by undertaking partial cover, as that can reduce the value-at-risk of the company's exposure.[17] On the other hand, a company that perceives it has greater FX exposure instability possibly perceives it has greater opportunity to accept artificial FX exposure, by undertaking uncovered FX deals, as these could potentially offset the company's unanticipated natural exposures.

Debt and equity

This predictor group includes some predictors that can be further categorised into two subgroups, as seen in the previous chapter. The predictor subgroups are ① debt and leverage, and ② equity ownership. The major findings involving the relevant predictors in these subgroups are stated below.

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[16] However, as implied above, a company that perceives it has greater FX exposure (size) is more inclined to manage all three FX exposure types. These illustrate the difference in the effects of (perceived) FX exposure instability and size in influencing a company's inclination to manage all exposure types.

[17] However, above, it was noted that a company that perceives it has greater FX exposure (size) seems less inclined to assume natural FX exposure. These then show the difference in the effects of (perceived) FX exposure unpredictability and size in influencing a company's inclination to assume natural FX exposure.

Debt and leverage

❶ A company with greater total debt, in general, has greater need to manage accounting exposure probably to ensure that translation losses do not adversely affect its credit risk and compliance with debt agreement conditions. However, a company with a moderate, compared to a low or high, level of total debt is generally less sensitive about managing accounting exposure possibly because it already has an established and optimum level of debt.

❷ Generally, a company with a higher debt ratio seems to have greater need to centralise (or avoid fully decentralising) its operations, including its domestic subsidiaries' operations and FERM, because the company faces greater financial risk. However, the company's debt ratio does not seem to influence the centralisation of its overseas subsidiaries' operations or FERM.

Equity ownership

In general, a company that manages FX risk and has greater foreign- or government-held equity appears to have greater capacity and opportunity to assume natural, or accept artificial, FX exposure. More particularly, a company with greater foreign-held equity probably has greater capacity to assume natural exposure because foreign investors are often more internationally diversified, compared to domestic Malaysian investors. On the other hand, a company with greater government-held equity probably has greater capacity to accept artificial exposure because the company has better reputation, implied solvency, and credit risk. Moreover, the company also possibly has greater opportunity to obtain special permission from the central bank to accept artificial exposure by undertaking uncovered FX deals.

Intra-company transactions

❶ Broadly, a company that manages FX risk and has a moderate, compared to a low or high, level of intra-company transactions probably finds adopting a formal FERM objective is less worthy, due to the resultant high costs of dealing with complexity and subsidiary disenchantment, and inadequate benefits from resolved conflicts.

❷ A company that has greater intra-company transactions generally seems to encounter lower net costs in decentralising fully its subsidiaries' FERM. In other words, in centralising its subsidiaries' FERM when the level of intra-company transactions is higher, a company seems to find the costs of dealing with complexity and subsidiary resentment to be higher than the benefits from reduced duplication of function and hedging cost.

Miscellaneous predictors

This final group of predictors encompasses three predictors, as described earlier in the previous chapter. They are ① number of overseas subsidiaries, ② foreign currency capital investment, and ③ company reputation. The findings pertaining to these predictors are briefly described next.

Number of overseas subsidiaries

A company that manages FX risk and has a higher number of overseas subsidiaries, in general, has greater ① capacity to collate the relevant information using its broader network of overseas subsidiaries, and ② opportunity to use the intra-company transactions with its overseas subsidiaries as justifications, for undertaking uncovered FX deals.

Foreign currency capital investment

Generally, a company with greater foreign currency capital investment is also likely to have greater (capital) investment, and therefore, the company is more likely to adopt a decentralised general management structure, and parallel with that, decentralise fully its subsidiaries' FERM as well. In contrast, however, the company is more likely to centralise the operations of specific subsidiaries, particularly overseas subsidiaries, into which the company makes greater (foreign currency) capital investment. Therefore, the overall effect on the decentralisation of all the overseas subsidiaries' FERM is less clear. Nonetheless, since domestic subsidiaries, unlike some overseas ones, do not normally receive foreign currency capital investment from the parent company, they are more likely to have their FERM decentralised.

Company reputation

In general, a company that has greater reputation (listed on the main, rather than on the second, board of the KLSE) seems to have greater and cheaper access to extensively use forward contracts.

7.1.3. Predictor significance

As explained earlier, each predictor seems to have different and disparate effects on companies' inclinations to undertake different FERM activities. These effects are so varied that it is difficult to summarise them briefly. In other words, it is rare to find predictors that influence all the FERM activities in a similar way. Nonetheless, the complex and varied effects seen in Chapter 5 have been reduced considerably in the last chapter and described briefly in the previous section, and illustrated in Figure 7.2. This section describes some broad conclusions derived from considering, in total, the predictor effects on companies' likelihood of undertaking particular FERM activities that were enumerated above.

The regrouped predictor categories can be ranked in terms of their importance, based upon the number of FERM activities each predictor category is found to influence. In descending order, they are as follows: ① FX exposure characteristics, ② company size, ③ debt and equity, ④ intra-company transactions, and finally, ⑤ miscellaneous predictors. In fact, particularly, the predictors that measure perceived FX exposure characteristics appear to have slightly greater impression than the predictors that measure actual FX exposure characteristics, in terms of the number of new predictor effects, i.e., predictor effects not found by previous studies. Figure 7.2 provides also an overview of the number of FERM activities each predictor category seems to influence, and the shaded boxes in this diagram allude to the new predictor effects. In short, the overview indicates that the most important predictor categories, in descending order, are ① perceived exposure characteristics, ② actual exposure characteristics, and ③ company size. Others seem less important.

Apart from that, the findings above indicate that different characteristics (or dimensions) of FX exposure may have different effects on companies' inclinations to undertake specific FERM activities. More particularly, a company's ① *perceived*

compared to *actual* exposure, ② *total* exposure compared to *financing component* exposure, and ③ exposure *size* compared to exposure *ambiguity*, have been found to have different effects or influences on the companies' inclinations of undertaking FERM activities.

7.2. Contributions

This second part of the chapter discusses the contributions this study makes to the body of empirical work on corporate FERM. Obviously, this study, firstly, provides the profile of FERM practices of Malaysian public-listed multinational companies. These constitute an important addition to the present empirical literature on FERM because no previous study had investigated these.

As described in Chapter 3, this study combines considerably large numbers of both dependent variables (FERM activities) and explanatory variables (predictors). This, in itself, is a notable contribution because previous empirical studies in this area have used large numbers of either the former or the latter variables, but not both.

Moreover, the variables used in this study are not only larger in number but also new. As described in greater detail in Chapter 3, these include the following. ① New research variables, i.e., FERM activities and characteristics that have not been studied previously. ② New dependent variables, i.e., FERM activities, for which predictors or explanatory variables have not been sought before. ③ New explanatory variables, i.e., predictors that have not been used formerly to explain FERM activities. These new variables constitute a significant contribution too since they expand the investigation

into FERM.[18]

On the whole, this research did not observe findings that conflicted with those from prior studies, neither in the FERM practices, nor in the predictors that influence companies' inclinations to undertake FERM activities. In contrast, there were several findings that were similar or congruent with those of previous studies. As seen earlier, several FERM practices are found to be common for companies in Malaysia and those in other countries, particularly the West. Likewise, there are four predictor effects that confirm the effects found in previous studies (see Table 7.1). In short, the absence of conflicting findings and the presence of congruent findings, when compared to previous research, appear to vouch for the overall soundness of the findings of this study. Therefore, this implies that this research contributes sound findings to the body of empirical findings in FERM.

Nonetheless, there were a few instances of discrepancies between the findings of this study and those of previous research. However, in the case of FERM practices, these discrepancies merely reflect the differences in the practices among Malaysian companies compared to the practices among companies in the West. In the case of predictor effects, on the other hand, this study did not find four predictor effects found in previous empirical studies (again, see Table 7.1). However, as explained in depth in the previous chapter, in all these instances, there are reasons to doubt the findings from previous studies – mainly because the studies had not controlled for the effects of other factors or predictors. In short, these discrepancies between this study's findings and those of prior research do not undermine the credibility of the findings of this study. In fact, these contribute by establishing the differences in the FERM practices in Malaysia compared to the West, and also by pointing out the possible shortcomings in the results

[18] Recapitulating, the new FERM activities and characteristics (research variables) include ① relative use of different FX exposure types (accounting, economic, and transaction exposures), ② sharing FERM responsibility among more than one department, ③ exposure recognition policy, ④ allowing time flexibility for hedging, ⑤ undertaking uncovered FX deals, ⑥ writing currency options, and ⑦ using internal FX rates. While, the new FERM activities (dependent variables) include ① management of accounting, economic, and transaction exposures (separately), ② management of all three FX exposure types, ③ sharing FERM responsibility among more than one department, ④ fully decentralising FERM for domestic, and overseas subsidiaries (separately), ⑤ allowing time flexibility for hedging, and ⑥ undertaking uncovered FX deals. Finally, the new predictors (explanatory variables) include ① various measures of FX involvement, including exposure components, ② company's perception of its own FX risk attributes, ③ intra-company transactions, ④ proportion of equity held by the government, and ⑤ listing board on the KLSE.

Table 7.1: Summary of predictor effects on companies' inclinations to undertake various FERM activities

	Manage FX risk…(1)	Manage all 3 types of FX exposure…(2)	Manage accounting exposure…(3)	Adopt formal FERM objective…(4)	Assume natural FX (exposure) risk…(5)	Accept artificial FX (exposure) risk…(6)	Share FERM responsibility…(7)	Fully decentralise domestic subsidiaries' FERM…(8)	Fully decentralise overseas subsidiaries' FERM…(9)	Use forward contracts…(10)	Use forward contracts extensively…(11)
1. Company size	+	–		+	?		–		–	+	
2. *Total* FX exposure *size*	+			?	+	–				+	?
3. Financing *component* exposure *size*		+								–	
4. *Individual exposure size & irregularity* (listing sector)							✶				
5. Perceived FX exposure *size*		+			–		+				
6. Perceived exposure instability		–				+					
7. Perceived exposure unpredictability					+						
8. Perceived exposure increment									–		
9. Debt			✶								
10. Leverage, debt ratio								–			
11. Foreign-held equity					+			?			
12. Government-held equity						+					
13. Intra-company transactions				✶				+	+		
14. Number of overseas subsidiaries						+					
15. Foreign currency capital investment								+			
16. *Company reputation* (listing board)											+

Key:

+ Positive effect

– Negative effect

✶ Non-linear effect

? Previous study findings not found in this study (4 effects)

Findings compatible with those of previous studies (4 effects)

New findings, not found in previous studies (26 effects)

(predictor effects) of prior studies.

Apart from the above, this study also has provided new findings, i.e., those that have no comparable findings from earlier works. Although these new findings are rather unremarkable in describing Malaysian companies' FERM practices, they constitute the bulk of the findings about the predictor effects. Broadly, 26 (of the 30) predictor effects found in this study are new, i.e., these were not found by previous researches (again, see Table 7.1). This reflects the extent of contribution this study makes to the extant empirical literature on FERM. This appears to be the one of the most important contributions because previously very few predictors and predictor effects have been identified.

Previous studies have used a company's FX involvement (sometimes labelled as FX risk) as an explanatory variable but it essentially measured only the company's actual total FX exposure size. However, in addition, this study has also used perceived (apart from actual) exposure, exposure components (apart from total exposure), and exposure ambiguity (apart from exposure size) as predictors. As explained earlier, these different dimensions of FX exposure have also been found to be important. In fact, as pointed out earlier, perceived FX exposure characteristics appear to be the most important predictor category. Besides, this study also discovered that individual (apart from total) FX exposure characteristics might be useful as predictors. Consequently, these too form an important contribution of this study.

7.3. Implications of currency crisis and fixed exchange rate

Malaysia and many other countries in the region were affected by the currency crisis that began in mid 1997. In Malaysia, Ringgit's value dropped continually and became more volatile. Therefore, the companies in Malaysia would have then encountered greater FX risk, compared to before the crisis. The data for this study were collected between November 1997 and April 1998, i.e., during the crisis, more particularly between five to nine months after the advent of the crisis. Therefore, companies were then probably more aware and concerned about FX risk, compared to before the crisis. However, arguably, there was inadequate lead-time, when the data were collected for this study, for the companies to materially change their FERM policies, procedures, and

structures, in response to the increased FX risk. Furthermore, many companies then believed that the crisis would be a temporary phenomenon, and the Ringgit would increase and stabilise in value. Consequently, the findings of this study on companies' FERM practices should generally reflect the practices that have been in place even before the crisis. Likewise, the data on company characteristics, e.g., company size, debt and equity characteristics, actual FX exposure characteristics, intra-company transactions etc., are thought to be predominantly unaffected by the crisis. Nonetheless, the data on companies' perceptions of FX risk could have been influenced by the increased FX risk during the crisis. This, therefore, casts some doubt about the reliability of some of the findings of this study, particularly companies' perceptions of specific FX exposure characteristics that have been identified to influence companies' inclinations to undertake particular FERM activities. Although unlikely, it is conceivable that the currency crisis could have highlighted these influences, which might have been weak or non-existent under non-crisis situations. This is something that should be investigated in the future. In spite of this, on the whole, the currency crisis is thought to have had very little impact on the findings of this study.

Before September 1998, Malaysia had maintained a managed-float exchange rate system by loosely pegging the Ringgit to a basket of trade-weighted currencies. In September 1998, the Ringgit's status as legal tender outside Malaysia was terminated, and its exchange rate to the US dollar was fixed. The fixed value of the dollar in Ringgit terms have significantly reduced Malaysian companies' FX risk because the bulk of their FX exposures are in the dollar. However, the data for this study were collected prior to the change in the exchange rate system, when Malaysian corporate FX risk was significantly higher. Notwithstanding this, the findings of this study are still important and relevant because Malaysian companies do face some FX risk in the present scenario.[19] ① The Ringgit's exchange rates against other currencies are allowed to float, and therefore, companies that have cash flows denominated in currencies other than the US dollar still face considerable FX risk. ② Moreover, companies also face FX risk from the possibility of the peg being changed (revalued or devalued) or removed altogether because the present exchange rate system cannot be sustained indefinitely. It

[19] Arguably, some companies might face greater FX risk in the current scenario. This is because Malaysian companies must now make or receive overseas trade payments in foreign currencies, and not in Ringgit. When these currencies are not the US dollar, the companies face fluctuating exchange rates and possibly greater FX risk.

will be interesting to investigate how, and to what extents, the change in the exchange rate system (and the resultant reduction in FX risk) has affected the companies' FERM practices, and the predictors' effects on companies' inclinations to undertake specific FERM activities. Again, these are avenues for future research. However, in the current scenario, the companies would be expected to be comparatively less inclined to manage FX risk, adopt sophisticated or formal FERM practices, or give prominence to FERM responsibility, but more inclined to assume natural FX exposures (by adopting the do-nothing strategy). Furthermore, the predictor effects, identified with data in the previous scenario (higher FX risk), would be expected to be broadly weaker in the present scenario (lower FX risk).

7.4. Shortcomings and limitations

This part of the chapter describes the shortcomings and limitations of this study. As pointed out in Chapter 3, the extant literature on corporate FERM does not provide extensive theories that proffer hypotheses that could be tested. Moreover, the present body of empirical works in this area is also sparse.[20] Due to these shortcomings in the literature, this study adopted the induction, rather than deduction, process in attempting to address the second (but prime) research question – why Malaysian public-listed multinational companies undertake certain FERM practices, or what factors influence the companies to undertake these practices. The study, therefore, searched for statistically significant predictors and their influences on companies' inclinations to undertake specific FERM activities (i.e., predictor effects), and then provided explanations and justifications to support these findings. These can be deemed to be the first steps in a process that should, with further research work, lead ultimately to the proposal of a body of theories for corporate FERM. Therefore, the study identifies possible predictors, rather than establishing the predictors, and their influences on companies' inclinations to undertake FERM activities.

As argued in Chapter 3, the mail questionnaire used in this type of studies seems to be selective of companies that manage FX risk. This implies that the profile of company characteristics found in this study may not be representative of the characteristics of all

[20] This is the case for all FERM activities, except for the activity of managing FX risk.

Malaysian public-listed multinational companies, including those that did not participate in the study and those that do not manage FX risk. Notwithstanding this, the profile of FERM practices among the companies that manage FX risk in the study, however, is expected to be representative of the practices among all companies that manage FX risk, including those that did not participate in the study.[21] Moreover, this is unlikely to affect the predictor effects identified in this study. The predictor effects are generally expected to be the same even for companies that did not participate in the study, and those that do not manage FX risk. This is because the effects were derived with the data from all companies, including those that did not manage FX risk, although these were disproportionately less. Further, it must be noted that all previous studies in this area that have used mail questionnaire too experienced similar problems. Furthermore, despite the shortcomings of using mail questionnaires, other methods of data collection, for example, data collected from company annual reports are unsuitable to answer the research questions of this study.

There was a slight non-response bias in this study. As explained in Chapter 4, companies that responded to the questionnaire, compared to those that did not, had greater proportions of their equity held by the government, and they also seemed to be larger in size (in terms of total assets). Although these have some implications for generalising the findings of this study to the intended population, the problem is unlikely to be serious because of the following reasons. ① Differences between respondent and non-respondent companies were significant in only the two predictor variables out of the seven used for comparison. ② Moreover, even the difference in company size was only marginally significantly. ③ Despite the significance of the difference in government-held equity between respondents and non-respondents, government-held equity seemed to influence companies' inclination to undertake only one FERM activity, i.e., undertaking partial cover. ④ Finally, as mentioned above, these differences are unlikely to affect the predictor effects because they are derived using data from companies that have both low and high government-held equity, and both small and large companies.

[21] In other words, the FERM practices found in this study, are expected to be generalisable to all Malaysian public-listed multinational companies, provided that they manage FX risk.

The number of cases, compared to the number of explanatory variables or predictors, in this study is rather small. Further, as explained above, the dearth of theories and scarcity of empirical evidence in the literature often fail to propose specific predictors that should influence many of corporate FERM activities. Therefore, prior to analysis, it is difficult to determine which predictors to include in a logistic regression model. Incorporating all predictors would culminate in the *complete separation* problem, or model saturation. This simply means that there are too many predictors and too few cases in a model. The remedy is to reduce the number of predictors. In this study, the stepwise elimination procedure, i.e., an iterative trial-and-error method, was adopted, as elaborated in Chapter 5. Broadly, this procedure searched for predictors that did not contribute significantly to the model fit, and then eliminated these, one by one, until the most reasonable model was identified. As explained earlier, this procedure is not ideal because it renders the accompanying statistical tests less meaningful.[22] However, since this study's intention is to identify potential, rather than establish the, predictors that influence companies' inclinations to undertake particular FERM activities, the procedure is acceptable. Therefore, again, as implied above, the results (predictor effects) from this study should be treated as tentative rather than conclusive. Since this problem is indirectly due to the small number of cases, future research on corporate FERM in Malaysia, could perhaps extend the population in order to draw a larger sample.

This study has omitted some factors that have been found by previous studies to be important in influencing companies' likelihood of managing FX risk. The factors (predictors) include ① dividend payout, ② tax shield, and ③ asset liquidity. As a result, the predictors that have been identified to influence a company's likelihood of managing FX risk in this study are unreliable because of the *missing variable* problem. In other words, there is a possibility that the predictors identified here could be unimportant if the omitted variables were included. Nonetheless, the validity of the study's predictor effects on companies' inclinations to undertake other FERM activities is not in doubt. However, perhaps studies in the future may want to incorporate the omitted predictors as well, in order to establish the predictor effects identified by this

[22] Only a small proportion of all possible conventionally fitted predictor effects would be statistically significant due chance, but as the procedure adopted in this study actively searched for such statistically significant results, those results may be due to random sampling errors (or chance), rather than due to true underlying relationships.

study.

A large number of variables, both dependent and predictor variables, have been measured at less than ordinal level, e.g., nominal and dichotomy. As explained in Chapter 5, nominal and dichotomous predictor variables can sometimes pose the problem of *zero cells* in logistic regression analysis, especially when the number of cases in the analysis sample is small. However, this study had only a few instances of this problem. Moreover, only a few predictor variables in this research could have been raised to the ordinal level from the nominal and dichotomous levels used. Furthermore, it must be noted that increasing a variable's measurement level, especially in a survey that uses questionnaire, might adversely affect the response rate. For example, if an interval level predictor is required to measure the level of FX exposure, companies may become more reluctant to disclose the data. Nonetheless, further research works might want to ensure that all predictor variables are measured, at least, at the ordinal level.

This research has used some variables that measure potentially volatile values of a company's characteristics at only single points in time. For example, a company's total assets, total market capitalisation, total sales, and total debt and others, are potentially volatile because they may change in value, sometimes drastically, from one year to the next. Therefore, taking the value of these variables at only a single point in time, as was done in this study, may be unrepresentative. However, there is no reason to suspect that this should lead to systematic bias in the data. The discrepancy is likely to be random, and therefore, is unlikely to introduce bias onto the results. Nonetheless, measures of average values over a few years for these variables would have been more appropriate and efficient.

The questions in the questionnaire that attempt to measure a company's perception of its own FX risk attributes have not been tested rigorously for validity or reliability. In fact, these constructs have been tapped using merely uni-dimensional measures. In other words, each construct was measured with a single question. The questions or measures were tested only for face validity. However, testing for reliability and validity more rigorously using a multi-dimensional method would require several questions measuring the same construct. This then would make the questionnaire too long and possibly reduce the response rate. Further, it is a very complex process especially since the literature does not explicitly identify the dimensions that need to be tapped in order to

measure the relevant constructs. Clearly, establishing the instrument to robustly measure these constructs validly and reliably is, in itself, a major research undertaking. The intention of this study is instead to see if these constructs are possibly useful in influencing a company's inclinations to undertake particular FERM activities. Since this study has shown that these constructs may be important, future research can go on to establish valid and reliable measures of these constructs, and prove conclusively that these constructs are indeed important, or otherwise.

The responses to some of the questions in the questionnaire were very skewed. For example, the responses for questions associated with a company's FX exposure proportions and intra-company transactions were especially affected. This was especially apparent in the first version questionnaire. In fact, the second version questionnaire was devised to correct the skewness found in the first version. Although the relevant responses in the second version were more dispersed, they provided no benefit finally because the responses from both versions had to be combined, due to the inadequate number of cases. Nonetheless, this highlights the importance of using the appropriate (ordinal) response categories in the questionnaire that adequately captures the variability in the responses from companies. Otherwise, a predictor variable would lose some its explanatory utility.

As mentioned above, this research has used two questionnaire versions. However, the combining of data that were collected using the two versions culminated in reduced data quality (and quantity, in certain instances). In other words, had the study used only one questionnaire version, the number of valid cases would have been higher (for some of the variables), and the variables' value categories would not have been collapsed. However, given that the two versions had been used, and the numbers of respondents were small for both the versions, the combining of the data was inevitable in order to achieve statistically significant results. Nevertheless, this serves to remind that every research undertaking, in the future, should stick to using only one questionnaire version.

The mail questionnaires were administered between November 1997 and April 1998. As explained in greater detail in Chapter 3, the first version questionnaires used in the first and second phases referred to the company exposure characteristics as at the end of 1996, while the second version used in the final phase referred to the characteristics as at the end of 1997. This implies that the relevant data measured disparate things, rather

than the same thing, for all companies. In fact, it is expected that the advent of the currency crisis in 1996 might have had some impact on most companies' characteristics in 1997. Nonetheless, the discrepancy in the data did not seem to be serious because the data referred to a full year in all cases, and the data were measured in proportions (percentages) that are, unlike absolute values, less likely to change. Moreover, a dummy (dichotomous) variable incorporated in the relevant logistic regression analyses, to control for this discrepancy, was not useful – was not significant and did not improve model fit. This indicates that the discrepancy is not serious. Notwithstanding this, it would probably have been wiser to have only one questionnaire version (as said above), and to administer it in the same calendar year rather than over two years.

The data extracted from the KLSE companies' annual handbook for the year 1996 contained the latest financial data in 1995 for some companies and in 1996 for others. This, again, implies that the data does not strictly measure the same thing for all companies. However, this discrepancy is unlikely to be serious because the year 1995 did not appear to be distinctly different from the year 1996, for businesses in Malaysia. Moreover, the financial data are, again, for a full year for all companies, and therefore, are not likely to be affected by the companies' different (arbitrary) financial or accounting year-end dates. Furthermore, a dummy (dichotomous) variable to control for the year in which a company's financial year ended was not useful. This indicates that the discrepancy in the companies' financial year-end dates has no serious impact on the results. Nonetheless, this problem could have been mitigated further if the average value over five years had been used instead of the value at a single date (financial year-end date).

It must be noted that the data for this study, from all sources, were collected in a continual process with minimum gaps or delay. Nonetheless, as pointed out above, the data from the KLSE handbook referred to the financial data for the end of 1996 or 1995, whereas the data from mail questionnaires referred to data relevant for the end of 1997 or 1996. Therefore, there was, at most, a two-year gap between the data from the two different sources. This may cast doubts about the findings of the study. However, the gap in the time reference between the two data sources was only one year in most cases. Moreover, this gap is not expected to have had a serious impact on the predictor effects identified in this study. Nevertheless, this problem may have been reduced if the data from the secondary source were collected after the mail questionnaires had been

collected, so that the data could have referred to about the same time.

7.5. Recommendations for future research

In this final part of the chapter, some pointers for future research in this area of FERM are outlined. As pointed out above, this study has been successful in identifying several predictors that appear to influence companies' inclinations to undertake FERM activities. In other words, some possible (tentative) predictor effects have been identified. Future research work based on a fresh sample, perhaps from another country, is required to help test and establish the validity of the predictors and their effects found in this study. Besides that, the shortcomings of this study must also be addressed, where possible, to ensure that they do not recur in the future. These redresses are enumerated next.

Future empirical research in this area should include the three factors that have been omitted in this study, namely, ① dividend pay-out, ② tax shield, and ③ asset liquidity, and perhaps also ④ long-term debt, and ⑤ interest cover, although the latter two seemed to have only mixed or weak influences in prior studies. This is particularly important to establish the conditional influence of a company's FX exposure size and its perception of exchange rate volatility on the company's inclination to manage FX risk, controlling for the effects of these five factors. Moreover, it would be interesting to see if these factors also influence the company's inclinations to undertake other FERM activities.

More effort should also be devoted to developing more robust measures of a company's perception of its own FX risk attributes, especially since this study has advanced the importance of these constructs. However, since this is a major undertaking, it probably needs to be handled separately. The focus ought to be on identifying and defining the relevant dimensions for each construct, and then, devising questions to measure these dimensions. Consequently, these measures must also be validated using factor analysis, reliability and validity tests, based upon company responses to these questions.

There is also a need to ensure that the number of cases, or companies, in the analysis is large. More particularly, the number of valid cases per predictor ought to be sufficiently large, or otherwise, the statistical significance of the results might be adversely affected. In a logistic regression model, a large number of cases mitigates the problem of

complete separation. It also reduces the need to depend on less efficient analysis techniques like the stepwise procedure used in this study. In order to increase the number of cases, future studies on FERM in Malaysia could extend the population to include all listed companies, including non-multinational companies, as well as foreign-owned companies.[23] Besides that, the studies could also include subsidiaries as well as parent companies. All these, however, would require a more elaborately designed questionnaire that needs to be relevant and applicable to a diverse group of participant companies.

On another tack, more stable measures of variables ought to be used in the future, especially for those variables that measure financial data that could potentially change drastically from one year to another. For example, average values over a period of say five years may be more appropriate than values taken at single points in time. This should help reduce the volatility and potential bias of these measures, and improve the efficiency (statistical significance) of the results.

Moreover, future studies in this area should try to incorporate variables at higher levels of measurement. More precisely, the predictor variables should be measured at the ordinal level, at least. This is particularly important when dealing with dependent variables that are nominal or dichotomous, as was the case in this study, because this should reduce the incidence of the *zero cell* problem in logistic regression analysis. It should help enhance the efficiency of the results too.

Furthermore, future research must ensure that the response categories used in the questionnaire capture sufficiently the variability in the companies' responses. In other words, the categories should help reduce the skewness in, and increase the dispersion of, the responses. Particularly, in the case of a predictor variable, a more dispersed range of values of the predictor would increase its explanatory utility.

There is also a need to ensure that the data from different sources are compatible, or valid at about the same time. It is important to ensure that the data from secondary sources, e.g., company annual report or financial statements, are valid for the time period in which the data from the primary sources are also valid. Perhaps, to this end,

[23] It would be almost impossible to increase the number of cases (or sample size) by increasing the response rate, because the response rate in this study is already comparatively very reasonable.

the data collection from the secondary sources should probably be delayed until the primary data have been collected. In addition, the data from secondary sources could also be collected, on a time series basis, for a period of several years that also encompasses the points in time when the data from the primary sources are valid.

One of the most notable lessons learnt from the conduct of this study is that the temptation to modify or improve questionnaires mid-way through the data collection process should be resisted. In other words, it is important to use only one questionnaire version, even if there are some shortcomings in the version that are identified while administering the questionnaire. Any amendment should only be done at the pilot phase. Otherwise, during the combining or merger of data, which may be necessary due to the lack of responses, a study might be forced to reduce the data quality, as has happened in this study. In addition, the problem encountered in this study also underscores the importance of administering all the questionnaires in the same calendar year.

Apart from pursuing the above pointers to redress the shortcomings of this study, further empirical work in this area should also pay heed to the findings of this study and their implications. The study identifies some new predictor variables that should be incorporated in future studies. Some of the more notable are about ❶ FX exposure characteristics, ❷ intra-company transactions, and ❸ equity cross-ownership between a company and its subsidiary. These are elaborated below.

Several dimensions of a company's FX exposure characteristics have been suggested as useful predictors. Future studies, therefore, should include measures of these predictors. More specifically, ① perceived exposure characteristics (i.e., a company's perception of its own exposure characteristics) should be used, rather than merely using actual exposure characteristics as have been done previously. Additionally, ② individual exposure and exposure component (particularly, financing exposure) characteristics should also be used, apart from using total exposure characteristics. Finally, ③ exposure ambiguity (uncertainty, instability, unpredictability etc.) should also be used, rather than using just exposure size.

Although the level of intra-company transactions did not appear to influence companies' likelihood of undertaking a wide spectrum of FERM activities, it nevertheless seems to influence two key FERM activities – the adoption of formal

FERM objectives and centralisation of FERM. Therefore, studies in the future that investigate these or related issues should include measures of intra-company transactions.

The study proposed that the cross-ownership of equity between a company and its subsidiary might influence the company's centralisation of FERM. Consequently, the proportion of equity held by the parent or holding company, as well as the proportion of subsidiary equity held by the company ought to be included in future studies to test this proposed hypothesis. Moreover, these predictors can also be used to control for the effect of cross-ownership of equity in determining the influences of other factors.

Apart from the above, future studies in this area can pursue several other avenues or options. Certainly, future studies could incorporate or expand into new research variables, i.e., FERM activities and characteristics, not investigated in this study. For example, the studies may wish to investigate the decision-making processes (including the use of forecast exchange and interest rates), and the performance assessment systems used by companies in their FERM programmes.

Research studies in the future could also venture into linking the research variables, FERM activities and characteristics, used in this study to other dependent variables, e.g., income volatility, profitability, share price, or even company satisfaction with the adopted FERM programme. These are particularly useful in the process of uncovering the effectiveness FERM and the best practices in FERM. This study has avoided this issue, and had tacitly assumed that the practices adopted by a company are the most appropriate (beneficial), given the conditions under which it operates.

Alternatively, new researches in this area could also incorporate new explanatory variables or predictors – apart from the ones suggested by the findings of this study (mentioned above). For example, more objective measures of the level of risk, including total risk, financial risk, and FX risk might be useful. The studies could also use company attitude towards risk (the degree of risk-aversion) as a predictor variable, although as seen in this study, this construct is complex and difficult to tap.

Apart from that, new studies could embark upon determining the relationships between research variables, i.e., the relationships between FERM activities and characteristics of a company. In this study, it was implicitly assumed that there was no relationship

between these FERM activities and characteristics. In other words, each FERM activity or characteristic was assumed to be independent of one another. This clearly is unrealistic. Evidently, there has also been very little previous empirical work on this aspect.

Similar studies in the future could instead focus solely on the management of transaction exposure rather than on all three types of exposure. This is because most companies manage transaction exposure, and often the exposure is the central part of most companies' FERM programmes. Most companies seem to place only slight emphasis on managing accounting and economic exposures anyway.

Finally, perhaps, other research methods could be employed to uncover more subtle aspects and intricacies of FERM activities and the complex inter-relationships between factors and corporate FERM activities and characteristics. There is a wealth of knowledge still to be learnt about how companies, specifically in Malaysia, manage FX risk. There is still much to study, to name but a few, about the day-to-day, as well as strategic, management of FX risk, decision making processes (including policies and procedures), and the placement and apportioning of FERM responsibility within the company hierarchy. A case study approach of a small number of companies of various industry sectors, company size, and extent of FX involvement might reveal some interesting findings and insight. A specific issue at hand, is the centralisation of overseas and domestic subsidiaries' FERM. Although this study has made some attempt to identify some of the factors that may influence this, more in depth analysis on a more personal basis may provide deeper insights into this issue.

SUMMARY

The study has managed to meet the two research objectives set out in the first chapter. It has met the first objective by providing a profile of FERM practices of Malaysian public-listed multinational companies. A complete listing of the conclusions concerning the Malaysian companies' FERM practices, have been provided earlier in this chapter, but here, the most notable ones are briefly highlighted. There are also some key differences in the FERM practices between companies in Malaysia and those in developed Western countries. Companies in Malaysia, compared to those in the

West, generally seem more willing to manage FX risk, but appear to have less sophisticated FERM practices. This is probably because Malaysian companies have less capacity, need, and opportunity to undertake sophisticated FERM practices. Besides that, companies in Malaysia, compared to companies in the West, seem to be less able to centralise the management of their domestic subsidiaries' FX exposures, possibly due to the more widespread presence of equity cross-ownership between parent companies and their domestic subsidiaries, in Malaysia.

Notwithstanding the differences noted above, some FERM practices appear to be applicable to most companies, both in Malaysia and in developed Western countries. ① The management of transaction exposure seems to be the most popular. ② Companies that manage FX risk appear intent on minimising FX risk or losses. ③ In spite of this, the companies seem to assume at least some natural FX risk. ④ The responsibility for managing FX risk does not appear very prominent. ⑤ Nonetheless, FERM responsibility seems to be centralised at least to some extent. ⑥ Finally, forward contract is the most used technique for managing FX risk.

Apart from the common FERM practices noted above, there appears to be some FERM practices that could be applicable only to Malaysian public-listed multinational companies. These companies generally do not appear to accept artificial FX risk. In general, FERM responsibility in these companies seems to be specialised, i.e., handled by only one department in each company. For these Malaysian companies, the do-nothing strategy broadly appears to be the next most used technique, after forward contract, for dealing with FX risk.

This study has also met the second research objective by identifying several factors (or predictors) that appear to influence the Malaysian public-listed multinational companies' FERM practices. The predictors used in this study appear to influence companies' inclinations to undertake many specific FERM activities.[24] In fact, a large proportion of the identified predictor influences (or predictor effects) are new, i.e., they have not been found in prior studies. The most important predictor categories, in descending order, appear to be ① FX exposure characteristics, ② company size, ③ debt

[24] The many predictor effects found in this study have been listed comprehensively earlier in section 7.1.2. However, as explained, it is difficult to aggregate and summarise these disparate effects into a few simple succinct conclusions. Therefore, these are not attempted here.

and equity, and ④ intra-company transactions – although the last two seem comparatively less important. The study has, furthermore, advanced the importance of predictors that measure different dimensions or characteristics of FX exposure, namely, those that measure ① perceived exposure, ② individual exposure, and exposure components, and ③ exposure ambiguity, apart from actual total exposure size.

Admittedly, there are several shortcomings and limitations in this study. These have been discussed in detail earlier in section 7.3. The more prominent of these are noted here. ❶ A few factors that have been found to be useful in previous studies has been omitted but the impact of this is limited as explained earlier. ❷ The study had used two different questionnaire versions, and due to the inadequate number of respondents, it had to combine the responses from the two versions, culminating in reduced data quality. ❸ The study had to contend with relatively small numbers of cases, compared to the number of predictor variables, in logistic regression analyses. ❹ There were also some problems with measurement in the research. These range from some variables measuring potentially volatile values at single points in time, to others measuring company perceptions of FX risk attributes using only single-dimensional measures. Although these shortcomings imply that some qualifications need to be applied when interpreting the predictor effects, they certainly do not warrant the dismissal of the findings of the predictor effects.

Notwithstanding the shortcomings noted earlier, this study has made some considerable contributions to the present body of empirical literature in corporate FERM. The major ones are recapitulated briefly here. ❶ The study has provided a profile of FERM practices of Malaysian public-listed multinational companies. ❷ It has synthesised and expanded research into corporate FERM by incorporating a combination of large numbers of both dependent variables and predictors, and by including a large number of new variables. ❸ It has also identified many new influences (or effects) the predictors seem to have on companies' inclinations to undertake specific FERM activities. ❹ The study has also advanced the prominence of a company's FX exposure characteristics (over all other predictors, including company size) in influencing a company's FERM practices, and has indicated that different dimensions of the FX exposure characteristics sometimes influence the practices in different ways. The last two are especially significant because previous studies have provided only a very limited number of predictor effects, and they have mostly focused on only company size, and to a lesser

extent, FX involvement (or essentially, actual total FX exposure size), to explain a company's FERM practices.

Finally, this chapter explored some avenues for further research work in this field of corporate FERM. These have been outlined in some depth in section 7.4. Here, however, some of the more important and interesting options are highlighted. ❶ Future studies could undertake to establish and validate the findings of this study, using a fresh sample perhaps from another country, since this study has identified several new predictors and the possible effects these predictors might have on companies' inclinations to undertake specific FERM activities. ❷ Further research should incorporate the few factors (predictors) – dividend payout, tax shield, asset liquidity, and perhaps, also long-term debt and interest cover – that have been omitted in this study. ❸ Besides these, they should also incorporate the new predictors that have been found to be important in this study, namely, FX exposure characteristics, intra-company transactions, and equity cross-ownership. In particular, the studies should include the predictors that measure the different dimensions of corporate FX exposure characteristics, including ① perceived as well as actual exposure, ② individual, component, as well as total exposure, and finally, ③ exposure ambiguity as well as size. ❹ Further research is also required to establish more robust measures of a company's perceptions of its own FX risk attributes. ❺ On a different tack, studies in the future may want to explore the relationships between corporate FERM practices and other dependent variables, e.g., profitability, income variability, share price, company satisfaction etc., in order to identify and establish the best FERM practices and their effectiveness. ❻ Some studies might wish to explore the relationships between specific FERM activities, as these activities have been assumed to be independent of one another, in this study.

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Appendix A: Major attributes of key empirical studies on FERM

Study	Abdel-Malek (1976)	Mathur (1982)	Soenan (1986)	Batten et al. (1993)
General Topic / Issues	FERM	FERM	Cash and FX risk management	FERM
Country	Canada	US	UK	Australian
Type of organi-sations		public, multinational; low FX involvement excluded	multinationals & subsidiaries; financial, government agencies, excluded	large
Sample (Source)	60	55 (Fortune 500)	60 (Association of Corporate Treasurers)	72 (Salescan)
Method	survey, interview	survey, mail questionnaire	survey, mail questionnaire	survey, mail questionnaire
Analysis	Descriptive, (chi-square statistics)	Descriptive, correlation statistics	Descriptive, (chi-square statistics)	Descriptive, chi-square statistics
FERM variables (research variables)	1. Manage (binary) 2. Objective 3. Centralisation 4. Procedure (planning & control) 5. Techniques (forward contract – binary)	1. Objective (formal – binary) 2. Exposure type (translation, transaction) 3. Centralisation 4. Techniques (internal, external, forward contact) 5. Procedure (forecast)	1. Objective (formal) 2. Exposure type (translation, transaction) 3. Responsibility 4. Centralisation 5. Policy (full, partial hedge) 6. Procedure (forecast; external services) 7. Techniques	1. Manage (binary) 2. Exposure type (translation, transaction, economic) 3. Centralisation 4. Policy (full, partial hedge; trading in FX) 5 Procedure (computer use) 6. Techniques (physical, synthetic; short-term, long-term)
Explanatory variables	1. Size (sales) 2. FX involvement (% exports & imports of total sales) 3. Multinational (binary) 4. Foreign (binary) 5. Industry (manufacturing / trading)	1. Size (total assets, number of subsidiaries) 2. FX involvement (foreign sales, number of countries)	1. Industry (industrial / trading)	1. Size (sales) 2. FX involvement (% exports & imports of total sales – binary) 3. Foreign (binary) 4. Public (binary) 5. Industry (primary, secondary or tertiary)

Study	Collier & Davis (1985), + Collier et al. (1992)	Collier et al. (1990)	Belk & Glaum (1990), + Glaum & Belk (1992)	Rawls & Smithson (1993)
General Topic / Issues	Transaction risk management (+ translation risk)	Transaction & translation risk management	FERM	Review of 2 (out of 4) studies on FERM
Country	UK	UK & US	UK	US
Type of organi-sations	large, multinational	large, multinational	major, industrial	companies
Sample (Source)	87; 51 (Times 200)	23 (Times 200 & Fortune 200)	17	255 & 173
Method	survey; phase 1: mail questionnaire; phase 2: interview	case study; interview	case study; interview	survey, mail questionnaire
Analysis	Descriptive, chi-square statistics	Descriptive, (chi-square statistics)	Descriptive	Descriptive
FERM variables (research variables)	1. Manage (binary) 2. Exposure type (transaction, translation) 3. Responsibility (treasurer, finance director) 4. Centralisation (centre, specific directives, general guidelines, autonomous) 5. Policy (close-out, or actively manage)	1. Manage (binary) 2. Exposure type (transaction, translation) 3. Policy (close-out, or actively manage)	1. Manage 2. Exposure type (accounting, transaction, economic) 3. Objective (type) 4. Responsibility (cost-profit accountability) 5. Centralisation 6. Techniques	1. Exposure type (translation, firm commitment, < a year, > a year, contingent, competitive) 2. Objective 3. Responsibility (cost-profit accountability) 4. Techniques
Explanatory variables	1. Level of risk (binary)	1. Level of risk (transaction, translation) 2. Country (US or UK)		

Study	Dolde (1993)	Bodnar et al. (1995)	Phillips (1995)
General Topic / Issues	FERM	Derivative and managing financial risks	Derivative for hedging, funding, and investing
Country	US	US	US
Type of organi-sations	large	companies; financial excluded	Organisations, profit & non-profit
Sample (Source)	244 (Fortune 500)	530 (Compustat 1993)	657 (TMA list)
Method	survey, mail questionnaire	survey, mail questionnaire	survey, mail questionnaire
Analysis	Descriptive, (chi-square, t-test, correlation statistics)	Descriptive	Descriptive
FERM variables	1. Manage (binary) 2. Responsibility (number of persons) 3. Centralisation 4. Policy (% exposure hedged) 5. Procedure (use & type of computer & software)	1. Use derivatives (binary) 2. Exposure type (source: FX, interest rate, commodity, and equity; type: firm commitment, < 12 months, > 12 months etc.) 3. Objective (type: cash flow, earnings, or balance sheet exposure) 4. Centralisation (policy, strategy, execution) 5. Procedure (internal reporting system; credit risk control; computer technology) 6. Techniques (two-sided, one-sided; OTC, exchange-traded)	1. Use derivatives (binary) 2. Exposure type (FX, interest rate, commodity-price risk) 3. Objective (type: hedging, financing, and investment) 4. Techniques (derivative contracts, derivative securities; forward based, options based; exchange-traded, OTC) 5. Perceived success or satisfaction (hedging, funding, investment)
Explanatory variables	1. Size (market value) 2. "View" on exchange rate movement (binary) 3. Leverage 4. Stock market return*	1. Size (market value) 2. Industry (classification)	1. Size (sales, total assets) 2. Industry (classification) 3. Single exposure size

*Actually, this was used as the dependent variable, and not as an explanatory variable.

Study	Nance et al. (1993)	Berkman & Bradbury (1996)	Mian (1996)
General Topic / Issues	Determinants of hedging	Determinants of derivative use	Determinants of hedging
Country	US	New Zealand	US
Type of organi-sations	companies	public listed, foreign & financial excluded	companies, financial excluded
Sample (Source)	169 (Fortune 500 & S&P 400)	116 (New Zealand Stock Exchange)	3022 (Compustat 1992)
Method	survey, mail questionnaire and Compustat 1977-86	data from audited financial statements	data from footnotes of annual reports
Analysis	Correlation, t-test statistics, & (restricted) logistic regression	Mann Whitney U test, and tobit regression	t-test, correlation statistics, and logistic regression
FERM (dependent) variables	1. Hedge (binary)	1. Derivatives (fair, contract value)	1. Hedge (FX risk, interest rate, commodity - binary)
Explanatory variables	1. Size (market value) 2. Leverage (long-term debt / size) 3. Coverage ratio (earnings before interest & tax / interest) 4. Book-Market value of assets 5. R&D expenditure (scaled) 6. Significant chance of income in progressive tax region (binary) 7. Investment tax credits (amount) 8. Tax loss carry forward (amount) 9. Dividend yield (dividend / price) 10. Current ratio 11. Convertible debt (scaled) 12. Preferred stock (scaled)	1. Size (market value - log) 2. Proportion of assets overseas 3. Leverage (debt / size) 4. Coverage ratio (earnings before interest & tax / interest - log) 5. Earnings-price ratio (inverted P-E) 6. Proportion of cash flow used for asset growth (change in net tangible assets + depreciation / net income + depreciation - log) 7. Tax loss carry forward (binary) 8. Dividend pay-out (dividend / earnings) 9. Quick ratio (log) 10. Convertible debt & preferred stock (scaled) 11. Proportion of shares held by directors	1. Size (market value - log) 2. Leverage (debt / market value of equity + preferred stock) 3. Proportion of total debt contributed by long-term debt (long-term debt / debt) 4. Market-Book value of assets 5. Regulated utility (binary) 6. Significant chance of income in progressive tax region (binary) 7. Foreign tax credit (binary) 8. Tax loss carry forwards (binary) 9. Current ratio 10. Dividend pay-out (dividend / earnings) 11. Dividend yield (dividend / price)

Study	Grant & Marshall (1997)	Geczy et al. (1997)	Marshall (2000)	Joseph (2000)
General Topic / Issues	Derivative use	Determinants of currency derivative use	FERM, regional differences	Determinants of hedging techniques
Country	UK	US	UK, US, & Asia-Pacific (Australia, HK, Japan, S'pore, & S'Korea)	UK
Type of organi-sations	large	large (non-finance)	large (non-finance) multinationals	multinationals (that hedge FX exposure)
Sample (Source)	91 and 55 (FTSE 250)	372 (Fortune 500, non-financial)	179 (unspecified))	75 (The Times 1000)
Method	surveys (2), mail questionnaires	annual report disclosures	survey, mail questionnaire	survey, mail questionnaire
Analysis	Descriptive	t-statistic, correlation coefficient, and binomial & multinomial logistic regression	Descriptive, chi-square statistics	Descriptive, chi-square, Kruskal-Wallis, logistic regression
FERM variables (research variables)	1. Extent of use (instruments) 2. Reasons for use (risk type managed, objective) 3. Concerns in use 4. Controls (valuation & reporting) 5. Disclosure	1. Use currency derivatives	1. FERM importance 2. Objective 3. Exposure type 4. Techniques	1. Utilisation of internal, & external techniques
Explanatory variables		1. Managerial wealth & option holding 2. Bondholder stake (interest coverage, LT debt, R&D, invest. expend., book-to-market) 3. Hedging substitutes (convertible debt, preferred stock) 4. Liquidity (quick ratio, dividend yield) 5. Equityholder stake (tax loss carry forward, inst. holding, analyst firms) 6. Firm size 7. Exposure (foreign sales, net income, assets, ST & LT debt, % import in industry) 8. Other (use other derivatives & industry sector)	1. Region (UK, US, Asia-Pacific) – main 2. Size (quartile of total sales) 3. FX involvement (% of overseas sales) 4. Industry	1. Internationalisation (countries, foreign subsidiaries, % overseas sales, % hedged) 2. Coefficient of variation of … *growth options* (sales/ mkt.val; net.assets/ mkt.val; div.yield) *profitability* (operating & trade profit margins) *cashflow & liquidity* (gross cashflow/ mkt.val; cash/ mkt.val; q.asset ratio; work.capital ratio) *leverage* (total debt/ mkt.val; interest/ income; LT debt/ mkt.val; …) *tax* (…) *manager / director remuneration* (…)

Appendix B-1: List of research variables – FERM activities and characteristics

	Variable label	Name	Data type	Source & question #	Value	Value label
	Management of FX risk					
1	Manage FX risk	MANAGE	Dichotomy	(QV1 & QV2) 1	1 2	no yes
	FX exposure type					
2	Manage accounting exposure	ACCTEXP	Dichotomy	(QV2) 18a (QV1) 14a	1 2	no yes
3	Manage economic exposure	ECONEXP	Dichotomy	(QV2) 19a (QV1) 16a	1 2	no yes
4	Manage transaction exposure	TRANEXP	Dichotomy	(QV2) 20a (QV1) 15a	1 2	no yes
5	Relative use of accounting exposure	ACCTRAN1	Rank	(QV2) 17 (QV1) 13	1 2 3	most used used least used
6	Relative use of economic exposure	ECONRAN1	Rank	(QV2) 17 (QV1) 13	1 2 3	most used used least used
7	Relative use of transaction exposure	TRANRAN1	Rank	(QV2) 17 (QV1) 13	1 2 3	most used used least used
	FERM objective					
8	FERM objective formalisation	OBJTYPE	Ordinal	(QV2) 2a (QV1) 2	1 2 3	undefined implied or informal written and formal
9	FERM objective content	OBJECT	Nominal	(QV2) 2b (QV1) 3	1 2 3 4 5 6	minimise FX risk minimise FX loss reduce FX risk, benefit > cost FX gain offset FX loss & cost FX gain > FX loss & cost maximise FX gain

	Variable label	Name	Data type	Source & question #	Value	Value label
			FERM responsibility			
10	Number of persons responsible for FERM	PERSONUM	Ratio	(QV2) 3a	--	--
11	Importance of FERM function	FUNCTION	Ordinal	(QV2) 3b (QV1) 4	1 2 3	small major the major
12	Share FERM responsibility among departments	JOINTRES	Dichotomy	(QV2) 4 (QV1) 4	1 2	no yes
			FERM centralisation			
13	Responsibility for domestic subsidiary exposures	DSUBCEN2	Ordinal	(QV2) 6 (QV1) 5a	1 2 3	parent parent & subsidiary subsidiary
14	Responsibility for overseas subsidiary exposures	OSUBCEN2	Ordinal	(QV2) 8 (QV1) 5b	1 2 3	parent parent & subsidiary subsidiary
			FERM policies and procedures			
15	Recognise likely inflow exposures	EXINLIKE	Dichotomy	(QV2) 9a	1 2	no yes
16	Recognise long-term inflow exposures	EXINLONG	Dichotomy	(QV2) 9a	1 2	no yes
17	Recognise likely outflow exposures	EXOTLIKE	Dichotomy	(QV2) 9b	1 2	no yes
18	Recognise long-term outflow exposures	EXOTLONG	Dichotomy	(QV2) 9b	1 2	no yes
19	Recognised inflow exposure	EXINFLOW	Ordinal	(QV1) 6a	1 2 3 4 5	forecast sales, > 12 months forecast sales, < 12 months buyer asks quote buyer places order buyer sent invoice

	Variable label	Name	Data type	Source & question #	Value	Value label
			FERM policies and procedures			
20	Recognised outflow exposure	EXOTFLOW	Ordinal	(QV1) 6b	1 2 3 4 5	forecast purchases, > 12 months forecast purchases, < 12 months company asks quote company places order company sent invoice
21	Manage only significant exposures	SIGNIFIC	Dichotomy	(QV2) 10a (QV1) 7a	1 2	no yes
22	Threshold for significant exposure	SIGVOLUM	Ratio	(QV2) 10b (QV1) 7b	--	--
23	Allow time flexibility for hedging	LAPSE	Dichotomy	(QV2) 11a (QV1) 8a	1 2	no yes
24	Time allowed for hedging	LAPSTIME	Ratio	(QV2) 11b (QV1) 8b	--	--
25	Undertake partial cover	PROPORT	Dichotomy	(QV2) 14 (QV1) 10	1 2	no yes
26	Write currency options	OPTIONS	Dichotomy	(QV2) 15 (QV1) 11	1 2	no yes
27	Undertake uncovered FX deal	UNOFFSET	Dichotomy	(QV2) 16 (QV1) 12	1 2	no yes
28	Use forecast rates	EXRATE1	Dichotomy	(QV2) 12 (QV1) 9	1 2	no yes
29	Use internal FX rates	INRATE	Dichotomy	(QV2) 13	1 2	no yes
			FERM techniques – accounting exposure			
30	Accounting exposure covered with back-to-back loan	ABTBAC2	Ordinal	(QV1) 14b	1 2 3	not used up to 60% more than 60%
31	Accounting exposure covered with balance sheet hedge	ABSHED2	Ordinal	(QV2) 18b (QV1) 14b	1 2 3	not used up to 60% more than 60%

	Variable label	Name	Data type	Source & question #	Value	Value label
FERM techniques – accounting exposure						
32	Accounting exposure covered with currency swap	ACSWAP2	Ordinal	(QV1) 14b	1 2 3	not used up to 60% more than 60%
33	Accounting exposure covered with forward contract	AFORCO2	Ordinal	(QV2) 18b (QV1) 14b	1 2 3	not used up to 60% more than 60%
34	Accounting exposure covered with income statement hedge	AISHED2	Ordinal	(QV2) 18b (QV1) 14b	1 2 3	not used up to 60% more than 60%
35	Accounting exposure managed with leading and lagging	ALELAG2	Ordinal	(QV1) 14b	1 2 3	not used up to 60% more than 60%
36	Accounting exposure left uncovered	ADONOT2	Ordinal	(QV2) 18b (QV1) 14b	1 2 3	not used up to 60% more than 60%
FERM techniques – economic exposure						
37	Economic exposure covered with back-to-back loan	EBTBAC2	Ordinal	(QV2) 19b (QV1) 16b	1 2 3	not used up to 60% more than 60%
38	Economic exposure covered with currency option	EOPTIO2	Ordinal	(QV2) 19b (QV1) 16b	1 2 3	not used up to 60% more than 60%
39	Economic exposure managed with diversifying financing	EDYFIN2	Ordinal	(QV2) 19b (QV1) 16b	1 2 3	not used up to 60% more than 60%
40	Economic exposure managed with diversifying operations	EDYOPR2	Ordinal	(QV2) 19b (QV1) 16b	1 2 3	not used up to 60% more than 60%

	Variable label	Name	Data type	Source & question #	Value	Value label
FERM techniques – economic exposure						
41	Economic exposure covered with forward contract	EFORCO2	Ordinal	(QV2) 19b (QV1) 16b	1 2 3	not used up to 60% more than 60%
42	Economic exposure managed with leading and lagging	ELELAG2	Ordinal	(QV1) 16b	1 2 3	not used up to 60% more than 60%
43	Economic exposure covered with matching	EMATCH2	Ordinal	(QV2) 19b (QV1) 16b	1 2 3	not used up to 60% more than 60%
44	Economic exposure left uncovered	EDONOT2	Ordinal	(QV2) 19b (QV1) 16b	1 2 3	not used up to 60% more than 60%
FERM techniques – transaction exposure						
45	Transaction exposure covered with back-to-back loan	TBTBAC2	Ordinal	(QV1) 15b	1 2 3	not used up to 60% more than 60%
46	Transaction exposure covered with currency option	TOPTIO2	Ordinal	(QV2) 20b (QV1) 15b	1 2 3	not used up to 60% more than 60%
47	Transaction exposure covered with currency swap	TCSWAP2	Ordinal	(QV1) 15b	1 2 3	not used up to 60% more than 60%
48	Transaction exposure covered with forward contract	TFORCO2	Ordinal	(QV2) 20b (QV1) 15b	1 2 3	not used up to 60% more than 60%
49	Transaction exposure managed with leading and lagging	TLELAG2	Ordinal	(QV2) 20b (QV1) 15b	1 2 3	not used up to 60% more than 60%

	Variable label	Name	Data type	Source & question #	Value	Value label
FERM techniques – transaction exposure						
50	Transaction exposure covered with matching	TMATCH2	Ordinal	(QV1) 15b	1 2 3	not used up to 60% more than 60%
51	Transaction exposure covered with money market hedge	TMMHED2	Ordinal	(QV2) 20b (QV1) 15b	1 2 3	not used up to 60% more than 60%
52	Transaction exposure covered with netting	TNET2	Ordinal	(QV2) 20b (QV1) 15b	1 2 3	not used up to 60% more than 60%
53	Transaction exposure managed with risk sharing agreement	TRSHAR2	Ordinal	(QV2) 20b (QV1) 15b	1 2 3	not used up to 60% more than 60%
54	Transaction exposure left uncovered	TDONOT2	Ordinal	(QV2) 20b (QV1) 15b	1 2 3	not used up to 60% more than 60%

Appendix B-2: List of dependent variables – FERM activities

	Variable label	Name	Remarks – adopted or adapted
Management of FX risk			
1	Manage FX risk	MANAGE	Adopted research variable
FX exposure type			
2	Manage accounting exposure	ACCTEXP	Adopted research variable
3	Manage economic exposure	ECONEXP	Adopted research variable
4	Manage transaction exposure	TRANEXP	Adopted research variable
5	Manage all three types of FX exposure	USE3	Adapted from ACCTEXP, ECONEXP, and TRANEXP; USE3=2 if ACCTEXP, ECONEXP, and TRANEXP, each=2, otherwise USE3=1
FERM objective			
6	Adopt formal FERM objective	OBJTYPE1	Adapted from OBJTYPE; OBJTYPE1=2 if OBJTYPE=3, otherwise OBJTYPE1=1
FERM responsibility			
7	Share FERM responsibility among departments	JOINTRES	Adopted research variable
FERM centralisation			
8	Decentralise fully domestic subsidiaries' FERM	DCEN2	Adapted from DSUBCEN2; DCEN2=2 if DSUBCEN2=3, otherwise DCEN2=1
9	Decentralise fully overseas subsidiaries' FERM	OCEN2	Adapted from OSUBCEN2; OCEN2=2 if OSUBCEN2=3, otherwise OCEN2=1
FERM policies and procedures			
10	Manage only significant exposures	SIGNIFIC	Adopted research variable
11	Allow time flexibility for hedging	LAPSE	Adopted research variable
12	Undertake partial cover	PROPORT	Adopted research variable
13	Undertake uncovered FX deals	UNOFFSET	Adopted research variable
14	Use forecast rates	EXRATE1	Adopted research variable
FERM techniques			
15	Use forward contracts	FORCON1	Adapted from TFORCO2; FORCON1=1 if TFORCO2=1, otherwise FORCON1=2
16	Use forward contracts extensively	FORCON2	Adapted from TFORCO2; FORCON2=2 if TFORCO2=3, otherwise FORCON2=1

Notes: ❖ All dependent variables are dichotomies, with 1 = "no", and 2 = "yes".
❖ For details about the research variable from which a dependent variable is adapted, refer to Appendix B-1.

