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Essays on Information Asymmetry, Agency Problem, and Corporate Actions

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Refereed publications:

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A version of Chapter 3 was presented during the 11th Corporate Finance Day in Liége (Belgium) in September 2013, and during 2013 Behavioural Finance Working Group Conference in London *(joint with Aydin Ozkan and Jannine Poletti-Hughes).*

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Abstract

This study investigates the implications of the asymmetric information between managers and shareholders and the resulting costly agency problems. In doing so, it focuses on the heterogeneity of executive directors with respect to their trading behaviour and personal characteristics, and the corporate governance mechanisms which can help lessen the adverse effects of the manager-shareholder agency conflicts. The study recognises that executive directors cannot be treated as a homogenous group and their incentives and the ability to impact decisions differ significantly. Two top executive directors are considered throughout this study, namely Chief Executive Officers (CEOs) and Chief Finance Officers (CFOs).

In this study, we address several important research questions. First, we consider whether executive directors have an informational advantage over outsiders. Second, we address if the heterogeneity of directors with respect to their role in the company and personal characteristics matters. Third, we examine whether internal corporate governance mechanisms play a significant role in moderating the manager-shareholder agency problem. Last but not least, we investigate if the nature of the interactions between asymmetric information, agency issues and corporate governance change during and after the global financial crisis of 2007-08. In carrying out our empirical analysis, we employ a unique dataset on the UK non-financial firms during the sample period 2000 to 2010. The detailed information about the corporate governance structure of firms and the personal characteristics of CEOs and CFOs enable us to carry out a comprehensive analysis of the research questions outlined above for three distinct periods, namely the pre-crisis, crisis and post-crisis periods.

Our analysis shows that the position that directors hold in the company and their characteristics can help explain the subsequent market-adjusted returns on insider trading. We find that the returns to insider purchase transactions are generally positive. However, they are weaker in the longer term, possibly suggesting that the informative content of director trades is less significant than it is perceived by the market. The main finding of our analysis in relation to the link between insider trading and the probability of bankruptcy is that insider trading increases the predictive power of insolvency models. This study also reports that CEOs exert a greater influence on the leverage decision than CFOs in firms that seem to operate under their optimal leverage. However, we observe that the CFO's characteristics become more significant in determining leverage after the recent financial crisis.

Overall, the analysis of this study provides strong evidence for the view that the presence of asymmetric information between insiders and outsiders and the costly manager-shareholder agency conflict are central to our understanding of the corporate finance decision making process and its consequences. However, more importantly, the findings of this study provide a relatively new notion that considering the heterogeneity of top executive directors in the empirical analysis of corporate decisions is essential, especially in exploring modern corporations.

CHAPTER 1. INTRODUCTION AND OVERVIEW OF THE THESIS

1.1. Introduction

Modern corporations are characterized by information asymmetry and agency conflicts between insiders and outsiders. The conflicts of interests become costly in the presence of asymmetric information unless the extent of asymmetry is reduced through internal and external control mechanisms. The well-known agency problems associated with asymmetric information, identified in previous literature, include asset substitution (Jensen and Meckling, 1976), underinvestment (Myers, 1977), and the free-cash flow (Jensen, 1986) problems. Whereas the first two problems arise from the agency conflicts between shareholders and bondholders where managers are supposed to act in the interests of shareholders, the last one arises from the conflict of interests between managers and shareholders. The main objective of this study is to examine the implications of the asymmetric information between managers and shareholders and the resulting costly agency problems, with special attention given to the heterogeneity of executive directors with respect to their trading behaviour and personal characteristics.