Appendix B-3: List of predictor variables

	Variable label	Name	Data type	Source & question #	Value	Value label
			Company size			
1	Total assets (in RM billion)	ASSETS_B	Ratio	KLSE handbook	--	--
2	Total sales (in RM billion)	SALES_B	Ratio	KLSE handbook	--	--
3	Total market capitalisation (in RM billion)	MKTVAL_B	Ratio	KLSE handbook	--	--
4	Number of subsidiaries	TSUBNUM	Ratio	KLSE handbook	--	--
			Debt and leverage			
5	Total debt (in RM billion)	DEBT_B	Ratio	KLSE handbook	--	--
6	Debt ratio	PERDEBT	Ratio	KLSE handbook	--	--
			Equity ownership			
7	Equity held by foreigners (in proportion)	EQFOREIN	Ratio	KLSE handbook	--	--
8	Equity held by government (in proportion)	EQGOVT	Ratio	KLSE handbook	--	--
			Listing board and sector			
9	KLSE listing board	BOARD	Dichotomy	KLSE handbook	1 2	Main Second
10	KLSE listing sector	SECTOR	Nominal	KLSE handbook & KLSE official web-site	1 2 3 4 5 6 7 8	Construction Consumer Hotel Industrial Mining Plantation Property Trading & services
			FX involvement			
11	Number of overseas subsidiaries	OSUBNUM	Ratio	KLSE handbook	--	--
12	Sales & other revenues in foreign currencies	PERSAL3	Dichotomy	(QV2) 21a (QV1) 17a	1 2	up to 25% more than 25%
13	Purchases & other expenses in foreign currencies	PERPUR3	Dichotomy	(QV2) 21b (QV1) 17b	1 2	up to 25% more than 25%
14	Financing in foreign currencies	PERFIN3	Dichotomy	(QV2) 21c (QV1) 17c	1 2	up to 25% more than 25%

	Variable label	Name	Data type	Source & question #	Value	Value label
			FX involvement			
15	Capital investment in foreign currencies	PERCAP3	Dichotomy	(QV2) 21d (QV1) 17d	1 2	up to 25% more than 25%
16	Transactions in foreign currencies	FOREIGN3	Dichotomy	(QV2) 22a (QV1) 26a	1 2	up to 30% more than 30%
17	Transactions in US Dollar	DOLLAR2	Ordinal	(QV2) 22a-d (QV1) 26a-d	1 2 3	up to 25% 26% - 70% more than 70%
18	Transactions in Japanese Yen	YEN2	Ordinal	(QV2) 22a-d (QV1) 26a-d	1 2 3	up to 25% 26% - 70% more than 70%
19	Transactions in Singaporean Dollar	SINGDOL2	Ordinal	(QV2) 22a-d (QV1) 26a-d	1 2 3	up to 25% 26% - 70% more than 70%
20	Transactions in British Pound	POUND2	Ordinal	(QV2) 22a-d (QV1) 26a-d	1 2 3	up to 25% 26% - 70% more than 70%
21	Transactions in Australian Dollar	AUSDOL2	Ordinal	(QV2) 22a-d (QV1) 26a-d	1 2 3	up to 25% 26% - 70% more than 70%
22	Transactions in German Mark	MARK2	Ordinal	(QV2) 22a-d (QV1) 26a-d	1 2 3	up to 25% 26% - 70% more than 70%
23	Transactions in Hong Kong Dollar	HONGKD2	Ordinal	(QV2) 22a-d (QV1) 26a-d	1 2 3	up to 25% 26% - 70% more than 70%
24	Transactions in Swiss Franc	SWISSF2	Ordinal	(QV2) 22a-d (QV1) 26a-d	1 2 3	up to 25% 26% - 70% more than 70%
25	Transactions in Italian Lira	LIRA2	Ordinal	(QV2) 22a-d (QV1) 26a-d	1 2 3	up to 25% 26% - 70% more than 70%

	Variable label	Name	Data type	Source & question #	Value	Value label
			FX involvement			
26	Transactions in Indonesian Rupiah	RUPIAH2	Ordinal	(QV2) 22a-d (QV1) 26a-d	1 2 3	up to 25% 26% - 70% more than 70%
27	Transactions in Thai Baht	BAHT2	Ordinal	(QV2) 22a-d (QV1) 26a-d	1 2 3	up to 25% 26% - 70% more than 70%
28	Transactions in Chinese Yuan	YUAN2	Ordinal	(QV2) 22a-d (QV1) 26a-d	1 2 3	up to 25% 26% - 70% more than 70%
29	Transactions in Philippine Peso	PHIPESO2	Ordinal	(QV2) 22a-d (QV1) 26a-d	1 2 3	up to 25% 26% - 70% more than 70%
30	Number of currencies	CURNUM	Ratio	(QV1) 25	--	--
			Intra-company transaction			
31	Intra-company transactions	INTRACO2	Ordinal	(QV2) 23 (QV1) 18	1 2 3	up to 20% 21% - 40% more than 40%
			Perceived FX risk attributes			
32	Perceived FX exposure pattern stability	STABLE1	Dichotomy	(QV2) 24 (QV1) 19	1 2	no yes
33	Perceived FX exposure volume size	VSIZE	Ordinal	(QV2) 25 (QV1) 20	1 2 3 4 5	very small small moderate large very large
34	Perceived FX exposure increment in future	VCHANGE	Ordinal	(QV2) 26 (QV1) 21	1 2 3 4 5	decreasing rapidly decreasing neutral increasing increasing rapidly

	Variable label	Name	Data type	Source & question #	Value	Value label
			Perceived FX risk attributes			
35	Perceived FX exposure unpredictability	XPREDIC	Ordinal	(QV2) 27 (QV1) 22	1 2 3 4 5	very predictable predictable moderate unpredictable very unpredictable
36	Perceived exchange rate uncertainty	VOLAT	Ordinal	(QV2) 28a (QV1) 23	1 2 3 4 5	very certain certain moderate uncertain very uncertain
37	Perceived exchange rate uncertainty prior to crisis	PVOLAT	Ordinal	(QV2) 28b	1 2 3 4 5	very certain certain moderate uncertain very uncertain
38	Perceived level of FX risk	RISK	Ordinal	(QV2) 29a (QV1) 24	1 2 3 4 5	very low low moderate high very high
39	Perceived level of FX risk prior to crisis	PRISK	Ordinal	(QV2) 29b	1 2 3 4 5	very low low moderate high very high

Appendix C-1: Questionnaire version 1 used in phase 1 of data collection

Attn. Angappan Regunathi
Fax. 04-924 1832

Foreign Exchange Risk Management by Malaysian Multinational Companies

Kindly tick ☑ the most appropriate responses. Please tick only one response per question, unless specified otherwise.

1. Does your company manage foreign exchange risk?
   - ☐ Yes ☐ No (If no, please skip questions 2 to 16, and go to question 17 on page 4)

Objective of Foreign Exchange Risk Management

2. What type of objective (goal) does your company have in managing foreign exchange risk?
   - ☐ It is undefined. (If it is undefined, please skip question 3 and go to question 4)
   - ☐ It is informal or implied.
   - ☐ It is formal and written.

3. Which of the following best describes the objective?
   - ☐ To minimise foreign exchange risks.
   - ☐ To minimise foreign exchange losses.
   - ☐ To ensure that benefits are greater than costs in reducing foreign exchange risks.
   - ☐ To ensure that foreign exchange gains off-set foreign exchange losses and costs.
   - ☐ To ensure that foreign exchange gains are greater than foreign exchange losses and costs.
   - ☐ To maximise foreign exchange gains.
   - ☐ Other (Please specify) .....

Responsibility and Degree of Centralisation of Foreign Exchange Risk Management

4. Who is responsible for managing foreign exchange risk in your company?
   - ☐ No one is responsible.
   - ☐ One or more persons are responsible, but managing foreign exchange risk is only *a small* component of the person(s)' functions.
   - ☐ One or more persons are responsible, and managing foreign exchange risk is *a major* component of the person(s)' functions.
   - ☐ A formal department is responsible, where managing foreign exchange risk is *the major* function.
   - ☐ Several departments are jointly responsible, especially for strategic decisions arising from movements in foreign exchange rates.
   - ☐ Other (Please specify) .....

5. a. In your company, the major foreign exchange exposures arising from a *domestic* subsidiary are generally:
   - ☐ Identified, monitored and dealt by the parent company.
   - ☐ Identified by the subsidiary but monitored and dealt by the parent company.
   - ☐ Identified and monitored by the subsidiary but dealt by the parent company.
   - ☐ Identified and dealt by the subsidiary but monitored by the parent company.
   - ☐ Identified, monitored and sometimes dealt by the subsidiary, and at other times, by the parent company.
   - ☐ Identified, monitored and dealt by the subsidiary.
   - ☐ Other (Please specify) .....

   b. In your company, the major foreign exchange exposures arising from an *overseas* subsidiary are generally:
   - ☐ Identified, monitored and dealt by the parent company.
   - ☐ Identified by the subsidiary but monitored and dealt by the parent company.
   - ☐ Identified and monitored by the subsidiary but dealt by the parent company.
   - ☐ Identified and dealt by the subsidiary but monitored by the parent company.
   - ☐ Identified, monitored and sometimes dealt by the subsidiary, and at other times, by the parent company.
   - ☐ Identified, monitored and dealt by the subsidiary.
   - ☐ Other (Please specify) .....

Policies and Procedures in Foreign Exchange Risk Management

6. a. Which of the following future cash *inflows (sales)* will your company recognise as an exposure? **Please tick more than one if necessary.**

- ☐ Forecast sales in foreign currency (more than 12 months in advance).
- ☐ Forecast sales in foreign currency (less than 12 months in advance).
- ☐ A potential foreign buyer asks for a price quote in foreign currency, for a specified volume.
- ☐ A foreign buyer places an order which is priced in foreign currency.
- ☐ A foreign buyer is sent an invoice with price denominated in foreign currency.
- ☐ Other (Please specify) .....

b. Which of the following future cash *outflows (purchases)* will your company recognise as an exposure? **Please tick more than one if necessary.**

- ☐ Forecast purchases in foreign currency (more than 12 months in advance).
- ☐ Forecast purchases in foreign currency (less than 12 months in advance).
- ☐ A potential foreign supplier quotes a price in foreign currency, for a specified volume, upon request from the company.
- ☐ The company places an order, which is priced in foreign currency, from a foreign supplier.
- ☐ The company is sent an invoice with price denominated in foreign currency for purchases.
- ☐ Other (Please specify) .....

7. a. Does your company *generally* hedge or manage only exposures that are *significant*?

☐ Yes ☐ No (If no, please **skip** question 7 b and go to question 8)

b. Please state the volume of exposure considered as *significant* by your company. (Please state in thousands of Malaysian Ringgit)

8. a. Does your company *generally* allow some time to elapse between the point when an exposure is identified and the point when it is managed or hedged?

☐ Yes ☐ No (If no, please **skip** question 8 b and go to question 9)

b. Please state the time elapsed, on average, between the identification of and the management or hedging of an exposure. (Please state in number of days)

9. How often does your company use exchange rate (and interest rate) forecasts to make exposure management decisions?

☐ Always ☐ Often ☐ Seldom ☐ Never

10. Does your company *sometimes* hedge or manage a *proportion* of an exposure (as opposed to hedging the whole exposure)?

☐ Yes ☐ No

11. Does your company *sometimes write* currency options?

☐ Yes ☐ No

12. Does your company *sometimes* undertake foreign exchange transactions that are *not off-set* by underlying commercial or operational transactions?

☐ Yes ☐ No

Measurement of Foreign Exchange Risk

13. Please rank the three measures of exposure, according to their relative extent of use in your company. **(1 - most used; 3 - least used)**. Please refer to the enclosed **Glossary Sheet**, if necessary. **Please enter the rank in the boxes.**

Accounting exposure ☐
Transaction exposure ☐
Economic exposure ☐

Strategies and Techniques of Foreign Exchange Risk Management

14. a. Does your company manage *accounting* exposure?

☐ Yes ☐ No (If no, please skip question 14 b and go to question 15)

b. Please consider the total *accounting* exposure encountered by your company in 1996. Please tick the approximate percentage of this exposure that was managed using each of the following strategy or technique. Please refer to the enclosed **Glossary Sheet**, if necessary.

	Not Used	Percentage of total accounting exposure ≤ 20%	21-40%	41-60%	>60%
Back-to-back Loan	☐	☐	☐	☐	☐
Balance Sheet Hedge	☐	☐	☐	☐	☐
Currency Futures	☐	☐	☐	☐	☐
Currency Option	☐	☐	☐	☐	☐
Currency Swap	☐	☐	☐	☐	☐
Forward Contract	☐	☐	☐	☐	☐
Income Statement Hedge	☐	☐	☐	☐	☐
Leading and Lagging	☐	☐	☐	☐	☐
Do Nothing	☐	☐	☐	☐	☐
Other (Please specify)	☐	☐	☐	☐	☐

.....

15. a. Does your company manage *transaction* exposure?

☐ Yes ☐ No (If no, please skip questions 15 b and go to question 16)

b. Please consider the total *transaction* exposure encountered by your company in 1996. Please tick the approximate percentage of this exposure that was managed using each of the following strategy or technique. Please refer to the enclosed **Glossary Sheet**, if necessary.

	Not Used	Percentage of total transaction exposure ≤ 20%	21-40%	41-60%	>60%
Back-to-back Loan	☐	☐	☐	☐	☐
Currency Futures	☐	☐	☐	☐	☐
Currency Option	☐	☐	☐	☐	☐
Currency Swap	☐	☐	☐	☐	☐
Forward Contract	☐	☐	☐	☐	☐
Leading and Lagging	☐	☐	☐	☐	☐
Matching	☐	☐	☐	☐	☐
Money Market Hedge	☐	☐	☐	☐	☐
Netting	☐	☐	☐	☐	☐
Risk Sharing Agreement	☐	☐	☐	☐	☐
Do Nothing	☐	☐	☐	☐	☐
Other (Please specify)	☐	☐	☐	☐	☐

.....

16. a. Does your company manage *economic* exposure?

☐ Yes ☐ No (If no, please **skip** question 16 b and go to question 17)

b. Please consider the total *economic* exposure encountered by your company currently. Please **tick** the approximate percentage of this exposure that is managed using each of the following strategy or technique. **Please refer** to the enclosed **Glossary Sheet**, if necessary.

	Not Used	Percentage of total economic exposure ☐ 20%	21-40%	41-60%	>60%
Back-to-back Loan	☐	☐	☐	☐	☐
Currency Futures	☐	☐	☐	☐	☐
Currency Option	☐	☐	☐	☐	☐
Currency Swap	☐	☐	☐	☐	☐
Diversifying Financing	☐	☐	☐	☐	☐
Diversifying Operations	☐	☐	☐	☐	☐
Forward Contract	☐	☐	☐	☐	☐
Leading and Lagging	☐	☐	☐	☐	☐
Matching	☐	☐	☐	☐	☐
Risk Sharing Agreement	☐	☐	☐	☐	☐
Do Nothing	☐	☐	☐	☐	☐
Other (Please specify)	☐	☐	☐	☐	☐

.....

Foreign Exchange Volume and Level of Foreign Exchange Risk

17. Please consider your company's total transaction volume in 1996. Please **tick** the percentage of total transaction volume that is denominated in foreign currencies, for the following transactions. For example, for (a), percentage of sales (and other revenues) denominated in foreign currencies, over total volume of sales (and other revenues).

	☐ 20%	21-40%	41-60%	61-80%	>80%
(a) Sales (and other revenues)	☐	☐	☐	☐	☐
(b) Purchases (and other expenses)	☐	☐	☐	☐	☐
(c) Financing (long-term debt & equity)	☐	☐	☐	☐	☐
(d) Capital investments (fixed assets)	☐	☐	☐	☐	☐

18. Again, please consider your company's total transaction volume in 1996. Please **tick** the volume of *intra-company transactions* (transactions between subsidiaries or between subsidiary and parent company), in terms of percentage over the total volume of transactions.

☐ 20%	21-40%	41-60%	61-80%	>80%
☐	☐	☐	☐	☐

19. How stable are the percentages (in questions 17 and 18) over time? (**1 - very unstable; 5 - very stable**).

1	2	3	4	5
☐	☐	☐	☐	☐

20. How large is the overall volume of foreign exchange exposure in your company? (**1 - very small; 5 - very large**).

1	2	3	4	5
☐	☐	☐	☐	☐

21. How is the overall volume of foreign exchange exposure changing over time, in your company? (**1 - decreasing rapidly; 5 - increasing rapidly**).

1	2	3	4	5
☐	☐	☐	☐	☐

22. How predictable are the foreign exchange exposures encountered by your company? (**1 - very unpredictable; 5 - very predictable**).

1	2	3	4	5
☐	☐	☐	☐	☐

23. How uncertain (volatile) are the exchange rates associated with the foreign exchange exposures encountered by your company? **(1 - very certain; 5 - very uncertain).**

1	2	3	4	5
☐	☐	☐	☐	☐

24. How much foreign exchange risk does your company encounter on the whole? **(1 - very low; 5 - very high).**

1	2	3	4	5
☐	☐	☐	☐	☐

25. In how many currencies (including Malaysian Ringgit) does your company have transactions? (Please state the number).

[ ]

26. Please consider your company's total transaction volume in 1996. Please **state** 3 major currencies (other than Malaysian Ringgit) in which your company had transactions. Then, **tick** the approximate percentage contribution of each currency (including Malaysian Ringgit) to total volume of transactions.

	percentage contribution to overall volume				
	≤ 20%	21-40%	41-60%	61-80%	>80%
a. Malaysian Ringgit	☐	☐	☐	☐	☐
b.	☐	☐	☐	☐	☐
c.	☐	☐	☐	☐	☐
d.	☐	☐	☐	☐	☐

Foreign Exchange Risk Attitude

27. Suppose your company expects, in 180 days, a very large receipt (exposure) in a foreign currency. The table below indicates the likelihood (chance) of foreign exchange gains and losses that may arise from four different hedging policies. Please **rank** each of the policies in terms of your company's preference. **(1 - most preferred; 4 - least preferred). Please enter the rank in the boxes.** For example, Hedge B has a 5% (or 1 in 20) chance of yielding significant foreign exchange gains, a further 5% chance of producing significant foreign exchange losses, and a 90% chance of giving only insignificant foreign exchange losses or gains. Foreign exchange gains and losses are here considered significant when they are more than 10% of the exposure value.

	Significant foreign exchange gains (more than 10% of exposure)	Insignificant foreign exchange losses/gains	Significant foreign exchange losses (more than 10% of exposure)
☐ Hedge A	0%	100% (10 in 10)	0%
☐ Hedge B	5% (1 in 20)	90% (9 in 10)	5% (1 in 20)
☐ Hedge C	20% (1 in 5)	60% (3 in 5)	20% (1 in 5)
☐ Hedge D	40% (2 in 5)	20% (1 in 5)	40% (2 in 5)

Please kindly complete the following as well, to enable me to send you a summary of this research's findings.

Name: .....
Designation: ..... Department: .....
Telephone: ..... Telefax: .....
Company name and address: .....
.....

Kindly hold this completed questionnaire for me until I come to collect it in person. If you have any query, please do contact me. My contact particulars are given below. Thank you for your kind assistance.

Angappan Regupathi
School of Management
Universiti Utara Malaysia
06010 UUM SINTOK
Tel: 04-700 5054 & Fax: 04-924 1832

Glossary Sheet (for your retention)

There are mainly three measures of currency risk (also known as exposure)

- Accounting exposure
  Potential for change in the company's consolidated net worth and reported net income, due to changes in the exchange rates that are used to restate or consolidate foreign subsidiaries' foreign currency financial statements into the company's reporting currency.

- Transaction exposure
  Potential for change in the value of outstanding (incurred but yet to be settled) financial obligations that are denominated in foreign currencies, due to changes in exchange rates.

- Economic exposure
  Potential for change in the value (or competitive position) of the company resulting from changes in the future operating cash flows due to unexpected changes in exchange rates.

There are several techniques or strategies used to manage these exposures. Some of the more popular are:

- Back-to-back Loan
  An agreement between two companies in separate countries, to each borrow the other's currency for a specific period of time and to repay at maturity.

- Balance Sheet Hedge
  Effort undertaken to match foreign currency assets (or liabilities) with liabilities (or assets) in the same currency.

- Currency Futures
  An exchange-traded standardized forward contract, i.e. for a fixed amount of foreign currency, at specified time and place of delivery.

- Currency Option
  An option (a right but not an obligation) to buy (call) or sell (put) foreign currencies at a specified rate, at or before a specified date.

- Currency Swap
  An agreement between two counterparties to exchange specific amounts of two different currencies at the outset and to repay (interest and possibly, principal) over time.

- Diversifying Financing
  Having financing facilities in many countries and then, making shifts in borrowing or obtaining of funds, from one country to another.

- Diversifying Operations
  Having operations in many countries and then, making shifts in sourcing, production runs, and/or marketing effort, from one country to another.

- Do Nothing
  The exposure is left unhedged or unmanaged.

- Forward Contract
  Selling or buying a foreign currency forward at a specified rate, i.e. for delivery or settlement at a date in the future.

- Income Statement Hedge
  Effort undertaken to match foreign currency revenues (or expenses) with expenses (or revenues) in the same currency.

- Leading and Lagging
  Adjusting the timing, i.e. delaying (lagging) or hastening (leading), of cash flows in foreign currencies.

- Matching
  Effort undertaken to match foreign currency cash inflows (or outflows) with outflows (or inflows) in the same currency.

- Money Market Hedge
  In the case of foreign currency receivables - use the foreign currency money market to borrow and then convert the funds at spot to home currency, allowing the expected receipts to pay off the borrowings. In the case of foreign currency payables - use the foreign currency money market to invest funds converted at spot from home currency, using the investment return to pay the payables.

- Netting
  Off-setting, the whole or a portion of, a cash outflow (or inflow) with an inflow (or outflow) occurring at the same time in the same foreign currency.

- Risk Sharing Agreement
  Contract between buyer and seller who agree to share currency gains and losses arising from the trade between them.

Appendix C-2: Questionnaire version 1 used in phase 2 of data collection

Attn: Angappan Regupathi
Fax: 04-924 1832

Foreign Exchange Risk Management by Malaysian Multinational Companies

Kindly tick ☑ the most appropriate responses. Please tick only one response per question, unless specified otherwise.

1. Does your company manage foreign exchange risk?

   ❑ Yes ❑ No (If no, please **skip** questions 2 to 16, and **go to** question 17 on page 4)

Objective of Foreign Exchange Risk Management

2. What type of objective (goal) does your company have in managing foreign exchange risk?

   ❑ It is undefined (If it is undefined, please **skip** question 3 and **go to** question 4)
   ❑ It is informal or implied
   ❑ It is formal and written

3. Which of the following best describes the objective?

   ❑ To minimise foreign exchange risks.
   ❑ To minimise foreign exchange losses.
   ❑ To ensure that benefits are greater than costs in reducing foreign exchange risks.
   ❑ To ensure that foreign exchange gains off-set foreign exchange losses and costs.
   ❑ To ensure that foreign exchange gains are greater than foreign exchange losses and costs.
   ❑ To maximise foreign exchange gains.
   ❑ Other (Please **specify**) .....

Responsibility and Degree of Centralisation of Foreign Exchange Risk Management

4. Who is responsible for managing foreign exchange risk in your company?

   ❑ No one is responsible.
   ❑ One or more persons are responsible, but managing foreign exchange risk is only *a small* component of the person(s)' functions.
   ❑ One or more persons are responsible, and managing foreign exchange risk is *a major* component of the person(s)' functions.
   ❑ A formal department is responsible, where managing foreign exchange risk is *the major* function.
   ❑ Several departments are jointly responsible, especially for strategic decisions arising from movements in foreign exchange rates.
   ❑ Other (Please **specify**) .....

5. a. In your company, the major foreign exchange exposures arising from a *domestic* subsidiary are generally:

   ❑ Identified, monitored and dealt by the parent company.
   ❑ Identified by the subsidiary but monitored and dealt by the parent company.
   ❑ Identified and monitored by the subsidiary but dealt by the parent company.
   ❑ Identified and dealt by the subsidiary but monitored by the parent company.
   ❑ Identified, monitored and sometimes dealt by the subsidiary, and at other times, by the parent company.
   ❑ Identified, monitored and dealt by the subsidiary.
   ❑ Other (Please **specify**) .....

   b. In your company, the major foreign exchange exposures arising from an *overseas* subsidiary are generally:

   ❑ Identified, monitored and dealt by the parent company.
   ❑ Identified by the subsidiary but monitored and dealt by the parent company.
   ❑ Identified and monitored by the subsidiary but dealt by the parent company.
   ❑ Identified and dealt by the subsidiary but monitored by the parent company.
   ❑ Identified, monitored and sometimes dealt by the subsidiary, and at other times, by the parent company.
   ❑ Identified, monitored and dealt by the subsidiary.
   ❑ Other (Please **specify**) .....

Policies and Procedures in Foreign Exchange Risk Management

6. a. Which of the following future cash *inflows (sales)* will your company recognise as an exposure? **Please tick more than one if necessary.**

- ❑ Forecast sales in foreign currency (more than 12 months in advance).
- ❑ Forecast sales in foreign currency (less than 12 months in advance).
- ❑ A potential foreign buyer asks for a price quote in foreign currency, for a specified volume.
- ❑ A foreign buyer places an order which is priced in foreign currency.
- ❑ A foreign buyer is sent an invoice with price denominated in foreign currency.
- ❑ Other (Please **specify**) .....

b. Which of the following future cash *outflows (purchases)* will your company recognise as an exposure? **Please tick more than one if necessary.**

- ❑ Forecast purchases in foreign currency (more than 12 months in advance).
- ❑ Forecast purchases in foreign currency (less than 12 months in advance).
- ❑ A potential foreign supplier quotes a price in foreign currency, for a specified volume, upon request from the company.
- ❑ The company places an order, which is priced in foreign currency, from a foreign supplier.
- ❑ The company is sent an invoice with price denominated in foreign currency for purchases.
- ❑ Other (Please **specify**) .....

7. a. Does your company *generally* hedge or manage only exposures that are *significant*?

❑ Yes ❑ No (If no, please **skip** question 7 b and **go to** question 8)

b. Please state the volume of exposure considered as *significant* by your company. (Please state in thousands of Malaysian Ringgit)

[ ]

8. a. Does your company *generally* allow some time to elapse between the point when an exposure is identified and the point when it is managed or hedged?

❑ Yes ❑ No (If no, please **skip** question 8 b and **go to** question 9)

b. Please state the time elapsed, on average, between the identification of and the management or hedging of an exposure. (Please state in number of days)

[ ]

9. How often does your company use exchange rate (and interest rate) forecasts to make exposure management decisions?

❑ Always ❑ Often ❑ Seldom ❑ Never

10. Does your company *sometimes* hedge or manage a *proportion* of an exposure (as opposed to hedging the whole exposure)?

❑ Yes ❑ No

11. Does your company *sometimes write* currency options?

❑ Yes ❑ No

12. Does your company *sometimes* undertake foreign exchange transactions that are *not off-set* by underlying commercial or operational transactions?

❑ Yes ❑ No

Attn: Angappan Regupathi
Fax: 04-924 1832

Measurement of Foreign Exchange Risk

13. Please **rank** the three measures of exposure, according to their relative extent of use in your company. **(1 - most used; 3 - least used)**. Please **refer** to the enclosed **Glossary Sheet**, if necessary. **Please enter the rank in the boxes.**

Accounting exposure ❑
Transaction exposure ❑
Economic exposure ❑

Strategies and Techniques of Foreign Exchange Risk Management

14. a. Does your company manage *accounting* exposure?

❑ Yes ❑ No (If no, please **skip** question 14 b and go to question 15)

b. Please consider the total *accounting* exposure encountered by your company in 1996. Please **tick** the approximate percentage of this exposure that was managed using each of the following strategy or technique. Please **refer** to the enclosed **Glossary Sheet**, if necessary.

	Not Used	Percentage of total accounting exposure ≤ 20%	21-40%	41-60%	>60%
Back-to-back Loan	❑	❑	❑	❑	❑
Balance Sheet Hedge	❑	❑	❑	❑	❑
Currency Futures	❑	❑	❑	❑	❑
Currency Option	❑	❑	❑	❑	❑
Currency Swap	❑	❑	❑	❑	❑
Forward Contract	❑	❑	❑	❑	❑
Income Statement Hedge	❑	❑	❑	❑	❑
Leading and Lagging	❑	❑	❑	❑	❑
Do Nothing	❑	❑	❑	❑	❑
Other (Please **specify**)	❑	❑	❑	❑	❑

.....

15. a. Does your company manage *transaction* exposure?

❑ Yes ❑ No (If no, please **skip** questions 15 b and go to question 16)

b. Please consider the total *transaction* exposure encountered by your company in 1996. Please **tick** the approximate percentage of this exposure that was managed using each of the following strategy or technique. Please **refer** to the enclosed **Glossary Sheet**, if necessary.

	Not Used	Percentage of total transaction exposure ≤ 20%	21-40%	41-60%	>60%
Back-to-back Loan	❑	❑	❑	❑	❑
Currency Futures	❑	❑	❑	❑	❑
Currency Option	❑	❑	❑	❑	❑
Currency Swap	❑	❑	❑	❑	❑
Forward Contract	❑	❑	❑	❑	❑
Leading and Lagging	❑	❑	❑	❑	❑
Matching	❑	❑	❑	❑	❑
Money Market Hedge	❑	❑	❑	❑	❑
Netting	❑	❑	❑	❑	❑
Risk Sharing Agreement	❑	❑	❑	❑	❑
Do Nothing	❑	❑	❑	❑	❑
Other (Please **specify**)	❑	❑	❑	❑	❑

.....

16. a. Does your company manage *economic* exposure?

❑ Yes ❑ No (If no, please **skip** question 16 b and **go to** question 17)

b. Please consider the total *economic* exposure encountered by your company currently. Please **tick** the approximate percentage of this exposure that is managed using each of the following strategy or technique. Please **refer** to the enclosed **Glossary Sheet**, if necessary.

	Not Used	Percentage of total economic exposure ≤ 20%	21-40%	41-60%	>60%
Back-to-back Loan	❑	❑	❑	❑	❑
Currency Futures	❑	❑	❑	❑	❑
Currency Option	❑	❑	❑	❑	❑
Currency Swap	❑	❑	❑	❑	❑
Diversifying Financing	❑	❑	❑	❑	❑
Diversifying Operations	❑	❑	❑	❑	❑
Forward Contract	❑	❑	❑	❑	❑
Leading and Lagging	❑	❑	❑	❑	❑
Matching	❑	❑	❑	❑	❑
Risk Sharing Agreement	❑	❑	❑	❑	❑
Do Nothing	❑	❑	❑	❑	❑
Other (Please **specify**)	❑	❑	❑	❑	❑

.....

Foreign Exchange Volume and Level of Foreign Exchange Risk

17. Please consider your company's total transaction volume in 1996. Please **tick** the percentage of total transaction volume that is denominated in foreign currencies, for the following transactions. For example, for (a), percentage of sales (and other revenues) denominated in foreign currencies, over total volume of sales (and other revenues).

	≤ 20%	21-40%	41-60%	61-80%	>80%
(a) Sales (and other revenues)	❑	❑	❑	❑	❑
(b) Purchases (and other expenses)	❑	❑	❑	❑	❑
(c) Financing (long-term debt & equity)	❑	❑	❑	❑	❑
(d) Capital investments (fixed assets)	❑	❑	❑	❑	❑

18. Again, please consider your company's total transaction volume in 1996. Please **tick** the volume of *intra-company transactions* (transactions between subsidiaries or between subsidiary and parent company), in terms of percentage over the total volume of transactions.

≤ 20%	21-40%	41-60%	61-80%	>80%
❑	❑	❑	❑	❑

19. How stable are the percentages (in questions 17 and 18) over time? (**1 - very unstable; 5 - very stable**).

1	2	3	4	5
❑	❑	❑	❑	❑

20. How large is the overall volume of foreign exchange exposure in your company? (**1 - very small; 5 - very large**).

1	2	3	4	5
❑	❑	❑	❑	❑

21. How is the overall volume of foreign exchange exposure changing over time, in your company? (**1 - decreasing rapidly; 5 - increasing rapidly**).

1	2	3	4	5
❑	❑	❑	❑	❑

22. How predictable are the foreign exchange exposures encountered by your company? (**1 - very unpredictable; 5 - very predictable**).

1	2	3	4	5
❑	❑	❑	❑	❑

23. How uncertain (volatile) are the exchange rates associated with the foreign exchange exposures encountered by your company? (**1 - very certain; 5 - very uncertain**).

1	2	3	4	5
☐	☐	☐	☐	☐

24. How much foreign exchange risk does your company encounter on the whole? (**1 - very low; 5 - very high**).

1	2	3	4	5
☐	☐	☐	☐	☐

25. In how many currencies (including Malaysian Ringgit) does your company have transactions? (Please state the number).

☐

26. Please consider your company's total transaction volume in 1996. Please **state** 3 major currencies (other than Malaysian Ringgit) in which your company had transactions. Then, **tick** the approximate percentage contribution of each currency (including Malaysian Ringgit) to total volume of transactions.

	percentage contribution to overall volume				
	☐ 20%	21-40%	41-60%	61-80%	>80%
a. Malaysian Ringgit	☐	☐	☐	☐	☐
b.	☐	☐	☐	☐	☐
c.	☐	☐	☐	☐	☐
d.	☐	☐	☐	☐	☐

Foreign Exchange Risk Attitude

27. Suppose your company expects, in 180 days, a very large receipt (exposure) in a foreign currency. The table below indicates the likelihood (chance) of foreign exchange gains and losses that may arise from four different hedging policies. Please **rank** each of the policies in terms of your company's preference. (**1 - most preferred; 4 - least preferred**). **Please enter the rank in the boxes**. For example, Hedge B has a 5% (or 1 in 20) chance of yielding significant foreign exchange gains, a further 5% chance of producing significant foreign exchange losses, and a 90% chance of giving only insignificant foreign exchange losses or gains. Foreign exchange gains and losses are here considered significant when they are more than 10% of the exposure value.

	Significant foreign exchange gains (more than 10% of exposure)	Insignificant foreign exchange losses/gains	Significant foreign exchange losses (more than 10% of exposure)
☐ Hedge A	0%	100% (10 in 10)	0%
☐ Hedge B	5% (1 in 20)	90% (9 in 10)	5% (1 in 20)
☐ Hedge C	20% (1 in 5)	60% (3 in 5)	20% (1 in 5)
☐ Hedge D	40% (2 in 5)	20% (1 in 5)	40% (2 in 5)

Please kindly complete the following as well, to enable me to send you a summary of this research's findings.

Name: .....
Designation: ..... Department: .....
Telephone: ..... Telefax: .....
Company name and address: .....
.....

Kindly hold this completed questionnaire, to be collected in person by the student. However, if this is not convenient, you can send it to me by post or by fax. My contact particulars are given below. Thank you for your kind assistance.

Angappan Regupathi
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Glossary Sheet (for your retention)

There are mainly three measures of currency risk (also known as exposure)

- Accounting exposure
  Potential for change in the company's consolidated net worth and reported net income, due to changes in the exchange rates that are used to restate or consolidate foreign subsidiaries' foreign currency financial statements into the company 's reporting currency.

- Transaction exposure
  Potential for change in the value of outstanding (incurred but yet to be settled) financial obligations that are denominated in foreign currencies, due to changes in exchange rates.

- Economic exposure
  Potential for change in the value (or competitive position) of the company resulting from changes in the future operating cash flows due to unexpected changes in exchange rates.

There are several techniques or strategies used to manage these exposures. Some of the more popular are:

- Back-to-back Loan
  An agreement between two companies in separate countries, to each borrow the other's currency for a specific period of time and to repay at maturity.

- Balance Sheet Hedge
  Effort undertaken to match foreign currency assets (or liabilities) with liabilities (or assets) in the same currency.

- Currency Futures
  An exchange-traded standardized forward contract, i.e. for a fixed amount of foreign currency, at specified time and place of delivery.

- Currency Option
  An option (a right but not an obligation) to buy (call) or sell (put) foreign currencies at a specified rate, at or before a specified date.

- Currency Swap
  An agreement between two counterparties to exchange specific amounts of two different currencies at the outset and to repay (interest and possibly, principal) over time.

- Diversifying Financing
  Having financing facilities in many countries and then, making shifts in borrowing or obtaining of funds, from one country to another.

- Diversifying Operations
  Having operations in many countries and then, making shifts in sourcing, production runs, and/or marketing effort, from one country to another.

- Do Nothing
  The exposure is left unhedged or unmanaged.

- Forward Contract
  Selling or buying a foreign currency forward at a specified rate, i.e. for delivery or settlement at a date in the future.

- Income Statement Hedge
  Effort undertaken to match foreign currency revenues (or expenses) with expenses (or revenues) in the same currency.

- Leading and Lagging
  Adjusting the timing, i.e. delaying (lagging) or hastening (leading), of cash flows in foreign currencies.

- Matching
  Effort undertaken to match foreign currency cash inflows (or outflows) with outflows (or inflows) in the same currency.

- Money Market Hedge
  In the case of foreign currency receivables - use the foreign currency money market to borrow and then convert the funds at spot to home currency, allowing the expected receipts to pay off the borrowings. In the case of foreign currency payables - use the foreign currency money market to invest funds converted at spot from home currency, using the investment return to pay the payables.

- Netting
  Off-setting, the whole or a portion of, a cash outflow (or inflow) with an inflow (or outflow) occurring at the same time in the same foreign currency.

- Risk Sharing Agreement
  Contract between buyer and seller who agree to share currency gains and losses arising from the trade between them.

Appendix C-3: Questionnaire version 2 used in phase 3 of data collection

Attn: Angappan Regupathi
Fax: 04-700 5761

Foreign Exchange Risk Management by Malaysian Public-Listed Companies

Kindly tick ☑ the most appropriate responses. Please tick only one response per question, unless specified otherwise.

1. Does your company manage foreign exchange risk?

   ❑ Yes ❑ No (If no, please **skip** questions 2 to 20, and **go to** question 21 on page 4)

Objective of Foreign Exchange Risk Management

2. a. What type of objective (goal) does your company have in managing foreign exchange risk?

   ❑ It is undefined. (If it is undefined, please **skip** question 2 b and **go to** question 3)
   ❑ It is informal or implied.
   ❑ It is formal and written.

   b. Which of the following best describes the objective?

   ❑ To minimise foreign exchange risks.
   ❑ To minimise foreign exchange losses.
   ❑ To ensure that benefits are greater than costs in reducing foreign exchange risks.
   ❑ To ensure that foreign exchange gains off-set foreign exchange losses and costs.
   ❑ To ensure that foreign exchange gains are greater than foreign exchange losses and costs.
   ❑ To maximise foreign exchange gains.
   ❑ Other (Please **specify**) .....

Responsibility of Managing Foreign Exchange Risk

3. a. How many persons are responsible for managing foreign exchange risk, at the centre (or head office), in your company?

   ❑ None (If none, please **skip** question 3 b and **go to** question 4)
   ❑ One or more (Please **specify** the number of persons responsible) .....

   b. Which of the following best describes the responsibility of the person(s) managing foreign exchange risk?

   ❑ Managing foreign exchange risk is only *a small* component of the person(s)' functions.
   ❑ Managing foreign exchange risk is *a major* component of the person(s)' functions.
   ❑ Managing foreign exchange risk is *the major* component of the person(s)' functions.
   ❑ Other (Please **specify**) .....

4. In your company, are several departments (e.g. Treasury, Accounts, Purchasing, Operations etc.) jointly responsible for strategic decisions in managing foreign exchange risk?

   ❑ Yes ❑ No

Degree of Centralisation of Foreign Exchange Risk Management

5. a. How many *domestic* subsidiaries does your company have?

   ❑ None (If none, please **skip** questions 5 b & 6, and **go to** question 7)
   ❑ One or more (Please **specify** the number of domestic subsidiaries) .....

   b. Do the *domestic* subsidiaries have cash flows in foreign currencies (i.e. foreign currency exposures)?

   ❑ Yes ❑ No (If no, please **skip** question 6 and **go to** question 7)

6. The decision to hedge or manage foreign exchange exposures of a *domestic* subsidiary are made:

   ❑ generally by the parent company (or centre).
   ❑ generally together by the parent company (or centre) and the subsidiary.
   ❑ generally by the subsidiary, with the parent company's (or centre's) advice.
   ❑ generally by the subsidiary, with the parent company's (or centre's) knowledge.
   ❑ generally independently by the subsidiary.
   ❑ Other (Please **specify**) .....

7. a. How many *overseas* subsidiaries does your company have?

❑ None (If none, please **skip** questions 7 b & 8, and **go to** question 9)
❑ One or more (Please **specify** the number of overseas subsidiaries) .....

b. Do the *overseas* subsidiaries have cash flows in foreign currencies (i.e. in currencies other than their own local currencies)?

❑ Yes ❑ No (If no, please **skip** question 8 and **go to** question 9)

8. The decision to hedge or manage foreign exchange exposures of an *overseas* subsidiary are made:

❑ generally by the parent company (or centre).
❑ generally together by the parent company (or centre) and the subsidiary.
❑ generally by the subsidiary, with the parent company's (or centre's) advice.
❑ generally by the subsidiary, with the parent company's (or centre's) knowledge.
❑ generally independently by the subsidiary.
❑ Other (Please **specify**) .....

Procedures in Foreign Exchange Risk Management

9. a. Which of the following cash *inflows* will your company recognise as an exposure? **Please tick more than one as required.**

❑ A likely (less than 100% chance of occurrence) receipt in foreign currency, more than 12 months ahead.
❑ A certain (100% chance of occurrence) receipt in foreign currency, more than 12 months ahead.
❑ A likely (less than 100% chance of occurrence) receipt in foreign currency, less than 12 months ahead.
❑ A certain (100% chance of occurrence) receipt in foreign currency, less than 12 months ahead.

b. Which of the following cash *outflows* will your company recognise as an exposure? **Please tick more than one as required.**

❑ A likely (less than 100% chance of occurrence) payment in foreign currency, more than 12 months ahead.
❑ A certain (100% chance of occurrence) payment in foreign currency, more than 12 months ahead.
❑ A likely (less than 100% chance of occurrence) payment in foreign currency, less than 12 months ahead.
❑ A certain (100% chance of occurrence) payment in foreign currency, less than 12 months ahead.

10. a. Does your company *generally* hedge or manage only exposures that are *significant*?

❑ Yes ❑ No (If no, please **skip** question 10 b and **go to** question 11)

b. Please state the volume of exposure considered as *significant* by your company.

(Please state amount in Malaysian Ringgit) .....

11. a. Does your company *generally* allow some time to elapse between the point when an exposure is identified and the point when it is hedged or managed?

❑ Yes ❑ No (If no, please **skip** question 11 b and **go to** question 12)

b. Please state the time elapsed, on average, between the identification of and the hedging or management of an exposure.

(Please state in number of days) .....

12. Does your company use, *more often than not*, exchange rate and interest rate forecasts to make foreign exchange risk management decisions?

❑ Yes ❑ No

13. Does your company *generally* set internal foreign exchange rate targets to be met, in planning and budgeting?

❑ Yes ❑ No

14. Does your company *sometimes* hedge or manage a *proportion* of an exposure (as opposed to hedging the whole exposure)?

❑ Yes ❑ No

15. Does your company *sometimes write* currency options?

❑ Yes ❑ No

16. Does your company *sometimes* undertake foreign exchange transactions that are *not off-set* by underlying commercial or operational transactions?

❑ Yes ❑ No

Measures of Foreign Exchange Risk

17. Please **rank** the three measures of exposure, according to their relative extent of use in your company. **(1 - most used; 3 - least used)**. Please **refer** to the enclosed **Glossary Sheet**, if necessary. **Please enter the rank in the boxes**.

☐ Accounting exposure ☐ Economic exposure ☐ Transaction exposure

Strategies and Tools Used in Foreign Exchange Risk Management

18. a. Does your company manage *accounting* exposure?

❑ Yes ❑ No (If no, please **skip** question 18 b and **go to** question 19)

b. Please consider the total *accounting* exposure encountered by your company in 1997. Please **tick** the approximate percentage of this exposure that was managed using each of the following strategy or tool. Please **refer** to the enclosed **Glossary Sheet**, if necessary. (Please note that the responses should add up to 100%)

	Not Used	Percentage of total accounting exposure			
		☐ 10%	11-30%	31-60%	>60%
Balance Sheet Hedge	❑	❑	❑	❑	❑
Forward Contract	❑	❑	❑	❑	❑
Income Statement Hedge	❑	❑	❑	❑	❑
Do Nothing	❑	❑	❑	❑	❑
Other (Please **specify**)	❑	❑	❑	❑	❑

.....

19. a. Does your company manage *economic* exposure?

❑ Yes ❑ No (If no, please **skip** question 19 b and **go to** question 20)

b. Please consider the total *economic* exposure encountered by your company currently. Please **tick** the approximate percentage of this exposure that is managed using each of the following strategy or tool. Please **refer** to the enclosed **Glossary Sheet**, if necessary. (Please note that the responses should add up to 100%)

	Not Used	Percentage of total economic exposure			
		☐ 10%	11-30%	31-60%	>60%
Back-to-back Loan	❑	❑	❑	❑	❑
Currency Option	❑	❑	❑	❑	❑
Currency Swap	❑	❑	❑	❑	❑
Diversifying Financing	❑	❑	❑	❑	❑
Diversifying Operations	❑	❑	❑	❑	❑
Forward Contract	❑	❑	❑	❑	❑
Matching	❑	❑	❑	❑	❑
Do Nothing	❑	❑	❑	❑	❑
Other (Please **specify**)	❑	❑	❑	❑	❑

.....

20. a. Does your company manage *transaction* exposure?

❑ Yes ❑ No (If no, please **skip** questions 20 b and **go to** question 21 on page 4)

b. Please consider the total *transaction* exposure encountered by your company in 1997. Please **tick** the approximate percentage of this exposure that was managed using each of the following strategy or tool. Please **refer** to the enclosed **Glossary Sheet**, if necessary. (Please note that the responses should add up to 100%)

	Not Used	Percentage of total transaction exposure			
		≤ 10%	11-30%	31-60%	>60%
Currency Option	❑	❑	❑	❑	❑
Forward Contract	❑	❑	❑	❑	❑
Leading and Lagging	❑	❑	❑	❑	❑
Money Market Hedge	❑	❑	❑	❑	❑
Netting	❑	❑	❑	❑	❑
Risk Sharing Agreement	❑	❑	❑	❑	❑
Do Nothing	❑	❑	❑	❑	❑
Other (Please specify)	❑	❑	❑	❑	❑

.....

Foreign Exchange Volume and Risk

21. Please consider your company's total transaction volume in 1997. Please **tick** the percentage of total transaction volume that was denominated in foreign currencies, for the following transactions. (For example, for (a), tick the percentage of sales and other revenues denominated in foreign currencies, over total volume of sales and other revenues)

	None (0%)	≤ 25%	26-50%	51-75%	>75%
(a) Sales and other revenues	❑	❑	❑	❑	❑
(b) Purchases and other expenses	❑	❑	❑	❑	❑
(c) Financing (long-term debt & equity)	❑	❑	❑	❑	❑
(d) Capital investments (fixed assets)	❑	❑	❑	❑	❑

22. Again, please consider your company's total transaction volume in 1997. Please **state** 3 major currencies (other than Malaysian Ringgit) in which your company had transactions. Then, **tick** the approximate percentage contribution of each currency (including Malaysian Ringgit) to total volume of transactions in 1997. (Please note that the responses should add up to 100%)

	percentage contribution to overall volume				
	≤ 10%	11-25%	26-45%	46-70%	>70%
a. Malaysian Ringgit	❑	❑	❑	❑	❑
b.	❑	❑	❑	❑	❑
c.	❑	❑	❑	❑	❑
d.	❑	❑	❑	❑	❑

23. Once again, please consider your company's total transaction volume in 1997. Please **tick** the volume of *intra-company transactions* (transactions between subsidiaries or between subsidiary and parent company), in terms of percentage over the total volume of transactions.

≤ 20%	21-40%	41-60%	61-80%	>80%
❑	❑	❑	❑	❑

24. Please consider the percentages in questions 21, 22, and 23 for the year 1997, and compare them with those for 1996 and those which are expected for 1998. Are all the percentages *rather stable*, i.e., *not changing significantly* over the years? (Please note that movements beyond the ticked ranges above, from one year to another, should be construed as significant changes)

❑ Yes ❑ No

Perceived Level of Foreign Exchange Risk

25. How large is the overall *volume* of foreign exchange exposure in your company? (**1 - very small; 2 - small; 3 - neutral; 4 - large; 5 - very large**).

1	2	3	4	5
❑	❑	❑	❑	❑

26. How is the overall volume of foreign exchange exposure *changing* over time, in your company? (**1 - decreasing rapidly; 2 - decreasing; 3 - neutral; 4 - increasing; 5 - increasing rapidly**)

1	2	3	4	5
❑	❑	❑	❑	❑

27. How predictable are the foreign exchange *exposures* encountered by your company? (**1 - very unpredictable; 2 - unpredictable; 3 - neutral; 4 - predictable; 5 - very predictable**)

1	2	3	4	5
❑	❑	❑	❑	❑

28. a. How uncertain (volatile) are the *exchange rates* associated with the foreign exchange exposures encountered by your company? (**1 - very certain; 2 - certain; 3 - neutral; 4 - uncertain; 5 - very uncertain**)

1	2	3	4	5
❑	❑	❑	❑	❑

b. How would your company have rated the uncertainty (volatility) of the exchange rates, prior to the current currency crisis? (**1 - very certain; 2 - certain; 3 - neutral; 4 - uncertain; 5 - very uncertain**)

1	2	3	4	5
❑	❑	❑	❑	❑

29. a. How much foreign exchange *risk* does your company encounter on the whole? (**1 - very low; 2 - low; 3 - neutral; 4 - high; 5 - very high**)

1	2	3	4	5
❑	❑	❑	❑	❑

b. How would your company have rated the level of foreign exchange risk, prior to the current currency crisis? (**1 - very low; 2 - low; 3 - neutral; 4 - high; 5 - very high**)

1	2	3	4	5
❑	❑	❑	❑	❑

Foreign Exchange Risk Attitude

30. Suppose your company has four large transaction exposures in foreign currencies. Should the exposures be left unhedged, how comfortable would your company be against each exposure, given the scenario described below? (**1 - very uncomfortable; 2 - uncomfortable; 3 - neutral; 4 - comfortable; 5 - very comfortable**)

a. Exposure A: The possibility of a significant foreign exchange *gain* occurring is **low**, and the possibility of a significant foreign exchange *loss* occurring is **low**.

1	2	3	4	5
❑	❑	❑	❑	❑

b. Exposure B: The possibility of a significant foreign exchange *gain* occurring is **high**, and the possibility of a significant foreign exchange *loss* occurring is **low**.

1	2	3	4	5
❑	❑	❑	❑	❑

c. Exposure C: The possibility of a significant foreign exchange *gain* occurring is **high**, and the possibility of a significant foreign exchange *loss* occurring is **high**.

1	2	3	4	5
❑	❑	❑	❑	❑

d. Exposure D: The possibility of a significant foreign exchange *gain* occurring is **low**, and the possibility of a significant foreign exchange *loss* occurring is **high**.

1	2	3	4	5
❑	❑	❑	❑	❑

Thank you for your kind assistance. Please kindly complete the following as well. Please be assured that all responses would be anonymous. This sheet would be detached from the rest of the questionnaire and kept separately. The information below would only be used to send you a summary of this research's findings after its completion. This research is expected to be completed by the end of 1999.

Name: .....

Designation: ..... Department: .....

Telephone: ..... Telefax: ..... E-mail: .....

Company name and address: .....

.....

.....

Kindly fold this completed questionnaire, put it into the enclosed (postage-paid) self-addressed envelope, and post it to me before 28 February 1998. Alternatively, you could send this completed questionnaire by fax. My contact particulars are given below. Again, thanks very much for your help.

ANGAPPAN REGUPATHI

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Glossary Sheet *(for your retention)*

MEASURES OF FOREIGN EXCHANGE RISK

There are mainly three measures of foreign exchange risk (also known as exposure)

* Accounting exposure

  Potential for change in the company's consolidated net worth and reported net income, due to changes in the exchange rates that are used to restate or consolidate foreign subsidiaries' foreign currency financial statements into the company's reporting currency. This refers to accounting losses (and gains), on paper, when assets, liabilities, revenues, and expenses denominated in foreign currencies are translated at exchange rates that are different from the rates at the previous date of reporting.

* Economic exposure

  Potential for change in the value of the company resulting from changes in the future operating cash flows due to unexpected changes in exchange rates. This refers also to losses (and gains) resulting from shifts in a company's competitive position due to unexpected movements in exchange rates. This exposure exists even if the company has no cashflows denominated in foreign currencies as the company's suppliers, customers, or competitors are likely to be affected by the exchange rate movement.

* Transaction exposure

  Potential for change in the value of outstanding (incurred but yet to be settled) financial obligations that are denominated in foreign currencies, due to changes in exchange rates. This refers to real losses (and gains) incurred when contracts denominated in foreign currencies are settled at exchange rates that are different from the rates that prevailed when the contracts were entered into.

STRATEGIES & TOOLS FOR MANAGING FOREIGN EXCHANGE RISK

There are several strategies and tools used to manage these exposures. Some of the more popular are:

☆ Back-to-back Loan

  An agreement between two companies in separate countries, to each borrow the other's currency for a specific period of time and to repay at maturity.

☆ Balance Sheet Hedge

  Effort undertaken to match assets (or liabilities) in a foreign currency with liabilities (or assets) in the same currency.

☆ Currency Futures

  An exchange-traded standardized forward contract, i.e., for a fixed amount of foreign currency, at specified time and place of delivery.

☆ Currency Option

  An option (a right but not an obligation) to buy (call) or sell (put) foreign currencies at a specified rate, at or before a specified date.

☆ Currency Swap

  An agreement between two counterparties to exchange specific amounts of two different currencies at the outset and to repay (principal and possibly, interest) over time.

☆ Diversifying Financing

  Having financing facilities in many countries and then, making shifts in borrowing or obtaining of funds, from one country to another.

☆ Diversifying Operations

  Having operations in many countries and then, making shifts in sourcing, production runs, and/or marketing effort, from one country to another.

☆ Do Nothing

  The exposure is left unhedged or uncovered. With reference to transaction exposure, do-nothing also includes transacting at spot (converting foreign currency to Ringgit for immediate delivery) and/or maintaining the funds as foreign currency deposits.

☆ Forward Contract

Selling or buying a foreign currency forward at a specified rate, i.e. for delivery or settlement at a date in the future.

☆ Income Statement Hedge

Effort undertaken to match revenues (or expenses) in a foreign currency with expenses (or revenues) in the same currency.

☆ Leading and Lagging

Adjusting the timing, i.e. delaying (lagging) or hastening (leading), of cash flows in foreign currencies.

☆ Matching

Effort undertaken to match cash inflows (or outflows) in a foreign currency with outflows (or inflows) in the same currency.

☆ Money Market Hedge

In the case of foreign currency receivables - use the foreign currency money market to borrow and then convert the funds at spot to home currency, allowing the expected receipts to pay off the borrowings. In the case of foreign currency payables - use the foreign currency money market to invest funds converted at spot from home currency, using the investment return to pay the payables.

☆ Netting

Off-setting, the whole or a portion of, a cash outflow (or inflow) with an inflow (or outflow) occurring at the same time in the same foreign currency.

☆ Risk Sharing Agreement

Contract between buyer and seller who agree to share foreign exchange gains and losses arising from the trade between them.

Appendix D-1: Companies that participated in the first phase of primary data collection, and their attributes. (The company name is withheld to preserve the anonymity of the participating companies)

	Total Assets (RM, m)	**Location**	**Foreign ownership**	**Govt ownership**	**No. of overseas subsidiaries**	**Other remarks**
Construction						
Company number 127	7217	KL	8%	0%	1	
Company number 118	449	KL	15%	1%	4	
Consumer						
Company number 114	3193	S'gor	39%	27%	2	
Company number 17	48	Perak	0%	0%	4	
Company number 15	64	Penang	0%	23%	1	
Industrial						
Company number 2	6810	KL	18%	0%	68	partially owns & partially held by another listed company
Company number 123	223	Penang	n.a.	n.a.	1	
Mining						
Company number 91	462	KL	4%	10%	7	partially owns company number 106
Plantation						
Company number 66	2607	KL	6%	7%	11	
Property						
Company number 147	950	KL	13%	0%	3	
Company number 45	419	KL	25%	0%	2	
Trading & Service						
Company number 151	18021	KL	21%	0%	5	
Company number 81	12450	KL	23%	38%	0	partially held by another listed company
Company number 99	9704	KL	20%	0%	3	partially owns company number 83 & another listed company
Company number 153	190	Penang	9%	0%	1	
Company number 136	8997	KL	17%	3%	116	

Appendix D-2: List of companies that participated in this study

(This also indicates the companies' listing boards and sectors, as well as the data collection phases in which the companies participated. The company names are withheld to preserve their anonymity)

Rec.	Company number	Board	Sector	Phase
1	2	Main	Industrial	1
2	3	Main	Trading/Service	2
3	7	Main	Plantation	3
4	9	Main	Mining	3
5	12	Main	Trading/Service	2
6	13	Second	Construction	3
7	14	Second	Construction	2
8	15	Second	Consumer	1
9	16	Main	Industrial	3
10	17	Second	Consumer	1
11	18	Main	Industrial	3
12	21	Main	Property	3
13	22	Main	Property	3
14	27	Main	Property	3
15	29	Second	Trading/Service	3
16	30	Main	Construction	3
17	31	Main	Trading/Service	2
18	33	Main	Industrial	3
19	34	Main	Plantation	3
20	35	Main	Consumer	3
21	36	Main	Trading/Service	3
22	37	Second	Industrial	3
23	39	Main	Industrial	2
24	40	Second	Industrial	3
25	41	Second	Trading/Service	3
26	42	Main	Property	3
27	43	Main	Construction	2
28	45	Main	Property	1
29	47	Main	Trading/Service	3
30	48	Main	Property	3
31	49	Second	Industrial	3
32	50	Main	Trading/Service	3
33	51	Second	Consumer	3
34	52	Second	Trading/Service	3
35	56	Main	Consumer	3
36	58	Second	Trading/Service	3
37	59	Main	Consumer	3
38	61	Main	Industrial	3
39	62	Main	Trading/Service	3
40	63	Main	Plantation	2
41	64	Second	Industrial	3
42	65	Main	Trading/Service	3
43	66	Main	Plantation	1
44	68	Main	Hotel	3
45	70	Second	Industrial	3
46	71	Second	Industrial	3
47	73	Main	Property	3
48	74	Main	Industrial	3

Rec.	Company number	Board	Sector	Phase
49	76	Second	Industrial	3
50	78	Main	Consumer	3
51	79	Main	Trading/Service	2
52	80	Main	Mining	2
53	81	Main	Trading/Service	1
54	83	Main	Plantation	3
55	85	Main	Construction	3
56	91	Main	Mining	1
57	92	Main	Property	3
58	93	Second	Industrial	3
59	95	Main	Property	2
60	98	Main	Trading/Service	3
61	99	Main	Trading/Service	1
62	100	Main	Consumer	3
63	102	Main	Construction	3
64	104	Main	Trading/Service	3
65	105	Main	Consumer	2
66	106	Main	Industrial	2
67	109	Main	Consumer	2
68	110	Main	Trading/Service	3
69	111	Main	Property	3
70	114	Main	Consumer	1
71	117	Main	Construction	3
72	118	Main	Construction	1
73	122	Second	Construction	3
74	123	Second	Industrial	1
75	125	Main	Consumer	3
76	126	Second	Trading/Service	3
77	127	Main	Construction	1
78	128	Second	Industrial	2
79	129	Second	Consumer	2
80	130	Second	Trading/Service	2
81	131	Main	Industrial	3
82	132	Main	Property	3
83	133	Second	Trading/Service	3
84	136	Main	Trading/Service	1
85	140	Main	Industrial	2
86	141	Second	Construction	3
87	142	Main	Trading/Service	2
88	143	Main	Trading/Service	2
89	144	Main	Construction	3
90	146	Main	Property	3
91	147	Main	Property	1
92	148	Main	Consumer	2
93	149	Main	Trading/Service	3
94	150	Main	Trading/Service	3
95	151	Main	Trading/Service	1
96	153	Second	Trading/Service	1
97	155	Main	Plantation	3
98	156	Main	Plantation	3
99	157	Main	Consumer	3

Rec.	Company number	Board	Sector	Phase
100	158	Second	Industrial	3
101	161	Main	Consumer	3
102	163	Main	Construction	2
103	164	Main	Trading/Service	2
104	167	Main	Industrial	3
105	168	Main	Consumer	2
106	169	Main	Construction	3

Appendix E: Results of tests for non-response bias in the data

This appendix provides the output of tests conducted to assess the non-response bias in the data. The companies that participated in the study and those that did not have been compared across seven characteristics: ① total assets, ② total debt, ③number of overseas subsidiaries, ④ proportion of equity held by foreigners, ⑤ proportion of equity held by the government, ⑥ listing board, and ⑦ listing sector. Note: For the variable, SELECT, companies in the targeted sample that participated in the study were denoted as two ("yes"), while those that did not participate were denoted as one ("no").

t-tests for independent samples of SELECT Selected for analyses

Variable	Number of Cases	Mean	SD	SE of Mean
ASSETS_B Total assets (in RM billion)				
no	60	.7971	1.316	.170
yes	104	1.4112	2.679	.263

Mean Difference = -.6140
Levene's Test for Equality of Variances: F= 6.820 P= .010

Variances	t-value	df	2-Tail Sig	SE of Diff	95% CI for Diff
Equal	-1.66	162	.098	.370	(-1.344, .116)
Unequal	-1.96	158.69	.051	.313	(-1.232, .004)

Levene's test (significant at 1%) indicates that the variances in total assets between respondent companies and non-respondent companies are unequal (different), and the corresponding t-test (marginally significant at 5.1%) suggests that there is a difference in the mean of total assets between the two groups. In short, companies that participated in the study had greater total assets than those companies that did not participate.

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t-tests for independent samples of SELECT Selected for analyses

Variable	Number of Cases	Mean	SD	SE of Mean
DEBT_B Total debt (in RM billion)				
no	60	.4345	.948	.122
yes	104	.6460	1.427	.140

Mean Difference = -.2115
Levene's Test for Equality of Variances: F= 2.366 P= .126

Variances	t-value	df	2-Tail Sig	SE of Diff	95% CI for Diff
Equal	-1.02	162	.307	.206	(-.619, .196)
Unequal	-1.14	158.70	.257	.186	(-.579, .156)

The t-test (not significant) suggests that there is no difference in the mean of total debt between the two groups. This implies that the respondent companies had about the same amount of total debt as the non-respondent companies.

---

t-tests for independent samples of SELECT Selected for analyses

Variable	Number of Cases	Mean	SD	SE of Mean
OSUBNUM Number of overseas subsidiaries				
no	63	3.8889	4.088	.515
yes	106	6.1887	14.274	1.386

Mean Difference = -2.2998
Levene's Test for Equality of Variances: F= 5.535 P= .020

Variances	t-value	df	2-Tail Sig	SE of Diff	95% CI for Diff
Equal	-1.25	167	.214	1.844	(-5.940, 1.341)
Unequal	-1.56	131.74	.122	1.479	(-5.226, .626)

t-test for Equality of Means

The t-test (not significant) suggests that there is no difference in the mean number of overseas subsidiaries between the two groups. This implies that the respondent companies had about the same number of overseas subsidiaries as the non-respondent companies.

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t-tests for independent samples of SELECT Selected for analyses

Variable	Number of Cases	Mean	SD	SE of Mean
EQFOREIN Equity held by foreigners (in proportion				
no	60	.1285	.134	.017
yes	93	.1362	.130	.014

Mean Difference = -.0077
Levene's Test for Equality of Variances: F= .127 P= .722

Variances	t-value	df	2-Tail Sig	SE of Diff	95% CI for Diff
Equal	-.35	151	.725	.022	(-.051, .035)
Unequal	-.35	123.64	.726	.022	(-.051, .036)

t-test for Equality of Means

The t-test (not significant) suggests that there is no difference in the mean proportion of equity held by foreigners between the two groups. This implies that the respondent companies had about the same proportion of equity held by foreigners as the non-respondent companies.

---

t-tests for independent samples of SELECT Selected for analyses

Variable	Number of Cases	Mean	SD	SE of Mean
EQGOVT Proportion of equity held by government				
no	60	.0303	.068	.009
yes	93	.0684	.144	.015

Mean Difference = -.0381
Levene's Test for Equality of Variances: F= 10.691 P= .001

Variances	t-value	df	2-Tail Sig	SE of Diff	95% CI for Diff
Equal	-1.92	151	.057	.020	(-.077, .001)
Unequal	-2.20	140.85	.029	.017	(-.072, -.004)

t-test for Equality of Means

Levene's test (significant at 0.1%) indicates that the variances in the equity proportion held by the government between respondent companies and non-respondent companies are unequal. The corresponding t-test (significant at 2.9%) suggests that there is a difference in the mean proportion of equity held by the government between the two groups. This implies that the respondent companies had greater proportion of equity held by the government than the non-respondent companies.

Note: The cross-tabulation cells below contain two entries each; the top is the observed frequency (or count), while the bottom is the expected frequency on the basis of independence.

BOARD KLSE listing board by SELECT Selected for analyses

SELECT Page 1 of 1

BOARD	Count / Exp Val	no (1)	yes (2)	Row Total
main	1	49	79	128
		47.7	80.3	75.7%
second	2	14	27	41
		15.3	25.7	24.3%
Column Total		63	106	169
		37.3%	62.7%	100.0%

Chi-Square	Value	DF	Significance
Pearson	.22707	1	.63370
Continuity Correction	.08466	1	.77108
Likelihood Ratio	.22899	1	.63227
Mantel-Haenszel test for linear association	.22573	1	.63471

Minimum Expected Frequency - 15.284

Number of Missing Observations: 0

Pearson chi-square (not significant) indicates that the ratios of respondent to non-respondent companies are about the same in both the main board and the second board. This implies that neither the companies listed on the main board nor those listed on the second board were more represented in the study.

SECTOR KLSE listing sector by SELECT Selected for analyses

SELECT Page 1 of 1

SECTOR	Count / Exp Val	no (1)	yes (2)	Row Total
1 construction		4 / 6.7	14 / 11.3	18 / 10.7%
2 consumer		6 / 8.6	17 / 14.4	23 / 13.6%
3 hotel		0 / .4	1 / .6	1 / .6%
4 industrial		21 / 16.0	22 / 27.0	43 / 25.4%
5 mining		1 / 1.5	3 / 2.5	4 / 2.4%
6 plantation		3 / 3.7	7 / 6.3	10 / 5.9%
7 property		12 / 9.3	13 / 15.7	25 / 14.8%
8 trading/services		16 / 16.8	29 / 28.2	45 / 26.6%
	Column Total	63 / 37.3%	106 / 62.7%	169 / 100.0%

Chi-Square	Value	DF	Significance
Pearson	7.79933	7	.35062
Likelihood Ratio	8.25557	7	.31060
Mantel-Haenszel test for linear association	1.11490	1	.29102

Minimum Expected Frequency - .373
Cells with Expected Frequency < 5 - 5 OF 16 (31.3%)

Number of Missing Observations: 0

Pearson chi-square (not significant) indicates that the ratio of respondent to non-respondent companies is about the same in all the different listing sectors. This implies that none of the listing sectors was more represented in the study.

Appendix F-1: Descriptive statistics and frequency tables for predictor variables

ASSETS_B Total assets (in RM billion)

Mean	1.411	Std dev	2.679	Kurtosis	17.256
S E Kurt	.469	Skewness	3.808	S E Skew	.237
Minimum	.028	Maximum	18.021		

Percentile	Value	Percentile	Value	Percentile	Value
25.00	.173	50.00	.521	75.00	1.187

Valid cases 104 Missing cases 2

SALES_B Total sales (in RM billion)

Mean	.706	Std dev	1.330	Kurtosis	18.989
S E Kurt	.469	Skewness	3.862	S E Skew	.237
Minimum	.000	Maximum	9.394		

Percentile	Value	Percentile	Value	Percentile	Value
25.00	.075	50.00	.222	75.00	.694

Valid cases 104 Missing cases 2

MKTVAL_B Total market capitalisation (in RM billion)

Mean	5.261	Std dev	17.763	Kurtosis	44.354
S E Kurt	.474	Skewness	6.243	S E Skew	.239
Minimum	.039	Maximum	147.297		

Percentile	Value	Percentile	Value	Percentile	Value
25.00	.395	50.00	.787	75.00	2.143

Valid cases 102 Missing cases 4

TSUBNUM Number of Subsidiaries

Mean	26.425	Std dev	32.120	Kurtosis	15.929
S E Kurt	.465	Skewness	3.409	S E Skew	.235
Minimum	2.000	Maximum	226.000		

Percentile	Value	Percentile	Value	Percentile	Value
25.00	8.000	50.00	16.000	75.00	33.250

Valid cases 106 Missing cases 0

DEBT_B Total debt (in RM billion)

Mean	.646	Std dev	1.427	Kurtosis	17.524
S E Kurt	.469	Skewness	4.040	S E Skew	.237
Minimum	.001	Maximum	8.952		

Percentile	Value	Percentile	Value	Percentile	Value
25.00	.066	50.00	.227	75.00	.469

Valid cases 104 Missing cases 2

PERDEBT Debt ratio

Mean	.448	Std dev	.202	Kurtosis	-.660
S E Kurt	.469	Skewness	.013	S E Skew	.237
Minimum	.012	Maximum	.919		

Percentile	Value	Percentile	Value	Percentile	Value
25.00	.284	50.00	.458	75.00	.603

Valid cases 104 Missing cases 2

EQFOREIN Equity held by foreigners (in proportion)

Mean	.136	Std dev	.130	Kurtosis	.350
S E Kurt	.495	Skewness	1.054	S E Skew	.250
Minimum	.000	Maximum	.496		

Percentile	Value	Percentile	Value	Percentile	Value
25.00	.030	50.00	.086	75.00	.216

Valid cases 93 Missing cases 13

EQGOVT Equity held by the government (in proportion)

Mean	.068	Std dev	.144	Kurtosis	9.684
S E Kurt	.495	Skewness	3.034	S E Skew	.250
Minimum	.000	Maximum	.773		

Percentile	Value	Percentile	Value	Percentile	Value
25.00	.000	50.00	.007	75.00	.061

Valid cases 93 Missing cases 13

BOARD KLSE listing board

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Main	1	79	74.5	74.5	74.5
Second	2	27	25.5	25.5	100.0
	Total	106	100.0	100.0	

Valid cases 106 Missing cases 0

SECTOR KLSE listing sector

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Construction	1	14	13.2	13.2	13.2
Consumer	2	17	16.0	16.0	29.2
Hotel	3	1	.9	.9	30.2
Industrial	4	22	20.8	20.8	50.9
Mining	5	3	2.8	2.8	53.8
Plantation	6	7	6.6	6.6	60.4
Property	7	13	12.3	12.3	72.6
Trading/service	8	29	27.4	27.4	100.0
	Total	106	100.0	100.0	

Valid cases 106 Missing cases 0

OSUBNUM Number of overseas subsidiaries

Mean	6.189	Std dev	14.274	Kurtosis	36.434
S E Kurt	.465	Skewness	5.512	S E Skew	.235
Minimum	.000	Maximum	116.000		

Percentile	Value	Percentile	Value	Percentile	Value
25.00	1.000	50.00	2.000	75.00	5.000

Valid cases 106 Missing cases 0

PERSAL3 Sales & other revenues in foreign currencies

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
up to 25%	1	78	73.6	76.5	76.5
more than 25%	2	24	22.7	23.5	100.0
	.	4	3.8	Missing	
	Total	106	100.0	100.0	

Valid cases 102 Missing cases 4

PERPUR3 Purchases & other expenses in foreign currencies

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
up to 25%	1	67	63.2	64.4	64.4
more than 25%	2	37	34.9	35.6	100.0
	.	2	1.9	Missing	
	Total	106	100.0	100.0	

Valid cases 104 Missing cases 2

PERFIN3 Financing in foreign currencies

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
up to 25%	1	87	82.1	86.1	86.1
more than 25%	2	14	13.2	13.9	100.0
	.	5	4.7	Missing	
	Total	106	100.0	100.0	

Valid cases 101 Missing cases 5

PERCAP3 Capital Investment in foreign currencies

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
less than 25%	1	82	77.4	81.2	81.2
more than 75%	2	19	17.9	18.8	100.0
	.	5	4.7	Missing	
	Total	106	100.0	100.0	

Valid cases 101 Missing cases 5

FOREIGN3 Transactions in foreign currencies

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
up to 30%	1	53	50.0	51.0	51.0
more than 75%	2	51	48.1	49.0	100.0
	.	2	1.9	Missing	
	Total	106	100.0	100.0	

Valid cases 104 Missing cases 2

CURNUM Number of currencies

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
	2	5	12.8	13.2	13.2
	3	7	17.9	18.4	31.6
	4	6	15.4	15.8	47.4
	5	10	25.6	26.3	73.7
	6	6	15.4	15.8	89.5
	7	2	5.1	5.3	94.7
	25	1	2.6	2.6	97.4
	44	1	2.6	2.6	100.0
	.	1	2.6	Missing	
	Total	39	100.0	100.0	

Mean	5.895	Std dev	7.322	Kurtosis	21.553
S E Kurt	.750	Skewness	4.491	S E Skew	.383
Minimum	2.000	Maximum	44.000		

Percentile	Value	Percentile	Value	Percentile	Value
25.00	3.000	50.00	5.000	75.00	6.000

Valid cases 38 Missing cases 1

INTRACO2 Intra-company transactions

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
up to 20%	1	64	60.4	63.4	63.4
21% - 40%	2	25	23.6	24.8	88.1
more than 40%	3	12	11.3	11.9	100.0
	.	5	4.7	Missing	
	Total	106	100.0	100.0	

Valid cases 101 Missing cases 5

STABLE1 Perceived FX exposure pattern stability

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
no	1	17	16.0	16.8	16.8
yes	2	84	79.2	83.2	100.0
	.	5	4.7	Missing	
	Total	106	100.0	100.0	

Valid cases 101 Missing cases 5

VSIZE Perceived FX exposure volume size

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
very small	1	32	30.2	30.5	30.5
small	2	24	22.6	22.9	53.3
moderate	3	20	18.9	19.0	72.4
large	4	20	18.9	19.0	91.4
very large	5	9	8.5	8.6	100.0
	.	1	.9	Missing	
	Total	106	100.0	100.0	

Valid cases 105 Missing cases 1

VCHANGE Perceived FX exposure increment in future

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
decreasing rapidly	1	2	1.9	1.9	1.9
decreasing	2	12	11.3	11.5	13.5
neutral	3	56	52.8	53.8	67.3
increasing	4	31	29.2	29.8	97.1
increasing rapidly	5	3	2.8	2.9	100.0
	.	2	1.9	Missing	
	Total	106	100.0	100.0	

Valid cases 104 Missing cases 2

XPREDIC Perceived FX exposure unpredictability

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
very predictable	1	4	3.8	3.9	3.9
predictable	2	27	25.5	26.2	30.1
moderate	3	37	34.9	35.9	66.0
unpredictable	4	25	23.6	24.3	90.3
very unpredictable	5	10	9.4	9.7	100.0
	.	3	2.8	Missing	
	Total	106	100.0	100.0	

Valid cases 103 Missing cases 3

VOLAT Perceived exchange rate uncertainty

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
certain	2	4	3.8	3.8	3.8
moderate	3	30	28.3	28.8	32.7
uncertain	4	46	43.4	44.2	76.9
very uncertain	5	24	22.6	23.1	100.0
	.	2	1.9	Missing	
	Total	106	100.0	100.0	

Valid cases 104 Missing cases 2

RISK Perceived level of FX risk

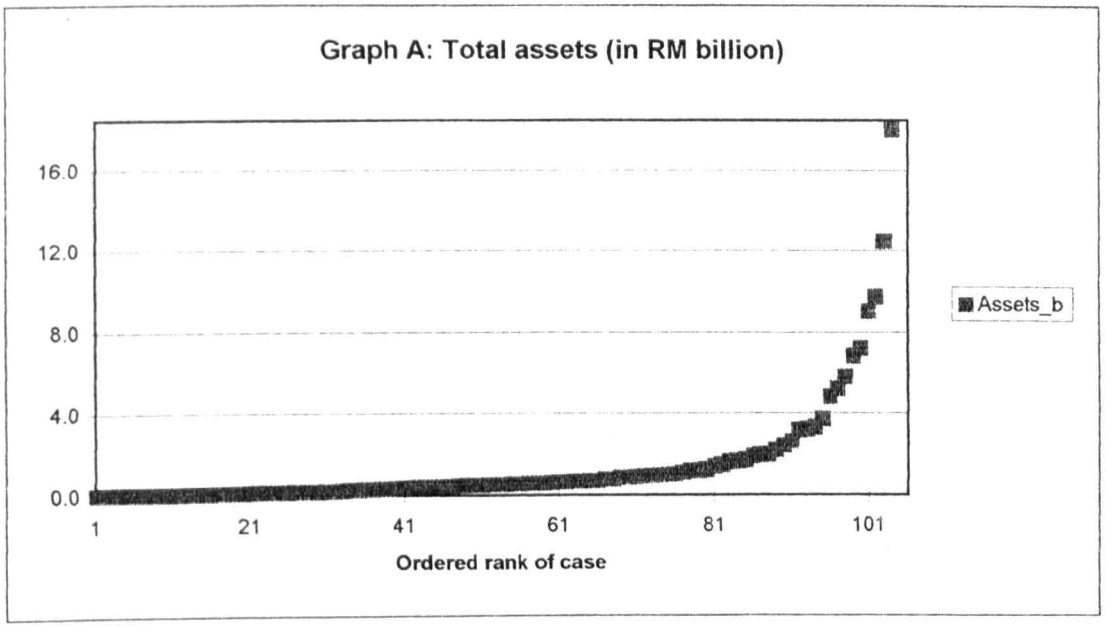
Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
very low	1	21	19.8	20.2	20.2
low	2	29	27.4	27.9	48.1
moderate	3	21	19.8	20.2	68.3
high	4	25	23.6	24.0	92.3
very high	5	8	7.5	7.7	100.0
	.	2	1.9	Missing	
	Total	106	100.0	100.0	

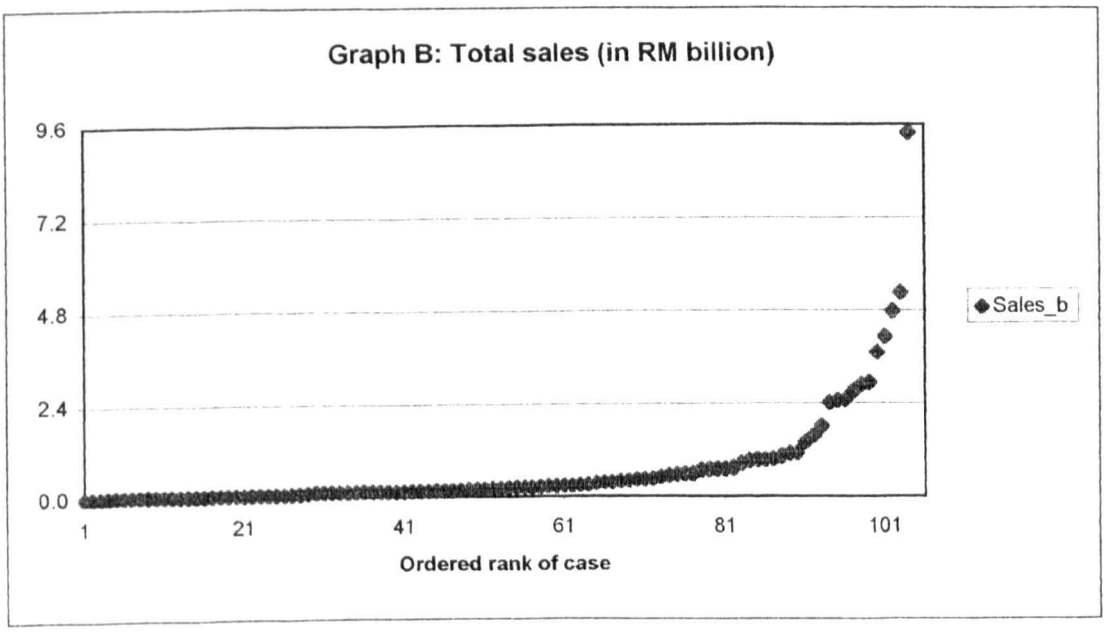
Valid cases 104 Missing cases 2

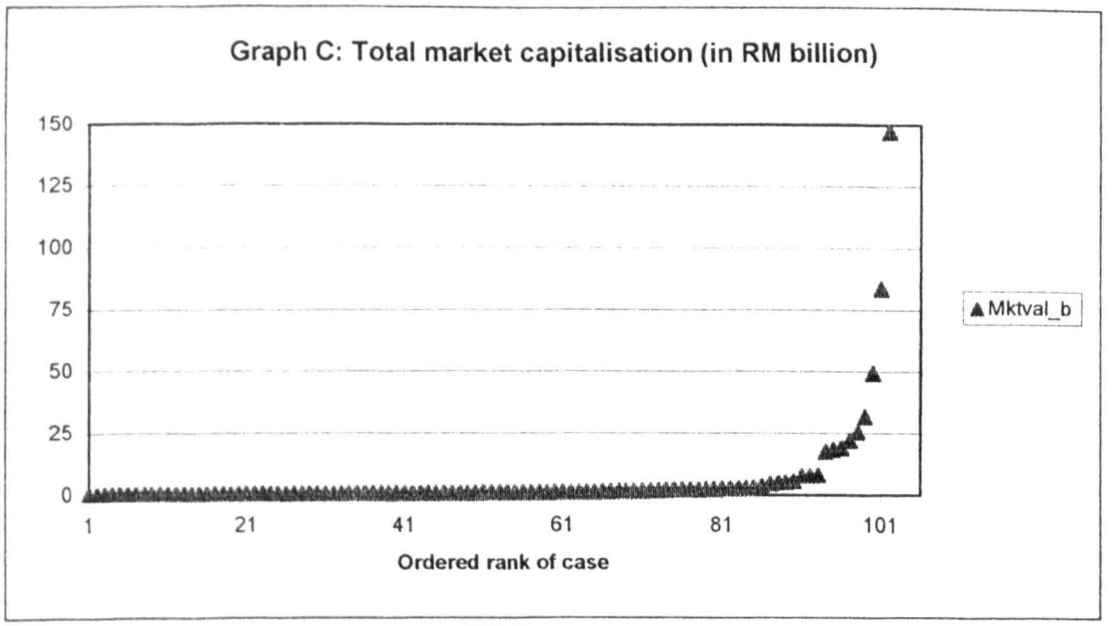
Appendix F-2: Distribution of values for selected predictor variables

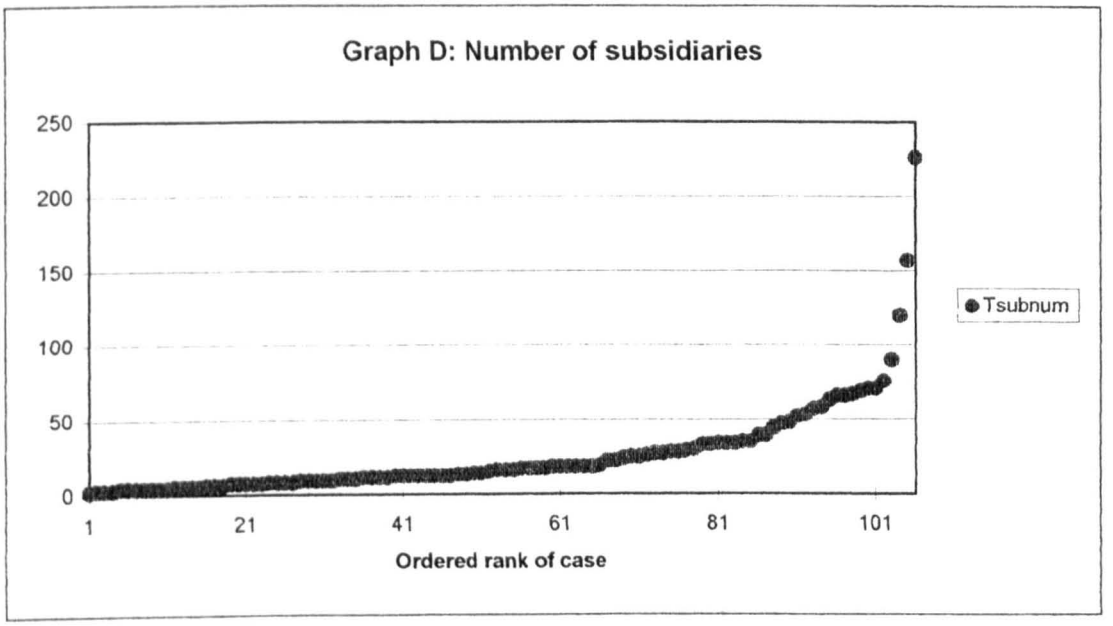
Note: The cases, in each predictor variable, have been ordered in ascending value, and they ranked from one (smallest value) to the highest rank (highest value). These ordered ranks have been plotted against the actual values of the cases.

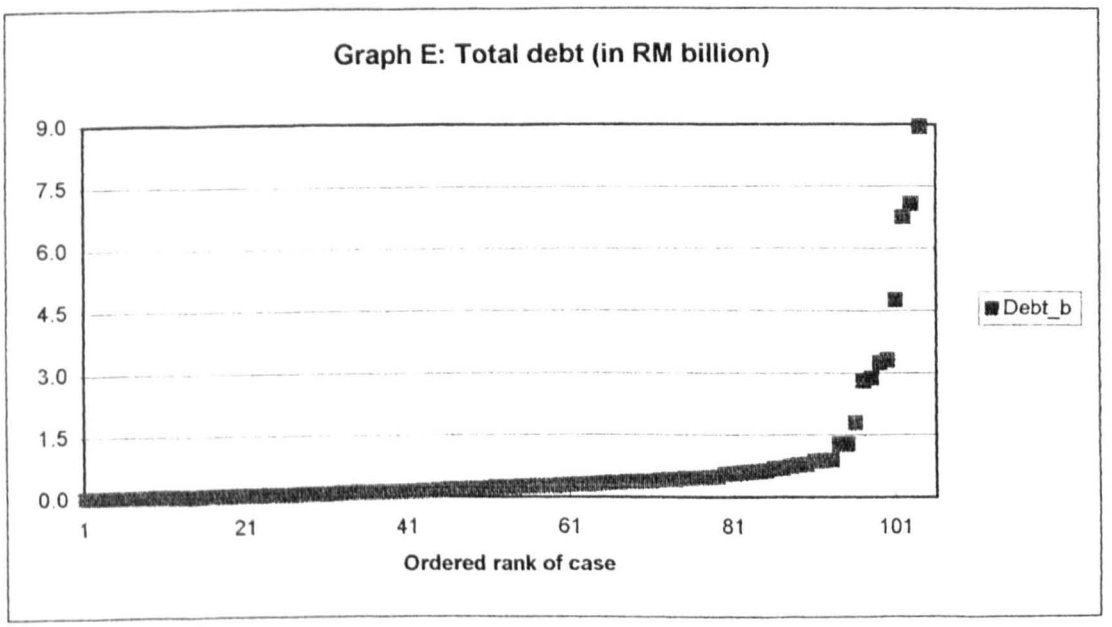
The increasing gradient of a plotted graph indicates a positively skewed data distribution.

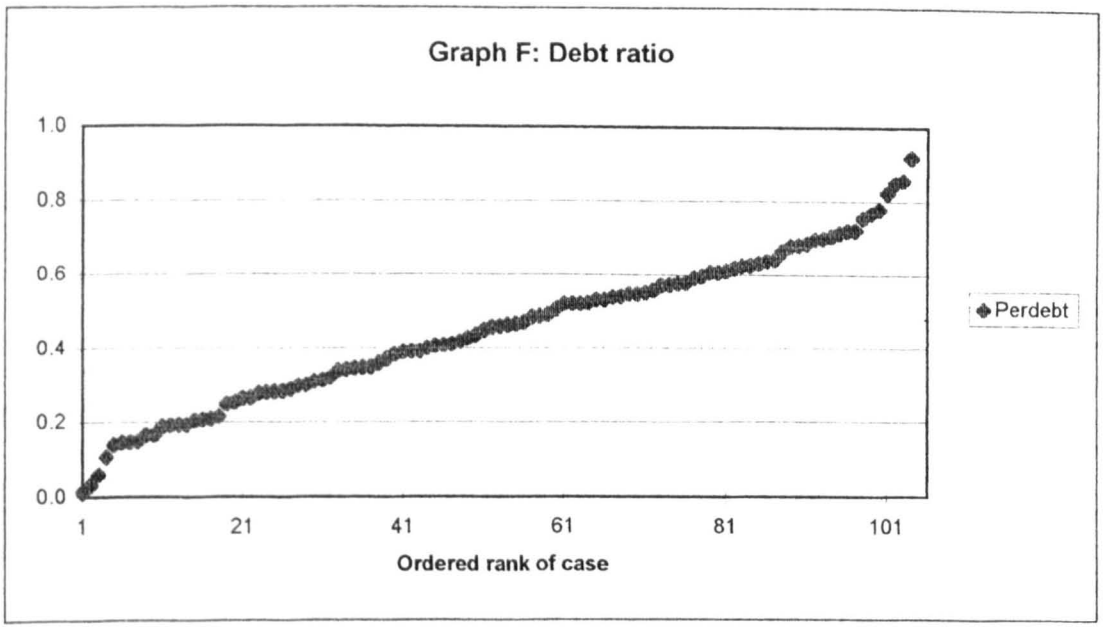


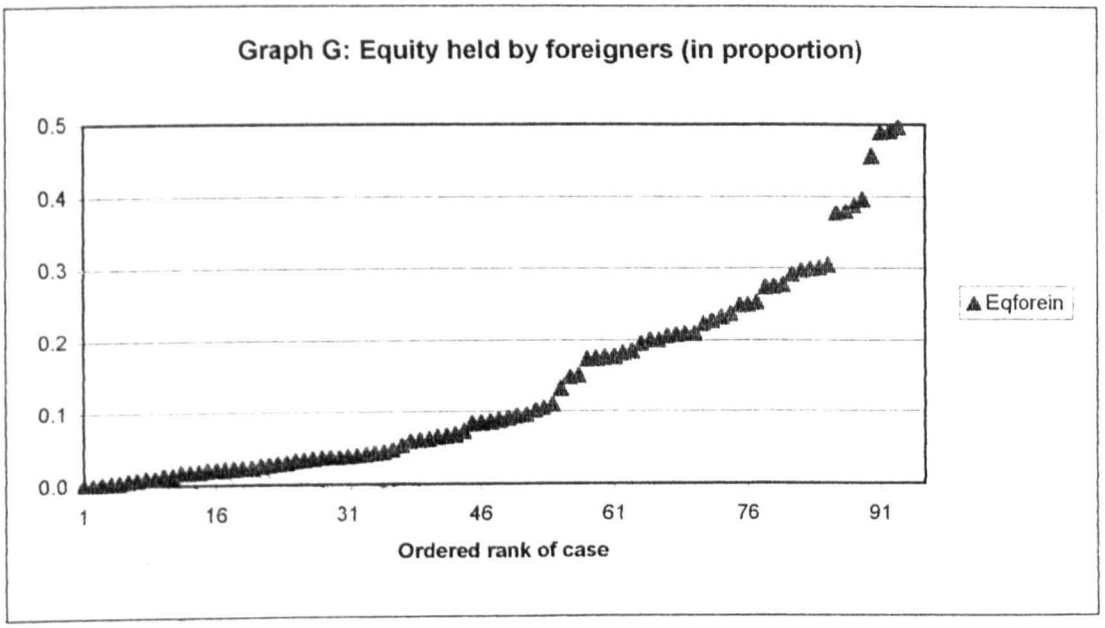



Graph C: Total market capitalisation (in RM billion)
150
125
100
75
50
25
0
1
21
41
61
81
101
Ordered rank of case
Mktval_b

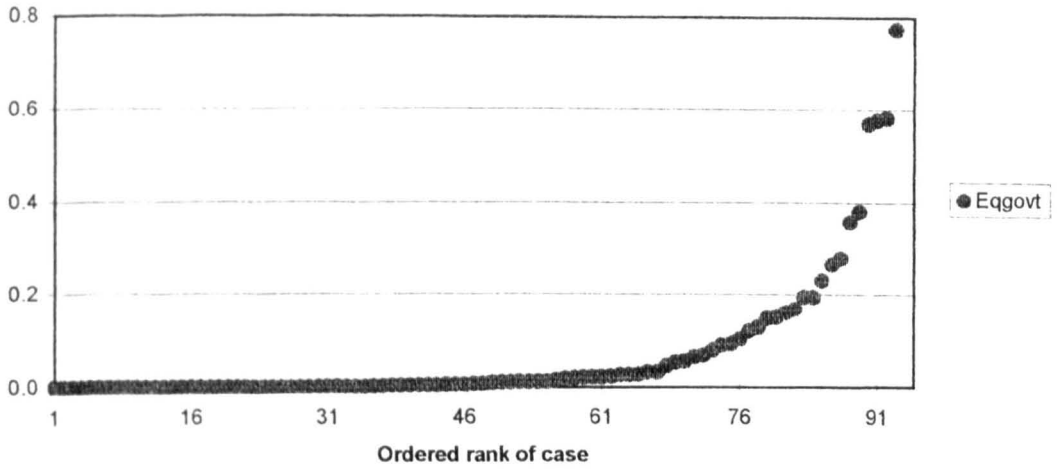

Graph D: Number of subsidiaries
250
200
150
100
50
0
1
21
41
61
81
101
Ordered rank of case
Tsubnum


Graph E: Total debt (in RM billion)
9.0
7.5
6.0
4.5
3.0
1.5
0.0
1
21
41
61
81
101
Ordered rank of case
Debt_b

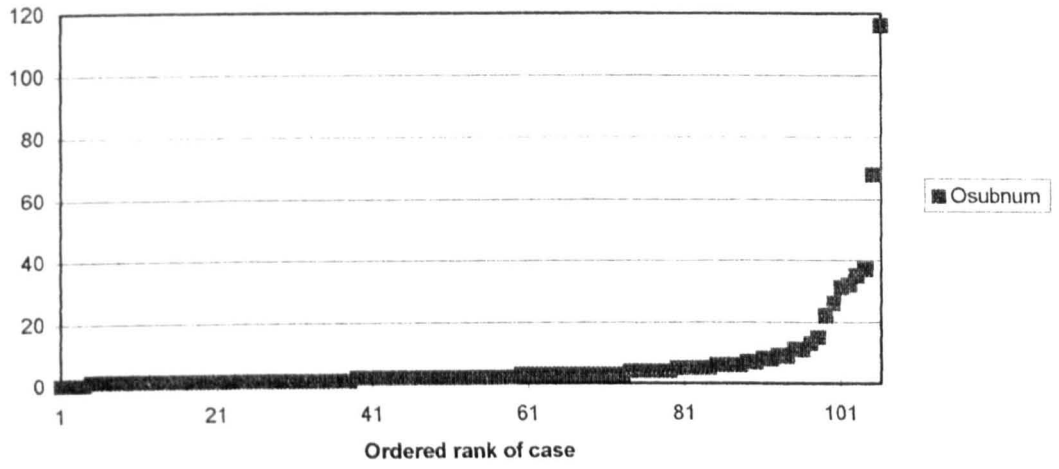

Graph F: Debt ratio
1.0
0.8
0.6
0.4
0.2
0.0
1
21
41
61
81
101
Ordered rank of case
Perdebt


Graph G: Equity held by foreigners (in proportion)
0.5
0.4
0.3
0.2
0.1
0.0
1
16
31
46
61
76
91
Ordered rank of case
Eqforein

Graph H: Equity held by the government (in proportion)



Graph I: Number of overseas subsidiaries



Appendix G: Descriptive statistics and frequency tables for research variables

MANAGE Manage FX risk

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
no	1	39	36.8	36.8	36.8
yes	2	67	63.2	63.2	100.0
	Total	106	100.0	100.0	

Valid cases 106 Missing cases 0

ACCTEXP Manage accounting exposure

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
no	1	36	53.7	53.7	53.7
yes	2	31	46.3	46.3	100.0
	Total	67	100.0	100.0	

Valid cases 67 Missing cases 0

ECONEXP Manage economic exposure

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
no	1	37	55.2	55.2	55.2
yes	2	30	44.8	44.8	100.0
	Total	67	100.0	100.0	

Valid cases 67 Missing cases 0

TRANEXP Manage transaction exposure

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
no	1	6	9.0	9.0	9.0
yes	2	61	91.0	91.0	100.0
	Total	67	100.0	100.0	

Valid cases 67 Missing cases 0

ACCTRAN1 Relative use of accounting exposure

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
most used	1	12	17.9	38.7	38.7
used	2	14	20.9	45.2	83.9
least used	3	5	7.5	16.1	100.0
	.	36	53.7	Missing	
	Total	67	100.0	100.0	

Valid cases 31 Missing cases 36

ECONRAN1 Relative use of economic exposure

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
most used	1	6	9.0	20.0	20.0
used	2	14	20.9	46.7	66.7
least used	3	10	14.9	33.3	100.0
	.	37	55.2	Missing	
	Total	67	100.0	100.0	

Valid cases 30 Missing cases 37

TRANRAN1 Relative use of transaction exposure

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
most used	1	49	73.1	80.3	80.3
used	2	11	16.4	18.0	98.4
least used	3	1	1.5	1.6	100.0
	.	6	9.0	Missing	
	Total	67	100.0	100.0	

Valid cases 61 Missing cases 6

OBJTYPE FERM objective formalisation

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
undefined	1	4	6.0	6.0	6.0
implied or informal	2	48	71.6	71.6	77.6
written and formal	3	15	22.4	22.4	100.0
	Total	67	100.0	100.0	

Valid cases 67 Missing cases 0

OBJECT FERM objective content

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
minimise FX risk	1	41	61.2	65.1	65.1
minimise FX loss	2	14	20.9	22.2	87.3
reduce FX risk, bene	3	4	6.0	6.3	93.7
maximise FX gain	6	4	6.0	6.3	100.0
	.	4	6.0	Missing	
	Total	67	100.0	100.0	

Valid cases 63 Missing cases 4

OSUBCEN2 Responsibility for overseas subsidiary exposures

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
parent	1	17	25.4	37.8	37.8
parent & subsidiary	2	17	25.4	37.8	75.6
subsidiary	3	11	16.4	24.4	100.0
	.	22	32.8	Missing	
	Total	67	100.0	100.0	

Valid cases 45 Missing cases 22

EXINLIKE Recognise likely inflow exposures

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
no	1	24	35.8	66.7	66.7
yes	2	12	17.9	33.3	100.0
	.	31	46.3	Missing	
	Total	67	100.0	100.0	

Valid cases 36 Missing cases 31

EXINLONG Recognise long-term inflow exposures

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
no	1	18	26.9	50.0	50.0
yes	2	18	26.9	50.0	100.0
	.	31	46.3	Missing	
	Total	67	100.0	100.0	

Valid cases 36 Missing cases 31

EXOTLIKE Recognise likely outflow exposures

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
no	1	25	37.3	69.4	69.4
yes	2	11	16.4	30.6	100.0
	.	31	46.3	Missing	
	Total	67	100.0	100.0	

Valid cases 36 Missing cases 31

EXOTLONG Recognise long-term outflow exposures

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
no	1	21	31.3	58.3	58.3
yes	2	15	22.4	41.7	100.0
	.	31	46.3	Missing	
	Total	67	100.0	100.0	

Valid cases 36 Missing cases 31

EXINFLOW Recognised inflow exposure

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
f/cast sales > 12 mo	1	4	6.0	17.4	17.4
f/cast sales < 12 mo	2	6	9.0	26.1	43.5
buyer asks quote	3	1	1.5	4.3	47.8
buyer places order	4	8	11.9	34.8	82.6
buyer sent invoice	5	4	6.0	17.4	100.0
	.	44	65.7	Missing	
	Total	67	100.0	100.0	

Valid cases 23 Missing cases 44

EXOTFLOW Recognised outflow exposure

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
f/cast purch > 12 mo	1	3	4.5	10.3	10.3
f/cast purch < 12 mo	2	8	11.9	27.6	37.9
company asks quote	3	4	6.0	13.8	51.7
company places order	4	12	17.9	41.4	93.1
company sent invoice	5	2	3.0	6.9	100.0
	.	38	56.7	Missing	
	Total	67	100.0	100.0	

Valid cases 29 Missing cases 38

SIGNIFIC Manage only significant exposures

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
no	1	19	28.4	28.4	28.4
yes	2	48	71.6	71.6	100.0
	Total	67	100.0	100.0	

Valid cases 67 Missing cases 0

SIGVOLUM Threshold for significant exposure

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
	10000	1	1.5	2.5	2.5
	20000	2	3.0	5.0	7.5
	50000	7	10.4	17.5	25.0
	100000	5	7.5	12.5	37.5
	200000	3	4.5	7.5	45.0
	500000	4	6.0	10.0	55.0
	1000000	8	11.9	20.0	75.0
	2000000	2	3.0	5.0	80.0
	3500000	1	1.5	2.5	82.5
	5000000	3	4.5	7.5	90.0
	10000000	1	1.5	2.5	92.5
	20000000	2	3.0	5.0	97.5
	80000000	1	1.5	2.5	100.0
	.	27	40.3	Missing	
	Total	67	100.0	100.0	

Mean	4100000.00	Mode	1000000.00	Std dev	13138354.9
Kurtosis	30.202	S E Kurt	.733	Skewness	5.283
S E Skew	.374	Minimum	10000.000	Maximum	80000000.0

Percentile	Value	Percentile	Value	Percentile	Value
25.00	62500.000	50.00	500000.000	75.00	1750000.000

Valid cases 40 Missing cases 27

LAPSE Allow time flexibility for hedging

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
no	1	31	46.3	47.7	47.7
yes	2	34	50.7	52.3	100.0
	.	2	3.0	Missing	
	Total	67	100.0	100.0	

Valid cases 65 Missing cases 2

LAPSTIME Time allowed for hedging

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
	2	1	1.5	3.7	3.7
	4	1	1.5	3.7	7.4
	5	3	4.5	11.1	18.5
	7	5	7.5	18.5	37.0
	10	1	1.5	3.7	40.7
	14	4	6.0	14.8	55.6
	15	1	1.5	3.7	59.3
	21	1	1.5	3.7	63.0
	30	6	9.0	22.2	85.2
	60	1	1.5	3.7	88.9
	90	2	3.0	7.4	96.3
	180	1	1.5	3.7	100.0
	.	40	59.7	Missing	
	Total	67	100.0	100.0	

Mean	28.074	Mode	30.000	Std dev	38.335
Kurtosis	9.323	S E Kurt	.872	Skewness	2.860
S E Skew	.448	Minimum	2.000	Maximum	180.000

Percentile	Value	Percentile	Value	Percentile	Value
25.00	7.000	50.00	14.000	75.00	30.000

Valid cases 27 Missing cases 40

PROPORT Undertake partial cover

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
no	1	17	25.4	25.4	25.4
yes	2	50	74.6	74.6	100.0
	Total	67	100.0	100.0	

Valid cases 67 Missing cases 0

OPTIONS Write currency options

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
no	1	60	89.6	90.9	90.9
yes	2	6	9.0	9.1	100.0
	.	1	1.5	Missing	
	Total	67	100.0	100.0	

Valid cases 66 Missing cases 1

UNOFFSET Undertake uncovered FX deals

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
no	1	57	85.1	85.1	85.1
yes	2	10	14.9	14.9	100.0
	Total	67	100.0	100.0	

Valid cases 67 Missing cases 0

EXRATE1 Use forecast rates

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
no	1	17	25.4	25.8	25.8
yes	2	49	73.1	74.2	100.0
	.	1	1.5	Missing	
	Total	67	100.0	100.0	

Valid cases 66 Missing cases 1

INRATE Use internal FX rates

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
no	1	8	11.9	22.2	22.2
yes	2	28	41.8	77.8	100.0
	.	31	46.3	Missing	
	Total	67	100.0	100.0	

Valid cases 36 Missing cases 31

Appendix H-1: Result for the test of difference in the companies' use of different FX exposure types

RANK1 Usage ranking by EXPOSURE FX exposure type

RANK1	Count	EXPOSURE Accounting 1	Economic 2	Transaction 3	Row Total
most used	1	12	6	49	67
					54.9
used	2	14	14	11	39
					32.0
least used	3	5	10	1	16
					13.1
	Column Total	31	30	61	122
		25.4	24.6	50.0	100.0

The data from three research variables, ACCTRAN1, ECONRAN1, and TRANRAN1, have been summarised in the cross-tabulation table above. Note that the figures in the columns correspond with the figures from the respective variables' frequency tables in Appendix G. Note, however, that the total of 122 represents the number of FX exposure types managed by the companies in the study, rather than the number of companies that participated in the study. The above aggregated level (rather than individual level) data are used to perform the Kruskal-Wallis one-way ANOVA shown below.