The manager-shareholder agency conflicts have been a subject of intense investigation since the seminal study of Jensen and Meckling (1976). Previous ample research provides explanations as to why the agency conflicts arise, what effects they have on shareholder wealth and firm value, and how the associated costs can be alleviated. It is argued that managers have different objectives than shareholders and choose to act in their own best interest when opportunities arise. Furthermore, the

literature shows that such opportunities are more likely to arise in firms in which dispersed ownership is combined with strong managers and poor corporate governance mechanisms. In such firms, although shareholders are the owners, they do not control the firm. Instead, managers who are appointed by shareholders to manage the firm on their behalf have discretion in the decision-making process and hence the control of the firm. This has become known as the separation of ownership and control. As Fama and Jensen (1983, 304) explain "... *managers who initiate and implement important decisions are not the major residual claimants and therefore do not bear a major share of the wealth effects of their decisions. Without effective control procedures, such decision managers are more likely to take actions that deviate from the interests of residual claimants*." Although the separation of ownership and control is normally a desired property it can also enable managers to adopt suboptimal strategies and policies affecting shareholders' wealth adversely.[1]

The existing literature shows the implications of the manager-shareholder agency conflicts and provides an extensive discussion as to how the costly consequences can be moderated. Specifically, in addition to the theoretical explanations, the empirical findings reveal that managers normally prefer lower than optimal leverage (Berger et al., 1997; Graham, 2000); choose debt financing with longer maturity (Brockman et al., 2010; Datta et al., 2005); hold large cash balances (Ferreira and Vilela, 2004; Harford et al., 2008; Ozkan and Ozkan, 2004); pay out lower than optimal dividends (Hu and Kumara, 2004; Khan, 2006); and tend to overinvest (Goergen and Renneboog, 2001; Pawlina and Renneboog, 2005). The main premise of this strand of the corporate finance literature is that the conflicts of

[1] See Shleifer and Vishny (1997) for an analytical discussion on various ways in which managers may not act in the best interests the firm and its shareholders.

interests between managers and shareholders generally lead to suboptimal decisions, which in turn reduce shareholders wealth and firm value.

The literature also shows the ways in which the costs associated with the manager-shareholder agency problem can be to some extent reduced. Specifically, there are mechanisms that can both curtail the extent of asymmetric information and limit the potential for suboptimal managerial behaviour. These mechanisms are generally known as corporate governance mechanisms and include both external and internal measures. External governance mechanisms that restrict managerial discretion focus on the rule of law, the quality of investor protection, the disciplining roles of banks and institutional investors, and the quality of auditing and accounting standards. On the other hand, internal corporate governance mechanisms relate to firm-specific characteristics including equity ownership structure, board characteristics, managerial compensation, and corporate policies such as dividend and capital structure policies of firms. It has been shown that both external and internal corporate governance mechanisms play an important role in reducing the costs of agency conflicts and asymmetric information.[2]

1.2. Gaps in the Literature and Main Research Questions of the Thesis

The existing literature provides a rich set of results and convincing evidence on the importance of the manager-shareholder agency problem in influencing corporate decisions. However, there has been relatively little emphasis on the heterogeneity of managers regarding their exact roles within the firm, personal

[2] See Bebchuk and Weisbach (2010) and Shleifer and Vishny (1997) for an extensive discussion and survey of research on corporate governance mechanisms.

characteristics, incentives and ability to make and execute policies. It is important to note that these features are important in determining not only the nature and extent of the agency problem in the first place but also the ways in which the agency issues are resolved. The main objective of this study is therefore to provide an analytical framework that investigates the consequences of asymmetric information and the manager-shareholder agency conflicts by mainly focusing on the differences in the personal characteristics and trading behaviour of executive directors. We also acknowledge that internal corporate governance mechanisms play a significant role in determining the ultimate effects of the manager-shareholder agency problem. Consistent with prior research, we note that executive directors are more relevant to investigate than other board members regarding the issues in relation to the agency conflicts between inside managers and outside shareholders. However, more importantly, we further argue that executive directors cannot be treated as a homogenous group and their incentives and the ability to impact decisions differ. To start with, the specific roles they hold within the company are likely to decide their contribution to the problem and its resolution. To this end, we focus on two executive directors throughout this study, namely Chief Executive Officers (CEOs) and Chief Finance Officers (CFOs).