- - - - - Kruskal-Wallis 1-Way Anova

RANK1 Usage ranking
by EXPOSURE FX exposure type

Mean Rank	Cases		
70.92	31	EXPOSURE = 1	Accounting
85.57	30	EXPOSURE = 2	Economic
44.88	61	EXPOSURE = 3	Transaction
	122	Total	

Chi-Square	D.F.	Significance	Corrected for ties Chi-Square	D.F.	Significance
29.5740	2	.0000	36.9907	2	.0000

The test statistic, chi-square (corrected for ties), is significant. This indicates that not all three FX exposure types were used to the same extent by the companies in the study. Basically, this means that some FX exposure types were more used than others. The mean ranks of the FX exposure types (above) indicate that transaction exposure is the most used, followed by accounting exposure, and finally, economic exposure.

Appendix H-2: Result for the test of difference in the companies' decentralisation of domestic and overseas subsidiaries' FERM

DSUBCEN2 Responsibility for domestic subsidiary exposures
by OSUBCEN2 Responsibility for overseas subsidiary exposures

	OSUBCEN2			Page 1 of 1
Count	parent	parent & subsidiary		Row
DSUBCEN2	1	2	3	Total
1 parent	11	3	6	20 / 46.5
2 parent & subsidi	3	13		16 / 37.2
3 subsidiary	1	1	5	7 / 16.3
Column Total	15 / 34.9	17 / 39.5	11 / 25.6	43 / 100.0

The data from two research variables, DSUBCEN2 and OSUBCEN2, have been used, as summarised in the cross-tabulation table above. Note, however, that the column and row totals do not correspond with the figures from the variables' frequency tables in Appendix G. This is due to the list-wise exclusion of cases with missing values. The above data are used to perform the Wilcoxon matched-pairs signed-ranks test, shown below.

- - - - - Wilcoxon Matched-Pairs Signed-Ranks Test

DSUBCEN2 Responsibility for domestic subsidiary exposures
with OSUBCEN2 Responsibility for overseas subsidiary exposures

Mean Rank	Cases	
5.40	5	- Ranks (OSUBCEN2 LT DSUBCEN2)
8.67	9	+ Ranks (OSUBCEN2 GT DSUBCEN2)
	29	Ties (OSUBCEN2 EQ DSUBCEN2)
	43	Total

Z = -1.6008 2-Tailed P = .1094

The test statistic is not significant. This indicates that there is no statistically significant difference in the companies' centralisation of overseas and domestic subsidiaries' FERM. The ranks above imply that overseas subsidiaries were slightly more autonomous in managing their own FX exposures, compared to domestic subsidiaries of the same company – but this is not significant.

Appendix H-3: Result for the test of difference in the companies' recognition of inflow and outflow FX exposures that are uncertain

```
EXINLIKE  Recognise likely inflow exposures
by  EXOTLIKE  Recognise likely outflow exposures
```

Count / Exp Val	EXOTLIKE no (1)	EXOTLIKE yes (2)	Row Total
EXINLIKE 1 no	21	3	24 66.7%
2 yes	4	8	12 33.3%
Column Total	25 69.4%	11 30.6%	36 100.0%

Page 1 of 1

The data from two research variables, EXINLIKE and EXOTLIKE, have been used, as summarised in the cross-tabulation table above. Note that the column and row totals correspond with the figures from the variables' frequency tables in Appendix G. The above data are used to perform the Wilcoxon matched-pairs signed-ranks test, shown below.

```
- - - - - Wilcoxon Matched-Pairs Signed-Ranks Test

     EXINLIKE  Recognise likely inflow exposures
with EXOTLIKE  Recognise likely outflow exposures

     Mean Rank     Cases
          4.00         4   - Ranks (EXOTLIKE LT EXINLIKE)
          4.00         3   + Ranks (EXOTLIKE GT EXINLIKE)
                      29     Ties  (EXOTLIKE EQ EXINLIKE)
                      --
                      36     Total

         Z =    -.3381            2-Tailed P =   .7353
```

The test statistic is not significant. This indicates that there is no statistically significant difference in the companies' recognition of inflow exposures compared to outflow exposures, in terms of recognising uncertain exposures. The ranks imply that companies were slightly more stringent (or conservative) in recognising outflow (rather than inflow) exposures – but this is not significant.

Appendix H-4: Result for the test of difference in the companies' recognition of inflow and outflow FX exposures that are long-term

```
EXINLONG  Recognise long-term inflow exposures
by  EXOTLONG  Recognise long-term outflow exposures

                    EXOTLONG      Page 1 of 1
           Count    |
          Exp Val   |no         yes
                    |                      Row
                    |        1|         2| Total
EXINLONG    --------+---------+----------+
                 1  |     16  |      2   |     18
  no                |         |          |  50.0%
                    +---------+----------+
                 2  |      5  |     13   |     18
  yes               |         |          |  50.0%
                    +---------+----------+
             Column       21         15         36
              Total    58.3%      41.7%     100.0%
```

The data from the two research variables, EXINLONG and EXOTLONG, have been used, as summarised in the cross-tabulation table above. Note that the column and row totals correspond with the figures from the variables' frequency tables in Appendix G. The above data are used to perform the Wilcoxon matched-pairs signed-ranks test, shown below.

```
- - - - - Wilcoxon Matched-Pairs Signed-Ranks Test

     EXINLONG  Recognise long-term inflow exposures
with EXOTLONG  Recognise long-term outflow exposures

     Mean Rank     Cases
          4.00         5   - Ranks  (EXOTLONG LT EXINLONG)
          4.00         2   + Ranks  (EXOTLONG GT EXINLONG)
                      29     Ties   (EXOTLONG EQ EXINLONG)
                      --
                      36     Total

         Z =   -1.0142              2-Tailed P =   .3105
```

The test statistic is, again, not significant. This too indicates that there is no statistically significant difference in the companies' recognition of inflow exposures compared to outflow exposures, in terms of recognising long-term exposures. The ranks imply that companies were slightly more stringent (or conservative) in recognising outflow (rather than inflow) exposures – but this is not significant.

Appendix H-5: Result for the test of difference in the companies' use of various techniques for managing accounting exposure

	N	Mean	Std Dev	Minimum	Maximum
ABTBAC2	31	1.129	.428	1	3
ABSHED2	31	1.581	.620	1	3
ACSWAP2	31	1.065	.250	1	2
AFORCO2	31	2.065	.680	1	3
AISHED2	31	1.419	.502	1	2
ALELAG2	31	1.032	.180	1	2
ADONOT2	31	1.742	.773	1	3

The techniques used to manage accounting exposure are examined first. The variables listed above measure the proportions of accounting exposure covered using specific techniques. The key descriptive statistics of these variables are summarised in the above list. These variables are used to perform the Friedman two-way ANOVA, shown below.

- - - - - Friedman Two-Way Anova

Mean Rank	Variable	
3.10	ABTBAC2	Acct exp covered with back-to-back loan
4.53	ABSHED2	Acct exp covered with balance sheet hedge
2.95	ACSWAP2	Acct exp covered with currency swap
5.56	AFORCO2	Acct exp covered with forward contract
4.16	AISHED2	Acct exp covered with income statement hedge
2.87	ALELAG2	Acct exp managed with leading & lagging
4.82	ADONOT2	Acct exp left uncovered

Cases	Chi-Square	D.F.	Significance
31	43.9977	6	.0000

The test statistic is very significant. This indicates that not all the techniques were used to same extent by the companies to manage accounting exposure. The mean ranks show that the most used techniques, in descending order, are forward contract, do-nothing strategy, balance sheet hedging, and income statement hedging.

Appendix H-6: Result for the test of difference in the companies' use of various techniques for managing economic exposure

	N	Mean	Std Dev	Minimum	Maximum
EBTBAC2	30	1.333	.661	1	3
EOPTIO2	30	1.067	.254	1	2
EDYFIN2	30	1.300	.535	1	3
EDYOPR2	30	1.267	.450	1	2
EFORCO2	30	2.000	.788	1	3
ELELAG2	30	1.033	.183	1	2
EMATCH2	30	1.300	.466	1	2
EDONOT2	30	1.667	.711	1	3

The techniques used to manage economic exposure are examined next. The variables listed above measure the proportions of economic exposure covered using specific techniques. The key descriptive statistics of these variables are summarised in the above list. These variables are used to perform the Friedman two-way ANOVA, shown below.

- - - - - Friedman Two-Way Anova

Mean Rank	Variable	
4.23	EBTBAC2	Econ exp covered with back-to-back loan
3.55	EOPTIO2	Econ exp covered with currency option
4.38	EDYFIN2	Econ exp managed with diversify financing
4.32	EDYOPR2	Econ exp managed with diversify operations
6.18	EFORCO2	Econ exp covered with forward contract
3.43	ELELAG2	Econ exp managed with leading & lagging
4.43	EMATCH2	Econ exp covered with matching
5.47	EDONOT2	Econ exp left uncovered

Cases	Chi-Square	D.F.	Significance
30	29.6556	7	.0001

The test statistic is very significant. This indicates that not all the techniques were used to same extent by the companies to manage economic exposure. The mean ranks show that the most used techniques, in descending order, are forward contract, do-nothing strategy, matching, diversifying financing, diversifying operations, and back-to-back loan.

Appendix H-7: Result for the test of difference in the companies' use of various techniques for managing transaction exposure

	N	Mean	Std Dev	Minimum	Maximum
TBTBAC2	61	1.049	.218	1	2
TOPTIO2	61	1.115	.370	1	3
TCSWAP2	61	1.016	.128	1	2
TFORCO2	61	2.230	.693	1	3
TLELAG2	61	1.180	.428	1	3
TMATCH2	61	1.082	.277	1	2
TMMHED2	61	1.279	.488	1	3
TNET2	61	1.213	.413	1	2
TRSHAR2	61	1.082	.277	1	2
TDONOT2	61	1.721	.733	1	3

The techniques used to manage transaction exposure are examined finally. The variables listed above measure the proportions of transaction exposure covered using specific techniques. The key descriptive statistics of these variables are summarised in the above list. These variables are used to perform the Friedman two-way ANOVA, shown below.

- - - - - Friedman Two-Way Anova

Mean Rank	Variable	
4.55	TBTBAC2	Tran exp covered with back-to-back loan
4.79	TOPTIO2	Tran exp covered with currency option
4.39	TCSWAP2	Tran exp covered with currency swap
8.67	TFORCO2	Tran exp covered with forward contract
5.14	TLELAG2	Tran exp managed with leading & lagging
4.70	TMATCH2	Tran exp covered with matching
5.59	TMMHED2	Tran exp covered with money market hedge
5.34	TNET2	Tran exp covered with netting
4.70	TRSHAR2	Tran exp managed with risk sharing agreement
7.14	TDONOT2	Tran exp left uncovered

Cases	Chi-Square	D.F.	Significance
61	112.1133	9	.0000

The test statistic is very significant. This indicates that not all the techniques were used to same extent by the companies to manage transaction exposure. The mean ranks show that the most used techniques, in descending order, are forward contract, do-nothing strategy, money market hedging, netting, and leading and lagging.

Appendix I: Summary of model characteristics

Dependent variable	MANAGE	ACCTEXP	ECONEXP	TRANEXP	USE3
Predictor 1 (coefficient); (standardised); (p-value)	ASSETS_B (0.85); (0.42); (W, 2.46%)	ASSETS_B (-1.67); (-0.91); (W, 2.77%)	PERFIN3 (2.58); (0.31); (W, 2.32%)	STABLE1 (4.59); (0.36); (W, 1.46%)	VSIZE (0.91); (0.39); (W, 0.23%)
Predictor 2 (coefficient); (standardised); (p-value)	FOREIGN3 (1.94); (0.18); (W, 0.02%)	DEBT_B (2.20); (0.64); (W, 4.20%)	ASSETS_B (-0.28) (-0.29); (W, 4.14%)	RISK3 (2.24); (0.33); (LR, 2.84%)	PERFIN3 (3.38); (0.38); (W, 0.10%)
Predictor 3 (coefficient); (standardised); (p-value)	VOLAT1 (0.76); (0.12); (W, 2.31%)	OSUBNUM (0.07); (0.20); (W, 2.86%)	VSIZE3 (0.92) (0.21); (W, 3.76%)		STABLE1 (2.87); (0.35); (W, 4.93%)
Predictor 4 (coefficient); (standardised); (p-value)		DEBT23_4 (-0.13); (-1.56); (W, 1.13%)			ASSETS_B (-0.39); (-0.34); (W, 4.80%)
Cases/predictor	33.33	16.50	20.67	32.00	24.00
R_L^2	0.2746	0.2221	0.1357	0.4195	0.2975
G_M (d.f.) (p-value)	35.886 (3) (0.00%)	20.201 (4) (0.05%)	11.585 (3) (0.89%)	12.553 (2) (0.19%)	24.758 (4) (0.01%)
λ_p	0.3889	0.3333	0.2857	0.0000	0.4000
Binomial d (p-value)	2.9167 (0.18%)	2.4721 (0.67%)	2.0415 (2.06%)	0.0000 (100%)	1.6865 (4.58%)
Residual analysis	VOLAT1 dependent on case 81	DEBT_B dependent on case 85; OSUBNUM dependent on case 96	ASSETS_B dependent on case 102; VSIZE3 dependent on case 76	RISK3 dependent on cases 100, 30 and 44	STABLE1 dependent on cases 48 and 29; ASSETS_B dependent on case 82
Other problems	none	Multi-collinearity	none	TRANEXP lack variance	none

Key:

	Poor measure	LR	Likelihood ratio test statistic
W	Wald statistic	R_L^2	Proportional reduction in log likelihood of the model
G_M	Model chi-square statistic	λ_p	Proportional reduction in prediction errors of the model

Dependent variable	OBJTYPE1	JOINTRES	DCEN2	OCEN2
Predictor 1 (coefficient); (standardised); (p-value)	DEBT_B (-2.17); (-0.69); (W, 1.09%)	MKTVAL_B (-0.18); (-0.53); (LR, 0.11%)	PDEBT4_4 (-2.95); (-0.30); (LR, 3.39%)	MKTVAL_B (-0.13); (-0.58); (LR, 3.18%)
Predictor 2 (coefficient); (standardised); (p-value)	ASSETS_B (1.13); (0.65); (W, 3.45%)	SECTOR3(2) (2.68); (0.15); (W, 0.40%)	HINTRACO (3.33); (0.24); (W, 1.40%)	HINTRACO (7.07); (0.36); (W, 2.91%)
Predictor 3 (coefficient); (standardised); (p-value)	MINTRACO (-7.70); (-0.61); (LR, 0.14%)	VSIZE (0.80); (0.14); (W, 1.27%)	PERCAP3 (2.11); (0.22); (W, 4.23%)	VCHANGE (-1.83); (-0.26); (W, 1.78%)
Predictor 4 (coefficient); (standardised); (p-value)	SALES_B (1.44); (0.32); (W, 1.40%)	SECTOR3(1) (-2.22); (-0.12); (LR, 2.56%)		
Cases/predictor	15.75	16.00	19.33	14.00
R_L^2	0.4322	0.3168	0.3016	0.3042
G_M (d.f.) (p-value)	28.845 (4) (0.00%)	25.661 (4) (0.00%)	12.887 (3) (0.49%)	14.027 (3) (0.29%)
λ_p	0.5714	0.3810	0.1429	0.5000
Binomial d (p-value)	2.4244 (0.77%)	2.1298 (1.66%)	0.4031 (34.34%)	1.8114 (3.50%)
Residual analysis	DEBT_B dependent on case 82; ASSETS_B dependent on cases 82, and 102; MINTRACO dependent on cases 82 and 80; SALES_B dependent on case 92	MKTVAL_B dependent on case 92	PDEBT4_4 dependent on cases 68 and 95	HINTRACO dependent on case 89
Other attributes	Multicollinearity; MINTRACO almost has zero cell	none	PDEBT4_4 almost has zero cell	none

Key:

Poor measure

W Wald statistic

G_M Model chi-square statistic

LR Likelihood ratio test statistic

R_L^2 Proportional reduction in log likelihood of the model

λ_p Proportional reduction in prediction errors of the model

Dependent variable	LAPSE	PROPORT	UNOFFSET	FORCON1	FORCON2
Predictor 1 (coefficient); (standardised); (p-value)	VSIZE3 (-2.54); (-0.51); (W, 0.06%)	HIFEQUTY (3.83); (0.46); (W, 0.39%)	PERSAL3 (-6.97); (-0.57); (W, 1.38%)	ASSETS_B (0.48); (0.35); (LR, 3.95%)	PERFIN3 (-9.30); (-0.45); (LR, 0.04%)
Predictor 2 (coefficient); (standardised); (p-value)	FOREIGN3 (2.73); (0.47); (W, 0.12%)	FOREIGN3 (3.88); (0.44); (W, 0.34%)	PERPUR3 (-5.02); (-0.43); (W, 4.73%)	PERFIN3 (-3.82); (-0.33); (W, 0.80%)	BOARD (-1.73); (0.09); (W, 4.23%)
Predictor 3 (coefficient); (standardised); (p-value)		XPREDICT (1.00); (0.25); (LR, 3.46%)	OSUBNUM (0.20); (0.38); (W, 1.82%)	FOREIGN3 (2.60); (0.26); (W, 3.54%)	
Predictor 4 (coefficient); (standardised); (p-value)			EQGOVT (12.82); (0.37) (W, 3.88%)		
Predictor 5 (coefficient); (standardised); (p-value)			STABLE1 (-5.83); (-0.34); (W, 1.45%)		
Cases/predictor	31.50	18.33	10.60	18.67	28.50
R_L^2	0.2383	0.3898	0.4977	0.2855	0.2122
G_M (d.f.) (p-value)	20.719 (2) (0.00%)	25.126 (3) (0.00%)	25.551 (5) (0.01%)	12.026 (3) (0.73%)	16.133 (2) (0.03%)
λ_p	0.4828	0.4600	0.6000	0.1429	0.1818
Binomial d (p-value)	3.5388 (0.02%)	2.1194 (1.70%)	2.1065 (1.76%)	0.4041 (34.31%)	1.0883 (13.82%)
Residual analysis	no abnormality	XPREDICT dependent on case 79	PERPUR3 dependent on case 68; OSUBNUM dependent on case 22	no abnormality	no abnormality
Other problems	none	none	none	none	Zero cells for PERFIN3

Key:

	Poor measure	LR	Likelihood ratio test statistic
W	Wald statistic	R_L^2	Proportional reduction in log likelihood of the model
G_M	Model chi-square statistic	λ_p	Proportional reduction in the prediction errors of the model

Appendix J-1: The fitted model for predicting a company's likelihood of managing FX risk

```
Number of selected cases:                    106
Number rejected because of missing data:     6
Number of cases included in the analysis:    100
```

The number of cases per predictor is 33.33 (100÷3). This is very much greater than the required minimum of 15. This implies that the statistical analyses arising from this model are generally reliable.

```
                                    Parameter
                    Value   Freq    Coding
                                      (1)
FOREIGN3
 no                   1      50     .000
 yes                  2      50    1.000

Dependent Variable..   MANAGE      Manage fx risk?

-2 Log Likelihood    130.68364
* Constant is included in the model.

 -2 Log Likelihood          94.798
 Goodness of Fit            92.010

                     Chi-Square     df Significance
 Model Chi-Square       35.886       3          .0000
```

G_M of 35.886, with 3 degrees of freedom, shows that the reduction in the badness-of-fit, compared to the model with only the constant, is statistically significant. In other words, there is statistically significant improvement in the model fit due to the incorporation of the three predictors.

$R_L^2 = 35.886 \div (130.68364) = 0.2746$. This shows that there is a reduction in the badness-of-fit, of about 27.46%, due to the inclusion of the three predictors. This proportional reduction is substantively significant.

```
Classification Table for MANAGE
                      Predicted
                    no        yes      Percent Correct
                     n   |     y
Observed             +-------+-------+
   no        n       |  24   |  12   |    66.67%
                     +-------+-------+
   yes       y       |  10   |  54   |    84.38%
                     +-------+-------+
                             Overall     78.00%
```

Model errors = 10+12 = 22. Chance errors = 36, i.e., the number of cases in the category of the dependent variable with the lower of the two frequencies. Therefore, λ_p = (36-22)÷36 = 0.3889. This shows that there is a reduction in the number of prediction errors of about 38.89% due to the inclusion of the three predictors. This is substantively significant.

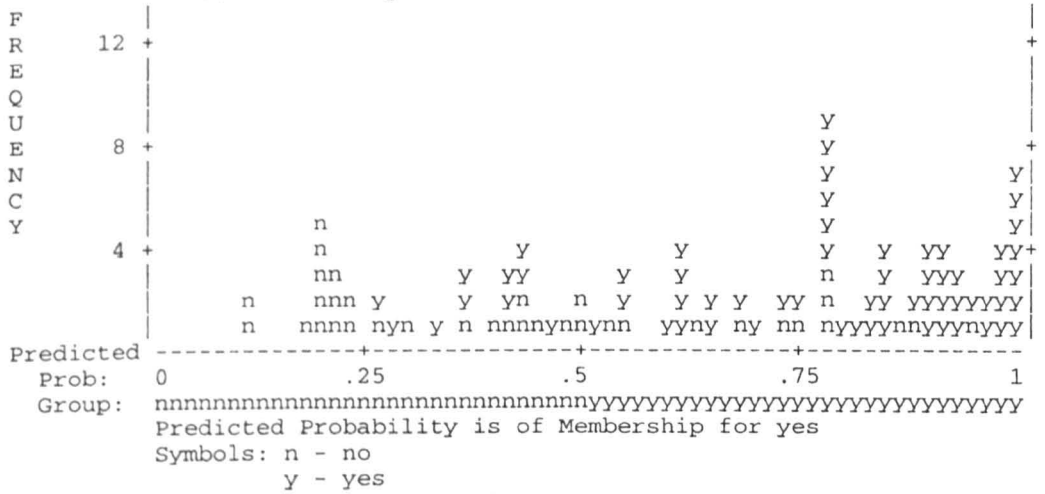
The binomial d statistic = (36-22) ÷ √[(36÷100)×(100-36)] = 2.9167. This has a p-value of 0.0018. This shows that the reduction in the number of prediction errors is also statistically significant.

---------- Variables in the Equation ----------

Variable	B	S.E.	Wald	df	Sig	R	Exp(B)
ASSETS_B	.8520	.3791	5.0520	1	.0246	.1528	2.3444
FOREIGN3(1)	1.9418	.5276	13.5450	1	.0002	.2972	6.9712
VOLAT1	.7600	.3345	5.1611	1	.0231	.1555	2.1383
Constant	-2.2811	.7445	9.3890	1	.0022		

Wald statistic p-values of all the three predictors are less than 0.05. This means that the effects by the predictors on the logit of MANAGE are statistically significant. In other words, a significant proportion of the variance of the logit of MANAGE, i.e., a proportion that cannot be attributed merely to random sampling distribution, is associated with a unit of variance in each of the predictor.

Observed Groups and Predicted Probabilities



---------- Model if Term Removed ----------

Term Removed	Log Likelihood	-2 Log LR	df	Significance of Log LR
ASSETS_B	-53.026	11.254	1	.0008
FOREIGN3	-55.212	15.627	1	.0001
VOLAT1	-50.178	5.559	1	.0184

Calculating the standardised coefficients of the fitted model

* * * * M U L T I P L E R E G R E S S I O N * * * *

Equation Number 1 Dependent Variable.. MANAGE Manage fx risk?

Variable(s) Entered on Step Number
1.. PGR_1 Predicted Group

Multiple R	.51720
R Square	.26749
Adjusted R Square	.26002
Standard Error	.41499

```
Analysis of Variance
                    DF        Sum of Squares      Mean Square
Regression           1              6.16299          6.16299
Residual            98             16.87701           .17221
F =       35.78677       Signif F =  .0000
```

```
                    Valid
Variable    Std Dev     N  Label
ASSETS_B       2.62   100  Total assets (billion RM)
FOREIGN3        .50   100  Foreign currency transactions > 30%?
VOLAT1          .81   100  Exchange rate uncertainty
LOGIT1         2.73   100  Natural log odds on managing FX risk
```

Calculating standardised coefficients:

Predictor	Coefficient		Predictor Std Dev		Correlation Coefficient		Logit Std Dev		Standardised Coefficient
ASSETS_B	0.8520	×	2.62	×	0.51720	÷	2.73	=	0.4229
FOREIGN3	1.9418	×	0.50	×	0.51720	÷	2.73	=	0.1839
VOLAT1	0.7600	×	0.81	×	0.51720	÷	2.73	=	0.1166

The standardised coefficients are all greater than 0.05. Therefore, all the predictor effects on the logit of MANAGE are substantively significant. The predictors in descending order of impact on the logit of MANAGE are ASSETS_B, FOREIGN3, and VOLAT1.

Testing the model for multicollinearity

```
          * * * *  M U L T I P L E  R E G R E S S I O N  * * * *

Equation Number 1    Dependent Variable..   MANAGE   Manage FX risk?

Variable(s) Entered on Step Number
   1..     VOLAT1     Exchange rate uncertainty
   2..     FOREIGN3   Foreign currency transactions > 30%?
   3..     ASSETS_B   Total assets (billion RM)

-- Variables in the Equation ---
Variable    Tolerance        VIF
ASSETS_B       .964149      1.037
FOREIGN3       .969838      1.031
VOLAT1         .973049      1.028
```

The tolerance statistics of all the three predictors are greater than 0.20. Therefore, multicollinearity is clearly not present in the model.

Cases with abnormal residual measures, and their predictor values

```
          ZRE_1        SRE_1        LEV_1    DBETA1   CHISCH1     DMCH1
   12      .54271       .80478      .20284*     .09       .37       .65
   29    -3.80083*    -2.36796*      .02363     .36*    14.80*    5.61*
   48    -2.39839*    -1.97770       .02340     .14      5.89*    3.91*
   73    -2.69337*    -2.09968*      .04246     .34*     7.58*    4.41*
   81    -1.69107     -1.75794       .12593*    .47*     3.27     3.09
```

	ASSETS_B	FOREIGN3	VOLAT1	PRE_1	PGR_1	MANAGE
12	3.2200	1	1	.77248	2	2
29	.8565	2	3	.93526	2	1
48	.6678	2	2	.85190	2	1
73	.0480	2	3	.87885	2	1
81	1.6315	2	0	.74091	2	1

The asterisks denote residual measures that are unusual. Cases 29, 73, and 48, seem to be poor-fitting. Removing case 29 improves model fit considerably but worsens the prediction accuracy. It also improves the effects and significance of all predictors. Similar results, but to lesser extents, are found when cases 73 or 48 is removed. On the other hand, cases 12 and 81 appear to have disproportionate influence on the parameter estimates of the model. The removal of case 12, however, does not change the predictor effect or significance drastically. With the removal of case 81, the predictor, VOLAT1, becomes less pronounced and not significant. Nonetheless, there is no compelling reason to remove any of the above cases. Therefore, generally, the model appears to be very reasonable because even in a true model, about 5% of the cases are expected to be abnormal.

Validity of fitted predictor relationship with the logit of the dependent variable

	Value	Freq	Parameter Coding (1)	(2)	(3)
ASSET4					
< RM 171 m	1	25	.000	.000	.000
RM 171 - 510 m	2	25	1.000	.000	.000
RM 510 - 1100 m	3	25	.000	1.000	.000
> RM 1100 m	4	25	.000	.000	1.000
FOREIGN3					
no	1	50	.000		
yes	2	50	1.000		

Dependent Variable.. MANAGE Manage fx risk?

	Chi-Square	df	Significance
Model Chi-Square	35.099	5	.0000

Classification Table for MANAGE

		Predicted no	Predicted yes	Percent Correct
		n	y	
Observed				
no	n	22	14	61.11%
yes	y	7	57	89.06%
			Overall	79.00%

Variables in the Equation

Variable	B	S.E.	Wald	df	Sig	R	Exp(B)
FOREIGN3(1)	1.8257	.5448	11.2296	1	.0008	.2658	6.2074
VOLAT1	.8084	.3452	5.4860	1	.0192	.1633	2.2444
ASSET4			7.7537	3	.0514	.1158	
ASSET4(1)	.4836	.6964	.4821	1	.4875	.0000	1.6219
ASSET4(2)	-.2119	.6825	.0964	1	.7562	.0000	.8090
ASSET4(3)	2.1876	.9127	5.7446	1	.0165	.1693	8.9141
Constant	-2.0994	.7954	6.9665	1	.0083		

Examining the fitted linear relationship between total assets and the logit of managing FX risk:

Range (RM b)	Predictor	Cases	Coefficient	Logit
0.0001 – 0.1710	constant	25	-2.0994	-2.0994 *
0.1711 – 0.5100	ASSET4(1)	25	0.4836	-1.6158 **
0.5101 – 1.1000	ASSET4(2)	25	-0.2119	-2.3113 **
1.1000 & greater	ASSET4(3)	25	2.1876	0.0882 **

*Logit = $\text{Coefficient}_{(\text{constant})}$; **Logit = Coefficient + $\text{Coefficient}_{(\text{constant})}$

Compare the logits from the above model (categorised) with those derived from the fitted model (fitted)

Assets (RM b)	Categorised	Fitted	Assets (RM b)	Categorised	Fitted
0.0001	-2.10	-2.28	0.1710	-2.10	-2.13
0.1711	-1.62	-2.13	0.5100	-1.62	-1.85
0.5101	-2.31	-1.85	1.1000	-2.31	-1.35
1.1001	0.09	-1.35	18.0210	0.09	13.04

The plot (see Graph 1A) appears to suggest that the relationship between ASSETS_B and the logit of MANAGE may not be exactly linear because it appears to show some discrepancies between the fitted model, i.e., a linear depiction, and a categorised model. The removal of the linearity constraint (the categorised model) worsens model fit although it improves prediction accuracy slightly. Moreover, the removal of the linearity constraint does not change significantly the effect and significance of the other predictors on the logit of MANAGE. Further, the categorised predictor ASSET4 is less significant than ASSETS_B. Therefore, at least for the sake of parsimony, the effect of ASSETS_B on the logit of MANAGE can be assumed to be linear.

	Value	Freq	Parameter Coding (1)	(2)	(3)
VOLAT					
certain	2	4	.000	.000	.000
moderate	3	29	1.000	.000	.000
uncertain	4	45	.000	1.000	.000
very uncertain	5	22	.000	.000	1.000
FOREIGN3					
no	1	50	.000		
yes	2	50	1.000		

Dependent Variable.. MANAGE Manage fx risk?

	Chi-Square	df	Significance
Model Chi-Square	36.273	5	.0000

Classification Table for MANAGE

		Predicted no	yes	Percent Correct
		n	y	
Observed				
no	n	24	12	66.67%
yes	y	10	54	84.38%
			Overall	78.00%

---------- Variables in the Equation ----------

Variable	B	S.E.	Wald	df	Sig	R	Exp(B)
ASSETS_B	.8648	.3918	4.8717	1	.0273	.1482	2.3745
FOREIGN3(1)	1.9808	.5352	13.6991	1	.0002	.2992	7.2484
VOLAT			5.3191	3	.1499	.0000	
VOLAT(1)	1.5913	1.4478	1.2081	1	.2717	.0000	4.9103
VOLAT(2)	2.1501	1.4152	2.3083	1	.1287	.0486	8.5859
VOLAT(3)	2.9434	1.5134	3.7827	1	.0518	.1168	18.9800
Constant	-2.9749	1.4553	4.1785	1	.0409		

Examining the fitted linear relationship between perceived exchange rate uncertainty and the logit of managing FX risk:

Value	Label	Predictor	Cases	Coefficient	Logit
2	certain	constant	4	-2.9749	-2.9749 *
3	moderate	VOLAT(1)	29	1.5913	-1.3836 **
4	uncertain	VOLAT(2)	45	2.1501	-0.8248 **
5	very uncertain	VOLAT(3)	22	2.9434	-0.0315 **

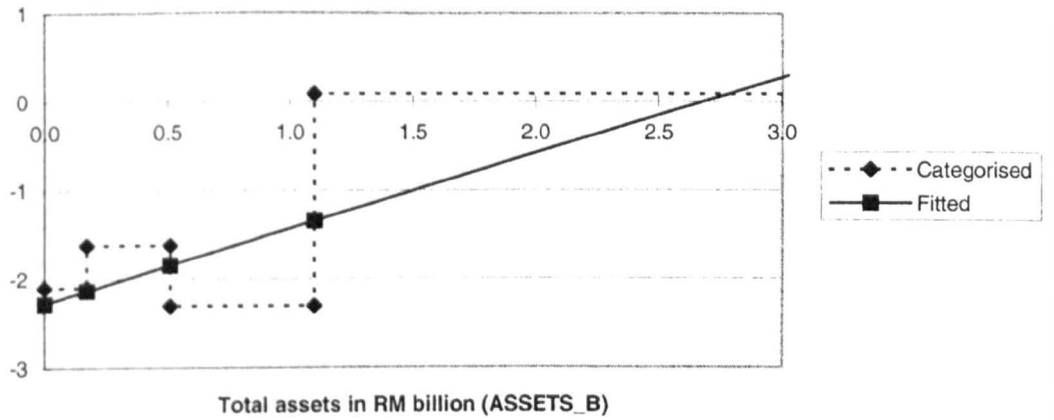
*Logit = $\text{Coefficient}_{(\text{constant})}$; **Logit = Coefficient + $\text{Coefficient}_{(\text{constant})}$

Compare the logits from the above model (categorised) with those derived from the fitted model (fitted)

Exchange rate uncertainty (VOLAT1)	0	1	2	3
Categorised	-2.97	-1.38	-0.82	-0.03
Fitted	-2.28	-1.52	-0.76	0.00

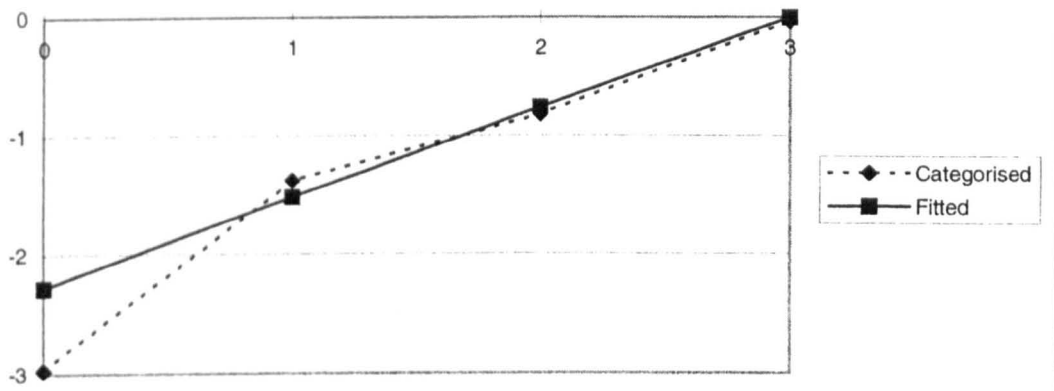
The plot (see Graph 1B) appears to suggest that the relationship between VOLAT1 and the logit of MANAGE is almost linear. It shows that the fitted linear model reasonably represents the relationship portrayed by the categorised model. The removal of the linearity constraint (the categorised model) does not improve the model fit significantly and does not change the prediction accuracy. Moreover, the removal of the linearity constraint does not change significantly the effect and significance of the other predictors on the logit of MANAGE. Furthermore, the categorised predictor VOLAT is not significant. Therefore, the effect of VOLAT1 on the logit of MANAGE can be assumed to be linear.

Graph 1A: Logit of managing FX risk



Total assets in RM billion (ASSETS_B)

Graph 1B: Logit of managing FX risk



Perceived exchange rate uncertainty (VOLAT1)

Appendix J-2: The fitted model for predicting a company's likelihood of managing accounting exposure

```
Number of selected cases:                    67
Number rejected because of missing data:     1
Number of cases included in the analysis:    66
```

The number of cases per predictor is 16.5 (66÷4). This is slightly greater than the required minimum of 15. This implies that the statistical analyses arising from this model are generally accepted to be reliable.

	Value	Freq	Parameter Coding (1)
DEBT23_4			
no	1	32	.000
yes	2	34	1.000

Dependent Variable.. ACCTEXP Manage accounting exposure?

-2 Log Likelihood 90.949219
* Constant is included in the model.

-2 Log Likelihood	70.748	
Goodness of Fit	58.761	
	Chi-Square	df Significance
Model Chi-Square	20.201	4 .0005

G_M of 20.201, with 4 degrees of freedom, is statistically significant. In other words, there is statistically significant improvement in the model fit due to the incorporation of the four predictors.

$R_L^2 = 20.201 \div (90.949219) = 0.2221$. This shows that there is a reduction in the badness-of-fit, of about 22.21%, due to the inclusion of the four predictors. As it is greater than 5%, the proportional reduction is considered to be substantively significant.

Classification Table for ACCTEXP

		Predicted no n	yes y	Percent Correct
Observed				
no	n	28	8	77.78%
yes	y	12	18	60.00%
			Overall	69.70%

Model errors = 12+8 = 20. Chance errors = 30, i.e., the (lower) frequency between the two observed categories of the dependent variable. Therefore, $\lambda_p = (30\text{-}20) \div 30 = 0.3333$. This shows that there is a one-third reduction in the number of prediction errors due to the inclusion of the four predictors. This is substantively significant.

The binomial d statistic = $(30\text{-}20) \div \sqrt{[(30 \div 66) \times (66\text{-}30)]} = 2.4721$. This has a p-value of 0.0067. This shows that the reduction in the prediction errors is also statistically significant.

---------- Variables in the Equation ----------

Variable	B	S.E.	Wald	df	Sig	R	Exp(B)
ASSETS_B	-1.6664	.7570	4.8452	1	.0277	-.1769	.1889
OSUBNUM	.0684	.0312	4.7939	1	.0286	.1753	1.0707
DEBT_B	2.2025	1.0830	4.1359	1	.0420	.1532	9.0480
DEBT23_4(1)	-1.5556	.6143	6.4136	1	.0113	-.2203	.2111
Constant	1.0404	.5139	4.0996	1	.0429		

Wald statistic p-values of all the four predictors are less than 0.05. This means that the effects on the logit of ACCTEXP are statistically significant. In other words, a significant proportion of the variance of the logit of ACCTEXP, is associated with a unit of variance in each of the predictors. Therefore, all the four predictors are important in modelling the logit of ACCTEXP.

```
            Observed Groups and Predicted Probabilities
F           |                                                             |
R       6 + |                                                  y          +
E           |                                                  y          |
Q           |                                                 yy          |
U           |                                                 yy          |
E       4 +n|                 n    yy                         yy          +
N         n|                 n    yy                         yy          |
C         n|                 n  yyyn                        yyy          |
Y         n|                 n  yyyn                        yyy          |
        2 +n  n     y        ny nnnnn y                   y  ynyy y       +
          n|n  n     y        ny nnnnn y                   y  ynyy y       |
          nn nnn    n    n  ynyynnnnn nn yn n   n n      y  nnnyyy       y|
          nn nnn    n    n  ynyynnnnn nn yn n   n n      y  nnnyyy       y|
Predicted ------------+-------------+-------------+-------------+----------
  Prob:   0           .25           .5            .75           1
  Group:  nnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyy
          Predicted Probability is of Membership for yes
          Symbols: n - no
                   y - yes
          Each Symbol Represents .5 Cases.
```

---------- Model if Term Removed ----------

Term Removed	Log Likelihood	-2 Log LR	df	Significance of Log LR
ASSETS_B	-41.816	12.885	1	.0003
OSUBNUM	-39.167	7.587	1	.0059
DEBT_B	-39.635	8.521	1	.0035
DEBT23_4	-38.851	6.954	1	.0084

Calculating the standardised coefficients of the fitted model

* * * * M U L T I P L E R E G R E S S I O N * * * *

Equation Number 1 Dependent Variable.. ACCTEXP Manage accounting exposure

Variable(s) Entered on Step Number
1.. PGR_2 Predicted Group

Multiple R	.38497
R Square	.14821
Adjusted R Square	.13490
Standard Error	.46668

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	1	2.42517	2.42517
Residual	64	13.93846	.21779

F = 11.13546 Signif F = .0014

Variable	Std Dev	Valid N	Label
ASSETS_B	3.24	66	Total assets (billion RM)
OSUBNUM	17.13	66	Number of Overseas Subsidiaries (KLSE)
DEBT_B	1.74	66	Total debt (billion RM)
DEBT23_4	.50	66	Debt in the second or third quartile?
LOGIT2	2.29	66	Natural log odds of managing accountin

Calculating standardised coefficients:

Predictor	Coefficient	Predictor Std Dev	Correlation Coefficient	Logit Std Dev	Standardised Coefficient
ASSETS_B	-1.6664 ×	3.24 ×	0.38497 ÷	2.29 =	-0.9076
OSUBNUM	0.0684 ×	17.13 ×	0.38497 ÷	2.29 =	0.1970
DEBT_B	2.2025 ×	1.74 ×	0.38497 ÷	2.29 =	0.6443
DEBT23_4	-1.5556 ×	0.50 ×	0.38497 ÷	2.29 =	-0.1308

The standardised coefficients are all greater than 0.05. Therefore, all the predictor effects on the logit of ACCTEXP are substantively significant. The predictors in descending order of impact on the logit of ACCTEXP are ASSETS_B, DEBT_B, and OSUBNUM (note that DEBT23_4 is a predictor derived from DEBT_B).

Testing the model for multicollinearity

* * * * M U L T I P L E R E G R E S S I O N * * * *

Equation Number 1 Dependent Variable.. ACCTEXP Manage accounting exposure

Variable(s) Entered on Step Number
1.. DEBT23_4 Debt in the second or third quartile?
2.. OSUBNUM Number of Overseas Subsidiaries (KLSE)
3.. DEBT_B Total debt (billion RM)
4.. ASSETS_B Total assets (billion RM)

-- Variables in the Equation ---

Variable	Tolerance	VIF
ASSETS_B	.144304	6.930
OSUBNUM	.875026	1.143
DEBT_B	.149531	6.688
DEBT23_4	.871589	1.147

The tolerance statistics of two out of the four predictors are less than 0.20. Therefore, multicollinearity appears to be present in the model. It affects ASSETS_B and DEBT_B. Although the two variables, ASSETS_B and DEBT_B, are positively correlated, the logistic coefficients of the relevant predictors are contrasted in terms of the direction of effect. Moreover, the estimated standard errors of the two coefficients are not uncharacteristically large. Therefore, although multicollinearity is present in the model, it may not be serious enough to warrant the dismissal of the model.

Cases with abnormal residual measures, and their predictor values

	ZRE_2	SRE_2	LEV_2	DBETA2	CHISCH2	DMCH2
82	-1.00600	-1.83972	.58686*	3.48*	2.45*	3.38*
85	1.01949	1.43753	.31030*	.68	1.51	2.07
96	.57425	1.81173	.82634*	9.04*	1.90*	3.28*
100	2.30193*	1.96775	.04941	.29	5.57*	3.87*

	ASSETS_B	OSUBNUM	DEBT_B	DEBT23_4	PRE_2	ACCTEXP
82	12.4496	0	8.9519	1	.50299	1
85	9.7036	3	6.7584	1	.49035	2
96	8.9973	116	3.2382	1	.75201	2
100	.9497	3	.1022	2	.15876	2

The asterisks denote residual measures that are unusual. Case 100 seems to be the only poor-fitting case. Removing it improves model fit, and prediction considerably. It also improves the effect and significance of all predictors. Cases 96, 85 and 82 appear to have disproportionate influence on the model parameter estimates. The removal of case 96 considerably reduces the effect and significance of predictor OSUBNUM. On the other hand, the removal of case 85 considerably reduces the effect and significance of DEBT_B. The removal of case 82, although, does not change the model characteristics drastically. However, there is no compelling argument for the removal of these cases. Therefore, generally, the model is reasonable.

Validity of fitted predictor relationship with the logit of the dependent variable

	Value	Freq	Parameter Coding (1)	(2)	(3)
ASSET4					
< RM 200 m	1	16	.000	.000	.000
RM 200-550 m	2	17	1.000	.000	.000
RM 550-2000 m	3	17	.000	1.000	.000
> RM 2 b	4	16	.000	.000	1.000
DEBT23_4					
no	1	32	.000		
yes	2	34	1.000		

Dependent Variable.. ACCTEXP Manage accounting exposure?

	Chi-Square	df	Significance
Model Chi-Square	14.775	6	.0221

Classification Table for ACCTEXP

		Predicted no	yes	Percent Correct
		n	y	
Observed				
no	n	29	7	80.56%
yes	y	13	17	56.67%
			Overall	69.70%

Variables in the Equation

Variable	B	S.E.	Wald	df	Sig	R	Exp(B)
ASSET4			5.5749	3	.1342	.0000	
ASSET4(1)	.5758	1.0061	.3275	1	.5671	.0000	1.7785
ASSET4(2)	.2903	.9706	.0895	1	.7649	.0000	1.3369
ASSET4(3)	-2.4994	1.2212	4.1888	1	.0407	-.1551	.0821
OSUBNUM	.0328	.0235	1.9584	1	.1617	.0000	1.0334
DEBT_B	.1593	.2284	.4865	1	.4855	.0000	1.1727
DEBT23_4(1)	-2.1348	.8674	6.0569	1	.0139	-.2112	.1183
Constant	.8608	.5809	2.1962	1	.1384		

Examining the fitted linear relationship between total assets and the logit of managing accounting exposure:

Total assets (RM b)	Predictor	Cases	Coefficient	Logit
0.0001 – 0.2000	constant	16	0.8608	0.8608 *
0.2001 – 0.5500	ASSET4(1)	17	0.5758	1.4366 **
0.5501 – 2.0000	ASSET4(2)	17	0.2903	1.1511 **
2.0001 & greater	ASSET4(3)	16	-2.4994	-1.6386 **

*Logit = $Coefficient_{(constant)}$; **Logit = Coefficient + $Coefficient_{(constant)}$

Compare the logits from the above model (categorised) with those derived from the fitted model (fitted):

Assets (RM b)	Categorised	Fitted	Assets (RM b)	Categorised	Fitted
0.0001	0.86	1.04	0.2000	0.86	0.71
0.2001	1.44	0.71	0.5500	1.44	0.12
0.5501	1.15	0.12	2.0000	1.15	-2.30
2.0001	-1.64	-2.30	18.0210	-1.64	-29.06

The plot (see Graph 2A) appears to suggest that the relationship between ASSETS_B and the logit of ACCTEXP may not be exactly linear because it appears to show some slight discrepancies between the fitted and the categorised models. However, the removal of the linearity constraint (the categorised model) reduces the model fit considerably although prediction accuracy is unchanged. Moreover, the removal of the linearity constraint reduces the other predictor effects. Furthermore, the categorised predictor, ASSET4, is not significant. Therefore, at least for the sake of parsimony, the effect of ASSETS_B on the logit of ACCTEXP can be reasonably assumed to be linear.

	Value	Freq	Parameter Coding (1)	(2)	(3)
OSUB4					
0 - 1	1	19	.000	.000	.000
2 - 3	2	22	1.000	.000	.000
4 - 6	3	12	.000	1.000	.000
7 & more	4	13	.000	.000	1.000
DEBT23_4					
no	1	32	.000		
yes	2	34	1.000		

Dependent Variable.. ACCTEXP Manage accounting exposure?

	Chi-Square	df	Significance
Model Chi-Square	13.344	6	.0379

Classification Table for ACCTEXP

		Predicted no	yes	Percent Correct
		n	y	
Observed				
no	n	28	8	77.78%
yes	y	12	18	60.00%
			Overall	69.70%

---------- Variables in the Equation ----------

Variable	B	S.E.	Wald	df	Sig	R	Exp(B)
ASSETS_B	-.7970	.3905	4.1653	1	.0413	-.1543	.4507
OSUB4			.7139	3	.8699	.0000	
OSUB4(1)	.2339	.6831	.1173	1	.7320	.0000	1.2636
OSUB4(2)	.6219	.8577	.5258	1	.4684	.0000	1.8625
OSUB4(3)	.6478	.9264	.4890	1	.4844	.0000	1.9114
DEBT_B	1.0497	.5803	3.2719	1	.0705	.1183	2.8567
DEBT23_4(1)	-1.5816	.6407	6.0928	1	.0136	-.2121	.2056
Constant	.8322	.6244	1.7764	1	.1826		

Examining the fitted linear relationship between the number of overseas subsidiaries and the logit of managing accounting exposure:

Overseas subsidiaries	Predictor	Cases	Coefficient	Logit
0 - 1	constant	19	0.8322	0.8322 *
2 - 3	OSUB4(1)	22	0.2339	1.0661 **
4 - 6	OSUB4(2)	12	0.6219	1.4551 **
7 & more	OSUB4(3)	13	0.6478	1.4810 **

*Logit = $\text{Coefficient}_{(\text{constant})}$; **Logit = Coefficient + $\text{Coefficient}_{(\text{constant})}$

Compare the logits from the above model (categorised) with those derived from the fitted model (fitted)

Overseas subs	0	1	2	3	4	6	7	116
Categorised	0.83	0.83	1.07	1.07	1.46	1.46	1.48	1.48
Fitted	1.04	1.11	1.18	1.25	1.32	1.46	1.53	9.16

The plot (see Graph 2B) appears to suggest that the relationship between OSUBNUM and the logit of ACCTEXP is almost linear, because the general trends from both the fitted and categorised models appear congruent, despite some discrepancies. The removal of the linearity constraint (the categorised model) reduces model fit considerably although prediction accuracy is unchanged. Moreover, this generally reduces the other predictor effects. Furthermore, the categorised predictor, OSUB4, is not significant. Therefore, the effect of OSUBNUM on the logit of ACCTEXP can be assumed to be linear.

	Value	Freq	Parameter Coding (1)	(2)	(3)
DEBT4					
< RM 70 m	1	16	.000	.000	.000
RM 70-255 m	2	17	1.000	.000	.000
RM 255-700 m	3	17	.000	1.000	.000
> RM 700 m	4	16	.000	.000	1.000

Dependent Variable.. ACCTEXP Manage accounting exposure?

	Chi-Square	df	Significance
Model Chi-Square	12.317	5	.0307

Classification Table for ACCTEXP

Observed		Predicted no (n)	Predicted yes (y)	Percent Correct
no	n	30	6	83.33%
yes	y	14	16	53.33%
			Overall	69.70%

Variables in the Equation

Variable	B	S.E.	Wald	df	Sig	R	Exp(B)
ASSETS_B	-.1849	.1713	1.1659	1	.2802	.0000	.8312
OSUBNUM	.0337	.0231	2.1232	1	.1451	.0368	1.0342
DEBT4			8.0154	3	.0457	.1489	
DEBT4(1)	-1.6914	.7709	4.8144	1	.0282	-.1759	.1843
DEBT4(2)	-2.0548	.8325	6.0918	1	.0136	-.2121	.1281
DEBT4(3)	-.7750	1.0939	.5019	1	.4787	.0000	.4607
Constant	1.0627	.5790	3.3686	1	.0664		

Examining the fitted relationship between total debt and the logit of managing accounting exposure:

Total debt (RM b)	Predictor	Cases	Coefficient	Logit
0.0001 – 0.0700	constant	16	1.0627	1.0627 *
0.0701 – 0.2550	DEBT4(1)	17	-1.6914	-0.6287 **
0.2551 – 0.7000	DEBT4(2)	17	-2.0548	-0.9921 **
0.7001 & greater	DEBT4(3)	16	-0.7750	0.2877 **

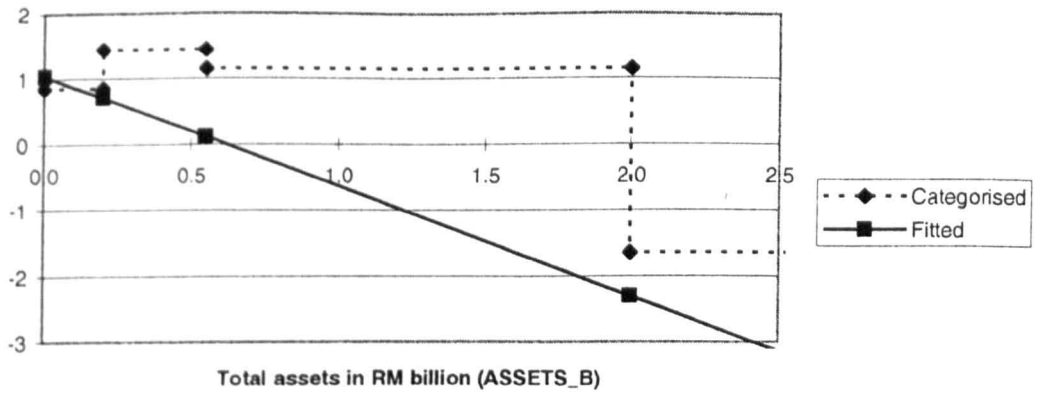
*Logit = $\text{Coefficient}_{(\text{constant})}$; **Logit = Coefficient + $\text{Coefficient}_{(\text{constant})}$

Compare the logits from the above model (categorised) with those derived from the fitted model (fitted)

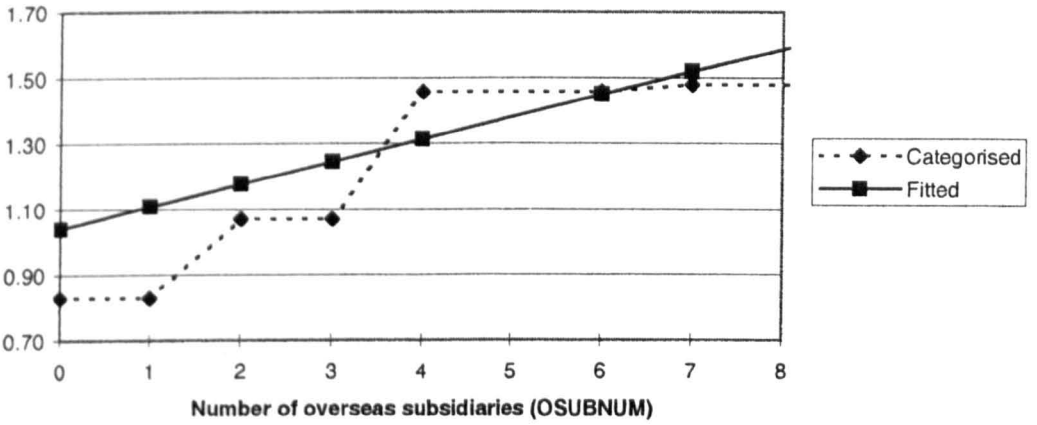
Debt (RM b)	Categorised	Fitted	Debt (RM b)	Categorised	Fitted
0.0001	1.06	1.04	0.0700	1.06	1.19
0.0701	-0.63	-0.37	0.2550	-0.63	0.04
0.2551	-0.99	0.04	0.7000	-0.99	1.02
0.7001	0.29	2.58	8.9519	0.29	20.73

The plot (see Graph 2C) appears to suggest that the relationship between DEBT_B and the logit of ACCTEXP may not be linear. It also shows some evident discrepancies between the fitted and the categorised models. However, the categorised model reduces model fit considerably although it does not change prediction accuracy. Moreover, it significantly reduces the other predictor effects. Although the categorised predictor, DEBT4, is significant, it is not as significant as DEBT_B and DEBT23_4 in the fitted model. Therefore, at least for the sake of parsimony, the effect of DEBT_B on the logit of ACCTEXP can be reasonably assumed to be as fitted.

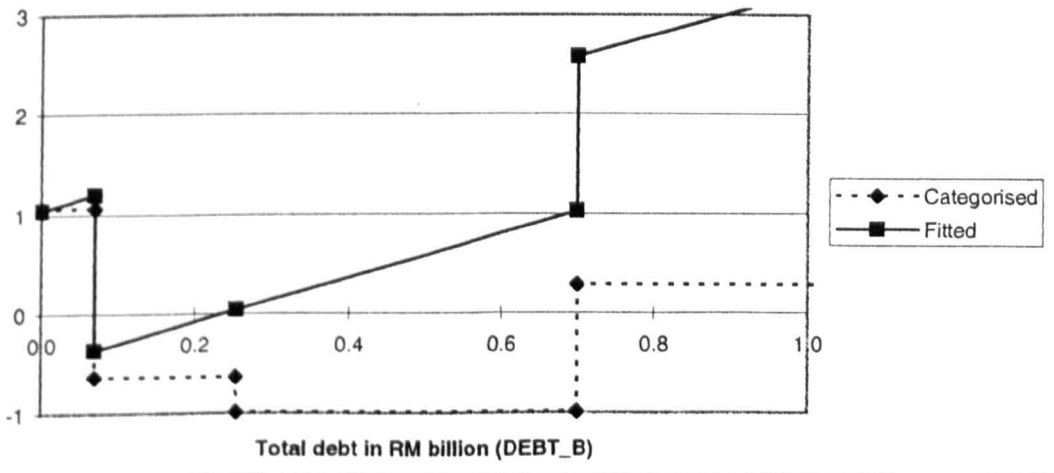
Graph 2A: Logit of managing accounting exposure



Graph 2B: Logit of managing accounting exposure



Graph 2C: Logit of managing accounting exposure



Appendix J-3: The fitted model for predicting a company's likelihood of managing economic exposure

```
Number of selected cases:                    67
Number rejected because of missing data:     5
Number of cases included in the analysis:    62
```

The number of cases per predictor is 20.67 (62÷3). This is greater than the required minimum of 15. This implies that the statistical analyses arising from this model are reliable.

```
                                    Parameter
                    Value   Freq    Coding
                                      (1)
PERFIN3
 less than 25%        1      52      .000
 more than 25%        2      10     1.000

Dependent Variable..   ECONEXP    Manage economic exposure?

-2 Log Likelihood    85.368696
* Constant is included in the model.

 -2 Log Likelihood          73.783
 Goodness of Fit            59.984

                     Chi-Square     df Significance
 Model Chi-Square        11.585       3          .0089
```

G_M of 11.585, with 3 degrees of freedom, is statistically significant. In other words, there is statistically significant improvement in the model fit due to the incorporation of the three predictors.

$R_L^2 = 11.585 \div (85.368696) = 0.1357$. This shows that there is a reduction in the badness-of-fit, of about 13.57%, due to the inclusion of the three predictors. Although this is not very large, it is greater than 5%, and therefore, the proportional reduction is considered to be substantively significant.

```
Classification Table for ECONEXP
                    Predicted
                   no        yes       Percent Correct
                    n   |     y
                  +-------+-------+
Observed          |       |       |
   no       n     |  27   |   7   |     79.41%
                  +-------+-------+
   yes      y     |  13   |  15   |     53.57%
                  +-------+-------+
                            Overall     67.74%
```

Model errors = 13+7 = 20. Chance errors = 28. Therefore, $\lambda_p = (28-20) \div 28 = 0.2857$. This shows that there is a 28.57% reduction in the number of prediction errors due to the inclusion of the three predictors. This is substantively significant.

The binomial d statistic = $(28-20) \div \sqrt{[(28 \div 62) \times (62-28)]} = 2.0415$. This has a p-value of 0.0206. This shows that the reduction in the number of prediction errors is also statistically significant.

```
---------------------- Variables in the Equation -----------------------
Variable            B        S.E.      Wald      df        Sig         R        Exp(B)
ASSETS_B         -.2776      .1361    4.1608       1      .0414   -.1591        .7576
PERFIN3(1)      2.5846     1.1381    5.1571       1      .0232    .1923      13.2577
VSIZE3           .9216      .4432    4.3233       1      .0376    .1650       2.5132
Constant       -2.0865      .9915    4.4288       1      .0353
```

Wald statistic p-values of all the three predictors are less than 0.05. This means that all the predictor effects on the logit of ECONEXP are statistically significant. Therefore, the three predictors are important in modelling the logit of ECONEXP.

```
                Observed Groups and Predicted Probabilities
F          |                                                                 |
R        6 +                          y             y                       +
E          |                          y             y                       |
Q          |                         yyy            y                       |
U          |                         yyy            y                       |
E        4 +              n          yny            y                       +
N          |              n          yny            y                       |
C          |              n n        nnn          y n                       |
Y          |              n n        nnn          y n                       |
         2 +    n         nyn    y   ynnn   y    y y n       y               +
           |    n         nyn    y   ynnn   y    y y n       y               |
           |    n     n yynnn n nnnnynnnny  ny   nyn n   y n y    yy   y    |
           |    n     n yynnn n nnnnynnnny  ny   nyn n   y n y    yy   y    |
Predicted  ---------------+--------------+--------------+---------------
  Prob:    0             .25            .5             .75             1
  Group:   nnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyy
           Predicted Probability is of Membership for yes
           Symbols: n - no
                    y - yes
           Each Symbol Represents .5 Cases.

----------------- Model if Term Removed ------------------
Term          Log                                  Significance
Removed       Likelihood     -2 Log LR     df      of Log LR
ASSETS_B        -39.716          5.648       1           .0175
PERFIN3         -40.415          7.046       1           .0079
VSIZE3          -39.294          4.805       1           .0284
```

Calculating the standardised coefficients of the fitted model

```
            * * * *   M U L T I P L E   R E G R E S S I O N   * * * *

Equation Number 1     Dependent Variable..   ECONEXP   Manage economic
exposure?

Variable(s) Entered on Step Number
   1..     PGR_3      Predicted Group

Multiple R              .34306
R Square                .11769
Adjusted R Square       .10298
Standard Error          .47518

Analysis of Variance
                    DF        Sum of Squares        Mean Square
Regression           1              1.80711            1.80711
Residual            60             13.54773             .22580
F =        8.00331          Signif F =  .0063
```

Variable	Std Dev	Valid N	Label
ASSETS_B	3.20	62	Total assets (billion RM)
PERFIN3	.37	62	Financing in FC
VSIZE3	.70	62	Recoded exposure volume
LOGIT3	1.06	62	Natural log odds on managing economic ex

Calculating standardised coefficients:

Predictor	Coefficient		Predictor Std Dev		Correlation Coefficient		Logit Std Dev	Standardised Coefficient
ASSETS_B	-0.2776	×	3.20	×	0.34306	÷	1.06 =	-0.2875
PERFIN3	2.5846	×	0.37	×	0.34306	÷	1.06 =	0.3095
VSIZE3	0.9216	×	0.70	×	0.34306	÷	1.06 =	0.2088

The standardised coefficients are all greater than 0.05. Therefore, all the predictor effects on the logit of ECONEXP are substantively significant. The predictors in descending order of impact on the logit of ECONEXP are PERFIN3, ASSETS_B, and VSIZE3.

Testing the model for multicollinearity

* * * * MULTIPLE REGRESSION * * * *

Equation Number 1 Dependent Variable.. ECONEXP Manage economic exposure?

Variable(s) Entered on Step Number

1..	VSIZE3	Recoded exposure volume
2..	PERFIN3	Financing in FC
3..	ASSETS_B	Total assets (billion RM)

-- Variables in the Equation ---

Variable	Tolerance	VIF
ASSETS_B	.710036	1.408
PERFIN3	.733910	1.363
VSIZE3	.958082	1.044

The tolerance statistics of all the three predictors are greater than 0.20. Therefore, multicollinearity is not present in the model.

Cases with abnormal residual measures, and their predictor values

	ZRE_3	SRE_3	LEV_3	DBETA3	CHISCH3	DMCH3
18	2.11113*	1.89714	.05707	.29	4.73*	3.60*
76	-1.76858	-1.92461	.23450*	1.25*	4.09*	3.70*
82	1.10166	1.51804	.31033*	.79*	1.76*	2.30*
100	2.04276*	1.86774	.05779	.27	4.43*	3.49*
102	-.41886	-.71620	.36975*	.16	.28	.51

	ASSETS_B	PERFIN3	VSIZE3	PRE_3	PGR_3	ECONEXP
18	1.1869	1	1	.18326	1	2
76	1.0060	2	1	.75775	2	1
82	12.4496	2	3	.45174	1	2
100	.9497	1	1	.19332	1	2
102	18.0210	2	3	.14926	1	1

The asterisks denote residual measures that are unusual. There are two poor-fitting cases, 18, and 100. Removing either of these cases improves slightly all model characteristics. On the other hand, cases 76, 102, and 82 appear to have disproportionate influence on the model parameter estimates. The removal of case 76 considerably reduces the effect and significance of predictor VSIZE3. Whereas, the removal of case 102 considerably reduces the effect and significance of predictor, ASSETS_B – this case has the highest ASSETS_B value. The removal of case 82 does not change the predictor effects drastically. However, there is no compelling reason to remove any of the above cases. Therefore, generally, the model is reasonable.

Validity of fitted predictor relationship with the logit of the dependent variable

	Value	Freq	Parameter Coding (1)	(2)	(3)
ASSET4					
< RM 200 m	1	15	.000	.000	.000
RM 200-540 m	2	16	1.000	.000	.000
RM 540-1750 m	3	16	.000	1.000	.000
> RM 1.75 b	4	15	.000	.000	1.000
PERFIN3					
less than 25%	1	52	.000		
more than 25%	2	10	1.000		

Dependent Variable.. ECONEXP Manage economic exposure?

	Chi-Square	df	Significance
Model Chi-Square	12.938	5	.0240

Classification Table for ECONEXP

		Predicted no	yes	Percent Correct
		n	y	
Observed				
no	n	24	10	70.59%
yes	y	12	16	57.14%
			Overall	64.52%

Variables in the Equation

Variable	B	S.E.	Wald	df	Sig	R	Exp(B)
ASSET4			5.6340	3	.1308	.0000	
ASSET4(1)	.4871	.7970	.3736	1	.5411	.0000	1.6276
ASSET4(2)	.9273	.8172	1.2876	1	.2565	.0000	2.5276
ASSET4(3)	-1.4036	.9981	1.9775	1	.1597	.0000	.2457
PERFIN3(1)	2.0129	.9817	4.2045	1	.0403	.1607	7.4847
VSIZE3	1.0445	.4671	5.0003	1	.0253	.1875	2.8421
Constant	-2.8296	1.2411	5.1977	1	.0226		

Examining the fitted linear relationship between total assets and the logit of managing economic exposure:

Total assets (RM b)	Predictor	Cases	Coefficient	Logit
0.0001 – 0.2000	constant	15	-2.8296	-2.8296 *
0.2001 – 0.5400	ASSET4(1)	16	0.4871	-2.3425 **
0.5401 – 1.7500	ASSET4(2)	16	0.9273	-1.9023 **
1.7501 & greater	ASSET4(3)	15	-1.4036	-4.2332 **

*Logit = $\text{Coefficient}_{(\text{constant})}$; **Logit = Coefficient + $\text{Coefficient}_{(\text{constant})}$

Compare the logits from the above model (categorised) with those derived from the fitted model (fitted)

Assets (RM b)	Categorised	Fitted	Assets (RM b)	Categorised	Fitted
0.0001	-2.83	-2.09	0.2000	-2.83	-2.15
0.2001	-2.34	-2.15	0.5400	-2.34	-2.24
0.5401	-1.90	-2.24	1.7500	-1.90	-2.58
1.7501	-4.23	-2.58	18.0210	-4.23	-7.14

The plot (see Graph 3A) appears to suggest that the relationship between ASSETS_B and the logit of ECONEXP may not be linear. The plot appears to show rather distinct disparities between the fitted and categorised models. However, the removal of the linearity constraint (the categorised model) does not significantly increase model fit and it reduces prediction accuracy. Further, the categorised model does not change the predictor effects drastically. Moreover, the categorised predictor, ASSET4, is not significant. Therefore, at least for the sake of parsimony, the relationship of ASSETS_B on the logit of ECONEXP can be assumed reasonably to be linear.

	Value	Freq	Parameter Coding (1)	(2)	(3)	(4)
VSIZE						
very small	1	11	.000	.000	.000	.000
small	2	15	1.000	.000	.000	.000
moderate	3	16	.000	1.000	.000	.000
large	4	13	.000	.000	1.000	.000
very large	5	7	.000	.000	.000	1.000
PERFIN3						
less than 25%	1	52	.000			
more than 25%	2	10	1.000			

Dependent Variable.. ECONEXP Manage economic exposure?

	Chi-Square	df	Significance
Model Chi-Square	11.836	6	.0657

Classification Table for ECONEXP

		Predicted no	yes	Percent Correct
		n	y	
Observed				
no	n	28	6	82.35%
yes	y	14	14	50.00%
			Overall	67.74%

Variables in the Equation

Variable	B	S.E.	Wald	df	Sig	R	Exp(B)
ASSETS_B	-.2902	.1397	4.3150	1	.0378	-.1647	.7481
PERFIN3(1)	2.6605	1.1754	5.1230	1	.0236	.1913	14.3033
VSIZE			4.6081	4	.3299	.0000	
VSIZE(1)	.7917	.9288	.7265	1	.3940	.0000	2.2071
VSIZE(2)	.5842	.9204	.4028	1	.5256	.0000	1.7936
VSIZE(3)	1.8746	1.0155	3.4078	1	.0649	.1284	6.5182
VSIZE(4)	1.6110	1.0751	2.2455	1	.1340	.0536	5.0080
Constant	-1.0053	.7403	1.8439	1	.1745		

Examining the fitted linear relationship between perceived exposure volume and the logit of managing economic exposure:

Value	Perceived exposure	Predictor	Cases	Coefficient	Logit
1	very small	constant	11	-1.0053	-1.0053 *
2	small	VSIZE(1)	15	0.7917	-0.2136 **
3	moderate	VSIZE(2)	16	0.5842	-0.4211 **
4	large	VSIZE(3)	13	1.8746	0.8693 **
5	very large	VSIZE(4)	7	1.6110	0.6057 **

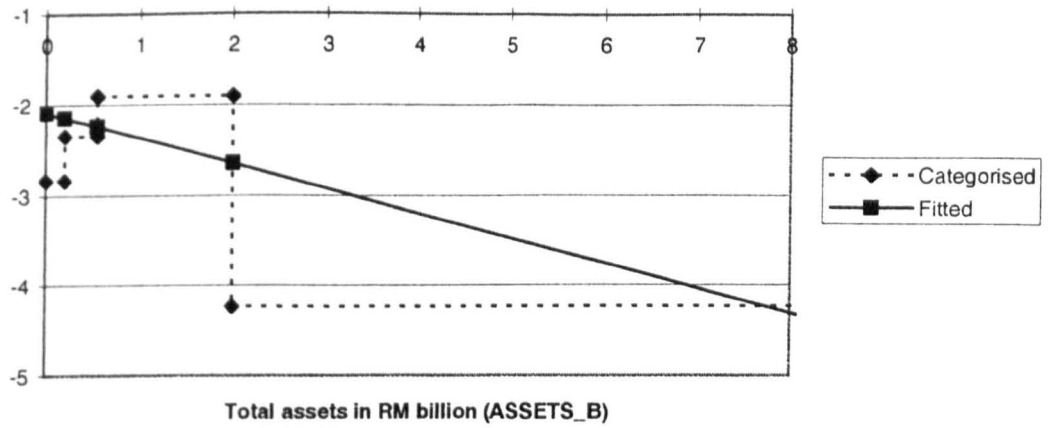
*Logit = $\text{Coefficient}_{(\text{constant})}$; **Logit = Coefficient + $\text{Coefficient}_{(\text{constant})}$

Compare the logits from the above model (categorised) with those derived from the fitted model (fitted)

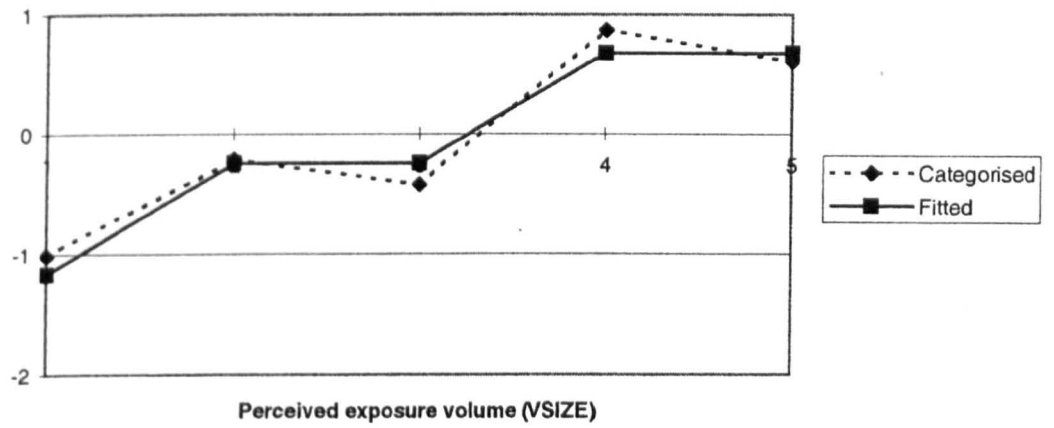
Perceived exposure size	1	2	3	4	5
Categorised	-1.01	-0.21	-0.42	0.87	0.61
Fitted	-1.17	-0.25	-0.25	0.67	0.67

The plot (see Graph 3B) shows that the fitted model closely traces the trend shown by the categorised model. However, the removal of the linearity constraint (the categorised model) does not improve model fit significantly and leaves prediction accuracy unchanged. Further, the categorised model does not drastically change the other predictor effects. In fact, the categorised predictor, VSIZE, is not significant. Incorporating the original variable, VSIZE, as a continuous variable (rather than as a categorised variable) in the model instead of VSIZE3, yields poorer model fit and predictor effects (not shown above). Therefore, the effect of VSIZE3 on the logit of ECONEXP can be assumed to be linear.

Graph 3A: Logit of managing economic exposure



Graph 3B: Logit of managing economic exposure



Appendix J-4: The fitted model for predicting a company's likelihood of managing transaction exposure

```
Number of selected cases:                    67
Number rejected because of missing data:     3
Number of cases included in the analysis:    64
```

The number of cases per predictor in the model is 32 (64÷2) which is very much greater than the required minimum of 15, and therefore, the statistical analyses arising from this model should be reliable.

```
                                    Parameter
                    Value   Freq    Coding
                                      (1)
STABLE1
 no                     1     10     .000
 yes                    2     54    1.000

Dependent Variable..   TRANEXP    Manage transaction exposure?

-2 Log Likelihood    29.925332
* Constant is included in the model.

 -2 Log Likelihood          17.372
 Goodness of Fit            20.972

                     Chi-Square     df Significance
 Model Chi-Square        12.553      2         .0019
```

G_M =12.553, is statistically significant. This means that the reduction in the badness of fit due to the inclusion of the two predictors into the model is statistically significant.

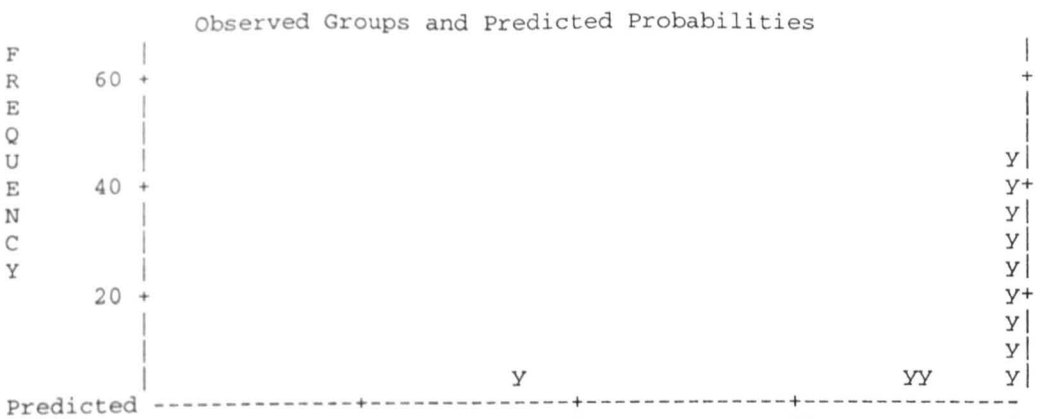
R_L^2 = 12.553 ÷ (29.925332) = 0.4195. This means that there is about 41.95% reduction in the badness of fit of the model due to the inclusion of the predictors. This is substantively significant.

```
Classification Table for TRANEXP
                      Predicted
                    no        yes      Percent Correct
                      n   |     y
Observed          +-------+-------+
   no       n     |     2 |     2 |     50.00%
                  +-------+-------+
   yes      y     |     2 |    58 |     96.67%
                  +-------+-------+
                            Overall     93.75%
```

Model errors = 4, whereas chance errors = 4. Therefore, λ_p = (4-4) ÷ 4 = 0. This means that, despite the inclusion of the predictors, there is no reduction in the number of prediction errors.

```
---------------------- Variables in the Equation -----------------------
Variable            B        S.E.      Wald     df       Sig        R     Exp(B)
STABLE1(1)     4.5860      1.8782    5.9619      1      .0146    .3639   98.0972
RISK3          2.2417      1.2193    3.3804      1      .0660    .2148    9.4097
Constant      -4.7525      3.0245    2.4691      1      .1161
```

The Wald statistic p-value of STABLE1 is significant but that of RISK3 is not significant. However, the more accurate Likelihood Ratio (LR) test, given below, ought to be consulted.



---------- Model if Term Removed ----------

Term Removed	Log Likelihood	-2 Log LR	df	Significance of Log LR
STABLE1	-13.929	10.486	1	.0012
RISK3	-11.088	4.804	1	.0284

Both predictors' Likelihood Ratio tests are less than 0.05. This means that both the predictors are significant in contributing to the model fit, and therefore, the predictors are both important.

Calculating the standardised coefficients of the fitted model

* * * * M U L T I P L E R E G R E S S I O N * * * *

Equation Number 1 Dependent Variable.. TRANEXP Manage transaction exposur

Variable(s) Entered on Step Number
1.. PGR_4 Predicted Group

Multiple R	.46667
R Square	.21778
Adjusted R Square	.20516
Standard Error	.21751

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	1	.81667	.81667
Residual	62	2.93333	.04731

F = 17.26136 Signif F = .0001

Variable	Std Dev	Valid N	Label
STABLE1	.37	64	Percentages stable?
RISK3	.69	64	Re-categorised risk variable
LOGIT4	2.22	64	Natural log odds on managing transaction

The calculation of standardised coefficients:

Predictor	Coefficient		Predictor Std Dev		Correlation Coefficient		Logit Std Dev		Standardised Coefficient
STABLE1	4.5860	×	0.37	×	0.46667	÷	2.22	=	0.3567
RISK3	2.2417	×	0.69	×	0.46667	÷	2.22	=	0.3251

The standardised coefficients are greater than 0.05, in absolute terms. Therefore, both the predictors have effects on the logit of TRANEXP that are substantively significant. The results indicate that STABLE1, followed by RISK3, in that descending order, are important, in terms of their relative impact on the logit of TRANEXP.

Testing the model for multicollinearity

```
          * * * *  M U L T I P L E  R E G R E S S I O N  * * * *

Equation Number 1    Dependent Variable..   TRANEXP   Manage
transaction exposur

Variable(s) Entered on Step Number
   1..     RISK3      Re-categorised risk variable
   2..     STABLE1    Percentages stable?

-- Variables in the Equation ---
Variable    Tolerance         VIF
STABLE1       .997186       1.003
RISK3         .997186       1.003
```

Both predictors' tolerance statistics are greater than 0.20. Therefore, multicollinearity is not present in this model.

Cases with abnormal residual measures, and their predictor values

	ZRE_4	SRE_4	LEV_4	DBETA4	CHISCH4	DMCH4
6	-2.68145*	-2.19134*	.12414	1.16*	8.21*	4.80*
18	1.14398	1.45377	.20823*	.43	1.65	2.11
28	1.14398	1.45377	.20823*	.43	1.65	2.11
30	-.87414	-1.19745	.20823*	.25	.97	1.43
44	-.87414	-1.19745	.20823*	.25	.97	1.43
100	-2.82243*	-2.23439*	.12130	1.25*	9.07*	4.99*

	STABLE1	RISK	RISK3	PRE_4	PGR_4	TRANEXP
6	1	4	3	.87790	2	1
18	1	2	2	.43315	1	2
28	1	2	2	.43315	1	2
30	1	2	2	.43315	1	1
44	1	2	2	.43315	1	1
100	2	1	1	.88847	2	1

The asterisks denote cases that have unusual residual measures. Cases 100 and 6 seem to be poor-fitting. The removal of either of these cases increases model fit and prediction accuracy slightly. The removal of case 6 increases the predictor effects, but reduces drastically the effect's significance due to the resultant problem of complete separation. Cases 18, 28, 30 and 44, appear to have disproportionate influence on the model parameter estimates. However, the removal of cases 18, or 28, does not significantly change the predictor effects. On the other hand, the removal case 30, or 44, reduces the effect of RISK3 and makes it insignificant. Likewise, the removal of case 100 also appears to make RISK3 insignificant. Nonetheless, there is no compelling reason to remove any of the above cases. Therefore, the model appears to be acceptable.

Validity of fitted predictor relationship with the logit of the dependent variable

	Value	Freq	Parameter Coding (1)	(2)	(3)	(4)
RISK						
very low	1	7	.000	.000	.000	.000
low	2	17	1.000	.000	.000	.000
moderate	3	15	.000	1.000	.000	.000
high	4	17	.000	.000	1.000	.000
very high	5	8	.000	.000	.000	1.000
STABLE1						
no	1	10	.000			
yes	2	54	1.000			

Dependent Variable.. TRANEXP Manage transaction exposure?

	Chi-Square	df	Significance
Model Chi-Square	14.819	5	.0112

Classification Table for TRANEXP

		Predicted no	Predicted yes	Percent Correct
		n	y	
Observed				
no	n	0	4	.00%
yes	y	0	60	100.00%
			Overall	93.75%

Variables in the Equation

Variable	B	S.E.	Wald	df	Sig	R	Exp(B)
STABLE1(1)	12.1803	98.7238	.0152	1	.9018	.0000	194918.0
RISK			.2108	4	.9948	.0000	
RISK(1)	10.3886	98.7282	.0111	1	.9162	.0000	32486.33
RISK(2)	21.1767	184.3049	.0132	1	.9085	.0000	1.57E+09
RISK(3)	11.0817	98.7319	.0126	1	.9106	.0000	64972.66
RISK(4)	21.1084	234.4980	.0081	1	.9283	.0000	1.47E+09
Constant	-10.3886	98.7297	.0111	1	.9162		

Examining the fitted linear relationship between perceived level of foreign exchange risk and the logit of managing transaction exposure:

Value	Label	Predictor	Cases	Coefficient	Logit	
1	very small	constant	7	-10.3886	-10.3886	*
2	small	RISK(1)	17	10.3886	0.0000	**
3	moderate	RISK(2)	15	21.1767	10.7881	**
4	high	RISK(3)	17	11.0817	0.6931	**
5	very high	RISK(4)	8	21.1084	10.7198	**

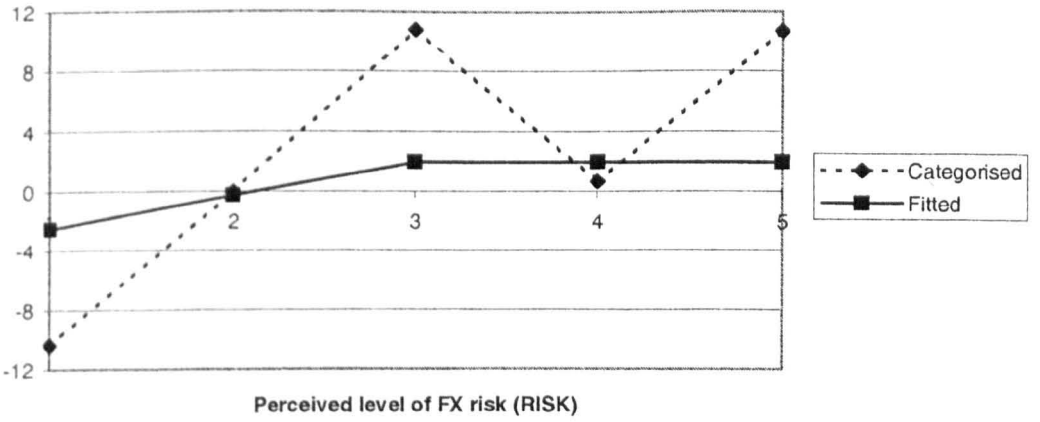
*Logit = $\text{Coefficient}_{(\text{constant})}$; **Logit = Coefficient + $\text{Coefficient}_{(\text{constant})}$

Compare the logits from the above model (categorised) with those derived from the fitted model (fitted)

Risk level	1	2	3	4	5
Categorised	-10.39	0.00	10.79	0.69	10.72
Fitted	-2.51	-0.27	1.97	1.97	1.97

The plot (see Graph 4A) appears to show some discrepancies between the fitted model and the categorised model. However, the removal of the linearity constraint (the categorised model) fails to increase the model fit significantly. Neither does it increase the prediction accuracy. Further, the categorised model does not increase the effect of STABLE1. Moreover, the categorised predictor, RISK, is not significant. Finally, the incorporation of RISK as a continuous predictor (not shown above) reduces model fit and the RISK predictor is not significant. Therefore, the relationship of RISK3 on the logit of TRANEXP can be reasonably assumed to be linear, at least for the sake of parsimony.

Graph 4A: Logit of managing transaction exposure



Appendix J-5: The fitted model for predicting a company's likelihood of managing all three types of exposure

```
Number of selected cases:                  106
Number rejected because of missing data:   10
Number of cases included in the analysis:  96
```

The number of cases per predictor is 24.00 (96÷4). This is greater than the required minimum of 15. This implies that the statistical analyses arising from this model are reliable.

	Value	Freq	Parameter Coding (1)
STABLE1			
no	1	16	.000
yes	2	80	1.000
PERFIN3			
less than 25%	1	83	.000
more than 25%	2	13	1.000

Dependent Variable.. USE3 Number of Exposure Types Managed

-2 Log Likelihood 83.212584
* Constant is included in the model.

-2 Log Likelihood	58.455
Goodness of Fit	257.311

	Chi-Square	df	Significance
Model Chi-Square	24.758	4	.0001

G_M of 24.758, with 4 degrees of freedom, is statistically significant. In other words, there is statistically significant improvement in the model fit due to the incorporation of the four predictors.

R_L^2 = 24.758÷ (83.212584) = 0.2975. This shows that there is a reduction in the badness-of-fit, of about 29.75%, due to the inclusion of the four predictors. The proportional reduction can be considered to be substantively significant.

Classification Table for USE3

		Predicted: two or less (1)	Predicted: three (2)	Percent Correct
Observed				
two or less	1	80	1	98.77%
three	2	8	7	46.67%
			Overall	90.63%

Model errors = 8+1 = 9. Chance errors = 15. Therefore, λ_p = (15-9)÷15 = 0.4000. This shows that there is a 40.00% reduction in the number of prediction errors due to the inclusion of the four predictors. This is substantively significant.

The binomial d statistic = (15-9) ÷ $\sqrt{[(15\div96)\times(96-15)]}$ = 1.6865. This has a p-value of 0.0458. This shows that the reduction in the number of prediction errors is statistically significant.

```
---------------------- Variables in the Equation -----------------------
Variable            B        S.E.      Wald     df       Sig        R    Exp(B)
ASSETS_B         -.3851      .1947    3.9103      1     .0480  -.1515     .6804
PERFIN3(1)       3.3808     1.0314   10.7454      1     .0010   .3242   29.3953
STABLE1(1)       2.8692     1.4597    3.8635      1     .0493   .1496   17.6231
VSIZE             .9142      .3004    9.2599      1     .0023   .2954    2.4947
Constant        -7.1498     1.9824   13.0072      1     .0003
```

Wald statistic p-values of all the four predictors are less than 0.05. This means that all the predictor effects on the logit of USE3 are statistically significant.

```
          Observed Groups and Predicted Probabilities
          | 1                                                          |
F         | 1                                                          |
R      24 + 1                                                          +
E         | 1                                                          |
Q         | 1                                                          |
U         | 1                                                          |
E      16 + 1                                                          +
N         |21                                                          |
C         |11                                                          |
Y         |11 1                                                        |
        8 +11 11                                                       +
          |11 11                2                                     |
          |11 11     1          1                                     |
          |11111111111    2121 11111    2 122  2             2    2   |
Predicted ---------------+--------------+--------------+---------------
  Prob:   0              .25            .5             .75             1
  Group:  11111111111111111111111111111122222222222222222222222222222
          Predicted Probability is of Membership for three
          Symbols: 1 - two or less
                   2 - three
          Each Symbol Represents 2 Cases.
```

```
----------------- Model if Term Removed ------------------
Term          Log                                 Significance
Removed       Likelihood     -2 Log LR     df     of Log LR
ASSETS_B         -32.764         7.074      1           .0078
PERFIN3          -35.868        13.281      1           .0003
STABLE1          -32.132         5.809      1           .0159
VSIZE            -34.999        11.543      1           .0007
```

Calculating the standardised coefficients of the fitted model

```
            * * * *   M U L T I P L E   R E G R E S S I O N   * * * *

Equation Number 1     Dependent Variable..   USE3   Number of Exposure
Types Mana

Variable(s) Entered on Step Number
   1..     PGR_5     Predicted Group

Multiple R              .59685
R Square                .35623
Adjusted R Square       .34938
Standard Error          .29441

Analysis of Variance
                    DF        Sum of Squares        Mean Square
Regression           1              4.50852           4.50852
Residual            94              8.14773            .08668
F =       52.01464        Signif F =  .0000
```

Variable	Std Dev	Valid N	Label
ASSETS_B	2.67	96	Total assets (billion RM)
PERFIN3	.34	96	Financing in FC
STABLE1	.37	96	Percentages stable?
VSIZE	1.31	96	Size of FX Exposure Volume
LOGIT5	1.81	96	Natural log odds on managing all 3 types

Calculating standardised coefficients:

Predictor	Coefficient		Predictor Std Dev		Correlation Coefficient		Logit Std Dev		Standardised Coefficient
ASSETS_B	-0.3851	×	2.67	×	0.59685	÷	1.81	=	-0.3391
PERFIN3	3.3808	×	0.34	×	0.59685	÷	1.81	=	0.3790
STABLE1	2.8692	×	0.37	×	0.59685	÷	1.81	=	0.3501
VSIZE	0.9142	×	1.31	×	0.59685	÷	1.81	=	0.3949

All the standardised coefficients are greater, in absolute value, than 0.05. Therefore, all the predictors' effects on the logit of USE3 are substantively significant. The predictors in descending order of impact on the logit of USE3 are VSIZE, PERFIN3, STABLE1, and ASSETS_B.

Testing the model for multicollinearity

```
          * * * *  M U L T I P L E  R E G R E S S I O N  * * * *

Equation Number 1     Dependent Variable..   USE3   Number of Exposure
Types Mana

Variable(s) Entered on Step Number
   1..     VSIZE      Size of FX Exposure Volume
   2..     STABLE1    Percentages stable?
   3..     PERFIN3    Financing in FC
   4..     ASSETS_B   Total assets (billion RM)

-- Variables in the Equation ---
Variable    Tolerance         VIF
ASSETS_B      .735629       1.359
PERFIN3       .766356       1.305
STABLE1       .957385       1.045
VSIZE         .934266       1.070
```

The tolerance statistics of all the four predictors are greater than 0.20. Therefore, multicollinearity is not a problem in the model.

Cases with abnormal residual measures, and their predictor values

	ZRE_5	SRE_5	LEV_5	DBETA5	CHISCH5	DMCH5
15	3.45065*	2.28693*	.02190	.27	12.17*	5.23*
29	-.80166	-1.25732	.37210*	.61	1.02	1.58
45	2.57220*	2.03478*	.01927	.13	6.75*	4.14*
48	-.83133	-1.30248	.38061*	.69	1.12	1.70
64	14.46400*	3.29063*	.01220	2.61*	211.79*	10.83*
82	-.36107	-.59930	.31758*	.09	.19	.36
99	2.29480*	1.93773	.02250	.12	5.39*	3.75

	ASSETS_B	PERFIN3	STABLE1	VSIZE	PRE_5	PGR_5	USE3
15	.0646	1	2	2	.07748	1	2
29	.8565	2	1	4	.39123	1	1
45	.9126	1	2	3	.13130	1	2
48	.6678	2	1	4	.40867	1	1
64	.0568	1	1	2	.00476	1	2
82	12.4496	2	2	4	.11534	1	1
99	.3199	1	2	3	.15959	1	2

The asterisks denote residual measures that are unusual. Cases 64, 15, 45, and 99 are poor-fitting. Removing case 64 improves model fit and prediction accuracy considerably. It also increases the effects of all predictors. However, the (Wald) statistic significance for STABLE1 is reduced drastically because of the problem of zero cells. Other poor-fitting cases, e.g., 15, 45, and 99, when removed, also have similar but less pronounced impact on model fit, prediction accuracy and predictor effects. On the other hand, cases 48, 29, and 82 appear to have disproportionate influence on model parameter estimates. The removal of cases 48 or 29 reduces the effect and significance of STABLE1, whereas, the removal of case 82 reduces the effect and significance of ASSETS_B. Overall, however, there is no compelling reason to remove any of these cases. Therefore, generally, the model appears to be reasonable.

Validity of fitted predictor relationship with the logit of the dependent variable

	Value	Freq	Parameter Coding (1)	(2)	(3)
ASSET4					
small (<175m)	1	24	.000	.000	.000
moderate (<510m)	2	24	1.000	.000	.000
large (<1.05b)	3	24	.000	1.000	.000
very large (>1.05b)	4	24	.000	.000	1.000
STABLE1					
no	1	16	.000		
yes	2	80	1.000		
PERFIN3					
less than 25%	1	83	.000		
more than 25%	2	13	1.000		

Dependent Variable.. USE3 Number of Exposure Types Managed

	Chi-Square	df	Significance
Model Chi-Square	20.465	6	.0023

Classification Table for USE3

		Predicted two or less 1	three 2	Percent Correct
Observed				
two or less	1	79	2	97.53%
three	2	10	5	33.33%
			Overall	87.50%

---------- Variables in the Equation ----------

Variable	B	S.E.	Wald	df	Sig	R	Exp(B)
ASSET4			2.6295	3	.4523	.0000	
ASSET4(1)	-.8367	1.0686	.6132	1	.4336	.0000	.4331
ASSET4(2)	-1.0186	.9515	1.1461	1	.2844	.0000	.3611
ASSET4(3)	-1.5563	.9898	2.4724	1	.1159	-.0753	.2109
PERFIN3(1)	2.5290	.8882	8.1064	1	.0044	.2709	12.5406
STABLE1(1)	1.9321	1.2665	2.3274	1	.1271	.0627	6.9041
VSIZE	.6971	.2793	6.2307	1	.0126	.2255	2.0079
Constant	-5.1488	1.7615	8.5440	1	.0035		

Examining the fitted linear relationship between the total assets (in RM billion) and the logit of managing all three types of exposure:

Total assets (RM b)	Predictor	Cases	Coefficient	Logit
0.0000 – 0.1750	constant	24	-5.1488	-5.1488 *
0.1751 – 0.5100	ASSET4(1)	24	-0.8367	-5.9855 **
0.5101 – 1.0500	ASSET4(2)	24	-1.0186	-6.1674 **
1.0501 & greater	ASSET4(3)	24	-1.5563	-6.7051 **

*Logit = $\text{Coefficient}_{(\text{constant})}$; **Logit = Coefficient + $\text{Coefficient}_{(\text{constant})}$

Compare the logits from the above model (categorised) with those derived from the fitted model (fitted)

Total assets	Categorised	Fitted	Total assets	Categorised	Fitted
0.0000	-5.15	-7.15	0.1750	-5.15	-7.22
0.1751	-5.99	-7.22	0.5100	-5.99	-7.35
0.5101	-6.17	-7.35	1.0500	-6.17	-7.55
1.0501	-6.70	-7.55	18.0210	-6.70	14.09

The plot (see Graph 5A) appears to suggest that the relationship between ASSETS_B and the logit of USE3 is approximately linear although there are some slight discrepancies between the fitted and the categorised models. However, the removal of the linearity constraint (the categorised model) reduces model fit, and prediction accuracy, and all the other predictor effects. Moreover, the categorised predictor, ASSET4, is not significant. Therefore, the effect of ASSETS_B on the logit of USE3 can be assumed to be linear, at least, for the sake of parsimony.

	Value	Freq	Parameter Coding (1)	(2)	(3)	(4)
VSIZE						
very small	1	29	.000	.000	.000	.000
small	2	22	1.000	.000	.000	.000
moderate	3	19	.000	1.000	.000	.000
large	4	19	.000	.000	1.000	.000
very large	5	7	.000	.000	.000	1.000
STABLE1						
no	1	16	.000			
yes	2	80	1.000			
PERFIN3						
less than 25%	1	83	.000			
more than 25%	2	13	1.000			

Dependent Variable.. USE3 Number of Exposure Types Managed

	Chi-Square	df	Significance
Model Chi-Square	30.379	7	.0001

Classification Table for USE3

Observed		Predicted: two or less (1)	Predicted: three (2)	Percent Correct
two or less	1	81	0	100.00%
three	2	10	5	33.33%
			Overall	89.58%

Variables in the Equation

Variable	B	S.E.	Wald	df	Sig	R	Exp(B)
ASSETS_B	-.4926	.2560	3.7034	1	.0543	-.1431	.6110
PERFIN3(1)	4.1492	1.4801	7.8591	1	.0051	.2654	63.3845
STABLE1(1)	3.2369	1.7553	3.4007	1	.0652	.1297	25.4537
VSIZE			2.0607	4	.7246	.0000	
VSIZE(1)	9.5009	27.0133	.1237	1	.7251	.0000	13371.92
VSIZE(2)	9.9403	27.0071	.1355	1	.7128	.0000	20750.86
VSIZE(3)	10.2653	27.0098	.1444	1	.7039	.0000	28717.91
VSIZE(4)	11.0839	27.0251	.1682	1	.6817	.0000	65116.74
Constant	-14.3048	27.0961	.2787	1	.5975		

Examining the fitted linear relationship between the perceived size of exposure volume and the logit of managing all three types of exposure:

Value	Exposure	Predictor	Cases	Coefficient	Logit
1	very small	constant	29	-14.3048	-14.3048 *
2	small	VSIZE(1)	22	9.5009	-4.8039 **
3	moderate	VSIZE(2)	19	9.9403	-4.3645 **
4	large	VSIZE(3)	19	10.2653	-4.0395 **
5	very large	VSIZE(4)	7	11.0839	-3.2209 **

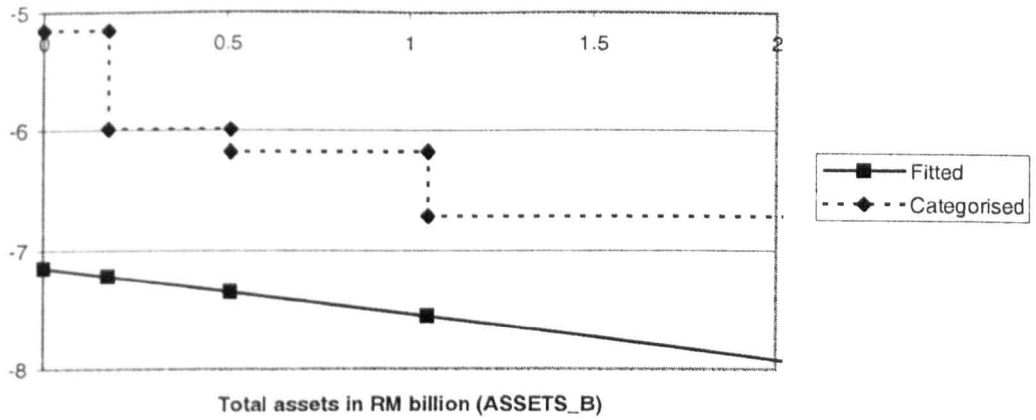
*Logit = $\text{Coefficient}_{(\text{constant})}$; **Logit = Coefficient + $\text{Coefficient}_{(\text{constant})}$

Compare the logits from the above model (categorised) with those derived from the fitted model (fitted)

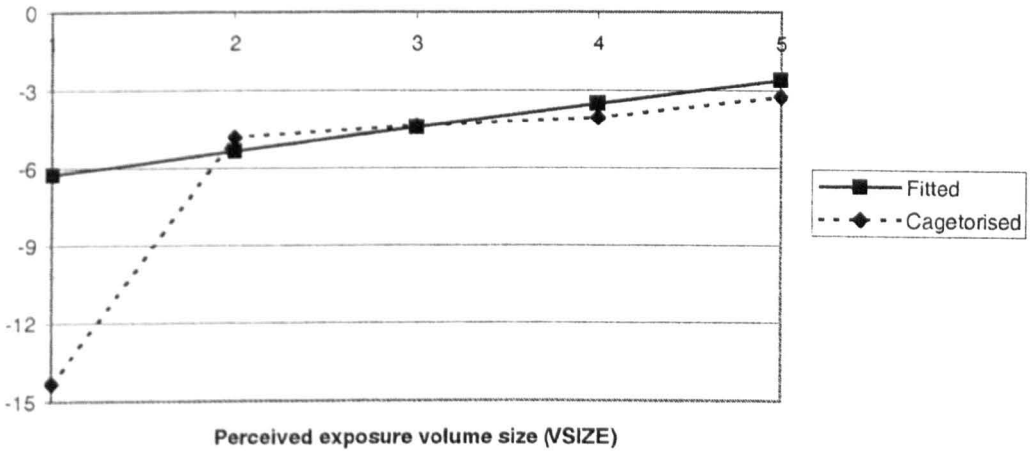
Perceived size	1	2	3	4	5
Categorised	-14.30	-4.80	-4.36	-4.04	-3.22
Fitted	-6.24	-5.32	-4.41	-3.49	-2.58

The plot (see Graph 5B) appears to suggest that the relationship between VSIZE and the logit of USE3 is almost linear. It, however, appears to show a clear discrepancy between the fitted and categorised models when the perceived exposure size is very small. However, this is due to the problem of zero cells – there was no case (company) that perceived very small exposure but managed all 3 types of exposure. The removal of the linearity constraint (the categorised model) does not increase model fit significantly, and it reduces prediction accuracy. Further, the categorised model reduces the significance of all the other predictor effects, although it increases the predictor effects themselves. Moreover, the categorised predictor, VSIZE, is not significant. Therefore, for the sake of parsimony, the relationship of VSIZE on the logit of USE3 can be reasonably assumed to be linear.