In developing the research strategy of this study, we recognize that the Chief Executive Officer (CEO) of a firm, being on the top level of the hierarchy in the executive officers rank, holds the key position within the firm to have the greatest influence on corporate decisions. Although CEOs are the leading and the most powerful figure within corporations, we also recognize that they do not have full discretion over running firms and taking decisions. In addition to monitoring and disciplining provided by the board of directors and to some extent external bodies,

Chief Finance Officers (CFOs) of firms also play a crucial governance role within corporations. They do so not only by leading the financial affairs of firms but also by representing a powerful figure on the board with a greater ability to moderate the incentives of CEOs. We therefore consider the CFO of a firm as the second most influential director in the firm. The fact that the CFO is heavily involved in the financial decision making process gives him a great insight into the concepts discussed in this study, namely asymmetric information, agency conflicts between directors and shareholders, and corporate governance mechanisms. The importance of the CFO has been widely acknowledged in recent studies partly in response to the regulatory changes implemented by the Sarbanes-Oxley Act of 2002 which resulted in a greater scrutiny of the CFO (Collins et al., 2009; Hoitash et al., 2012). There are also recent studies that investigate the corporate governance role of CFOs and the relevance of their specific characteristics for corporate actions and in relation to the CEO. For instance, it is shown that CFOs influence decisions on leverage (Frank and Goyal, 2007), debt maturity choices (Chava and Purnanandam, 2010), and earnings management (Jiang et al., 2010). In addition, CFOs are found to possess superior information which revealed via their insider trading (Wang et al., 2012) or option holdings (Kim et al., 2011).

In this study, we address several important research questions. One of the main questions we consider is whether executive directors have indeed an informational advantage over outsiders. To address this question we provide an empirical analysis that examines the trades carried out by executive directors. This is to test the informative content of director trades and hence the presence of asymmetric information between insiders and outsiders. This analysis is carried out to test inside trades generate abnormal subsequent returns and provide additional

information in predicting insolvencies. The second main question we address is whether the heterogeneity of directors with respect to their role in the company and personal characteristics matters. To do so, as mentioned above, we distinguish between the executive directors and consider the two most important executive directors in the company, the CEO and the CFO. We also incorporate in the analysis detailed personal information about each director separately over a relatively long period of time observing the changes both cross-sectionally and over time. The third important research question relates to the effectiveness of the central internal corporate governance mechanisms in moderating the aforementioned manager-shareholder agency problem. Last but not least, we investigate if the nature of the interactions between asymmetric information, agency issues and corporate governance changes during and after the global financial crisis of 2007-08. We argue that the severity of information asymmetry and its impact on the manager shareholder conflict, as well as their consequences, are likely to have changed with the financial crisis.

1.3. Dataset

In carrying out our empirical analysis, we employ a unique dataset on the UK non-financial firms, which was created by combining information from several databases i.e. Morningstar UK, BoardEx, Datastream, and Thomson One. In addition to the standard financial and accounting data, this dataset provides detailed information on the state of corporate governance mechanisms available within a firm, including the identity and size of major shareholders, the number of executive and independent directors on the board, and their equity ownership. The members of the board are further described according to their roles on the basis of which we

select the directors who act as the CEO or CFO during the sample period. In the next stage, we collect information on the personal characteristics of executives (i.e. CEOs and CFOs) including age, tenure, gender, and their external affiliations. Lastly, the dataset contains information on the insider trading and holdings of all board members, which we subsequently categorise into executive (with further distinction for CEO and CFO) and independent director deals. The dealings are further described in terms of the number of shares traded, value, announcement and transaction dates, and transaction types (i.e. purchase, sale, option exercise, routine or opportunistic).

The dataset provides us with detailed information during the sample period 2000 to 2010, giving us the opportunity to carry out a comprehensive analysis of the research questions outlined above for three distinct periods, namely the pre-crisis, crisis and post-crisis periods. The unique dataset we employ in the study also enables us to provide a dynamic analysis of the role of asymmetric information and the manager-shareholder conflict impacting issues in an environment characterised by dispersed ownership and relatively strong managers operating in a relatively strong corporate governance environment.