Graph 5A: Logit of managing all 3 types of exposure



Graph 5B: Logit of managing all 3 types of exposure



Appendix J-6: The fitted model for predicting a company's likelihood of adopting formal FERM objective

```
Number of selected cases:                    67
Number rejected because of missing data:     4
Number of cases included in the analysis:    63
```

The number of cases per predictor is 15.75 (63÷4). This is only slightly greater than the required minimum of 15. This implies that the statistical analyses arising from this model are generally expected to be reliable.

	Value	Freq	Parameter Coding (1)
MINTRACO			
no	1	47	.000
yes	2	16	1.000

Dependent Variable.. OBJTYPE1 Have formal FERM Objective?

-2 Log Likelihood 66.742981
* Constant is included in the model.

-2 Log Likelihood	37.898
Goodness of Fit	50.232

	Chi-Square	df	Significance
Model Chi-Square	28.845	4	.0000

G_M of 28.845, with 4 degrees of freedom is statistically significant. In other words, there is statistically significant improvement in the model fit due to the incorporation of the four predictors.

$R_L^2 = 28.845 \div (66.742981) = 0.4322$. This shows that there is a reduction in the badness-of-fit, of about 43.22%, due to the inclusion of the four predictors. Therefore, the proportional reduction is substantively significant.

Classification Table for OBJTYPE1

		Predicted no	Predicted yes	Percent Correct
		n	y	
Observed				
no	n	48	1	97.96%
yes	y	5	9	64.29%
			Overall	90.48%

Model errors = 5+1 = 6. Chance errors = 14. Therefore, $\lambda_p = (14-6) \div 14 = 0.5714$. This shows that there is a 57.14% reduction in the number of prediction errors due to the inclusion of the four predictors. This is substantively significant.

The binomial d statistic = $(14-6) \div \sqrt{[(14 \div 63) \times (63-14)]} = 2.4244$. This has a p-value of 0.0077. This shows that the reduction in the number of prediction errors is also statistically significant.

```
---------------------- Variables in the Equation -----------------------
Variable            B        S.E.      Wald     df      Sig        R    Exp(B)
ASSETS_B          1.1297      .5344    4.4689     1     .0345    .1923   3.0948
SALES_B           1.4352      .5841    6.0376     1     .0140    .2460   4.2005
MINTRACO(1)      -7.6954     3.9530    3.7897     1     .0516   -.1638    .0005
DEBT_B           -2.1690      .8516    6.4874     1     .0109   -.2593    .1143
Constant         -2.5031      .6142   16.6083     1     .0000
```

Wald statistic p-values of almost all of the four predictors are less than 0.05, except for the predictor MINTRACO. However, although the Wald statistic significance value for the predictor MINTRACO is more than 0.05, the more accurate LR test (below) must be consulted to determine its true significance.

```
              Observed Groups and Predicted Probabilities
           |n                                                          |
F          |n                                                          |
R       12 +n                                                         +
E          |n                                                          |
Q          |n    y                                                     |
U          |n    y                                                     |
E        8 +n    n                                                     +
N          |n   nn                                                     |
C          |n   nn                                                     |
Y          |n   nn                                                     |
         4 +n   nny y                                                  +
           |n   nnn n       n                                         |
           |n   nnnnn       n                              y y   y    |
           |n  nnnnnnnnn n nnn y     n              yy      y n   yy   y|
Predicted ---------------+--------------+--------------+---------------
  Prob:    0             .25            .5             .75             1
  Group:   nnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyy
           Predicted Probability is of Membership for yes
           Symbols: n - no
                    y - yes
           Each Symbol Represents 1 Case.
```

```
----------------- Model if Term Removed ------------------
Term          Log                                Significance
Removed       Likelihood     -2 Log LR     df    of Log LR
ASSETS_B        -21.822          5.747      1          .0165
SALES_B         -23.151          8.404      1          .0037
MINTRACO        -24.060         10.222      1          .0014
DEBT_B          -23.961         10.024      1          .0015
```

The LR test's significance values for all the predictors, including MINTRACO, are less than 0.05. This means that all the predictors are statistically significant. Thus, all the four predictors are important in modelling the logit of OBJTYPE1.

Calculating the standardised coefficients of the fitted model

```
            * * * *   M U L T I P L E   R E G R E S S I O N   * * * *

Equation Number 1     Dependent Variable..   OBJTYPE1   Have formal
FERM Objectiv

Variable(s) Entered on Step Number
   1..     PGR_6      Predicted Group

Multiple R              .70815
R Square                .50148
Adjusted R Square       .49331
Standard Error          .29831
```

```
Analysis of Variance
                    DF        Sum of Squares        Mean Square
Regression           1               5.46059            5.46059
Residual            61               5.42830             .08899
F =       61.36280       Signif F =  .0000
```

```
                    Valid
Variable    Std Dev     N  Label
ASSETS_B       3.18    63  Total assets (billion RM)
SALES_B        1.22    63  Total sales (billion RM)
MINTRACO        .44    63  Moderate level of intra-company transact
DEBT_B         1.76    63  Total debt (billion RM)
LOGIT6         3.93    63  Natural log odds on adopting formal obje
```

Calculating standardised coefficients:

Predictor	Coefficient		Predictor Std Dev		Correlation Coefficient		Logit Std Dev	Standardised Coefficient
ASSETS_B	1.1297	×	3.18	×	0.70815	÷	3.93 =	0.6473
SALES_B	1.4352	×	1.22	×	0.70815	÷	3.93 =	0.3155
MINTRACO	-7.6954	×	0.44	×	0.70815	÷	3.93 =	-0.6101
DEBT_B	-2.1690	×	1.76	×	0.70815	÷	3.93 =	-0.6879

The standardised coefficients are all greater than 0.05. Therefore, all the predictors' effects on the logit of OBJTYPE1 are substantively significant. The predictors in descending order of impact on the logit of OBJTYPE1 are DEBT_B, ASSETS_B, MINTRACO and SALES_B.

Testing the model for multicollinearity

```
          * * * *  M U L T I P L E  R E G R E S S I O N  * * * *

Equation Number 1     Dependent Variable..    OBJTYPE1    Have formal
FERM Objectiv

Variable(s) Entered on Step Number
   1..     DEBT_B     Total debt (billion RM)
   2..     MINTRACO   Moderate level of intra-company transact
   3..     SALES_B    Total sales (billion RM)
   4..     ASSETS_B   Total assets (billion RM)

-- Variables in the Equation ---
Variable    Tolerance          VIF
ASSETS_B      .116374        8.593
SALES_B       .272790        3.666
MINTRACO      .969790        1.031
DEBT_B        .149416        6.693
```

The tolerance statistics of two predictors, ASSETS_B and DEBT_B are less than 0.20. These and another predictor, SALES_B, appear to be highly correlated to one another. Therefore, there is multicollinearity in the model involving mainly these three predictors. However, although ASSETS_B and DEBT_B variables are positively correlated, the relevant predictor effects are contrasted in the direction of their impact on the logit of OBJTYPE1. Moreover, the predictors' estimated standard errors are not uncharacteristically large. On the other hand, although ASSETS_B and SALES_B are positively correlated and the relevant predictor coefficients are similar in the direction of impact on the logit of OBJTYPE1, the standard error estimates of the two predictors are not uncharacteristically large either. Furthermore, the tolerance statistic of SALES_B is greater than 0.20. All these points indicate that, although the problem of multicollinearity exists, the problem may not be serious enough to warrant the dismissal of the model.

Cases with abnormal residual measures, and their predictor values

	ZRE_6	SRE_6	LEV_6	DBETA6	CHISCH6	DMCH6
5	2.89859*	2.14784*	.02848	.25	8.65*	4.61*
15	3.30422*	2.25703*	.02711	.31	11.22*	5.09*
31	2.44025*	2.00029*	.03056	.19	6.14*	4.00*
52	3.09280*	2.20303*	.02847	.29	9.85*	4.85*
80	-.30858	-.68008	.60669*	.37	.24	.46
82	-.60801	-1.38510	.67207*	2.31*	1.13	1.92
92	-.59344	-1.11752	.51682*	.78*	.73	1.25
101	-2.34563*	-2.09499*	.14691	1.11*	6.45*	4.39*
102	.31054	.69368	.61735*	.41	.25	.48

	ASSETS_B	SALES_B	MINTRACO	DEBT_B	PRE_6	OBJTYPE1
5	.2214	.1701	1	.0552	.10636	2
15	.0646	.0796	1	.0343	.08391	2
31	.6905	.2355	1	.1841	.14378	2
52	.0640	.1708	1	.0334	.09465	2
80	5.2122	2.4750	2	.7347	.08694	1
82	12.4496	4.7801	1	8.9519	.26990	1
92	7.2167	.3191	1	3.2971	.26045	1
101	1.9405	2.4240	1	.6745	.84620	1
102	18.0210	5.2528	2	7.0816	.91205	2

The asterisks denote residual measures that are unusual. Cases 15, 52, 5, 31, and 101 are poor-fitting. However, removing any of these cases, broadly, only changes slightly some of the model characteristics. On the other hand, cases 82, 102, 80 and 92 appear to have disproportionate influence on the model parameter estimates. The removal of case 82 drastically reduces the effects and significance of predictors, DEBT_B, ASSETS_B, and MINTRACO. The removal of case 102 drastically reduces the effect and significance of ASSETS_B. The removal of case 80 reduces drastically the effect and significance of MINTRACO. The removal of case 92 reduces the effect and significance of SALES_B. However, there is no compelling reason for any of these cases to be removed. Nonetheless, this analysis indicates that the model's significance is perhaps a little too dependent on a single case – case 82.

Validity of fitted predictor relationship with the logit of the dependent variable

	Value	Freq	Parameter Coding (1)	(2)	(3)
ASSET4					
< RM 200 m	1	15	.000	.000	.000
RM 200-540 m	2	16	1.000	.000	.000
RM 540-1800 m	3	16	.000	1.000	.000
> RM 1800 m	4	16	.000	.000	1.000
MINTRACO					
no	1	47	.000		
yes	2	16	1.000		

Dependent Variable.. OBJTYPE1 Have formal FERM Objective?

	Chi-Square	df	Significance
Model Chi-Square	26.822	6	.0002

Classification Table for OBJTYPE1

		Predicted no	yes	Percent Correct
		n	y	
Observed				
no	n	47	2	95.92%
yes	y	5	9	64.29%
			Overall	88.89%

Variables in the Equation

Variable	B	S.E.	Wald	df	Sig	R	Exp(B)
ASSET4			3.4174	3	.3316	.0000	
ASSET4(1)	-.5242	1.3054	.1612	1	.6880	.0000	.5920
ASSET4(2)	-1.0746	1.3214	.6613	1	.4161	.0000	.3415
ASSET4(3)	1.5487	1.4461	1.1469	1	.2842	.0000	4.7052
SALES_B	1.2451	.7411	2.8224	1	.0930	.1110	3.4732
MINTRACO(1)	-2.4235	1.5271	2.5187	1	.1125	-.0882	.0886
DEBT_B	-.6355	.3691	2.9647	1	.0851	-.1202	.5297
Constant	-1.8075	.7686	5.5303	1	.0187		

Examining the fitted linear relationship between total assets and the logit of adopting formal FERM objective:

Total assets (RM b)	Predictor	Cases	Coefficient	Logit
0.0001 – 0.2000	constant	15	-1.8075	-1.8075 *
0.2001 – 0.5400	ASSET4(1)	16	-0.5242	-2.3317 **
0.5401 – 1.8000	ASSET4(2)	16	-1.0746	-2.8821 **
1.8001 & greater	ASSET4(3)	16	1.5487	-0.2588 **

*Logit = $\text{Coefficient}_{(\text{constant})}$; **Logit = Coefficient + $\text{Coefficient}_{(\text{constant})}$

Compare the logits from the above model (categorised) with those derived from the fitted model (fitted)

Assets (RM b)	Categorised	Fitted	Assets (RM b)	Categorised	Fitted
0.0001	-1.81	-2.50	0.2000	-1.81	-2.27
0.2001	-2.33	-2.27	0.5400	-2.33	-1.89
0.5401	-2.88	-1.89	1.8000	-2.88	-0.47
1.8001	-0.26	-0.47	18.0210	-0.26	-17.86

The plot (see Graph 6A) appears to suggest that the relationship between ASSETS_B and the logit of OBJTYPE1 may not be linear. The plot appears to show clear disparities between the fitted and categorised models. However, the removal of the linearity constraint (the categorised model) reduces model fit and prediction accuracy. Further, the categorised model reduces the other predictor effects. Moreover, the categorised predictor, ASSET4, is not significant. Therefore, at least for the sake of parsimony, the relationship of ASSETS_B on the logit of OBJTYPE1 can be reasonably assumed to be linear.

	Value	Freq	Parameter Coding (1)	(2)	(3)
SALES4					
< RM 134 m	1	15	.000	.000	.000
RM 134-275 m	2	16	1.000	.000	.000
RM 275-950 m	3	16	.000	1.000	.000
> RM 950 m	4	16	.000	.000	1.000
MINTRACO					
no	1	47	.000		
yes	2	16	1.000		

Dependent Variable.. OBJTYPE1 Have formal FERM Objective?

	Chi-Square	df	Significance
Model Chi-Square	37.117	6	.0000

Classification Table for OBJTYPE1

		Predicted no	Predicted yes	Percent Correct
		n	Y	
Observed				
no	n	48	1	97.96%
yes	y	5	9	64.29%
			Overall	90.48%

Variables in the Equation

Variable	B	S.E.	Wald	df	Sig	R	Exp(B)
ASSETS_B	2.0271	1.2896	2.4708	1	.1160	.0840	7.5919
SALES4			1.8520	3	.6037	.0000	
SALES4(1)	1.1709	1.2513	.8755	1	.3494	.0000	3.2248
SALES4(2)	-10.6206	53.2179	.0398	1	.8418	.0000	.0000
SALES4(3)	2.4029	1.8501	1.6868	1	.1940	.0000	11.0550
MINTRACO(1)	-12.0437	8.9043	1.8294	1	.1762	.0000	.0000
DEBT_B	-2.8910	1.7069	2.8688	1	.0903	-.1141	.0555
Constant	-2.6089	1.0675	5.9724	1	.0145		

Examining the fitted linear relationship between total sales and the logit of adopting formal FERM objective:

Range (RM b)	Predictor	Cases	Coefficient	Logit
0.0001 – 0.1340	constant	15	-2.6089	-2.6089 *
0.1341 – 0.2750	SALES4(1)	16	1.1709	-1.4380 **
0.2751 – 0.9500	SALES4(2)	16	-10.6206	-13.2295 **
0.9501 & greater	SALES4(3)	16	2.4029	-0.2060 **

*Logit = $\text{Coefficient}_{(\text{constant})}$; **Logit = Coefficient + $\text{Coefficient}_{(\text{constant})}$

Compare the logits from the above model (categorised) with those derived from the fitted model (fitted)

Sales (RM b)	Categorised	Fitted	Sales (RM b)	Categorised	Fitted
0.0001	-2.61	-2.50	0.1340	-2.61	-2.31
0.1341	-1.44	-2.31	0.2750	-1.44	-2.10
0.2751	-13.23	-2.10	0.9500	-13.23	-1.13
0.9501	-0.21	-1.13	5.2528	-0.21	5.06

The plot (see Graph 6B) appears to suggest that the relationship between SALES_B and the logit of OBJTYPE1 may not be linear because it shows some discrepancies between the fitted and categorised models. The discrepancy is caused by the problem of zero cells in the third quartile category of sales (represented by predictor SALES4(2) as there is no case that adopted formal FERM objective in this category). Further, it should be pointed out that if a 3-category classification of total sales is used (not shown above), then the categorised logits pose a trend that seem linear. However, the removal of the linearity constraint (the categorised model above), although improves the model fit significantly, leaves the prediction accuracy unchanged and it generally reduces the other predictor effects. Moreover, the categorised predictor, SALES4, is not significant. Therefore, the effect of SALES_B on the logit of OBJTYPE1 can be assumed to be linear, for the sake of parsimony, at least.

	Value	Freq	Parameter Coding (1)	(2)	(3)
DEBT4					
< RM 70 m	1	15	.000	.000	.000
RM 70 - 240 m	2	16	1.000	.000	.000
RM 240 - 600 m	3	16	.000	1.000	.000
> RM 600 m	4	16	.000	.000	1.000
MINTRACO					
no	1	47	.000		
yes	2	16	1.000		

Dependent Variable.. OBJTYPE1 Have formal FERM Objective?

	Chi-Square	df	Significance
Model Chi-Square	20.805	6	.0020

Classification Table for OBJTYPE1

		Predicted no	yes	Percent Correct
		n	y	
Observed				
no	n	47	2	95.92%
yes	y	7	7	50.00%
			Overall	85.71%

Variables in the Equation

Variable	B	S.E.	Wald	df	Sig	R	Exp(B)
ASSETS_B	-.0237	.2592	.0083	1	.9273	.0000	.9766
SALES_B	1.5348	.8230	3.4780	1	.0622	.1488	4.6404
MINTRACO(1)	-3.1801	2.2400	2.0155	1	.1557	-.0152	.0416
DEBT4			1.8377	3	.6068	.0000	
DEBT4(1)	-1.3207	1.2393	1.1357	1	.2866	.0000	.2670
DEBT4(2)	-.9318	1.0587	.7747	1	.3788	.0000	.3938
DEBT4(3)	-1.9677	1.8365	1.1480	1	.2840	.0000	.1398
Constant	-1.3405	.6595	4.1313	1	.0421		

Examining the fitted linear relationship between total debt and the logit of adopting formal FERM objective:

Range (RM b)	Predictor	Cases	Coefficient	Logit
0.0001 – 0.0700	constant	15	-1.3405	-1.3405 *
0.0701 – 0.2400	DEBT4(1)	16	-1.3207	-2.6612 **
0.2401 – 0.6000	DEBT4(2)	16	-0.9318	-2.2723 **
0.6001 & greater	DEBT4(3)	16	-1.9677	-3.3082 **

*Logit = $\text{Coefficient}_{(\text{constant})}$; **Logit = Coefficient + $\text{Coefficient}_{(\text{constant})}$

Compare the logits from the above model (categorised) with those derived from the fitted model (fitted)

Debt (RM b)	Categorised	Fitted	Debt (RM b)	Categorised	Fitted
0.0001	-1.34	-2.50	0.0700	-1.34	-2.65
0.0701	-2.66	-2.65	0.2400	-2.66	-3.02
0.2401	-2.27	-3.02	0.6000	-2.27	-3.80
0.6001	-3.31	-3.80	8.9519	-3.31	-21.93

The plot (see Graph 6C) appears to suggest that the relationship between DEBT_B and the logit of OBJTYPE1 may not be exactly linear because it shows some slight discrepancies between the fitted and categorised models. However, the removal of the linearity constraint (the categorised model), deteriorates the model fit, prediction accuracy and the other predictor effects significantly. Further, the categorised predictor, DEBT4, is not significant. Therefore, the effect of DEBT_B on the logit of OBJTYPE1 can be assumed to be linear, for the sake of parsimony.

	Value	Freq	Parameter Coding (1)	(2)
INTRACO3				
less than 20%	1	40	.000	.000
21% - 40%	2	16	1.000	.000
more than 40%	3	7	.000	1.000

Dependent Variable.. OBJTYPE1 Have formal FERM Objective?

	Chi-Square	df	Significance
Model Chi-Square	29.268	5	.0000

Classification Table for OBJTYPE1

		Predicted no	yes	Percent Correct
		n	y	
Observed				
no	n	48	1	97.96%
yes	y	5	9	64.29%
			Overall	90.48%

---------- Variables in the Equation ----------

Variable	B	S.E.	Wald	df	Sig	R	Exp(B)
ASSETS_B	1.1110	.5761	3.7183	1	.0538	.1605	3.0373
SALES_B	1.4437	.5940	5.9060	1	.0151	.2419	4.2362
INTRACO3			3.3821	2	.1843	.0000	
INTRACO3(1)	-8.1537	4.4848	3.3054	1	.0691	-.1399	.0003
INTRACO3(2)	-1.0889	1.7712	.3780	1	.5387	.0000	.3366
DEBT_B	-2.0119	.8940	5.0644	1	.0244	-.2143	.1337
Constant	-2.4739	.6233	15.7515	1	.0001		

Examining the fitted relationship between intra-company transaction volume and the logit of adopting formal FERM objective:

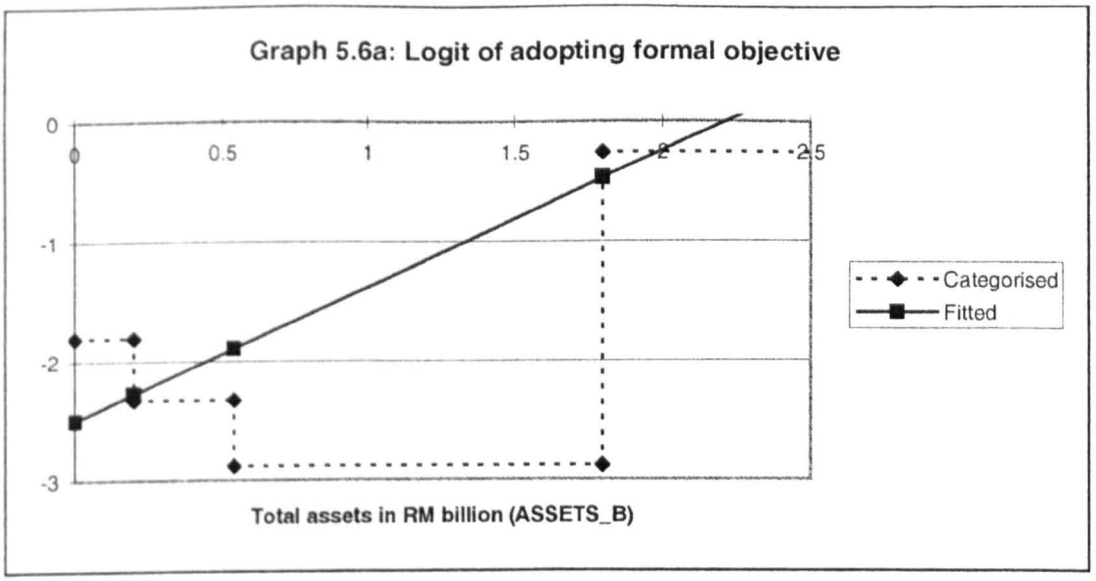
Intra-company transactions	Predictor	Cases	Coefficient	Logit
up to 20%	constant	40	-2.4739	-2.4739 *
20% - 40%	INTRACO3(1)	16	-8.1537	-10.6276 **
more than 40%	INTRACO3(2)	7	-2.0119	-4.4858 **

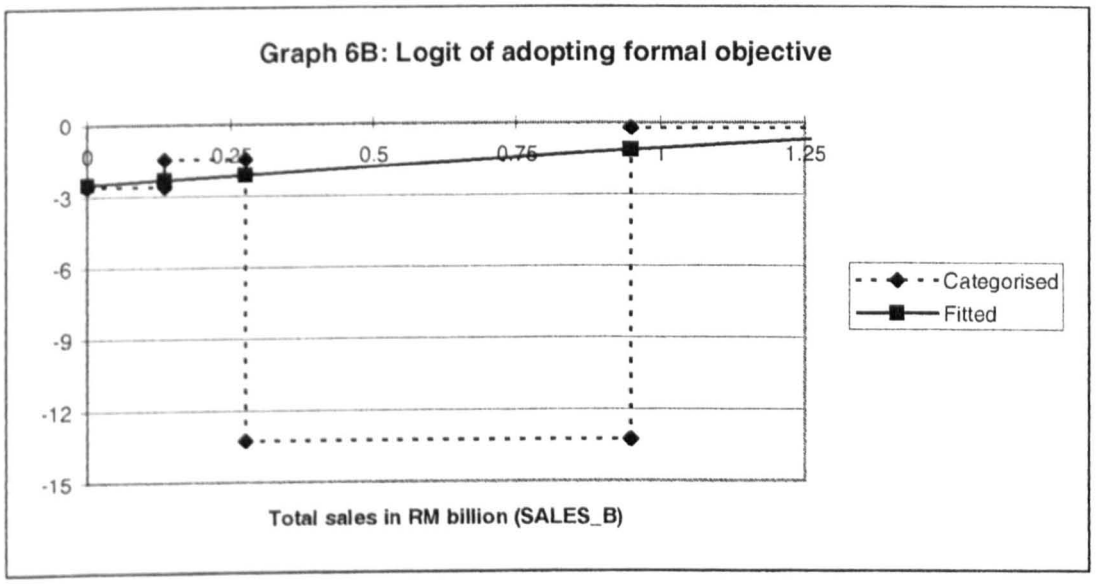
*Logit = $\text{Coefficient}_{(\text{constant})}$; **Logit = Coefficient + $\text{Coefficient}_{(\text{constant})}$

Compare the logits from the above model (categorised) with those derived from the fitted model (fitted)

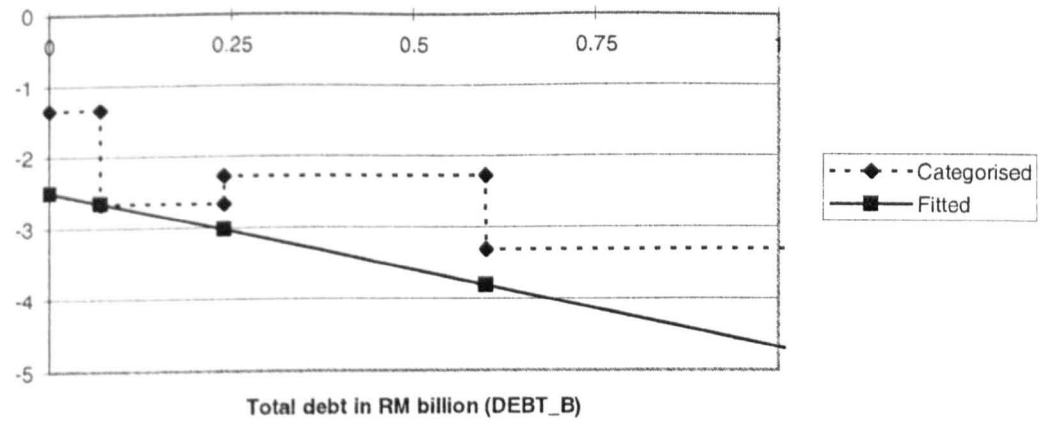
Intra-company transactions	up to 20%	20% - 40%	more than 40%
Categorised	-2.47	-10.63	-4.49
Fitted	-2.50	-10.20	-2.50

The plot (see Graph 6D) appears to show that the fitted model closely traces the categorised model, although there is a slight disparity in the third category of INTRACO3 (represented by predictor INTRACO3(2)). However, using the 3-category predictor, INTRACO3 (the categorised model above), rather than the fitted dichotomous predictor MINTRACO, does not improve the model fit significantly. It also leaves the prediction accuracy unchanged, and generally, reduces the other predictor effects. Moreover, the categorised predictor, INTRACO3, is not significant. Therefore, the effect of MINTRACO on the logit of OBJTYPE1 can reasonably be assumed to be as depicted by the fitted model.

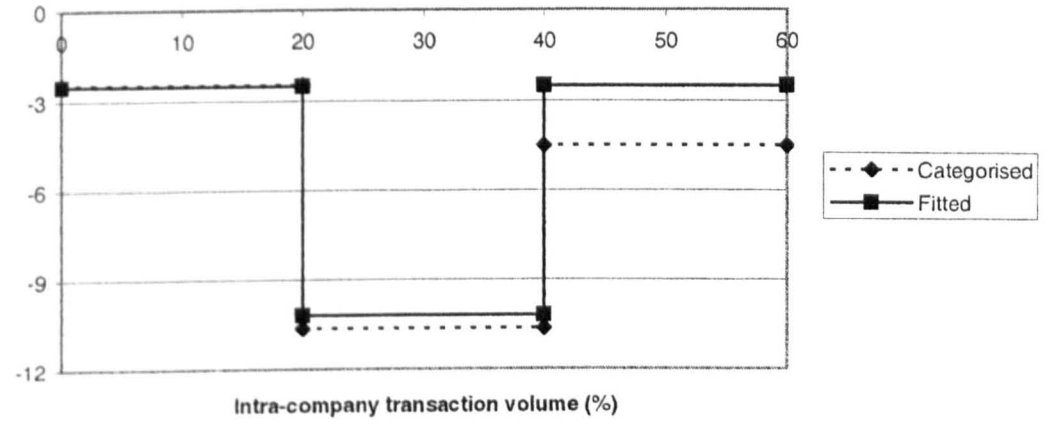

Graph 5.6a: Logit of adopting formal objective
0
-1
-2
-3
0
0.5
1
1.5
2
2.5
Categorised
Fitted
Total assets in RM billion (ASSETS_B)


Graph 6B: Logit of adopting formal objective
0
-3
-6
-9
-12
-15
0
0.25
0.5
0.75
1
1.25
Categorised
Fitted
Total sales in RM billion (SALES_B)

Graph 6C: Logit of adopting formal objective



Graph 6D: Logit of adopting formal objective



Appendix J-7: The fitted model for predicting a company's likelihood of sharing FERM responsibility among two or more departments

```
Number of selected cases:                    67
Number rejected because of missing data:     3
Number of cases included in the analysis:    64
```

The number of cases per predictor is 16 (64÷4). This is just greater than the required minimum of 15. This implies that the statistical analyses arising from this model is generally accepted to be reliable.

```
                                          Parameter
                          Value   Freq    Coding
                                            (1)     (2)
SECTOR3
 indust, trade, plant         1     38    .000    .000
 consumer                     2     12   1.000    .000
 prope, const, hotel          3     14    .000   1.000

Dependent Variable..   JOINTRES   Several departments jointly
responsible?

-2 Log Likelihood    81.003882
* Constant is included in the model.

 -2 Log Likelihood          55.343
 Goodness of Fit            58.495

                     Chi-Square     df Significance
 Model Chi-Square        25.661      4          .0000
```

G_M of 25.661, with 4 degrees of freedom is statistically significant. In other words, there is statistically significant improvement in the model fit due to the incorporation of the four predictors.

$R_L^2 = 25.661 \div (81.003882) = 0.3168$. This shows that there is a reduction in the badness-of-fit, of about 31.68%, due to the inclusion of the four predictors. Therefore, the proportional reduction is substantively significant.

```
Classification Table for JOINTRES
                    Predicted
                  no        yes      Percent Correct
                    n   |     y
Observed          +-------+-------+
   no       n     |   36  |     7 |    83.72%
                  +-------+-------+
   yes      y     |    6  |    15 |    71.43%
                  +-------+-------+
                            Overall   79.69%
```

Model errors = 6+7 = 13. Chance errors = 21. Therefore, $\lambda_p = (21\text{-}13) \div 21 = 0.3810$. This shows that there is a 38.10% reduction in the number of prediction errors due to the inclusion of the four predictors. This is substantively significant.

The binomial d statistic = $(21\text{-}13) \div \sqrt{[(21 \div 64) \times (64\text{-}21)]} = 2.1298$. This has a p-value of 0.0166. This shows that the reduction in the number of prediction errors is also statistically significant.

```
---------------------- Variables in the Equation -----------------------
Variable            B        S.E.      Wald     df      Sig        R    Exp(B)
MKTVAL_B         -.1776      .1016    3.0579      1     .0803  -.1143     .8373
VSIZE             .8013      .3215    6.2114      1     .0127   .2280    2.2284
SECTOR3                                12.0911      2     .0024   .3160
 SECTOR3(1)     -2.2192     1.1853    3.5053      1     .0612  -.1363     .1087
 SECTOR3(2)      2.6787      .9319    8.2635      1     .0040   .2781   14.5667
Constant        -2.8425     1.0950    6.7383      1     .0094
```

Wald statistic p-values of almost all predictors are less than 0.05. This means that all these predictor effects on the logit of JOINTRES are statistically significant. Although MKTVAL_B seems statistically not significant, the more accurate Likelihood Ratio (LR) method must be consulted (below).

```
            Observed Groups and Predicted Probabilities
       8 +n                                                           +
         |n                                                           |
         |n                                                           |
F        |n                                                           |
R      6 +n     n                                                     +
E        |n     n                                                     |
Q        |n     n                                                     |
U        |n     n                                                     |
E      4 +n     n     y                                               +
N        |n     n     y                                               |
C        |n  yn n     ny       y          y   y     y                 |
Y        |n  yn n     ny       y          y   y     y                 |
       2 +nn nn n     nn   y   n          nn yy     y        y        +
         |nn nn n     nn   y   n          nn yy     y        y        |
         |nnnnn nny n nnn nn  nnn        yynnn yn    yn yy     y  y   |
         |nnnnn nny n nnn nn  nnn        yynnn yn    yn yy     y  y   |
Predicted ------------+-------------+-------------+-------------+-------------
  Prob:   0           .25           .5            .75           1
  Group:  nnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyy
          Predicted Probability is of Membership for yes
          Symbols: n - no
                   y - yes
          Each Symbol Represents .5 Cases.

----------------- Model if Term Removed ------------------
Term          Log                              Significance
Removed       Likelihood    -2 Log LR    df    of Log LR
MKTVAL_B         -32.993       10.644     1          .0011
VSIZE            -31.516        7.690     1          .0056
SECTOR3          -36.683       18.024     2          .0001
```

All the predictors, including MKTVAL_B, have LR test significance of less than 0.05. This means that all the predictor effects on the logit of JOINTRES are statistically significant.

Calculating the standardised coefficients of the fitted model

```
            * * * *  M U L T I P L E  R E G R E S S I O N  * * * *

Equation Number 1     Dependent Variable..   JOINTRES   Several
departments joint

Variable(s) Entered on Step Number
   1..     PGR_7      Predicted Group

Multiple R              .54519
R Square                .29723
Adjusted R Square       .28590
Standard Error          .39991
```

```
Analysis of Variance
                    DF        Sum of Squares        Mean Square
Regression           1               4.19379             4.19379
Residual            62               9.91558              .15993
F =       26.22286       Signif F =  .0000
```

```
                    Valid
Variable     Std Dev      N  Label
MKTVAL_B       22.07     64  Total market capitalisation (billion RM)
VSIZE           1.28     64  Size of FX Exposure Volume
SECTOR_2         .39     64  Consumer sector?
SECTOR_3         .42     64  Property, construction, hotel etc.?
LOGIT7          4.02     64  Natural log odds on having joint respons
```

Calculating standardised coefficients:

Predictor	Coefficient		Predictor Std Dev		Correlation Coefficient		Logit Std Dev		Standardised Coefficient
MKTVAL_B	-0.1776	×	22.07	×	0.54519	÷	4.02	=	-0.5316
VSIZE	0.8013	×	1.28	×	0.54519	÷	4.02	=	0.1391
SECTOR3(1)	-2.2192	×	0.39	×	0.54519	÷	4.02	=	-0.1174
SECTOR3(2)	2.6787	×	0.42	×	0.54519	÷	4.02	=	0.1526

All the standardised coefficients are greater than 0.05. Therefore, the predictor effects on the logit of JOINTRES are substantively significant. The predictors in descending order of impact on the logit of JOINTRES are MKTVAL_B, VSIZE, and SECTOR3.

Testing the model for multicollinearity

```
          * * * *  M U L T I P L E  R E G R E S S I O N  * * * *

Equation Number 1     Dependent Variable..   JOINTRES   Several
departments joint

Variable(s) Entered on Step Number
   1..     SECTOR_3   Property, construction, hotel etc.?
   2..     MKTVAL_B   Total market capitalisation (billion RM)
   3..     SECTOR_2   Consumer sector?
   4..     VSIZE      Size of FX Exposure Volume

-- Variables in the Equation ---
Variable    Tolerance         VIF
MKTVAL_B      .951934       1.050
VSIZE         .838299       1.193
SECTOR_2      .882769       1.133
SECTOR_3      .863045       1.159
```

The tolerance statistics of all predictors are greater than 0.20. Therefore, multicollinearity does not appear to be a problem in the model.

Cases with abnormal residual measures, and their predictor values

	ZRE_7	SRE_7	LEV_7	DBETA7	CHISCH7	DMCH7
13	-.55220	-.82926	.22593*	.11	.39	.69
44	3.99769*	2.46894*	.07077	1.31*	17.20*	6.10*
46	1.94841	1.81938	.05270	.22	4.01*	3.31
60	2.51877*	2.07274*	.07179	.53*	6.83*	4.30*
92	-.60535	-1.16659	.54117*	.94*	.80	1.36

	MKTVAL_B	VSIZE	SECTOR3	PRE_7	PGR_7	JOINTRES
13	.7455	5	2	.23367	1	1
44	.6395	3	2	.05889	1	2
46	.5299	2	1	.20849	1	2
60	7.9330	3	1	.13616	1	2
92	18.2657	3	3	.26818	1	1

The asterisks denote residual measures that are unusual. Cases 44, 60 and 46 appear to be the most poor-fitting. The removal of any of these cases improves model fit to various degrees but the other model characteristics are not significantly changed. On the other hand, cases 92 and 13 seem to have disproportionate influence on the model parameter estimates. However, among the two only the removal of case 92 considerably reduces the effect and significance of MKTVAL_B. The removal of case 13 does not significantly change the characteristics of the model. However, overall, there is no compelling reason to remove any of the above cases. Therefore, the model appears to be very acceptable.

Validity of fitted predictor relationship with the logit of the dependent variable

	Value	Freq	Parameter Coding (1)	(2)	(3)
MKTVAL4					
< RM 425 m	1	16	.000	.000	.000
RM 425-950 m	2	16	1.000	.000	.000
RM 950-3750 m	3	16	.000	1.000	.000
> RM 3750 m	4	16	.000	.000	1.000
SECTOR3					
indust, trade, plant	1	38	.000	.000	
consumer	2	12	1.000	.000	
prope, const, hotel	3	14	.000	1.000	

Dependent Variable.. JOINTRES Several departments jointly responsible?

	Chi-Square	df	Significance
Model Chi-Square	25.089	6	.0003

Classification Table for JOINTRES

		Predicted no	yes	Percent Correct
		n	y	
Observed				
no	n	39	4	90.70%
yes	y	7	14	66.67%
			Overall	82.81%

---------- Variables in the Equation ----------

Variable	B	S.E.	Wald	df	Sig	R	Exp(B)
MKTVAL4			8.1728	3	.0426	.1638	
MKTVAL4(1)	1.6570	.9725	2.9031	1	.0884	.1056	5.2435
MKTVAL4(2)	1.2837	.9515	1.8201	1	.1773	.0000	3.6101
MKTVAL4(3)	-1.0724	1.1014	.9480	1	.3302	.0000	.3422
VSIZE	.7506	.3293	5.1962	1	.0226	.1986	2.1184
SECTOR3			9.6933	2	.0079	.2651	
SECTOR3(1)	-2.5216	1.2579	4.0182	1	.0450	-.1578	.0803
SECTOR3(2)	2.0886	.9053	5.3223	1	.0211	.2025	8.0739
Constant	-3.6977	1.3079	7.9933	1	.0047		

Examining the fitted linear relationship between market capitalisation value and the logit of sharing FERM responsibility among two or more departments:

Range (RM b)	Predictor	Cases	Coefficient	Logit
0.0001 – 0.4250	constant	16	-3.6977	-3.6977 *
0.4251 – 0.9500	MKTVAL4(1)	16	1.6570	-2.0407 **
0.9501 – 3.7500	MKTVAL4(2)	16	1.2837	-2.4140 **
3.7501 & greater	MKTVAL4(3)	16	-1.0724	-4.7701 **

*Logit = $\text{Coefficient}_{(\text{constant})}$; **Logit = Coefficient + $\text{Coefficient}_{(\text{constant})}$

Compare the logits from the above model (categorised) with those derived from the fitted model (fitted)

Mkt val (RM b)	Categorised	Fitted	Mkt val (RM b)	Categorised	Fitted
0.0001	-3.70	-2.84	0.4250	-3.70	-2.92
0.4251	-2.04	-2.92	0.9500	-2.04	-3.01
0.9501	-2.41	-3.01	3.2500	-2.41	-3.52
3.2501	-4.77	-3.52	147.2973	-4.77	-29.35

The plot (see Graph 7A) appears to suggest that the relationship between MKTVAL_B and the logit of JOINTRES may not be linear. The plot appears to show clear discrepancies between the fitted and categorised models. However, the removal of the linearity constraint (the categorised model) reduces the model fit although it increases the prediction accuracy. Further, the categorised model does not change the other predictor effects drastically. Nonetheless, the categorised predictor, MKTVAL4, is more significant compared to MKTVAL_B in the fitted model. However, transformations to incorporate the non-linear pattern displayed by the categorised model, fail to improve the model significantly. Therefore, at least for the sake of parsimony, the relationship of MKTVAL_B on the logit of JOINTRES can be reasonably assumed to be linear.

	Value	Freq	Parameter Coding (1)	(2)	(3)	(4)
VSIZE						
very small	1	12	.000	.000	.000	.000
small	2	14	1.000	.000	.000	.000
moderate	3	17	.000	1.000	.000	.000
large	4	14	.000	.000	1.000	.000
very large	5	7	.000	.000	.000	1.000
SECTOR3						
indust, trade, plant	1	38	.000	.000		
consumer	2	12	1.000	.000		
prope, const, hotel	3	14	.000	1.000		

Dependent Variable.. JOINTRES Several departments jointly responsible?

	Chi-Square	df	Significance
Model Chi-Square	30.789	7	.0001

Classification Table for JOINTRES

		Predicted no (n)	Predicted yes (y)	Percent Correct
Observed				
no	n	40	3	93.02%
yes	y	10	11	52.38%
			Overall	79.69%

Variables in the Equation

Variable	B	S.E.	Wald	df	Sig	R	Exp(B)
MKTVAL_B	-.2762	.1394	3.9283	1	.0475	-.1543	.7586
VSIZE			6.0923	4	.1924	.0000	
VSIZE(1)	3.7235	1.9107	3.7978	1	.0513	.1490	41.4082
VSIZE(2)	4.5631	2.0549	4.9310	1	.0264	.1902	95.8796
VSIZE(3)	4.2751	2.0546	4.3296	1	.0375	.1696	71.8880
VSIZE(4)	5.3722	2.2026	5.9487	1	.0147	.2208	215.3392
SECTOR3			8.9908	2	.0112	.2482	
SECTOR3(1)	-2.1885	1.1806	3.4362	1	.0638	-.1332	.1121
SECTOR3(2)	4.1256	1.7756	5.3986	1	.0202	.2048	61.9046
Constant	-4.3150	1.8571	5.3986	1	.0202		

Examining the fitted linear relationship between perceived exposure volume and the logit of sharing FERM responsibility among two or more departments:

Value	Label	Predictor	Cases	Coefficient	Logit
1	very small	constant	12	-4.3150	-4.3150 *
2	small	VSIZE(1)	14	3.7235	-0.5915 **
3	moderate	VSIZE(2)	17	4.5631	0.2481 **
4	large	VSIZE(3)	14	4.2751	-0.0399 **
5	very large	VSIZE(4)	7	5.3722	1.0572 **

*Logit = $\text{Coefficient}_{(\text{constant})}$; **Logit = Coefficient + $\text{Coefficient}_{(\text{constant})}$

Compare the logits from the above model (categorised) with those derived from the fitted model (fitted)

Exposure volume	1	2	3	4	5
Categorised	-4.32	-0.59	0.25	-0.04	1.06
Fitted	-2.04	-1.24	-0.44	0.36	1.16

The plot (see Graph 7B) appears to suggest that the relationship between VSIZE and the logit of JOINTRES is close to being linear although it shows some discrepancies between the fitted and categorised models. However, the removal of the linearity constraint (the categorised model above), does not improve the model fit significantly, although it leaves the prediction accuracy unchanged. Generally, it also does not change the other predictor effects drastically. Moreover, the categorised predictor, VSIZE, is not significant. Therefore, the effect of VSIZE on the logit of JOINTRES can be assumed to be linear.

	Value	Freq	Parameter Coding (1)	(2)	(3)	(4)	(5)
SECTOR_R							
Consumer	1	12	.000	.000	.000	.000	.000
Plantation	2	5	1.000	.000	.000	.000	.000
Industrial	3	16	.000	1.000	.000	.000	.000
Trade/services	4	17	.000	.000	1.000	.000	.000
Property	5	6	.000	.000	.000	1.000	.000
Construction	6	8	.000	.000	.000	.000	1.000

Dependent Variable.. JOINTRES Several departments jointly responsible?

	Chi-Square	df	Significance
Model Chi-Square	26.702	7	.0004

Classification Table for JOINTRES

		Predicted no	Predicted yes	Percent Correct
		n	y	
Observed				
no	n	37	6	86.05%
yes	y	7	14	66.67%
			Overall	79.69%

Variables in the Equation

Variable	B	S.E.	Wald	df	Sig	R	Exp(B)
MKTVAL_B	-.1923	.1090	3.1153	1	.0776	-.1173	.8250
VSIZE	.8207	.3347	6.0120	1	.0142	.2225	2.2720
SECTOR_R			12.3758	5	.0300	.1713	
SECTOR_R(1)	1.3339	1.6263	.6728	1	.4121	.0000	3.7959
SECTOR_R(2)	2.2646	1.2941	3.0622	1	.0801	.1145	9.6274
SECTOR_R(3)	2.4999	1.2884	3.7650	1	.0523	.1476	12.1809
SECTOR_R(4)	4.5998	1.6523	7.7500	1	.0054	.2664	99.4693
SECTOR_R(5)	5.2992	1.6716	10.0499	1	.0015	.3152	200.1717
Constant	-5.1146	1.7276	8.7645	1	.0031		

Examining the fitted relationship between the exchange listing sector and the logit of sharing FERM responsibility among two or more departments:

Sector	Predictor	Cases	Coefficient	Logit
Consumer	constant	12	-5.1146	-5.1146 *
Plantation	SECTOR_R(1)	5	1.3339	-3.7807 **
Industrial	SECTOR_R(2)	16	2.2646	-2.8500 **
Trade/services	SECTOR_R(3)	17	2.4999	-2.6147 **
Property	SECTOR_R(4)	6	4.5998	-0.5148 **
Construction	SECTOR_R(5)	8	5.2992	0.1846 **

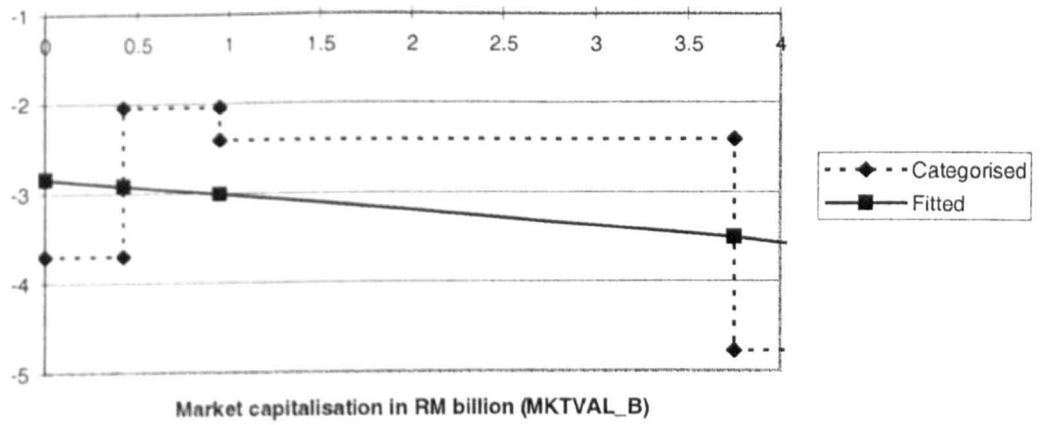
*Logit = $\text{Coefficient}_{(\text{constant})}$; **Logit = Coefficient + $\text{Coefficient}_{(\text{constant})}$

Compare the logits from the above model (categorised) with those derived from the fitted model (fitted)

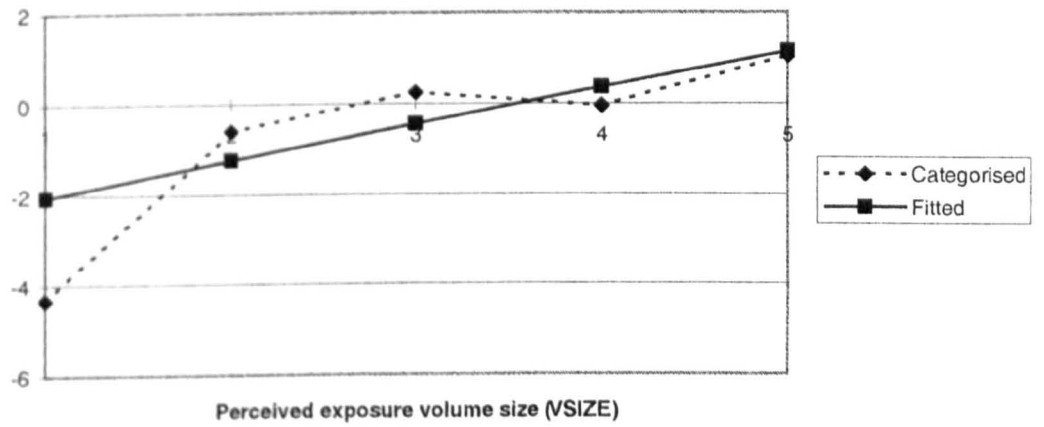
Sector	Consumer	Plantation	Industrial	Trade/services	Property	Construction
Categorised	-5.11	-3.78	-2.85	-2.61	-0.51	0.18
Fitted	-5.06	-2.84	-2.84	-2.84	-0.16	-0.16

The plot (see Graph 7C) appears to show only slight discrepancies between the fitted model and the categorised model. However, the categorised model, compared to the fitted model, does not significantly improve the model fit, although it does not change the prediction accuracy. Further, it also has only mixed impact on the other predictor effects. Moreover, the categorised predictor, SECTOR_R, is less significant than SECTOR3 in the fitted model. Therefore, the relationship between SECTOR3 and the logit of JOINTRES can be assumed to be as depicted by the fitted model.

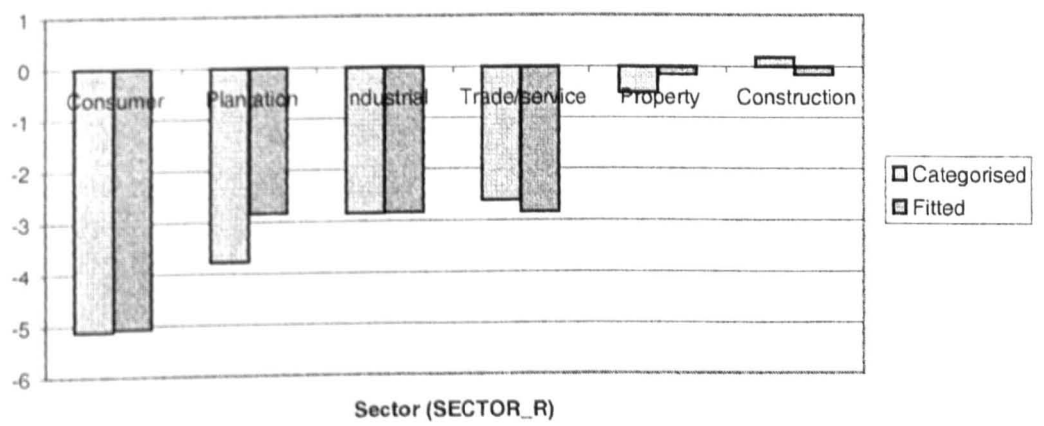
Graph 7A: Logit of sharing FERM responsibility



Graph 7B: Logit of sharing FERM responsibility



Graph 7C: Logit of sharing FERM responsibility



Appendix J-8: The fitted model for predicting a company's likelihood of fully decentralising domestic subsidiaries' FERM

```
Number of selected cases:                    67
Number rejected because of missing data:     9
Number of cases included in the analysis:    58
```

The number of cases per predictor is 19.33 (58÷3). This is greater than the required minimum of 15. This implies that the statistical analyses arising from this model should generally be reliable.