1.4. Structure, Main Contributions and Findings of Chapters

In an attempt to address the issues outlined above, this study is structured as follows. In Chapter 2, we explore the relation between insider trading and subsequent stock returns to investigate the informative content of inside trades in order to see if insiders have any informational advantage over outside investors. In particular, we investigate the impact of the CEO and the CFO insider trading on stock returns in the short-term to long-term periods following the trades. The

analysis of this chapter extends the recent studies of Wang et al. (2012) and Cohen et al. (2012) on the informative content of insider trading. However, it provides a unique approach that enables us to explore the CEO and CFO purchase transactions separately and to distinguish between their opportunistic and routine trades. Also, differently from both studies, this study investigates the interactions between managerial and corporate governance characteristics and the subsequent returns on inside transactions. This allows us to control for a potential role they are likely to play as an additional channel of information lessening the unfavourable consequences of asymmetric information between insiders and outsiders. Furthermore, the empirical analysis is carried out for the whole sample, as well as separately for three sub-periods, to investigate whether the findings of prior research are affected by the recent global financial crisis. To the best of our knowledge, the analysis of this chapter is the first attempt that provides a unifying approach to consider in the same framework the identity and personal attributes of trading executive directors, firm-level corporate governance features, the nature of purchase transactions, and the trading period characteristics.

Our analysis shows that the position that directors hold in the company and their characteristics can help explain the subsequent market-adjusted returns on insider trading. We find that the returns to insider purchase transactions are generally positive. They are, however, weaker in the longer term, possibly suggesting that the informative content of director trades is less significant than the market's perception of how informative they are. When we separately consider opportunistic and routine trades and carry out the analysis for different sub-periods, we find that the opportunistic trades made by both CEOs and CFOs are more informative than the routine trades they make. Interestingly, the market reacts more positively to routine

trades in the short term, in particular to the routine trades carried out by CEOs. It is also worth mentioning that the strongest results we can provide for the positive impact of insider purchases on returns relate to the trades made by CEOs in the post-crisis period. Additionally, we find that the market-adjusted returns increase with the size of trade and decrease with greater external affiliations and the number of past trades. Among the corporate governance characteristics examined in the study, only board independence has a significant impact on returns, influencing the returns positively during the crisis period and negatively in the post-crisis era.

In Chapter 3, we provide additional insights into the role of asymmetric information between insiders and outsiders by investigating whether insider trading activities are related to the probability of insolvency. While the main focus of the study is on the link between insider trading and the likelihood of insolvency, the empirical analysis also controls for the effects of a number of accounting and market variables, as well as a rich set of corporate governance characteristics. In contrast to previous research, which mainly examines the patterns of trading prior to the event of bankruptcy, the primary objective of this chapter is to examine the relevance of the trading activities of directors in determining the likelihood of insolvency.

To our knowledge, this is the first attempt in the literature to establish the association between insider trading and the probability of insolvency in the United Kingdom. In doing so, the analysis of this chapter not only provides important insights into our understanding of bankruptcy prediction models, but also extends the literature on the informative content of insider trading. Furthermore, our analysis contributes to efforts to understand the interaction between corporate governance characteristics and corporate insolvencies. Earlier research on the relation between corporate governance and corporate bankruptcies is mainly dominated by the US

studies (e.g., Daily and Dalton, 1994a, b; Fitch and Slezak, 2008; Gilson, 1990; Kose and Lang, 1991; Platt and Platt, 2012). We carry out our analysis using data for the UK firms, both solvent and insolvent during the sample period, and note that there are important differences between the UK and the US concerning the ways in which the corporate governance provides an effective monitoring and disciplining of the management of firms.

The main finding of our analysis is that insider trading increases the predictive power of insolvency models. There is strong evidence that in the period leading to insolvency insiders of insolvent firms increase their purchase transactions significantly. Moreover, the intensity of trading in insolvent is different than that for solvent firms. In the more distant past, the trading volume and the percentage of trading directors in insolvent firms are significantly lower than in solvent firms, whereas the activity of insiders rises significantly when companies are on the verge of insolvency. It is found that there is a positive relation between net purchase and the probability of insolvency only in the short period before insolvency. In more distant periods, the relation becomes negative. The findings also show that increases in both the volume of trade and the number of trading directors in the period leading to insolvency are associated with a greater probability of insolvency. On the other hand, a higher number of active insiders and volume of trade in earlier periods lower the likelihood. Regarding the impact of corporate governance on the likelihood of insolvency, the findings reveal that board independence diminishes the probability of insolvency. Interestingly, board size has a negative effect on the probability of insolvency, which is not consistent with the classic view that small boards lead to better overall firm performance. Also, differently from the results on US companies, the relation between institutional ownership and the probability of insolvency is

found to be positive. We argue that these findings to some extent arise from the differences in the US and the UK corporate governance systems. This possibly provides further evidence that institutional investors in the UK are not effective in monitoring firms' management and hence reducing the agency conflicts between managers and shareholders. Overall, the analysis suggests that while the earlier trades appear to be motivated by superior information held by insiders, insider trading closer to the insolvency date is possibly initiated by directors' rational motives to influence the market perception of the firm in an attempt to avert insolvency, or caused by their overconfidence (i.e. irrationality).

In Chapter 4, we explore further the effects of the asymmetric information between managers and shareholders by focusing on the capital structure policy. The central emphasis of the analysis is on the factors that affect the managerial ability to choose a specific leverage policy, which serve their own interests rather than outside shareholders. The analysis of this chapter recognises that directors may diverge in terms of their general ability to act independently and in their specific skills in shaping the firm's capital structure policy. By considering both the impact of the CEO and the CFO characteristics on the leverage decision simultaneously the study enables us to address at least two important and related questions. First, by incorporating in the analysis a proxy for director ability we explicitly investigate whose impact, the CEO or the CFO, is more significant in determining corporate leverage. Second, we test whether the impact on leverage of managerial tenure, ownership, and the number of director external affiliations is homogenous or varies with the identity of director. In doing so, it contributes to the recently emerging literature that compares CEOs and CFOs in terms of their characteristics and impact on corporate policies (Chava and Purnanandam (2010); and Graham et al. (2013)),

and the existing empirical research that explores the impact of managerial attributes on leverage (see for example Berger et al., 1997; De Miguel et al., 2005; Florackis and Ozkan, 2009b). Also importantly, noting that in unstable economic conditions the presence of strong executives from a corporate governance point of view becomes more crucial than the presence of independent boards of directors, the study sheds further light on the impact of managerial and corporate governance characteristics on leverage during the financial crisis. While we focus on the influence of senior executives on leverage, our empirical analysis also casts light on the relationship between internal corporate governance mechanisms and capital structure. It is argued that good corporate governance practices endorse higher leverage as a disciplining mechanism, and therefore limit agency costs (Jensen, 1986; Jensen and Meckling, 1976). Prior research also suggests that good corporate governance is perceived favourably by the market and leads to lower costs of debt financing (Klock et al., 2005). This would in turn enable firms to raise and afford higher amounts of debt.

Our empirical analysis reveals several important findings that enrich our understanding of the role of the characteristics of top executives and corporate governance mechanisms in shaping corporate leverage policy. First, our analysis shows that compared to CFOs, the characteristics of CEOs exert a greater influence in the leverage decision. The findings regarding the greater CEO impact hold during the whole period of our analysis. Second, by distinguishing between under- and overleveraged firms we find that the negative interaction between the CEO ability and leverage is more pronounced in firms that seem to operate under their optimal leverage. In line with this finding, when we consider individual director characteristics separately, we find that the characteristics of CEOs impact

underleveraged firms more significantly than the overleveraged ones. Third, we observe that during and after the financial crisis the CFO's tenure, ownership and affiliations become more significant in determining leverage. However, the findings are again significant only for the sample of underleveraged firms. The number of CFO affiliations together with his ownership and tenure exerts a negative effect in the leverage decision of underleveraged firms, especially in the post-crisis period. Furthermore, we show that that the relationship between CFOs' external affiliations and leverage is opposite to what we find for CEOs. Fourth, the impact of corporate governance mechanisms on leverage varies between the underleveraged and overleveraged firms. In particular, more independent boards have a positive effect on leverage in underleveraged companies whereas their influence is not significant in the overleveraged sample. On the other hand, board size influences only the leverage decision of overleveraged firms where the estimated relation is significantly positive.