	Value	Freq	Parameter Coding (1)
PDEBT4_4			
no	1	43	.000
yes	2	15	1.000
HINTRACO			
no	1	52	.000
yes	2	6	1.000
PERCAP3			
less than 25%	1	43	.000
more than 25%	2	15	1.000

Dependent Variable.. DCEN2 Domestic Subs: full autonomy?

-2 Log Likelihood 42.722433
* Constant is included in the model.

-2 Log Likelihood	29.835
Goodness of Fit	49.881

	Chi-Square	df	Significance
Model Chi-Square	12.887	3	.0049

G_M of 12.887, with 3 degrees of freedom, is statistically significant. In other words, there is statistically significant improvement in the model fit due to the incorporation of the three predictors.

$R_L^2 = 12.887 \div (42.722433) = 0.3016$. This shows that there is a reduction in the badness-of-fit, of about 30.16%, due to the inclusion of the three predictors. The proportional reduction can be considered to be substantively significant.

Classification Table for DCEN2

		Predicted no	Predicted yes	Percent Correct
		n	y	
Observed				
no	n	50	1	98.04%
yes	y	5	2	28.57%
			Overall	89.66%

Model errors = 5+1 = 6. Chance errors = 7. Therefore, $\lambda_p = (7\text{-}6) \div 7 = 0.1429$. This shows that there is a 14.29% reduction in the number of prediction errors due to the inclusion of the three predictors. This is substantively significant.

The binomial d statistic = (7-6) ÷ √[(7÷58)×(58-7)] = 0.4031. This has a p-value of 0.3434. This shows that the reduction in the number of prediction errors is, however, not statistically significant.

---------- Variables in the Equation ----------

Variable	B	S.E.	Wald	df	Sig	R	Exp(B)
PERCAP3(1)	2.1112	1.0400	4.1214	1	.0423	.2228	8.2585
HINTRACO(1)	3.3345	1.3565	6.0422	1	.0140	.3076	28.0644
PDEBT4_4(1)	-2.9534	1.7126	2.9738	1	.0846	-.1510	.0522
Constant	-2.9134	.7433	15.3619	1	.0001		

Wald statistic p-values of all the predictors are less than 0.05, except for PDEBT4_4. However, the more accurate LR test, below, ought to be used for PDEBT4_4.

Observed Groups and Predicted Probabilities

```
F        |   y                                                          |
R     30 +   n                                                          +
E        |   n                                                          |
Q        |   n                                                          |
U        |   n                                                          |
E     20 +   n                                                          +
N        |   n                                                          |
C        |   n                                                          |
Y        |   n                                                          |
      10 +   n                                                          +
         |n  n              y                                          |
         |nn n              n                                          |
         |nn n              n    y           y                         |
Predicted ---------------+-------------+-------------+---------------
  Prob:   0              .25           .5            .75             1
  Group:  nnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyy
          Predicted Probability is of Membership for yes
          Symbols: n - no
                   y - yes
          Each Symbol Represents 2.5 Cases.
```

---------- Model if Term Removed ----------

Term Removed	Log Likelihood	-2 Log LR	df	Significance of Log LR
PERCAP3	-17.057	4.279	1	.0386
HINTRACO	-18.575	7.315	1	.0068
PDEBT4_4	-17.167	4.498	1	.0339

LR test p-values of all the predictors are less than 0.05. This means that all the predictor effects, including that of PDEBT4_4, on the logit of DCEN2 are statistically significant.

Calculating the standardised coefficients of the fitted model

* * * * M U L T I P L E R E G R E S S I O N * * * *

Equation Number 1 Dependent Variable.. DCEN2 Domestic Subs: full autonomy

Variable(s) Entered on Step Number
1.. PGR_8 Predicted Group

Multiple R	.39142
R Square	.15321
Adjusted R Square	.13809
Standard Error	.30508

```
Analysis of Variance
                    DF        Sum of Squares        Mean Square
Regression           1              .94305              .94305
Residual            56             5.21212              .09307
F =       10.13232        Signif F =  .0024
```

```
                    Valid
Variable     Std Dev     N  Label
PERCAP3          .44    58  Capital Investment in FC
HINTRACO         .31    58  Intra-company transactions > 40%?
PDEBT4_4         .44    58  Debt ratio in fourth quartile?
LOGIT8          1.67    58  Natural log odds on allowing full autono
```

Calculating standardised coefficients:

Predictor	Coefficient		Predictor Std Dev		Correlation Coefficient		Logit Std Dev		Standardised Coefficient
PERCAP3	2.1112	×	0.44	×	0.39142	÷	1.67	=	0.2177
HINTRACO	3.3345	×	0.31	×	0.39142	÷	1.67	=	0.2423
PDEBT4_4	-2.9534	×	0.44	×	0.39142	÷	1.67	=	-0.3046

All the standardised coefficients are greater, in absolute value, than 0.05. Therefore, all the predictors' effects on the logit of DCEN2 are substantively significant. The predictors in descending order of impact on the logit of DCEN2 are PDEBT4_4, HINTRACO, and PERCAP3.

Testing the model for multicollinearity

```
          * * * *  M U L T I P L E  R E G R E S S I O N  * * * *

Equation Number 1     Dependent Variable..   DCEN2   Domestic Subs:
full autonomy

Variable(s) Entered on Step Number
   1..     PDEBT4_4  Debt ratio in fourth quartile?
   2..     HINTRACO  Intra-company transactions > 40%?
   3..     PERCAP3   Capital Investment in FC

-- Variables in the Equation ---
Variable     Tolerance          VIF
PERCAP3         .902448        1.108
HINTRACO        .945241        1.058
PDEBT4_4        .902448        1.108
```

The tolerance statistics of all the four predictors are greater than 0.20. Therefore, multicollinearity is not a problem in the model.

Cases with abnormal residual measures, and their predictor values

	ZRE_8	SRE_8	LEV_8	DBETA8	CHISCH8	DMCH8
31	4.29182*	2.46923*	.02699	.53	18.93*	6.10*
68	-.81015	-1.27320	.37743*	.64	1.05	1.62
82	1.23435	1.72446	.37743*	1.48*	2.45	2.97
89	-1.23435	-1.72446	.37743*	1.48*	2.45	2.97
95	.81015	1.27320	.37743*	.64	1.05	1.62
105	4.29182*	2.46923*	.02699	.53	18.93*	6.10*

	PERCAP3	HINTRACO	PDEBT4_4	PRE_8	PGR_8	DCEN2
31	1	1	1	.05149	1	2
68	2	2	2	.39626	1	1
82	2	2	2	.39626	1	2
89	1	2	1	.60374	2	1
95	1	2	1	.60374	2	2
105	1	1	1	.05149	1	2

The asterisks denote residual measures that are unusual. Cases 31 and 105 are poor-fitting cases. The removal of cases 31 and 105 increases model fit considerably, prediction accuracy slightly, and the effect and significance of all predictors, although it reduces the significance of predictor PDEBT4_4. Cases 82, 89, 95 and 68 seem to have disproportionate influence on the model parameter estimates. Removing case 82 or case 89 reduces the effect and significance of PERCAP3, but not drastically. Similarly, removing case 95 reduces the effect and significance of HINTRACO, but not drastically. The removal of cases 68, and 95, on the other hand, reduces the effect and significance of the PDEBT4_4 drastically. Overall, however, there is no compelling reason to remove any of these cases. Therefore, despite these abnormal cases, generally, the model can be summed up as reasonable.

Validity of fitted predictor relationship with the logit of the dependent variable

	Value	Freq	Parameter Coding (1)	(2)
INTRACO3				
less than 20%	1	36	.000	.000
21% - 40%	2	16	1.000	.000
more than 40%	3	6	.000	1.000
PDEBT4_4				
no	1	43	.000	
yes	2	15	1.000	
PERCAP3				
less than 25%	1	43	.000	
more than 25%	2	15	1.000	

Dependent Variable.. DCEN2 Domestic Subs: full autonomy?

	Chi-Square	df	Significance
Model Chi-Square	13.641	4	.0085

Classification Table for DCEN2

		Predicted no	yes	Percent Correct
		n	y	
Observed				
no	n	50	1	98.04%
yes	y	5	2	28.57%
			Overall	89.66%

Variables in the Equation

Variable	B	S.E.	Wald	df	Sig	R	Exp(B)
PERCAP3(1)	2.4566	1.1580	4.5003	1	.0339	.2419	11.6647
INTRACO3			6.2593	2	.0437	.2300	
INTRACO3(1)	-1.1308	1.3814	.6701	1	.4130	.0000	.3228
INTRACO3(2)	3.0719	1.3928	4.8644	1	.0274	.2589	21.5824
PDEBT4_4(1)	-3.2014	1.7969	3.1744	1	.0748	-.1658	.0407
Constant	-2.6994	.7611	12.5788	1	.0004		

Examining the fitted relationship between the level of intra-company transactions and the logit of fully decentralising domestic subsidiaries' FERM:

Value	Intra-company transaction	Predictor	Cases	Coefficient	Logit
1	up to 20%	constant	36	-2.6994	-2.6994 *
2	20-40%	INTRACO3(1)	16	-1.1308	-3.8302 **
3	more than 40%	INTRACO3(2)	6	3.0719	0.3725 **

*Logit = $Coefficient_{(constant)}$; **Logit = Coefficient + $Coefficient_{(constant)}$

Compare the logits from the above model (categorised) with those derived from the fitted model (fitted)

Intra-company transactions	up to 20%	20-40%	> 40%
Categorised	-2.70	-3.83	0.37
Fitted	-2.91	-2.91	0.42

The plot (see Graph 8A) appears to suggest that the relationship between HINTRACO and the logit of DCEN2 may be as fitted, although there is a slight discrepancy between the fitted and categorised models. The use of INTRACO3 (the categorised model) does not increase model fit significantly, and it does not change prediction accuracy. Nonetheless, the categorised model increases all the other predictor effects. However, the categorised predictor, INTRACO3, is less significant than the fitted predictor, HINTRACO. Therefore, for the sake of parsimony, the relationship of HINTRACO on the logit of DCEN2 can be reasonably assumed to be as depicted in the fitted model.

	Value	Freq	Parameter Coding (1)	(2)	(3)
PERDEBT4					
low (<28.30%)	1	15	.000	.000	.000
moderate (<45.00%)	2	13	1.000	.000	.000
high (<59.50%)	3	15	.000	1.000	.000
v. high (>59.50%)	4	15	.000	.000	1.000
HINTRACO					
no	1	52	.000		
yes	2	6	1.000		
PERCAP3					
less than 25%	1	43	.000		
more than 25%	2	15	1.000		

Dependent Variable.. DCEN2 Domestic Subs: full autonomy?

	Chi-Square	df	Significance
Model Chi-Square	14.513	5	.0127

Classification Table for DCEN2

		Predicted no	yes	Percent Correct
		n	y	
Observed				
no	n	50	1	98.04%
yes	y	4	3	42.86%
			Overall	91.38%

Variables in the Equation

Variable	B	S.E.	Wald	df	Sig	R	Exp(B)
PERCAP3(1)	2.3608	1.1160	4.4752	1	.0344	.2407	10.5996
HINTRACO(1)	3.5004	1.4922	5.5031	1	.0190	.2864	33.1299
PERDEBT4			4.1566	3	.2450	.0000	
PERDEBT4(1)	-1.2882	1.4041	.8417	1	.3589	.0000	.2758
PERDEBT4(2)	-1.4933	1.3784	1.1737	1	.2786	.0000	.2246
PERDEBT4(3)	-3.9852	1.9953	3.9891	1	.0458	-.2158	.0186
Constant	-2.2365	.8526	6.8809	1	.0087		

Examining the fitted relationship between the debt ratio (debt over total assets) and the logit of fully decentralising domestic subsidiaries' FERM:

Debt ratio (%)	Predictor	Cases	Coefficient	Logit
0.00 – 28.30	constant	15	-2.2365	-2.2365 *
28.31 – 45.00	PERDEBT4(1)	13	-1.2882	-3.5247 **
45.01 – 59.50	PERDEBT4(2)	15	-1.4933	-3.7298 **
59.51 & greater	PERDEBT4(3)	15	-3.9852	-6.2217 **

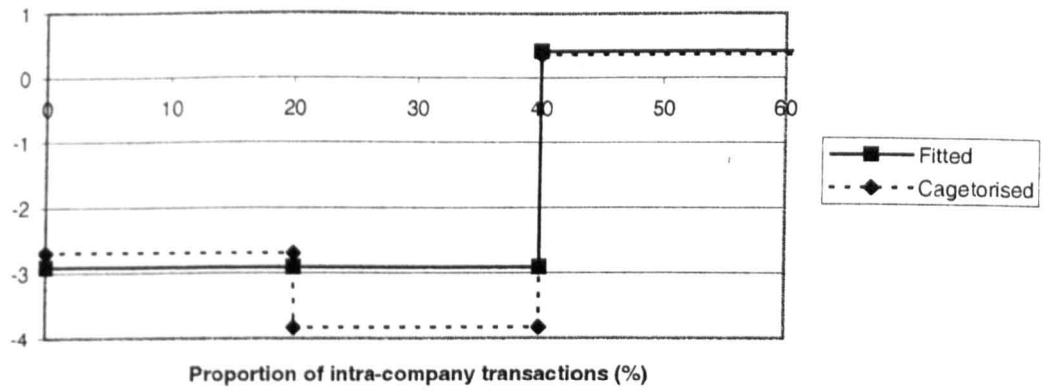
*Logit = $\text{Coefficient}_{(\text{constant})}$; **Logit = Coefficient + $\text{Coefficient}_{(\text{constant})}$

Compare the logits from the above model (categorised) with those derived from the fitted model (fitted)

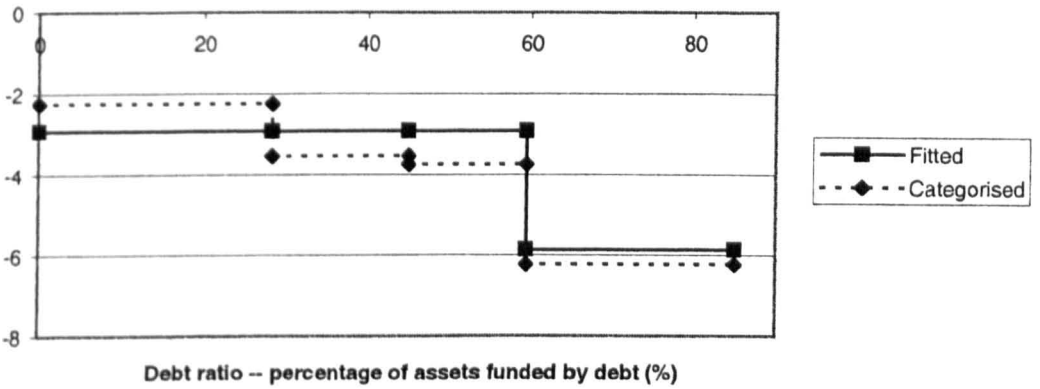
Debt ratio	Categorised	Fitted	Debt ratio	Categorised	Fitted
0.00%	-2.24	-2.91	28.30%	-2.24	-2.91
28.31%	-3.52	-2.91	45.00%	-3.52	-2.91
45.01%	-3.73	-2.91	59.50%	-3.73	-2.91
59.51%	-6.22	-5.86	84.95%	-6.22	-5.86

The plot (see Graph 8B) appears to suggest that the relationship between PDEBT4_4 and the logit of DCEN2 may be as fitted because there is only a slight discrepancy between the fitted and the categorised models. However, the use of the PERDEBT4 predictor (the categorised model) does not improve model fit significantly, although it improves the prediction accuracy slightly. Nonetheless, it generally improves the other predictor effects slightly. However, the categorised predictor, PERDEBT4, is not significant. Therefore, the effect of PDEBT4_4 on the logit of DCEN2 can be assumed to be as fitted.

Graph 8A: Logit of decentralising fully domestic subsidiaries' FERM



Graph 8B: Logit of decentralising fully domestic subsidiaries' FERM



Appendix J-9: The fitted model for predicting a company's likelihood of decentralising fully overseas subsidiaries' FERM

```
Number of selected cases:                    67
Number rejected because of missing data:     25
Number of cases included in the analysis:    42
```

The number of cases per predictor is 14.00 (42÷3). This is less than the required minimum of 15. This implies that the statistical analyses arising from this model could potentially be unreliable.

```
                                    Parameter
                    Value   Freq    Coding
                                      (1)
HINTRACO
 no                     1     38     .000
 yes                    2      4    1.000

Dependent Variable..   OCEN2      Overseas Subs: full autonomy?

-2 Log Likelihood    46.105448
* Constant is included in the model.

 -2 Log Likelihood          32.078
 Goodness of Fit            39.609

                     Chi-Square     df Significance
 Model Chi-Square        14.027      3          .0029
```

G_M of 14.027, with 3 degrees of freedom, is statistically significant. In other words, there is statistically significant improvement in the model fit due to the incorporation of the three predictors.

R_L^2 = 14.027 ÷ (46.105448) = 0.3042. This shows that there is a reduction in the badness-of-fit, of about 30.42%, due to the inclusion of the three predictors. The proportional reduction is substantively significant.

```
Classification Table for OCEN2
                      Predicted
                     no       yes      Percent Correct
                       n   |    y
Observed             +-------+-------+
   no        n       |   31  |    1  |    96.88%
                     +-------+-------+
   yes       y       |    4  |    6  |    60.00%
                     +-------+-------+
                             Overall     88.10%
```

Model errors = 4+1 = 5. Chance errors = 10. Therefore, λ_p = (10-5)÷10 = 0.5000. This shows that there is a 50.00% reduction in the number of prediction errors due to the inclusion of the three predictors. This is substantively significant.

The binomial d statistic = (10-5) ÷ √[(10÷42)×(42-10)] = 1.8114. This has a p-value of 0.0350. This shows that the reduction in the number of prediction errors is also statistically significant.

```
---------------------- Variables in the Equation -----------------------
Variable            B        S.E.      Wald     df        Sig         R    Exp(B)
MKTVAL_B         -.1268      .1199    1.1185      1      .2902    .0000     .8809
HINTRACO(1)     7.0721     3.2414    4.7603      1      .0291    .2447  1178.654
VCHANGE         -1.8272      .7712    5.6134      1      .0178   -.2800     .1609
Constant         4.5626     2.3033    3.9240      1      .0476
```

Wald statistic p-values of all the predictors are less than 0.05, except for MKTVAL_B. However, the more accurate LR test, below, ought to be used then for MKTVAL_B.

```
                Observed Groups and Predicted Probabilities
         8 +    y                                                        +
           |    y                                                        |
           |    n                                                        |
F          |    n                                                        |
R        6 +    n             n                                         +
E          |    n             n                                         |
Q          |n   n             n                                         |
U          |n   n             n                                         |
E        4 +n   n             n                                         +
N          |n   n             n                                         |
C          |nn  n            nn                          y              |
Y          |nn  n            nn                          y              |
         2 +nn  n            nn                          y              +
           |nn  n            nn                          y              |
           |nnnn   n nnyyynnnn       n        y   yy  n                 y|
           |nnnn   n nnyyynnnn       n        y   yy  n                 y|
Predicted ------------+-------------+-------------+-------------+-------
  Prob:    0            .25           .5            .75           1
  Group:   nnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyy
           Predicted Probability is of Membership for yes
           Symbols: n - no
                    y - yes
           Each Symbol Represents .5 Cases.
```

```
----------------- Model if Term Removed ------------------
Term          Log                                 Significance
Removed       Likelihood     -2 Log LR     df     of Log LR
MKTVAL_B        -18.343          4.607      1           .0318
HINTRACO        -20.481          8.884      1           .0029
VCHANGE         -20.118          8.157      1           .0043
```

LR test p-values of all the predictors are less than 0.05. This means that all the predictor effects, including that of MKTVAL_B, on the logit of OCEN2 are statistically significant.

Calculating the standardised coefficients of the fitted model

```
          * * * *  M U L T I P L E  R E G R E S S I O N  * * * *

Equation Number 1     Dependent Variable..    OCEN2    Overseas Subs:
full autonomy

Variable(s) Entered on Step Number
   1..     PGR_9     Predicted Group

Multiple R              .65000
R Square                .42250
Adjusted R Square       .40806
Standard Error          .33166
```

```
Analysis of Variance
                    DF        Sum of Squares        Mean Square
Regression           1               3.21905             3.21905
Residual            40               4.40000              .11000
F =      29.26407        Signif F =  .0000
```

```
                    Valid
Variable    Std Dev     N  Label
MKTVAL_B      26.61    42  Total market capitalisation (billion RM)
HINTRACO        .30    42  High level of intra-company transactions
VCHANGE         .82    42  Change over Time of FX Exposure Volume
LOGIT9         3.79    42  Natural log odds on allowing full autono
```

Calculating standardised coefficients:

Predictor	Coefficient		Predictor Std Dev		Correlation Coefficient		Logit Std Dev		Standardised Coefficient
MKTVAL_B	-0.1268	×	26.61	×	0.65000	÷	3.79	=	-0.5787
HINTRACO	7.0721	×	0.30	×	0.65000	÷	3.79	=	0.3639
VCHANGE	-1.8272	×	0.82	×	0.65000	÷	3.79	=	-0.2570

All the standardised coefficients are greater, in absolute value, than 0.05. Therefore, all the predictors' effects on the logit of OCEN2 are substantively significant. The predictors in descending order of impact on the logit of OCEN2 are MKTVAL_B, HINTRACO, and VCHANGE.

Testing the model for multicollinearity

```
          * * * *  M U L T I P L E  R E G R E S S I O N  * * * *

Equation Number 1     Dependent Variable..    OCEN2    Overseas Subs:
full autonomy

Variable(s) Entered on Step Number
   1..     VCHANGE    Change over Time of FX Exposure Volume
   2..     MKTVAL_B   Total market capitalisation (billion RM)
   3..     HINTRACO   Intra-company transactions >40%?

-- Variables in the Equation ---
Variable    Tolerance          VIF
MKTVAL_B      .919774        1.087
HINTRACO      .840100        1.190
VCHANGE       .856675        1.167
```

The tolerance statistics of all the four predictors are greater than 0.20. Therefore, multicollinearity is not a problem in the model.

Cases with abnormal residual measures, and their predictor values

	ZRE_9	SRE_9	LEV_9	DBETA9	CHISCH9	DMCH9
68	-.86743	-1.51576	.51164*	1.61*	1.54	2.30
74	-.47288	-1.06357	.64319*	1.13*	.63	1.13
78	1.97904	1.82336	.04193	.18	4.09*	3.32
89	.86692	1.52200	.51607*	1.66*	1.55	2.32
97	2.10462*	1.88449	.04720	.23	4.65*	3.55
105	4.10683*	2.46576*	.05167	.97	17.79*	6.08*

	MKTVAL_B	HINTRACO	VCHANGE	PRE_9	PGR_9	OCEN2
68	21.9465	2	5	.42937	1	1
74	18.9721	1	2	.18275	1	1
78	3.5196	1	3	.20339	1	2
89	17.4518	2	5	.57092	2	2
97	4.4898	1	3	.18418	1	2
105	.6252	1	4	.05597	1	2

The asterisks denote residual measures that are unusual. The poor-fitting cases are 105, 97 and 78. The removal of any one of these cases improves model fit considerably, and prediction accuracy slightly, but it does not drastically change the predictor effects or their significance. The cases that have disproportionate influence on the model parameter estimates, are 74, 89, and 68. The removal of case 74 or 89 appears to reduce the effect and significance of MKTVAL_B, but not drastically, while the removal of case 89 drastically reduces the effect and significance of HINTRACO. The removal of case 68, on the other hand, increases the effect but drastically reduces the significance of HINTRACO, but this is due to the problem of zero cells. However, overall, there is no compelling reason to remove any of these cases. Therefore, generally, the model appears to be reasonable.

Validity of fitted predictor relationship with the logit of the dependent variable

	Value	Freq	Parameter Coding (1)	(2)	(3)
MKTVAL4					
<492.5m	1	10	.000	.000	.000
0.4925-1.1000b	2	11	1.000	.000	.000
1.1000-5.2500b	3	11	.000	1.000	.000
>5.25b	4	10	.000	.000	1.000
HINTRACO					
no	1	38	.000		
yes	2	4	1.000		

Dependent Variable.. OCEN2 Overseas Subs: full autonomy?

	Chi-Square	df	Significance
Model Chi-Square	16.750	5	.0050

Classification Table for OCEN2

		Predicted no	Predicted yes	Percent Correct
		n	y	
Observed				
no	n	31	1	96.88%
yes	y	7	3	30.00%
			Overall	80.95%

Variables in the Equation

Variable	B	S.E.	Wald	df	Sig	R	Exp(B)
MKTVAL4			2.7857	3	.4259	.0000	
MKTVAL4(1)	.7369	1.6516	.1991	1	.6555	.0000	2.0895
MKTVAL4(2)	1.9327	1.2567	2.3650	1	.1241	.0890	6.9079
MKTVAL4(3)	-8.3042	52.9158	.0246	1	.8753	.0000	.0002
HINTRACO(1)	12.6104	52.9566	.0567	1	.8118	.0000	299652.5
VCHANGE	-1.8629	.8990	4.2934	1	.0383	-.2230	.1552
Constant	3.5913	2.3488	2.3378	1	.1263		

Examining the fitted linear relationship between the market capitalisation value and the logit of decentralising fully overseas subsidiaries' FERM:

Range (in RM billion)	Predictor	Cases	Coefficient	Logit
0.0001 – 0.4925	constant	10	3.5913	3.5913 *
0.4926 – 1.1000	MKTVAL4(1)	11	0.7369	4.3282 **
1.1001 – 5.2500	MKTVAL4(2)	11	1.9327	5.5240 **
5.2501 & greater	MKTVAL4(3)	10	-8.3042	-4.7129 **

*Logit = $\text{Coefficient}_{(\text{constant})}$; **Logit = Coefficient + $\text{Coefficient}_{(\text{constant})}$

Compare the logits from the above model (categorised) with those derived from the fitted model (fitted)

Market value	Categorised	Fitted	Market value	Categorised	Fitted
0.0001	3.59	4.56	0.4925	3.59	4.50
0.4926	4.33	4.50	1.1000	4.33	4.42
1.1001	5.52	4.42	5.2500	5.52	3.90
5.2501	-4.71	3.90	147.2973	-4.71	-14.11

The plot (see Graph 9A) appears to suggest that the relationship between MKTVAL_B and the logit of OCEN2 may not be linear because there is clear discrepancy between the fitted and the categorised models. However, the use the MKTVAL4 predictor (the categorised model) does not improve model fit significantly, and it reduces the prediction accuracy considerably. Moreover, it generally worsens the significance of the other predictor effects. Also, the categorised predictor, MKTVAL4, is not significant. Therefore, the effect of MKTVAL_B on the logit of OCEN2 can be assumed to be linear, at least for the sake of parsimony.

	Value	Freq	Parameter Coding (1)	(2)
INTRACO3				
less than 20%	1	26	.000	.000
21% - 40%	2	12	1.000	.000
more than 40%	3	4	.000	1.000

Dependent Variable.. OCEN2 Overseas Subs: full autonomy?

	Chi-Square	df	Significance
Model Chi-Square	14.127	4	.0069

Classification Table for OCEN2

		Predicted no	Predicted yes	Percent Correct
		n	y	
Observed				
no	n	31	1	96.88%
yes	y	4	6	60.00%
			Overall	88.10%

Variables in the Equation

Variable	B	S.E.	Wald	df	Sig	R	Exp(B)
MKTVAL_B	-.1327	.1228	1.1688	1	.2797	.0000	.8757
INTRACO3			4.7220	2	.0943	.1251	
INTRACO3(1)	-.3280	1.0488	.0978	1	.7545	.0000	.7204
INTRACO3(2)	7.2252	3.3263	4.7183	1	.0298	.2428	1373.630
VCHANGE	-1.9016	.8170	5.4174	1	.0199	-.2723	.1493
Constant	4.8977	2.5722	3.6255	1	.0569		

Examining the fitted relationship between the level of intra-company transactions and the logit of decentralising fully overseas subsidiaries' FERM:

Value	Intra-company transactions	Predictor	Cases	Coefficient	Logit
1	up to 20%	constant	26	4.8977	4.8977 *
2	20-40%	INTRACO3(1)	12	-0.3280	4.5697 **
3	more than 40%	INTRACO3(2)	4	7.2252	12.1229 **

*Logit = $\text{Coefficient}_{(\text{constant})}$; **Logit = Coefficient + $\text{Coefficient}_{(\text{constant})}$

Compare the logits from the above model (categorised) with those derived from the fitted model (fitted)

Intra-company transactions	up to 20%	20-40%	> 40%
Categorised	4.90	4.57	12.12
Fitted	4.56	4.56	11.63

The plot (see Graph 9B) appears to suggest that the relationship between HINTRACO and the logit of OCEN2 is as fitted, because the fitted and the categorised plots are very similar. The use of the predictor INTRACO3 (the categorised model) does not increase the model fit significantly, and it does not change the prediction accuracy. Further, the categorised model shows only marginal increases on the other predictor effects. Moreover, INTRACO3 (in the categorised model) is not significant. Therefore, for the sake of parsimony, the relationship of HINTRACO on the logit of OCEN2 can be assumed to be as depicted in the fitted model.

	Value	Freq	Parameter Coding (1)	(2)	(3)
VCHANGE					
decreasing	2	6	.000	.000	.000
moderate	3	18	1.000	.000	.000
increasing	4	15	.000	1.000	.000
increasing rapidly	5	3	.000	.000	1.000
HINTRACO					
no	1	38	.000		
yes	2	4	1.000		

Dependent Variable.. OCEN2 Overseas Subs: full autonomy?

	Chi-Square	df	Significance
Model Chi-Square	14.733	5	.0116

Classification Table for OCEN2

		Predicted no	Predicted yes	Percent Correct
		n	y	
Observed				
no	n	31	1	96.88%
yes	y	4	6	60.00%
			Overall	88.10%

Variables in the Equation

Variable	B	S.E.	Wald	df	Sig	R	Exp(B)
MKTVAL_B	-.1432	.1214	1.3902	1	.2384	.0000	.8666
HINTRACO(1)	8.5239	12.9384	.4340	1	.5100	.0000	5033.880
VCHANGE			6.5104	3	.0893	.1052	
VCHANGE(1)	-2.5315	1.1947	4.4903	1	.0341	-.2324	.0795
VCHANGE(2)	-3.4343	1.4451	5.6476	1	.0175	-.2813	.0322
VCHANGE(3)	-7.0345	12.2262	.3310	1	.5650	.0000	.0009
Constant	1.3244	1.0762	1.5144	1	.2185		

Examining the fitted linear relationship between the perceived future exposure increment and the logit of decentralising fully overseas subsidiaries' FERM:

Value	Perceived increment	Predictor	Cases	Coefficient	Logit	
2	decreasing	constant	6	1.3244	1.3244	*
3	moderate	VCHANGE(1)	18	-2.5315	-1.2071	**
4	increasing	VCHANGE(2)	15	-3.4343	-2.1099	**
5	increasing rapidly	VCHANGE(3)	3	-7.0345	-5.7101	**

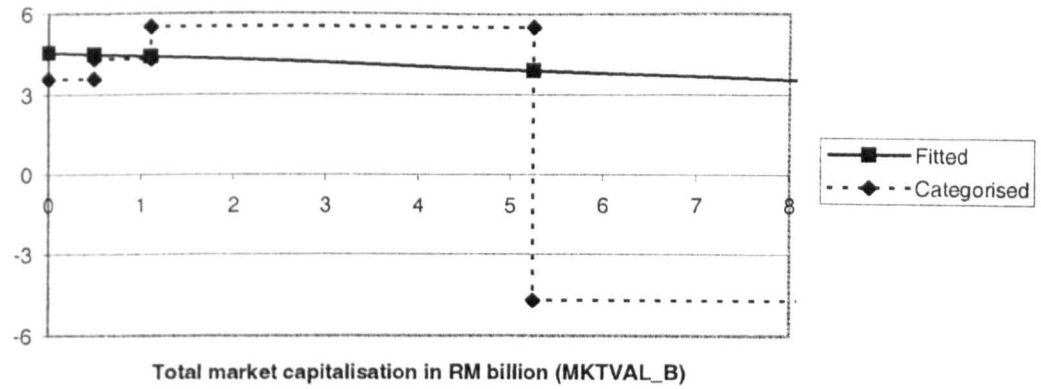
*Logit = $\text{Coefficient}_{(\text{constant})}$; **Logit = Coefficient + $\text{Coefficient}_{(\text{constant})}$

Compare the logits from the above model (categorised) with those derived from the fitted model (fitted)

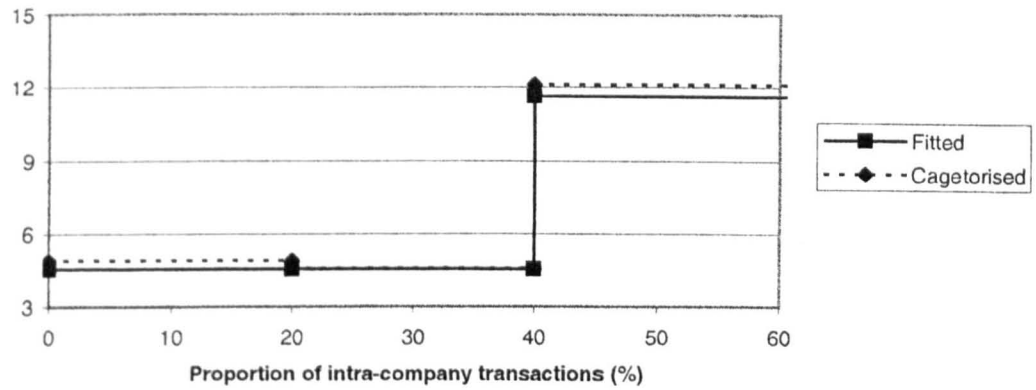
Perceived increment	2	3	4	5
Categorised	1.32	-1.21	-2.11	-5.71
Fitted	0.90	-0.93	-2.76	-4.59

The plot (see Graph 9C) appears to suggest that the relationship between VCHANGE and the logit of OCEN2 is linear. The plot shows very little discrepancy between the fitted model and the categorised model. The use of the VCHANGE predictor (in the categorised model) does not increase the model fit significantly, and it does not change the prediction accuracy. Nonetheless, the categorised model has only mixed impact on the other predictor effects. Specifically, it reduces the significance of the predictor, HINTRACO. Furthermore, the categorised predictor, VCHANGE, is not significant. Therefore, the relationship of VCHANGE on the logit of OCEN2 can be assumed to be linear.

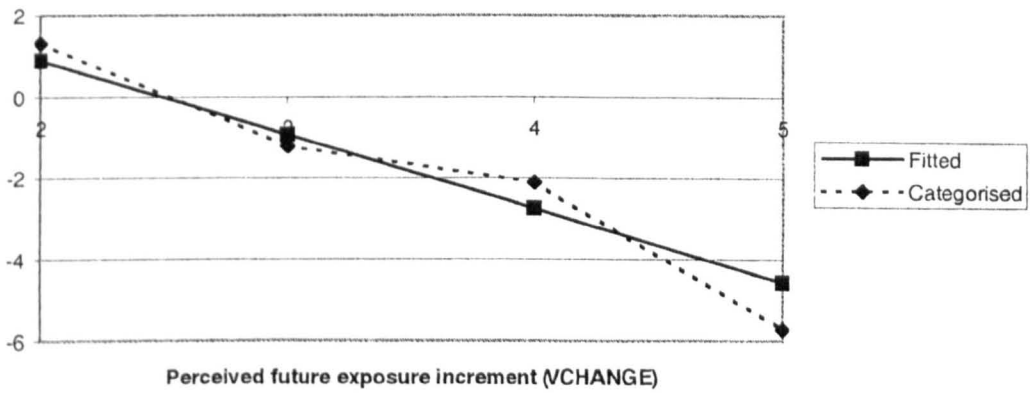
Graph 9A: Logit of decentralising fully overseas subsidiaries' FERM



Graph 9B: Logit of decentralising fully overseas subsidiaries' FERM



Graph 9C: Logit of decentralising fully overseas subsidiaries' FERM



Appendix J-10: The fitted model for predicting a company's likelihood of allowing time flexibility for hedging

```
Number of selected cases:                    67
Number rejected because of missing data:     4
Number of cases included in the analysis:    63
```

The number of cases per predictor is 31.50 (63÷2), and this is very much greater than the required minimum of 15. This means that the statistical analyses in this model are reliable.

```
                                        Parameter
                        Value   Freq    Coding
                                          (1)
FOREIGN3
 less than 30%            1      20     .000
 more than 30%            2      43    1.000

Dependent Variable..   LAPSE        Allow time to elapse?

-2 Log Likelihood    86.939302
* Constant is included in the model.

 -2 Log Likelihood          66.220
 Goodness of Fit            60.457

                      Chi-Square     df Significance
 Model Chi-Square        20.719       2         .0000
```

G_M of 20.719, with a degree of freedom of two, above shows that the reduction in the badness-of-fit, due to the inclusion of the two predictors, is statistically significant. In other words, there is statistically significant improvement to the model fit due to the inclusion of the predictors.

$R_L^2 = 20.719 \div (86.939302) = 0.2383$. This means that there is a reduction in the badness-of-fit of about 23.83% due to the inclusion of the predictors. This is substantively significant.

```
Classification Table for LAPSE
                        Predicted
                      no        yes      Percent Correct
                        n   |     y
                    +-------+-------+
Observed            |       |       |
   no        n      |   17  |   12  |    58.62%
                    +-------+-------+
   yes       y      |    3  |   31  |    91.18%
                    +-------+-------+
                            Overall     76.19%
```

Model errors = 3+12 = 15, whereas chance errors = 29. Therefore, $\lambda_p = (29-15) \div 29 = 0.4828$. This means that the inclusion of the predictors have reduced the number of prediction errors by about 48.28%. This is substantively significant.

The binomial statistic $d = (29-15) \div \sqrt{\{(29 \div 63)(63-29)\}} = 3.5388$. The corresponding p-value, 0.0002, is significant. This means that the proportional reduction in the number of prediction errors is statistically significant as well.

```
---------------------- Variables in the Equation -------------------------
Variable              B        S.E.      Wald     df       Sig        R     Exp(B)
FOREIGN3(1)        2.7318      .8445   10.4647      1      .0012   .3120   15.3612
VSIZE3            -2.5359      .7401   11.7405      1      .0006  -.3347     .0792
Constant           3.2776     1.2082    7.3596      1      .0067
```

All the predictors' Wald statistic p-values are less than 0.05, and therefore, all the predictors' effects on the logit of LAPSE are statistically significant.

```
                Observed Groups and Predicted Probabilities
F           |                                          y                |
R       30  +                                          y                +
E           |                                          y                |
Q           |                                          y                |
U           |                                          y                |
E       20  +                                          y                +
N           |                                          y                |
C           |                                          y                |
Y           |                                          y                |
        10  +          n                               n                +
            |          n y                         y   n                |
            |          n n                         y   n                |
            |          n n                         n   n              y |
Predicted   ---------------+--------------+--------------+---------------
  Prob:     0              .25            .5             .75             1
  Group:    nnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyy
            Predicted Probability is of Membership for yes
            Symbols: n - no
                     y - yes
            Each Symbol Represents 2.5 Cases.

----------------- Model if Term Removed ------------------
Term          Log                                  Significance
Removed       Likelihood     -2 Log LR     df      of Log LR
FOREIGN3         -40.104        13.988      1            .0002
VSIZE3           -41.332        16.443      1            .0001
```

Calculating the standardised coefficients of the fitted model

```
            * * * *   M U L T I P L E   R E G R E S S I O N   * * * *

Equation Number 1     Dependent Variable..    LAPSE   Allow time to
elapse?

Variable(s) Entered on Step Number
   1..     PGR_10      Predicted Group

Multiple R              .53320
R Square                .28431
Adjusted R Square       .27257
Standard Error          .42852

Analysis of Variance
                    DF        Sum of Squares       Mean Square
Regression           1              4.44963           4.44963
Residual            61             11.20116            .18363
F =       24.23208        Signif F =  .0000

-----------------------------------------------------------------------------
                    Valid
Variable     Std Dev      N  Label
FOREIGN3         .47     63  Proportion of transactions in Foreign Cu
VSIZE3           .55     63  Recoded Perceived exposure volume
LOGIT10         1.46     63  Natural log odds on allowing time flexib
```

Calculating standardised coefficients:

Predictor	Coefficient		Predictor Std Dev		Correlation Coefficient		Logit Std Dev		Standardised Coefficient
foreign3	2.7318	×	0.47	×	0.53320	÷	1.46	=	0.4689
vsize3	-2.5359	×	0.55	×	0.53320	÷	1.46	=	-0.5094

The standardised coefficients are all above 0.05. This shows that all the predictors' effects on the logit of LAPSE are also substantively significant. The predictors in descending order of impact on the logit of LAPSE are VSIZE3, and FOREIGN3.

Testing the model for multicollinearity

```
          * * * *   M U L T I P L E   R E G R E S S I O N   * * * *

Equation Number 1     Dependent Variable..    LAPSE    Allow time to
elapse?

Variable(s) Entered on Step Number
   1..     VSIZE3     Recategorised Exposure volume
   2..     FOREIGN3   Proportion of transactions in Foreign Cu

-- Variables in the Equation ---
Variable     Tolerance          VIF
FOREIGN3       .827680        1.208
VSIZE3         .827680        1.208
```

The tolerance statistics of both predictors, are greater than 0.20. This shows that multicollinearity is not present in the model.

Cases with abnormal residual measures, and their predictor values

	ZRE_10	SRE_10	LEV_10	DBETA10	CHISCH10	DMCH10
13	2.22364*	1.96332	.07515	.43*	5.35*	3.85
70	-1.44895	-1.57996	.09367	.24*	2.32	2.50
78	2.22364*	1.96332	.07515	.43*	5.35*	3.85
85	2.45252*	2.03615*	.06026	.41*	6.40*	4.15*
100	-1.44895	-1.57996	.09367	.24*	2.32	2.50

	FOREIGN3	VSIZE3	VSIZE	PRE_10	PGR_10	LAPSE
13	2	3	5	.16822	1	2
70	1	1	1	.67736	2	1
78	2	3	5	.16822	1	2
85	1	2	2	.14255	1	2
100	1	1	1	.67736	2	1

The asterisks denote residual measures that are unusual. Although the removal of any of the above cases enhances model fit and prediction accuracy slightly, it does not change the predictor effects significantly. Moreover, overall, there is no compelling reason to remove any of the above cases. Therefore, generally, the model appears to be very reasonable.

Validity of fitted predictor relationship with the logit of the dependent variable

	Value	Freq	Parameter Coding (1)	(2)	(3)	(4)
VSIZE						
very small	1	10	.000	.000	.000	.000
small	2	14	1.000	.000	.000	.000
moderate	3	16	.000	1.000	.000	.000
large	4	14	.000	.000	1.000	.000
very large	5	9	.000	.000	.000	1.000
FOREIGN3						
less than 30%	1	20	.000			
more than 30%	2	43	1.000			

Dependent Variable.. LAPSE Allow time to elapse?

	Chi-Square	df	Significance
Model Chi-Square	21.850	5	.0006

Classification Table for LAPSE

		Predicted no n	yes y	Percent Correct
Observed				
no	n	17	12	58.62%
yes	y	3	31	91.18%
			Overall	76.19%

Variables in the Equation

Variable	B	S.E.	Wald	df	Sig	R	Exp(B)
FOREIGN3(1)	3.2537	1.1259	8.3511	1	.0039	.2703	25.8858
VSIZE			11.9765	4	.0175	.2139	
VSIZE(1)	-3.3938	1.3823	6.0274	1	.0141	-.2152	.0336
VSIZE(2)	-3.4251	1.4042	5.9498	1	.0147	-.2131	.0325
VSIZE(3)	-3.7268	1.4597	6.5180	1	.0107	-.2280	.0241
VSIZE(4)	-5.4761	1.5910	11.8464	1	.0006	-.3365	.0042
Constant	1.1153	.8134	1.8801	1	.1703		

Examining the fitted linear relationship between perceived exposure volume and the logit of allowing time flexibility for hedging:

Value	Label	Predictor	Cases	Coefficient	Logit
1	very small	constant	10	1.1153	1.1153 *
2	small	VSIZE(1)	14	-3.3938	-2.2785 **
3	moderate	VSIZE(2)	16	-3.4251	-2.3098 **
4	large	VSIZE(3)	14	-3.7268	-2.6115 **
5	very large	VSIZE(4)	9	-5.4761	-4.3608 **

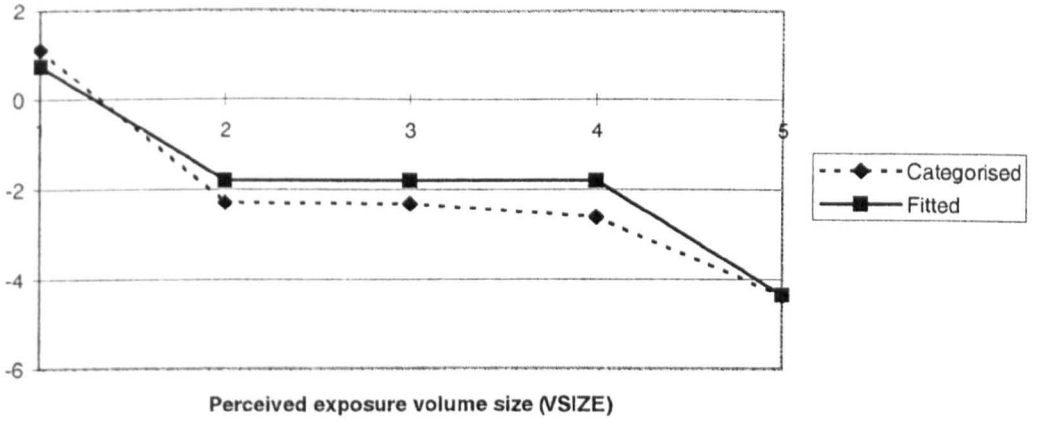
*Logit = $\text{Coefficient}_{(\text{constant})}$; **Logit = Coefficient + $\text{Coefficient}_{(\text{constant})}$

Compare the logits from the above model (categorised) with those derived from the fitted model (fitted)

Exposure volume	1	2	3	4	5
Categorised	1.12	-2.28	-2.31	-2.61	-4.36
Fitted	0.74	-1.8	-1.8	-1.8	-4.34

The plot (see Graph 10A) appears to show only very slight discrepancies between the fitted model (using VSIZE3) and the categorised model (using categorised VSIZE). However, the removal of the linearity constraint (the categorised model) does not improve the model fit significantly although it leaves the prediction accuracy unchanged. Further, the categorised model reduces slightly the significance of predictor, FOREIGN3. Although the categorised predictor, VSIZE, is statistically significant, it is less significant than the fitted predictor, VSIZE3, in the fitted model. However, incorporating VSIZE as a continuous variable with linear relationship with the logit of LAPSE (not shown above) drastically deteriorates the model fit, and the predictor effects, although this does not affect the prediction accuracy. Therefore, the relationship of VSIZE3 on the logit of LAPSE can be assumed to be linear.

Graph 10A: Logit of allowing time flexibility for hedging



Perceived exposure volume size (VSIZE)

Appendix J-11: The fitted model for predicting a company's likelihood of undertaking partial cover

```
Number of selected cases:                    67
Number rejected because of missing data:     12
Number of cases included in the analysis:    55
```

The number of cases per predictor is 18.33 (55÷3). This is greater than the required minimum of 15. This implies that the statistical analyses arising from this model may not be reliable.

	Value	Freq	Parameter Coding (1)
HIFEQUTY			
no	1	28	.000
yes	2	27	1.000
FOREIGN3			
less than 30%	1	17	.000
more than 30%	2	38	1.000

Dependent Variable.. PROPORT Manage proportion of an exposure?

-2 Log Likelihood 64.454788
* Constant is included in the model.

-2 Log Likelihood	39.329
Goodness of Fit	39.110

	Chi-Square	df	Significance
Model Chi-Square	25.126	3	.0000

G_M of 25.126, with 3 degrees of freedom, is statistically significant. In other words, there is statistically significant improvement in the model fit due to the incorporation of the three predictors.

$R_L^2 = 25.126 \div (64.454788) = 0.3898$. This shows that there is a reduction in the badness-of-fit, of about 38.98%, due to the inclusion of the three predictors. Therefore, the proportional reduction is substantively significant.

Classification Table for PROPORT

		Predicted no	Predicted yes	Percent Correct
		n	y	
Observed				
no	n	8	7	53.33%
yes	y	1	39	97.50%
			Overall	85.45%

Model errors = 7+1 = 8. Chance errors = 15. Therefore, $\lambda_p = (15\text{-}8) \div 15 = 0.4600$. This shows that there is a 46.00% reduction in the number of prediction errors due to the inclusion of the three predictors. This is substantively significant.

The binomial d statistic = $(15\text{-}8) \div \sqrt{[(15 \div 55) \times (55\text{-}15)]} = 2.1194$. This has a p-value of 0.0170. This shows that the reduction in the number of prediction errors is also statistically significant.

```
---------------------- Variables in the Equation -------------------------
Variable              B        S.E.      Wald     df       Sig        R    Exp(B)
FOREIGN3(1)      3.8792      1.3238    8.5867      1      .0034   .3197  48.3840
XPREDICT         1.0014       .5248    3.6415      1      .0564   .1596   2.7222
HIFEQUTY(1)      3.8344      1.3275    8.3430      1      .0039   .3137  46.2677
Constant        -5.8512      2.3723    6.0833      1      .0136
```

Wald statistic p-values of almost all the predictors are less than 0.05 – except XPREDICT. This means that the predictor effects, of FOREIGN3, and HIFEQUTY, on the logit of PROPORT are statistically significant. Although the predictor effect of XPREDICT appears not significant, the more accurate Likelihood Ratio (LR) test should be conferred below.

```
                Observed Groups and Predicted Probabilities
F          |                                                            |
R      12  +                                                            +
E          |                                                            |
Q          |                                                            |
U          |                                                         y  |
E       8  +                                                  y         y+
N          |                                                  y         y|
C          |                                  y               y        yy|
Y          |                                  y              yy    y   yy|
        4  +                                  y              yy    y   yy+
           |                                  y              yy   yy   yy|
           | n n    n                        nn              yn   yn yyyy|
           | n n    n          y             nn              nn   yn yyyy|
Predicted  ---------------+--------------+--------------+---------------
  Prob:    0              .25            .5             .75              1
  Group:   nnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyy
           Predicted Probability is of Membership for yes
           Symbols: n - no
                    y - yes
           Each Symbol Represents 1 Case.
```

```
----------------- Model if Term Removed ------------------
Term          Log                                 Significance
Removed       Likelihood     -2 Log LR     df     of Log LR
FOREIGN3         -27.708        16.088      1           .0001
XPREDICT         -21.897         4.465      1           .0346
HIFEQUTY         -27.604        15.878      1           .0001
```

Each predictor's LR test significance is less than 0.05. This means that all predictors, including XPREDICT, are statistically significant in modelling the logit of PROPORT.

Calculating the standardised coefficients of the fitted model

```
            * * * *   M U L T I P L E   R E G R E S S I O N   * * * *

Equation Number 1     Dependent Variable..   PROPORT   Manage
proportion of an ex

Variable(s) Entered on Step Number
   1..     PGR_11      Predicted Group

Multiple R             .61196
R Square               .37450
Adjusted R Square      .36269
Standard Error         .35882
```

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	1	4.08542	4.08542
Residual	53	6.82367	.12875

F = 31.73178 Signif F = .0000

Variable	Std Dev	Valid N	Label
FOREIGN3	.47	55	Proportion of transactions in Foreign Cu
XPREDICT	1.04	55	Unpredictability of FX Exposures
HIFEQUTY	.50	55	Low percentage of equity held by Malaysi
LOGIT11	2.53	55	Natural log odds on undertaking partial

Calculating standardised coefficients:

Predictor	Coefficient	Predictor Std Dev	Correlation Coefficient	Logit Std Dev	Standardised Coefficient
FOREIGN3	3.8792 ×	0.47 ×	0.61196 ÷	2.53 =	0.4410
XPREDICT	1.0014 ×	1.04 ×	0.61196 ÷	2.53 =	0.2519
HIFEQUTY	3.8344 ×	0.50 ×	0.61196 ÷	2.53 =	0.4637

All the standardised coefficients are greater than 0.05. Therefore, all the predictors' effects on the logit of PROPORT are substantively significant. The predictors in descending order of impact on the logit of PROPORT are HIFEQUTY, FOREIGN3, and XPREDICT.