Overall, the analysis of this study provides strong evidence for the view that the presence of asymmetric information between insiders and outsiders and the costly manager-shareholder agency conflict are central to our understanding of the corporate finance decision making process and its consequences. However, more importantly, the findings of this study provide a relatively new notion that considering the heterogeneity of top executive directors in the empirical analysis of corporate decisions is essential, especially in exploring modern corporations characterised by dispersed ownership and hence weak shareholders and strong managers.

Chapter 5 provides additional remarks and concludes the study by providing suggestions for future research.

CHAPTER 2. THE INFORMATIVE CONTENT OF CEO AND CFO SHARE DEALINGS

2.1. Introduction

This paper investigates the relationship between open market purchases made by CEOs and CFOs and subsequent stock returns. Prior studies of insider trading show that corporate insiders earn abnormal returns on their trades, which is taken as evidence that insiders have superior information about a firm's future performance. In these studies, insider trading is recognized as an important source of information and outsiders expect insider transactions to be informative because company directors, in particular the executives, are better informed about the operating and financing characteristics of their firms (Hoque and Lasfer, 2013; Jiang and Zaman, 2010; Lakonishok and Lee, 2001; and Seyhun, 1986). Early research on insider trading considers the short-term market reaction and provides evidence of abnormal returns on aggregate insider trading in the months following directors' dealings (Finnerty, 1976; Jaffe, 1974; Seyhun, 1988; and Sylvain et al., 2002). This earlier strand of the literature was followed by extensive research that focuses on the long-term profitability of insider trading. This research reports strong evidence on the abnormal returns outsiders can achieve by replicating the trades of insiders, suggesting that the predictive power of insider trades regarding the future market returns is high (Brochet, 2010; Gregory et al., 2013; and Lakonishok and Lee, 2001)[3].

[3] There is also evidence that insiders trade on the basis of their contrarian beliefs, buying (selling) undervalued (overvalued) shares in an attempt to take advantage of any perceived

More recently, it is argued that the subsequent returns to trades by insiders may also depend on the position directors hold within the firm. For example, in a study of US companies, focusing on the trades made by CEOs and CFOs, Wang et al. (2012) provide strong evidence that CFOs earn significantly greater returns from their purchases of company shares than CEOs. They argue that trades of CFOs reveal more information about future stock returns. Also, Ravina and Sapienza (2010) examine the impact of purchase transactions made by independent company directors. They find that positive abnormal returns that independent directors earn when they purchase shares in their companies are not significantly different from those earned by executive directors. Fidrmuc et al. (2006) also report positive abnormal returns on insider purchases for UK firms. However, they find that the market's positive reaction to the trades made by CEOs is lower than it is for other directors.

In a similar vein to Wang et al. (2012) we investigate the informative content of trades made by CEOs and CFOs by examining the impact of their open market purchases on stock returns. In doing so, we note that the two executive directors are the most informed directors about the issues relevant to firm value, while we assume that the ability to convey and trade on information vary between these two executives. Although the market tends to perceive their trades as a signal of superior information, the information content of their trades, and hence the impact on subsequent returns, are likely to differ. It is argued that, in comparison to CFOs, CEOs are higher in the corporate hierarchy and usually have superior insights into the firm's affairs. Therefore, CEO insider transactions are potentially more

misvaluation (Brennan and Cao, 1996; Jiang and Zaman, 2010; Piotroski and Roulstone, 2005; and Rozeff and Zaman, 1998).

informative than CFO trading (Lin and Howe, 1990; and Seyhun, 1986). However, it is also recognized that CFO trades may be more informative because CEOs are more closely scrutinized by the market and hence may be more reluctant to trade using their informational advantage over outsiders. In contrast, CFOs would be more willing to exploit their superior information by trading, which makes their transactions more strongly linked to future earnings and returns (Wang et al., 2012).