Testing the model for multicollinearity

* * * * M U L T I P L E R E G R E S S I O N * * * *

Equation Number 1 Dependent Variable.. PROPORT Manage proportion of an ex

Variable(s) Entered on Step Number

1..	HIFEQUTY	Low percentage of equity held by Malaysi
2..	XPREDICT	Unpredictability of FX Exposures
3..	FOREIGN3	Proportion of transactions in Foreign Cu

-- Variables in the Equation ---

Variable	Tolerance	VIF
FOREIGN3	.973931	1.027
XPREDICT	.975956	1.025
HIFEQUTY	.965409	1.036

The tolerance statistics of all the three predictors are greater than 0.20. Therefore, multicollinearity is not a problem in the model.

Cases with abnormal residual measures, and their predictor values

	ZRE_11	SRE_11	LEV_11	DBETA11	CHISCH11	DMCH11
79	1.52495	1.87813	.31869*	1.60*	3.41	3.53
94	-2.76460*	-2.15181*	.06842	.60	8.20*	4.63*
95	-2.76460*	-2.15181*	.06842	.60	8.20*	4.63*

	FOREIGN3	XPREDICT	HIFEQUTY	PRE_11	PGR_11	PROPORT
79	1	5	1	.30071	1	2
94	2	4	1	.88430	2	1
95	2	4	1	.88430	2	1

The asterisks denote residual measures that are unusual. The removal of case 79 drastically reduces the (Wald) statistical significance of predictors, FOREIGN3 and HIFEQUTY effects, but this is due to the problem of complete separation. However, the removal of case 79 drastically reduces the effect and significance of XPREDICT. The removal of cases 94, or 95, generally improves all the attributes of the model, but does not change the predictor effects significantly significantly. Overall, however, there is no compelling reason to remove any of the cases. Therefore, generally, the model appears to be reasonable.

Validity of fitted predictor relationship with the logit of the dependent variable

	Value	Freq	Parameter Coding (1)	(2)	(3)	(4)
XPREDICT						
very predictable	1	2	.000	.000	.000	.000
predictable	2	16	1.000	.000	.000	.000
moderate	3	20	.000	1.000	.000	.000
unpredictable	4	11	.000	.000	1.000	.000
very unpredictable	5	6	.000	.000	.000	1.000
HIFEQUTY						
no	1	28	.000			
yes	2	27	1.000			
FOREIGN3						
less than 30%	1	17	.000			
more than 30%	2	38	1.000			

Dependent Variable.. PROPORT Manage proportion of an exposure?

	Chi-Square	df	Significance
Model Chi-Square	30.328	6	.0000

Classification Table for PROPORT

		Predicted no	yes	Percent Correct
		n	y	
Observed				
no	n	8	7	53.33%
yes	y	0	40	100.00%
			Overall	87.27%

Variables in the Equation

Variable	B	S.E.	Wald	df	Sig	R	Exp(B)
FOREIGN3(1)	10.8116	46.0936	.0550	1	.8146	.0000	49590.40
XPREDICT			1.8155	4	.7696	.0000	
XPREDICT(1)	-.4478	196.9676	.0000	1	.9982	.0000	.6390
XPREDICT(2)	.7667	196.9683	.0000	1	.9969	.0000	2.1526
XPREDICT(3)	.6606	196.9692	.0000	1	.9973	.0000	1.9359
XPREDICT(4)	19.1889	228.2608	.0071	1	.9330	.0000	2.16E+08
HIFEQUTY(1)	10.7362	46.0938	.0543	1	.8158	.0000	45992.73
Constant	-10.3449	212.5304	.0024	1	.9612		

Examining the fitted linear relationship between perceived exposure unpredictability and the logit of undertaking partial cover:

Value	Label	Predictor	Cases	Coefficient	Logit
1	very predictable	constant	2	-10.3449	-10.3449 *
2	predictable	XPREDICT(1)	16	-0.4478	-10.7927 **
3	moderate	XPREDICT(2)	20	0.7667	-9.5782 **
4	unpredictable	XPREDICT(3)	11	0.6606	-9.6843 **
5	very unpredictable	XPREDICT(4)	6	19.1889	8.8440 **

*Logit = $\text{Coefficient}_{(\text{constant})}$; **Logit = Coefficient + $\text{Coefficient}_{(\text{constant})}$

Compare the logits from the above model (categorised) with those derived from the fitted model (fitted)

Exposure unpredictability	1	2	3	4	5
Categorised	-21.16	-21.60	-20.39	-20.50	-1.97
Fitted	-4.85	-3.85	-2.85	-1.85	-0.85

The plot (see Graph 11A) appears to suggest that the relationship between XPREDICT and the logit of PROPORT may not be linear. The plot appears to show some clear discrepancies between the fitted and the categorised models, but this may be due to the problem of zero cells. Nonetheless, the removal of the linearity constraint (the categorised model) fails to increase model fit significantly, although it increases prediction accuracy slightly. Further, the categorised model increases the other predictor effects but also reduces their significance drastically. Moreover, the categorised predictor, XPREDICT, is not significant. Therefore, at least for the sake of parsimony, the relationship of XPREDICT on the logit of PROPORT can be reasonably assumed to be linear.

	Value	Freq	Parameter Coding (1)	(2)	(3)
EQMSIAN4					
low (<78.50%)	1	13	.000	.000	.000
moderate (<90.00%)	2	14	1.000	.000	.000
high (<97.00%)	3	14	.000	1.000	.000
v. high (>97.00%)	4	14	.000	.000	1.000
FOREIGN3					
less than 30%	1	17	.000		
more than 30%	2	38	1.000		

Dependent Variable.. PROPORT Manage proportion of an exposure?

	Chi-Square	df	Significance
Model Chi-Square	27.452	5	.0000

Classification Table for PROPORT

		Predicted no	Predicted yes	Percent Correct
		n	y	
Observed				
no	n	9	6	60.00%
yes	y	3	37	92.50%
			Overall	83.64%

---------- Variables in the Equation ----------

Variable	B	S.E.	Wald	df	Sig	R	Exp(B)
FOREIGN3(1)	3.8201	1.3666	7.8141	1	.0052	.3003	45.6076
XPREDICT	.9102	.5628	2.6161	1	.1058	.0978	2.4849
EQMSIAN4			9.5500	3	.0228	.2347	
EQMSIAN4(1)	-.6284	1.4501	.1878	1	.6648	.0000	.5335
EQMSIAN4(2)	-4.8310	1.7353	7.7506	1	.0054	-.2987	.0080
EQMSIAN4(3)	-3.3511	1.7356	3.7279	1	.0535	-.1637	.0350
Constant	-1.3780	1.9602	.4942	1	.4821		

Examining the fitted relationship between the proportion of equity held by Malaysians and the logit of undertaking partial cover:

M'sian-held equity	Foreign-held equity	Predictor	Cases	Coefficient	Logit
0.5001 – 0.7850	0.4999 – 0.2150	constant	13	-1.3780	-1.3780 *
0.7851 – 0.9000	0.2149 – 0.1000	EQMSIAN4(1)	14	-0.6284	-2.0064 **
0.9001 – 0.9700	0.0999 – 0.0300	EQMSIAN4(2)	14	-4.8310	-6.2090 **
0.9701 & greater	0.0299 – 0.0000	EQMSIAN4(3)	14	-3.3511	-4.7291 **

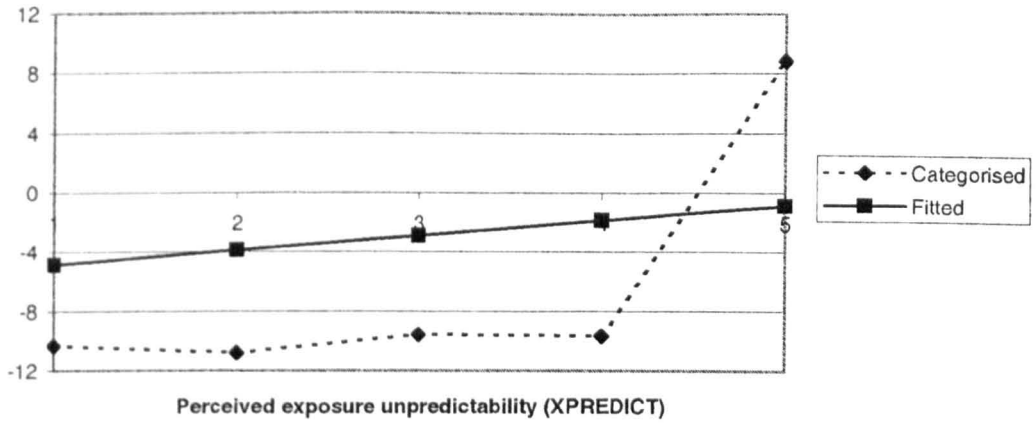
*Logit = $\text{Coefficient}_{(\text{constant})}$; **Logit = Coefficient + $\text{Coefficient}_{(\text{constant})}$

Compare the logits from the above model (categorised) with those derived from the fitted model (fitted)

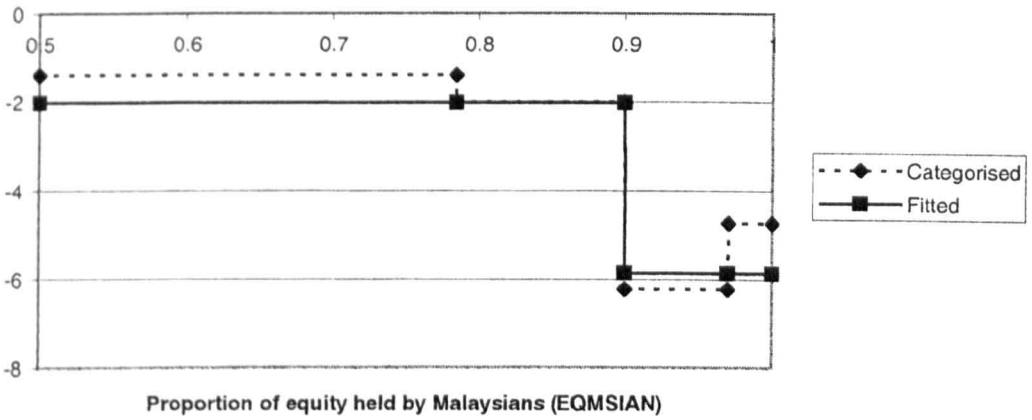
M'sian-held equity	Categorised	Fitted	M'sian-held equity	Categorised	Fitted
0.5001	-1.38	-2.02	0.7850	-1.38	-2.02
0.7851	-2.01	-2.02	0.9000	-2.01	-2.02
0.9001	-6.21	-5.85	0.9700	-6.21	-5.85
0.9701	-4.73	-5.85	1.0000	-4.73	-5.85

The plot (see Graph 11B) appears to show only some discrepancies between the fitted model (using HIFEQUTY) and the categorised model (using EQMSIAN4). However, the categorised model does not improve the model fit significantly and it reduces the prediction accuracy. Further, the categorised model reduces the other predictor effects too. Moreover, the categorised predictor, EQMSIAN4, although significant, is not as significant as HIFEQUTY in the fitted model. Therefore, the relationship of HIFEQUTY on the logit of PROPORT can be reasonably assumed to be as depicted by the fitted model.

Graph 11A: Logit of undertaking partial cover



Graph 11B: Logit of undertaking partial cover



Appendix J-12: The fitted model for predicting a company's likelihood of undertaking uncovered FX deals

```
Number of selected cases:                    67
Number rejected because of missing data:     14
Number of cases included in the analysis:    53
```

The number of cases per predictor is 10.60 (53÷5). This is very much less than the required minimum of 15. This implies that the statistical analyses arising from this model may very well not be reliable.

	Value	Freq	Parameter Coding (1)
STABLE1			
no	1	7	.000
yes	2	46	1.000
PERPUR3			
less than 25%	1	31	.000
more than 25%	2	22	1.000
PERSAL3			
less than 25%	1	35	.000
more than 25%	2	18	1.000

Dependent Variable.. UNOFFSET Undertake uncovered FX deals?

-2 Log Likelihood 51.336031
* Constant is included in the model.

-2 Log Likelihood	25.785
Goodness of Fit	40.543

	Chi-Square	df	Significance
Model Chi-Square	25.551	5	.0001

G_M of 25.551, with 5 degrees of freedom, is statistically significant. In other words, there is statistically significant improvement in the model fit due to the incorporation of the five predictors.

$R_L^2 = 25.551 \div (51.336031) = 0.4977$. This shows that there is a reduction in the badness-of-fit, of about 49.77%, due to the inclusion of the four predictors. Therefore, the proportional reduction is substantively significant.

Classification Table for UNOFFSET

		Predicted no	Predicted yes	Percent Correct
		n	y	
Observed				
no	n	42	1	97.67%
yes	y	3	7	70.00%
			Overall	92.45%

Model errors = 3+1 = 4. Chance errors = 10. Therefore, $\lambda_p = (10-4) \div 10 = 0.6000$. This shows that there is a 60.00% reduction in the number of prediction errors due to the inclusion of the five predictors. This is substantively significant.

The binomial d statistic = (10-4) ÷ √[(10÷53)×(53-10)] = 2.1065. This has a p-value of 0.0176. This shows that the reduction in the number of prediction errors is also statistically significant.

---------- Variables in the Equation ----------

Variable	B	S.E.	Wald	df	Sig	R	Exp(B)
OSUBNUM	.2009	.0850	5.5807	1	.0182	.2641	1.2224
PERSAL3(1)	-6.9678	2.8311	6.0574	1	.0138	-.2811	.0009
PERPUR3(1)	-5.0242	2.5325	3.9358	1	.0473	-.1942	.0066
STABLE1(1)	-5.8323	2.3862	5.9740	1	.0145	-.2782	.0029
EQGOVT	12.8167	6.2026	4.2698	1	.0388	.2103	368328.6
Constant	3.2296	1.9151	2.8438	1	.0917		

Wald statistic p-values of all the five predictors are less than 0.05. This means that all the predictor effects on the logit of UNOFFSET are statistically significant.

Observed Groups and Predicted Probabilities

```
F        |                                                             |
R     24 +                                                             +
E        |n                                                            |
Q        |n                                                            |
U        |n                                                            |
E     16 +n                                                            +
N        |n                                                            |
C        |n                                                            |
Y        |n                                                            |
       8 +n                                                            +
         |n                                                            |
         |n     ny n                                                 y |
         |nnynnnnn nn nn   n  y n n      y  y n                     yy |
Predicted ------------+-------------+-------------+-------------+------
  Prob:   0           .25           .5            .75           1
  Group:  nnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyy
          Predicted Probability is of Membership for yes
          Symbols: n - no
                   y - yes
          Each Symbol Represents 2 Cases.
```

---------- Model if Term Removed ----------

Term Removed	Log Likelihood	-2 Log LR	df	Significance of Log LR
OSUBNUM	-16.469	7.153	1	.0075
PERSAL3	-20.624	15.463	1	.0001
PERPUR3	-16.787	7.789	1	.0053
STABLE1	-19.809	13.834	1	.0002
EQGOVT	-17.088	8.390	1	.0038

Calculating the standardised coefficients of the fitted model

* * * * M U L T I P L E R E G R E S S I O N * * * *

Equation Number 1 Dependent Variable.. UNOFFSET Undertake uncovered fx de

Variable(s) Entered on Step Number
1.. PGR_12 Predicted Group

Multiple R	.73962
R Square	.54703
Adjusted R Square	.53815
Standard Error	.26844

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	1	4.43821	4.43821
Residual	51	3.67500	.07206

F = 61.59145 Signif F = .0000

Variable	Std Dev	Valid N	Label
OSUBNUM	11.03	53	Number of Overseas Subsidiaries (KLSE)
PERSAL3	.48	53	Sales & Other Revenue in FC
PERPUR3	.50	53	Purchases & Other Revenues in FC
STABLE1	.34	53	Percentages stable?
EQGOVT	.17	53	Equity Held by Government
LOGIT12	4.36	53	Natural log odds on undertaking uncovere

Calculating standardised coefficients:

Predictor	Coefficient		Predictor Std Dev		Correlation Coefficient		Logit Std Dev		Standardised Coefficient
OSUBNUM	0.2009	×	11.03	×	0.73962	÷	4.36	=	0.3759
PERSAL3	-6.9678	×	0.48	×	0.73962	÷	4.36	=	-0.5674
PERPUR3	-5.0242	×	0.50	×	0.73962	÷	4.36	=	-0.4261
STABLE1	-5.8323	×	0.34	×	0.73962	÷	4.36	=	-0.3364
EQGOVT	12.8167	×	0.17	×	0.73962	÷	4.36	=	0.3696

All the standardised coefficients are greater, in absolute value, than 0.05. Therefore, all the predictors' effects on the logit of UNOFFSET are substantively significant. The predictors in descending order of impact on the logit of UNOFFSET are PERSAL3, PERPUR3, OSUBNUM, EQGOVT, and STABLE1.

Testing the model for multicollinearity

* * * * M U L T I P L E R E G R E S S I O N * * * *

Equation Number 1 Dependent Variable.. UNOFFSET Undertake uncovered fx de

Variable(s) Entered on Step Number

1..	EQGOVT	Equity Held by Government
2..	OSUBNUM	Number of Overseas Subsidiaries (KLSE)
3..	STABLE1	Percentages stable?
4..	PERPUR3	Purchases & Other Revenues in FC
5..	PERSAL3	Sales & Other Revenue in FC

-- Variables in the Equation ---

Variable	Tolerance	VIF
OSUBNUM	.872587	1.146
PERSAL3	.858261	1.165
PERPUR3	.865497	1.155
STABLE1	.927843	1.078
EQGOVT	.825778	1.211

The tolerance statistics of all the five predictors are greater than 0.20. Therefore, multicollinearity is not a problem in the model.

Cases with abnormal residual measures, and their predictor values

	ZRE_12	SRE_12	LEV_12	DBETA12	CHISCH12	DMCH12
13	-.43414	-1.04000	.68071*	1.26*	.59	1.08
22	4.78371*	2.64153*	.09047	2.50*	25.16*	6.98*
36	.87399	2.00064*	.71643*	6.81*	2.69	4.00*
67	2.71675*	2.12342*	.05701	.47	7.83*	4.51*
68	-.63042	-2.86059*	.91821*	54.55*	4.86*	8.18*
78	-.76529	-1.37843	.51476*	1.28*	1.21	1.90

	OSUBNUM	PERSAL3	PERPUR3	STABLE1	EQGOVT	PRE_12	UNOFFSET
13	3	2	1	2	.5695	.15859	1
22	32	2	1	2	.0010	.04187	2
36	2	1	2	1	.1297	.56694	2
67	3	1	1	2	.0001	.11932	2
68	68	2	2	2	.0011	.28440	1
78	13	2	1	1	.0462	.36935	1

The asterisks denote residual measures that are unusual. Cases 22 and 67 appear to be poor-fitting. The removal of case 22 improves the model fit and the prediction accuracy considerably, but reduces the effect and significance of OSUBNUM. The removal of case 67 does not affect the model characteristics drastically. On the other hand, cases 68, 36, 78, and 13 seem to have disproportionate influence on model parameter estimates. The removal of case 68 reduces the effect and significance of PERPUR3 drastically. The removal of any one of the other cases, on the other hand, does not change distinctly the model attributes. Overall, however, there is no compelling reason to remove any of the above cases. Therefore, generally, the model can be summed up as reasonable.

Validity of fitted predictor relationship with the logit of the dependent variable

	Value	Freq	Parameter Coding (1)	(2)
OSUB3				
0-1	1	15	.000	.000
2-3	2	18	1.000	.000
>= 4	3	20	.000	1.000
PERPUR3				
less than 25%	1	31	.000	
more than 25%	2	22	1.000	
STABLE1				
no	1	7	.000	
yes	2	46	1.000	
PERSAL3				
less than 25%	1	35	.000	
more than 25%	2	18	1.000	

Dependent Variable.. UNOFFSET Undertake uncovered fx deals?

	Chi-Square	df	Significance
Model Chi-Square	19.773	6	.0030

Classification Table for UNOFFSET

Observed		Predicted no (n)	Predicted yes (y)	Percent Correct
no	n	43	0	100.00%
yes	y	4	6	60.00%
			Overall	92.45%

Variables in the Equation

Variable	B	S.E.	Wald	df	Sig	R	Exp(B)
PERSAL3(1)	-4.1192	1.8111	5.1733	1	.0229	-.2486	.0163
PERPUR3(1)	-2.8459	1.7656	2.5982	1	.1070	-.1079	.0581
STABLE1(1)	-3.9231	1.5232	6.6339	1	.0100	-.3004	.0198
EQGOVT	7.0188	3.9504	3.1568	1	.0756	.1501	1117.389
OSUB3			1.1385	2	.5659	.0000	
OSUB3(1)	1.2354	1.8393	.4512	1	.5018	.0000	3.4399
OSUB3(2)	1.8056	1.7894	1.0182	1	.3129	.0000	6.0835
Constant	1.1973	1.8250	.4305	1	.5118		

Examining the fitted linear relationship between the number of overseas subsidiaries and the logit of undertaking uncovered FX deals:

Overseas subsidiaries	Predictor	Cases	Coefficient	Logit
0 - 1	constant	15	1.1973	1.1973 *
2 - 3	OSUB3(1)	18	1.2354	2.4327 **
4 & more	OSUB3(2)	20	1.8056	3.0029 **

*Logit = $\text{Coefficient}_{(\text{constant})}$; **Logit = Coefficient + $\text{Coefficient}_{(\text{constant})}$

Compare the logits from the above model (categorised) with those derived from the fitted model (fitted)

Overseas subsidiaries	0	1	2	3	4	68
Categorised	1.20	1.20	2.43	2.43	3.00	3.00
Fitted	3.23	3.43	3.63	3.83	4.03	16.83

The plot (see Graph 12A) appears to suggest that the relationship between OSUBNUM and the logit of UNOFFSET may be linear. The plot, however, appears to show some discrepancies between the fitted and the categorised models but it also shows that the trend depicted by both are very similar. The removal of the linearity constraint (the categorised model) reduces the model fit but leaves prediction accuracy unchanged. Further, the categorised model reduces all the other predictor effects slightly, but it makes the effect of PERPUR3 insignificant. Moreover, the categorised predictor, OSUB3, is not significant. Therefore, the relationship of OSUBNUM on the logit of UNOFFSET can be reasonably assumed to be linear.

	Value	Freq	Parameter Coding (1)	(2)	(3)
EGOVT4					
very low (< 0.1%)	1	14	.000	.000	.000
low (<1.25%)	2	13	1.000	.000	.000
moderate (<13.5%)	3	13	.000	1.000	.000
high (>13.5%)	4	13	.000	.000	1.000
PERPUR3					
less than 25%	1	31	.000		
more than 25%	2	22	1.000		
STABLE1					
no	1	7	.000		
yes	2	46	1.000		
PERSAL3					
less than 25%	1	35	.000		
more than 25%	2	18	1.000		

Dependent Variable.. UNOFFSET Undertake uncovered fx deals?

	Chi-Square	df	Significance
Model Chi-Square	25.062	7	.0007

Classification Table for UNOFFSET

		Predicted no n	yes y	Percent Correct
Observed				
no	n	42	1	97.67%
yes	y	4	6	60.00%
			Overall	90.57%

Variables in the Equation

Variable	B	S.E.	Wald	df	Sig	R	Exp(B)
OSUBNUM	.2097	.0894	5.5002	1	.0190	.2611	1.2333
PERSAL3(1)	-6.9934	3.0905	5.1207	1	.0236	-.2466	.0009
PERPUR3(1)	-3.7603	2.2777	2.7254	1	.0988	-.1189	.0233
STABLE1(1)	-5.5123	2.8300	3.7941	1	.0514	-.1869	.0040
EGOVT4			4.2347	3	.2372	.0000	
EGOVT4(1)	-2.7455	1.6944	2.6257	1	.1051	-.1104	.0642
EGOVT4(2)	-.5516	1.5770	.1223	1	.7265	.0000	.5760
EGOVT4(3)	2.9859	2.5527	1.3683	1	.2421	.0000	19.8043
Constant	4.1184	2.7627	2.2222	1	.1360		

Examining the fitted linear relationship between the proportion of equity held by government and the logit of undertaking uncovered FX deals:

Govt-held equity	Predictor	Cases	Coefficient	Logit
0.0000 – 0.0010	constant	13	4.1184	4.1184 *
0.0011 – 0.0125	EGOVT4(1)	14	-2.7455	1.3729 **
0.0126 – 0.1350	EGOVT4(2)	14	-0.5516	3.5668 **
0.1351 & greater	EGOVT4(3)	14	2.9859	7.1043 **

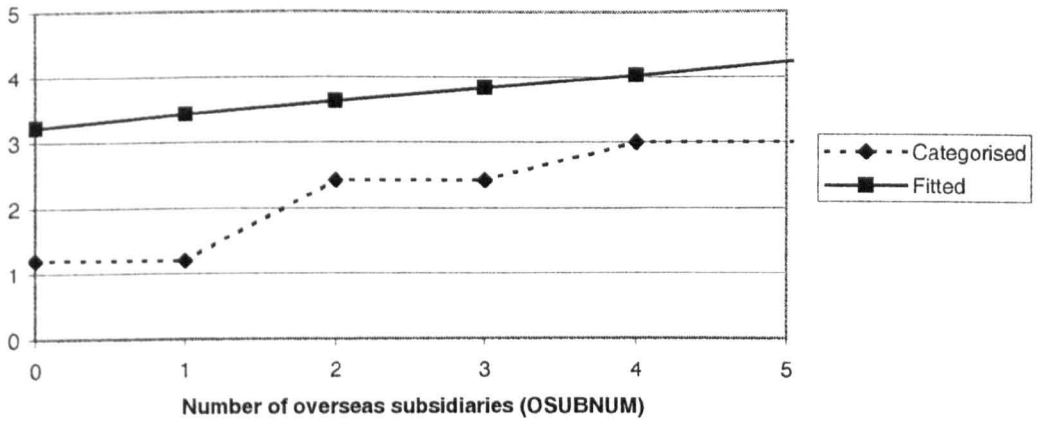
*Logit = $\text{Coefficient}_{(\text{constant})}$; **Logit = Coefficient + $\text{Coefficient}_{(\text{constant})}$

Compare the logits from the above model (categorised) with those derived from the fitted model (fitted)

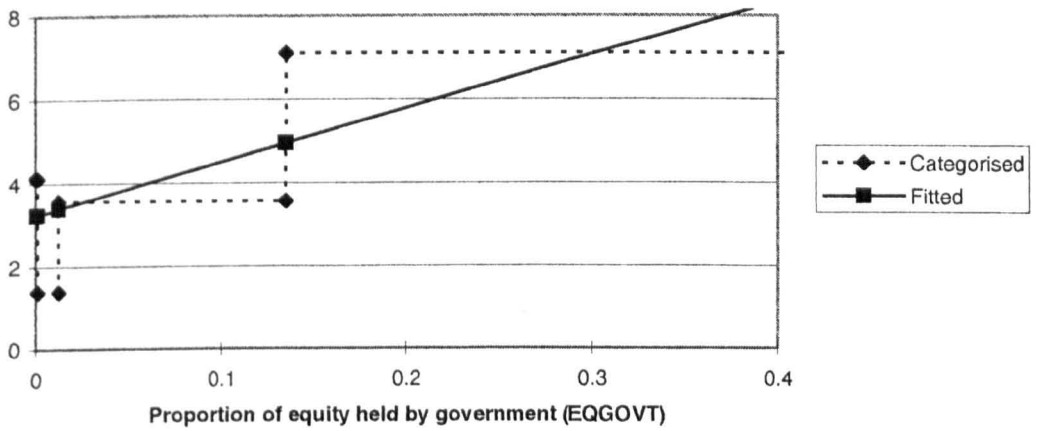
Govt-held equity	Categorised	Fitted	Govt-held equity	Categorised	Fitted
0.0000	4.12	3.23	0.0010	4.12	3.24
0.0011	1.37	3.24	0.0125	1.37	3.39
0.0126	3.57	3.39	0.1350	3.57	4.96
0.1351	7.10	4.96	0.7732	7.10	13.14

The plot (see Graph 12B) appears to suggest that the relationship between EGOVT4 and the logit of UNOFFSET may not be exactly linear because it shows some discrepancies between the fitted and the categorised models. However, the removal of the linearity constraint (the categorised model) reduces model fit, and prediction accuracy, slightly, and it generally reduces the other predictor effects. Again, PERPUR3 is statistically not significant in the categorised model. Moreover, the categorised predictor, EGOVT4, is not significant. Therefore, the effect of EQGOVT on the logit of UNOFFSET can be assumed to be linear, for the sake of parsimony.

Graph 12A: Logit of undertaking uncovered FX deals



Graph 12B: Logit of undertaking uncovered FX deals



Appendix J-13: The fitted model for predicting a company's likelihood of using forward contracts

```
Number of selected cases:                    61
Number rejected because of missing data:     5
Number of cases included in the analysis:    56
```

The number of cases per predictor is 18.67 (56÷3). This is greater than the required minimum of 15. This implies that the statistical analyses arising from this model ought to be generally reliable.

	Value	Freq	Parameter Coding (1)
FOREIGN3			
less than 30%	1	17	.000
30% or more	2	39	1.000
PERFIN3			
less than 25%	1	46	.000
more than 25%	2	10	1.000

Dependent Variable.. FORCON1 Forward Contracts: used?

-2 Log Likelihood 42.198258
* Constant is included in the model.

-2 Log Likelihood	30.173
Goodness of Fit	50.619

	Chi-Square	df	Significance
Model Chi-Square	12.026	3	.0073

G_M of 12.026, with 3 degrees of freedom, is statistically significant. In other words, there is statistically significant improvement in the model fit due to the incorporation of the three predictors.

R_L^2 = 12.026÷ (42.198258) = 0.2855. This shows that there is a reduction in the badness-of-fit, of about 28.55%, due to the inclusion of the three predictors. The proportional reduction can be considered to be substantively significant.

Classification Table for FORCON1

		Predicted no	Predicted yes	Percent Correct
		n	y	
Observed				
no	n	2	5	28.57%
yes	y	1	48	97.96%
			Overall	89.29%

Model errors = 5+1 = 6. Chance errors = 7. Therefore, λ_p = (7-6)÷7 = 0.1429. This shows that there is a 14.29% reduction in the number of prediction errors due to the inclusion of the three predictors. This could be considered to be substantively significant.

The binomial d statistic = (7-6) ÷ √[(7÷56)×(56-7)] = 0.4041. This has a p-value of 0.3431. This shows that the reduction in the number of prediction errors is, however, not statistically significant.

---------- Variables in the Equation ----------

Variable	B	S.E.	Wald	df	Sig	R	Exp(B)
ASSETS_B	.4781	.3399	1.9785	1	.1596	.0000	1.6130
PERFIN3(1)	-3.8243	1.4422	7.0313	1	.0080	-.3453	.0218
FOREIGN3(1)	2.5956	1.2337	4.4265	1	.0354	.2398	13.4040
Constant	.8244	.6828	1.4577	1	.2273		

Wald statistic p-values of all the predictors are less than 0.05, except for ASSETS_B. However, the more accurate LR test, below, ought to be used then for ASSETS_B.

Observed Groups and Predicted Probabilities

```
F         |                                                          |
R      24 +                                                          +
E         |                                                       y  |
Q         |                                                       y  |
U         |                                                       y  |
E      16 +                                                       y  +
N         |                                                       y  |
C         |                                                       yy |
Y         |                                                       yy |
       8  +                                                       yy +
          |                                                       yy |
          |                                          y y          yy |
          |                    n       n   yn       yynn yn    yy yyny|
Predicted ----------+----------+----------+----------+----------
  Prob:   0         .25        .5         .75        1
  Group:  nnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyy
          Predicted Probability is of Membership for yes
          Symbols: n - no
                   y - yes
          Each Symbol Represents 2 Cases.
```

---------- Model if Term Removed ----------

Term Removed	Log Likelihood	-2 Log LR	df	Significance of Log LR
ASSETS_B	-17.206	4.240	1	.0395
PERFIN3	-19.557	8.941	1	.0028
FOREIGN3	-18.080	5.987	1	.0144

LR test p-values of all the predictors are less than 0.05. This means that all the predictor effects, including that of ASSETS_B, on the logit of FORCON1 are statistically significant.

Calculating the standardised coefficients of the fitted model

* * * * M U L T I P L E R E G R E S S I O N * * * *

Equation Number 1 Dependent Variable.. FORCON1 Forward Contracts: used?

Variable(s) Entered on Step Number
1.. PGR_13 Predicted Group

Multiple R	.38967
R Square	.15184
Adjusted R Square	.13614
Standard Error	.31017

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	1	.93003	.93003
Residual	54	5.19497	.09620

F = 9.66737 Signif F = .0030

Variable	Std Dev	Valid N	Label
ASSETS_B	3.34	56	Total assets (billion RM)
PERFIN3	.39	56	Financing in FC
FOREIGN3	.46	56	Transactions in foreign currencies
LOGIT13	1.78	56	Natural log odds on using forward contra

Calculating standardised coefficients:

Predictor	Coefficient		Predictor Std Dev		Correlation Coefficient		Logit Std Dev		Standardised Coefficient
ASSETS_B	0.4781	×	3.34	×	0.38967	÷	1.78	=	0.3496
PERFIN3	-3.8243	×	0.39	×	0.38967	÷	1.78	=	-0.3265
FOREIGN3	2.5956	×	0.46	×	0.38967	÷	1.78	=	0.2614

All the standardised coefficients are greater, in absolute value, than 0.05. Therefore, all the predictors' effects on the logit of FORCON1 are substantively significant. The predictors in descending order of impact on the logit of FORCON1 are ASSETS_B, PERFIN3, and FOREIGN3.

Testing the model for multicollinearity

* * * * M U L T I P L E R E G R E S S I O N * * * *

Equation Number 1 Dependent Variable.. FORCON1 Forward Contracts: used?

Variable(s) Entered on Step Number
1.. FOREIGN3 Transactions in foreign currencies
2.. ASSETS_B Total assets (billion RM)
3.. PERFIN3 Financing in FC

-- Variables in the Equation ---

Variable	Tolerance	VIF
ASSETS_B	.738596	1.354
PERFIN3	.707756	1.413
FOREIGN3	.949942	1.053

The tolerance statistics of all the three predictors are greater than 0.20. Therefore, multicollinearity is not a problem in the model.

Cases with abnormal residual measures, and their predictor values

	ZRE_13	SRE_13	LEV_13	DBETA13	CHISCH13	DMCH13
18	-2.00558*	-1.85516	.06212	.28	4.29*	3.44
33	-5.61028*	-2.68746*	.03621	1.23*	32.66*	7.22*
104	-.70603	-1.23239	.46740*	.82	.94	1.52

	ASSETS_B	PERFIN3	FOREIGN3	PRE_13	PGR_13	FORCON1
18	1.1869	1	1	.80089	2	1
33	.0611	1	2	.96921	2	1
104	4.8183	2	1	.33266	1	1

The asterisks denote residual measures that are unusual. Cases 33 and 18 seem to be poor-fitting, whereas case 104 appears to have disproportionate influence on the parameter estimates. The removal of case 33 improves model fit considerably and prediction accuracy slightly. Although it increases the predictor effects, it also reduces the (Wald) statistical significance of the effects. The removal of case 18 or 104 reduces the effect and significance of FOREIGN3. However, the changes in the effect and significance are not drastic. Overall, there is no compelling reason to remove any of these cases. Therefore, generally, the model is reasonable.

Validity of fitted predictor relationship with the logit of the dependent variable

	Value	Freq	Parameter Coding (1)	(2)	(3)
ASSET4					
small (<222m)	1	14	.000	.000	.000
moderate (<610m)	2	14	1.000	.000	.000
large (<2.225b)	3	14	.000	1.000	.000
v.large (>2.225b)	4	14	.000	.000	1.000
FOREIGN3					
less than 30%	1	17	.000		
30% or more	2	39	1.000		
PERFIN3					
less than 25%	1	46	.000		
more than 25%	2	10	1.000		

Dependent Variable.. FORCON1 Forward Contracts: used?

	Chi-Square	df	Significance
Model Chi-Square	12.285	5	.0311

Classification Table for FORCON1

		Predicted no	Predicted yes	Percent Correct
		n	y	
Observed				
no	n	3	4	42.86%
yes	y	2	47	95.92%
			Overall	89.29%

Variables in the Equation

Variable	B	S.E.	Wald	df	Sig	R	Exp(B)
ASSET4			3.1248	3	.3728	.0000	
ASSET4(1)	-.1747	1.3857	.0159	1	.8997	.0000	.8397
ASSET4(2)	-.0307	1.5031	.0004	1	.9837	.0000	.9698
ASSET4(3)	2.6217	2.0200	1.6844	1	.1943	.0000	13.7593
PERFIN3(1)	-3.8905	1.5583	6.2327	1	.0125	-.3167	.0204
FOREIGN3(1)	2.8406	1.3154	4.6638	1	.0308	.2512	17.1265
Constant	1.0470	1.1787	.7891	1	.3744		

Examining the fitted linear relationship between the total assets (in RM billion) and the logit of using forward contracts:

Total assets (RM b)	Predictor	Cases	Coefficient	Logit
0.0000 – 0.2225	constant	14	1.0470	1.0470 *
0.2226 – 0.6100	ASSET4(1)	14	-0.1747	0.8723 **
0.6101 – 2.2500	ASSET4(2)	14	-0.0307	1.0163 **
2.2501 & greater	ASSET4(3)	14	2.6217	3.6687 **

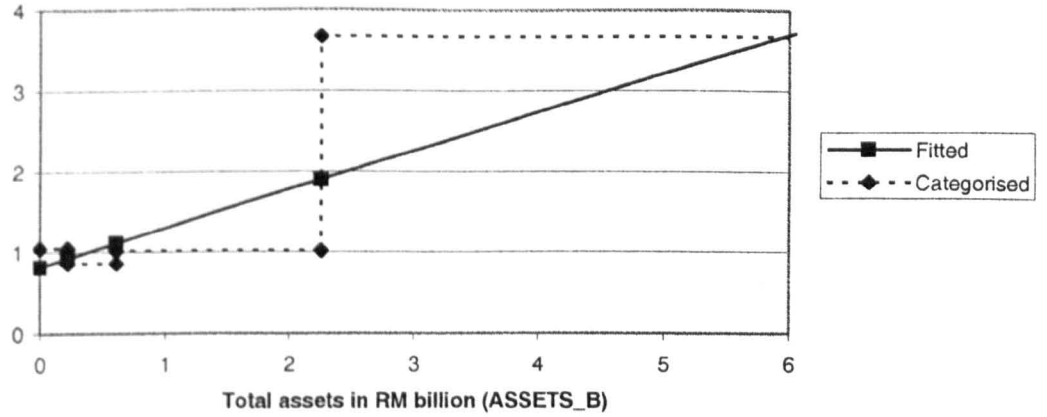
*Logit = $\text{Coefficient}_{(\text{constant})}$; **Logit = Coefficient + $\text{Coefficient}_{(\text{constant})}$

Compare the logits from the above model (categorised) with those derived from the fitted model (fitted)

Total assets	Categorised	Fitted	Total assets	Categorised	Fitted
0.0000	1.05	0.82	0.2225	1.05	0.93
0.2226	0.87	0.93	0.6100	0.87	1.12
0.6101	1.02	1.12	2.2500	1.02	1.90
2.2501	3.67	1.90	18.0210	3.67	9.44

The plot (see Graph 13) appears to suggest that the relationship between ASSETS_B and the logit of FORCON1 is approximately linear although it shows some discrepancies between the fitted and the categorised models. However, the removal of the linearity constraint (the categorised model) does not increase the model fit significantly, and it does not change the prediction accuracy. Nonetheless, it slightly improves the other predictor effects. Moreover, the categorised predictor, ASSET4, is not significant. Therefore, the effect of ASSETS_B on the logit of FORCON1 can be assumed to be linear, for the sake of parsimony.

Graph 13: Logit of using forward contracts



Appendix J-14: The fitted model for predicting a company's likelihood of using forward contracts extensively

```
Number of selected cases:                    61
Number rejected because of missing data:     4
Number of cases included in the analysis:    57
```

The number of cases per predictor is 28.5 (57÷2). This is greater than the required minimum of 15. This implies that the statistical analyses arising from this model are reliable.

	Value	Freq	Parameter Coding (1)
BOARD			
Main	1	45	.000
Second	2	12	1.000
PERFIN3			
less than 25%	1	47	.000
more than 25%	2	10	1.000

Dependent Variable.. FORCON2 Forward Contracts: used mostly?

-2 Log Likelihood 76.027612
* Constant is included in the model.

-2 Log Likelihood	59.894
Goodness of Fit	47.001

	Chi-Square	df	Significance
Model Chi-Square	16.133	2	.0003

G_M of 16.133, with 2 degrees of freedom, is statistically significant. In other words, there is statistically significant improvement in the model fit due to the incorporation of the two predictors.

R_L^2 = 16.133÷ (76.027612) = 0.2122. This shows that there is a reduction in the badness-of-fit, of about 21.22%, due to the inclusion of the two predictors. The proportional reduction can be considered to be substantively significant.

Classification Table for FORCON2

		Predicted no (n)	Predicted yes (y)	Percent Correct
Observed				
no	n	19	16	54.29%
yes	y	2	20	90.91%
			Overall	68.42%

Model errors = 2+16 = 18. Chance errors = 22. Therefore, λ_p = (22-18)÷22 = 0.1818. This shows that there is a 18.18% reduction in the number of prediction errors due to the inclusion of the two predictors. This could be considered to be substantively significant.

The binomial d statistic = (22-18) ÷ $\sqrt{[(22\div57)\times(57-22)]}$ = 1.0883. This has a p-value of 0.1382. This shows that the reduction in the number of prediction errors is, however, not statistically significant.

```
---------------------- Variables in the Equation -----------------------
Variable            B        S.E.      Wald     df       Sig        R    Exp(B)
PERFIN3(1)      -9.3020     30.9143    .0905      1     .7635   .0000    .0001
BOARD(1)        -1.7272      .8506   4.1228      1     .0423  -.1671    .1778
Constant          .2231      .3354    .4426      1     .5059
```

Wald statistic p-value of predictor, BOARD, is less than 0.05, but that of predictor, PERFIN3, is greater than 0.05. However, the more accurate LR test, below, ought to be used then for PERFIN3.

```
              Observed Groups and Predicted Probabilities
         |                                   Y                          |
F        |                                   Y                          |
R     30 +                                   Y                          +
E        |                                   Y                          |
Q        |                                   Y                          |
U        |                                   Y                          |
E     20 +                                   Y                          +
N        |                                   Y                          |
C        |                                   n                          |
Y        |                                   n                          |
      10 +n          n                       n                          +
         |n          n                       n                          |
         |n          n                       n                          |
         |n          n                       n                          |
Predicted ------------+-------------+-------------+--------------
  Prob:   0           .25           .5            .75           1
  Group:  nnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnyyyyyyyyyyyyyyyyyyyyyyyyyyyyyyy
          Predicted Probability is of Membership for yes
          Symbols: n - no
                   y - yes
          Each Symbol Represents 2.5 Cases.

----------------- Model if Term Removed ------------------
Term          Log                                 Significance
Removed       Likelihood     -2 Log LR     df     of Log LR
PERFIN3          -36.320        12.746      1           .0004
BOARD            -32.483         5.072      1           .0243
```

LR test p-values of both the predictors are less than 0.05. This means that all the predictor effects, including that of PERFIN3, on the logit of FORCON2, are statistically significant.

Calculating the standardised coefficients of the fitted model

```
            * * * *   M U L T I P L E   R E G R E S S I O N   * * * *

Equation Number 1     Dependent Variable..    FORCON2    Forward
Contracts: used mo

Variable(s) Entered on Step Number
   1..     PGR_14     Predicted Group

Multiple R              .45611
R Square                .20804
Adjusted R Square       .19364
Standard Error          .44104

Analysis of Variance
                    DF        Sum of Squares        Mean Square
Regression           1              2.81036            2.81036
Residual            55             10.69841             .19452
F =       14.44792          Signif F =  .0004
```

Variable	Std Dev	Valid N	Label
PERFIN3	.38	57	Financing in FC
BOARD	.41	57	Listing Board
LOGIT14	3.55	57	Natural log odds on using forward contra

Calculating standardised coefficients:

Predictor	Coefficient		Predictor Std Dev		Correlation Coefficient		Logit Std Dev		Standardised Coefficient
PERFIN3	-9.3020	×	0.38	×	0.45611	÷	3.55	=	-0.4542
BOARD	-1.7272	×	0.41	×	0.45611	÷	3.55	=	0.0910

All the standardised coefficients are greater, in absolute value, than 0.05. Therefore, both the predictors' effects on the logit of FORCON2 are substantively significant. The predictors in descending order of impact on the logit of FORCON2 are PERFIN3, and BOARD.

Testing the model for multicollinearity

* * * * M U L T I P L E R E G R E S S I O N * * * *

Equation Number 1 Dependent Variable.. FORCON2 Forward Contracts: used mo

Variable(s) Entered on Step Number
1.. BOARD Listing Board
2.. PERFIN3 Financing in FC

-- Variables in the Equation ---

Variable	Tolerance	VIF
PERFIN3	.984362	1.016
BOARD	.984362	1.016

The tolerance statistics of both the predictors are greater than 0.20. Therefore, multicollinearity is not a problem in the model.

Cases with abnormal residual measures, and their predictor values

	ZRE_14	SRE_14	LEV_14	DBETA14	CHISCH14	DMCH14
15	2.12132*	1.93661	.09091	.49*	4.95*	3.75
21	2.12132*	1.93661	.09091	.49*	4.95*	3.75

	PERFIN3	BOARD	PRE_14	PGR_14	FORCON2
15	1	2	.18182	1	2
21	1	2	.18182	1	2

The asterisks denote residual measures that are unusual. Only two, almost identical, cases, 15 and 21, are poor-fitting. Removing either of these cases improves the model fit considerably and the prediction accuracy slightly. It also improves the effect and significance of the predictor, BOARD. This has little impact on the predictor effect of PERFIN3 because of the problem of zero cells – no case (company) that had high financing exposure used forward contracts extensively. Overall, however, there is no compelling reason to remove either of these cases. Therefore, the model appears rather reasonable.

Appendix K: Predictor effects on specific FERM activities, found in this study, and possible justifications for the observed effects

	Effect	Justification
1.	A company was more likely to manage FX risk, with all other predictors held constant, when the company had:	
	a. greater total assets	Greater resources; lower cost of external hedging tools; greater informational and transactional scale economies, greater capacity to manage FX risk
	b. a high level of FX exposure	Greater exposure, greater need to manage FX risk
	c. perceived higher exchange rate volatility	Greater aversion or sensitivity to FX risk, greater inclination to manage FX risk
2.	A company was more likely to manage accounting exposure, given that it managed FX risk, with all other predictors held constant, when the company had:	
	a. lower total assets	Greater information asymmetry, lower access to external funding sources, lower ability to assume risk from not managing accounting exposure
	b. greater total debt	Greater need to manage accounting exposure to ensure translation losses do not affect debt agreement conditions drawn on accounting ratios
	c. a low or high (rather than moderate) level of total debt	Greater need to expand or defend debt capacity that is affected by translation losses, more sensitive about managing accounting exposure
	d. a greater number of overseas subsidiaries	More sensitive about managing accounting exposure due to the need to regularly consolidate statements
3.	A company was more likely to manage economic exposure, given that it managed FX risk, with all other predictors held constant, when the company had:	
	a. a high level of financing exposure	Financial exposures are more critical, larger and longer-term; lack of suitable hedging instruments for hedging long-term financial exposures; greater dependence on multi-departmental operational strategies – congruent with economic exposure management
	b. lower total assets	Lower ability to assume risk from not managing economic exposure; less inhibition to practise cross-departmental co-operation for executing long-term strategies
	c. perceived it had greater FX exposure	Perceive greater need to manage using perspectives that focus on company-wide, longer-term, and competitive exposures – compatible with economic exposure management

4.	A company was more likely to manage transaction exposure, given that it managed FX risk, with all other predictors held constant, when the company had:	
	a. perceived it had stable FX exposures	Exposure pattern does not vary widely, greater willingness to invest in the transaction exposure management programme
	b. perceived it had greater FX risk	Perceive greater need to manage transaction exposure
5.	A company was more likely to manage all three FX exposure types, with all other predictors held constant, when the company had:	
	a. perceived it had greater FX exposure	More sensitive towards overall risk, perceive greater need to manage all types of FX exposure to reduce this risk
	b. a high level of financing exposure	More critical, larger, and longer-term exposures, higher risk, greater need to manage all FX exposure types
	c. lower total assets	Less capacity to assume risk from not managing all exposure types
	d. perceived it had stable FX exposures	Exposure pattern does not vary widely, greater willingness to invest and dedicate resources for managing all FX exposure types
6.	A company was more likely to adopt a formal FERM objective, given that it managed FX risk, with all other predictors held constant, when the company had:	
	a. lower total debt	Less debt servicing cost, greater resources for adopting formal objective; lower debt capacity, adopting formal objective might increase debt capacity; prudent companies might use less debt as well as adopt formal objectives
	b. greater total assets	Greater access to resources to fund the setting-up and conduct of formal FERM programme
	c. a low or high (rather than moderate) level of intra-company transactions	When transaction level is low, cheaper and easier (less inhibitions) to formalise; when transaction level is high, higher benefits (resolved conflicts) than the considerably high costs (dealing with complexity, conflicts, and subsidiary disenchantment) from formalising
	d. greater total sales	Greater revenue to fund the conduct of formal FERM programme

7.	A company was more likely to share FERM responsibility among two or more departments, given that it managed FX risk, with all other predictors held constant, when the company had:	
	a. lower market capitalisation	Less access to resources, less capacity to specialise
	b. been listed on the construction or property sectors (but not the consumer sector)	Greater complexity in dealing with a small number of irregular but large individual exposures that are not a permanent feature of corporate operations, greater need to share FERM responsibility
	c. perceived it had greater FX exposure	Perceive greater need to increase accountability and cross-functional co-operation, greater need to share responsibility for dealing with the exposure
8.	A company was more likely to decentralise fully its domestic subsidiaries' FERM, given that it managed FX risk, with all other predictors held constant, when the company had:	
	a. a high level of intra-company transactions	Greater costs (complexity and subsidiary resentment) than benefits in centralising subsidiaries' FX exposure management
	b. a low debt ratio	Lower financial risk, less need for central control
	c. a high level of capital investment in foreign currencies	Investment activities are less centralised; greater foreign currency investment, greater need for autonomy – compatible with greater FERM decentralisation
9.	A company was more likely to decentralise fully its overseas subsidiaries' FERM, given that it managed FX risk, with all other predictors held constant, when the company had:	
	a. lower market capitalisation	Less access to resources, less capacity to centralise FERM
	b. a high level of intra-company transactions	Greater costs (complexity and subsidiary resentment) than benefits in centralising subsidiaries' FX exposure management
	c. perceived it had greater FX exposure increment	Perceive greater need for centralised FERM in anticipation of increased exposure and risk

10.	A company was more likely to allow time flexibility for hedging, given that it managed FX risk, with the other predictor held constant, when the company had:	
	a. perceived it had smaller FX exposure	Less anxious or sensitive about temporarily assuming exposure, allow more time to execute hedges
	b. a high level of FX exposure	Greater opportunity for netting; greater capacity to search for favourable hedging rates; less anxious or sensitive, allow time flexibility
11.	A company was more likely to undertake partial cover, given that the company managed FX risk, with all other predictors held constant, when the company had:	
	a. a high level of foreign-held equity	Foreign investors more diversified internationally, more capacity to assume risk from partially uncovered exposures
	b. a high level of FX exposure	Greater chance of netting; greater competence to consider and select exposures to hedge; less anxious or sensitive about assuming some exposure
	d. perceived it had greater FX exposure unpredictability	When exposures are unpredictable, partial covers can reduce exposures' value-at-risk
12.	A company was more likely to undertake uncovered FX deals, given that it managed FX risk, with all other predictors held constant, when the company had:	
	a. a low level of sales exposure	Less sensitive or averse towards accepting additional artificial FX exposure
	b. a low level of purchases exposure	Less sensitive or averse towards accepting additional artificial FX exposure
	c. a greater number of overseas subsidiaries	Greater opportunity for justifying uncovered FX deals; greater access to wide information sources
	d. greater government-held equity	Greater reputation, greater capacity to accept additional artificial exposure; easier access to central bank permission for undertaking uncovered FX deals
	e. perceived it had unstable FX exposures	When exposure pattern is unstable, uncovered FX deals might be able to offset unanticipated natural FX exposures

13.	A company was more likely to use forward contracts to manage transaction exposure, given that it managed transaction exposure, with all other predictors held constant, when the company had:	
	a. greater total assets	Better credit risk, greater and cheaper access to forward contracts; greater capacity to meet high fixed cost needs of using forward contracts
	b. a low level of financing exposure	Proportionally more exposures that can be hedged using forward contracts; less access to alternative hedging technique – money market hedge
	c. a high level of FX exposure	Greater need to use forward contracts
14.	A company was more likely to extensively use forward contracts to manage transaction exposure, given that it managed transaction exposure, with the other predictor held constant, when the company had:	
	a. a low level of financing exposure	More exposures that can be hedged using forward contracts; less access to money market hedge, greater need to depend on forward contracts
	b. been listed on the main (rather than second) board	Greater reputation, cheaper access to forward contracts, higher counter-party limit, greater opportunity to use forward contracts extensively