There are two distinct features of the analysis provided in this paper. Firstly, we acknowledge that insider trading is not homogenous as to the timing of purchase transactions made by the firm's CEO and CFO. To this end, we consider two types of insider stock purchases, *routine* and *opportunistic*, classifying trades on the basis of the historical trading behavior of the trading insider. Distinguishing between the two types of trades enables us to better focus on the informative content of insider purchases as opportunistic trades are more likely to be triggered by private information. To the extent that opportunistic purchases are informed, we argue that they should be associated with greater subsequent market returns compared to routine purchases. Moreover, we do not rule out the possibility that the difference in the impact on returns of different types of purchases may also depend on whether the trading executive is the firm's CEO or CFO. We therefore identify four groups of insider trades, namely *CEO-opportunistic, CEO-routines, CFO-opportunistic*, and *CFO-routine* purchases, and provide insights into the purchase-return relation for each group.

Secondly, we incorporate the view that the predictive power of insider trades is likely to vary over time with market-wide changes and macroeconomic shocks. We argue that the severity of asymmetric information between insiders and outsiders, and hence the impact of private information on returns, should be greater

during the recent global financial crisis. To incorporate this view, we test whether the predicted relation between insider trading and market-adjusted returns changes between the normal times, captured by the trades during the period from 2000 to 2006, and the crisis period from 2007 to 2008. Additionally, we consider the period from 2009 to 2010 as the post-crisis period.

Our sample consists of 10,230 open market purchases executed in 679 UK firms by 1,477 top executives in the sample period (2000-2010). During this period CFOs (CEOs) make 5,450 (4,780) purchases. We also observe that the average value of opportunistic purchases is significantly greater than it is for routine purchases. This holds throughout the sample period. Our detailed descriptive and regression analysis show that the subsequent market-adjusted returns to insider purchase transactions are generally positive. However, the findings also reveal that the positive returns are much weaker in the longer term. This possibly suggests that the informative content of the purchases by CEOs and CFOs is less significant than the market's perception of how informative they are. More importantly, our initial findings imply that there are no significant differences between opportunistic and routine trades. Nonetheless, the results change when we distinguish between opportunistic and routine trades made by both types of executives and carry out the analysis for different sub-periods. More specifically, the findings indicate that the opportunistic trades made by both CEOs and CFOs are more informative than the routine ones in the longer term, but only in the post-crisis period. We cannot provide any evidence supporting the view that opportunistic trades would be more informative during the crisis. If anything, the market reacts more positively to routine trades in the short term during this period, in particular to those made by CEOs. Moreover, the longer-term market-adjusted returns associated with CEO

opportunistic trades are significantly lower. Overall, the strongest results on the positive impact of insider purchases on returns relates to CEO trades made in the post-crisis period. We also find that the market-adjusted returns seem to increase with the size of trade and decrease with greater external affiliations and the number of past trades. Among the corporate governance characteristics included in the analysis, board independence affects the returns positively during the crisis and negatively in the post-crisis period. The latter finding possibly suggests that board independence and insider purchases are substitutes in reducing the information asymmetry between insiders and outsiders.

This study extends the literature on the informative content of insider trading in several important ways. Firstly, the analysis of the paper provides a unique setting by unifying the recent analyses of Wang et al. (2012) and Cohen et al. (2012) in a framework that allows us to distinguish not only between CEO and CFO purchases but also opportunistic and routine trades. Also, differently from both studies, we incorporate in the empirical analysis important managerial and corporate governance characteristics, which may impact the returns subsequent to director purchases. Including them in the analysis enables us to control for the potential role they may play as an additional channel of information and a tool to reduce the consequences of asymmetric information between insiders and outsiders. Secondly, the empirical analysis is carried out during a period that also covers the recent global financial crisis period and its immediate aftermath. Each prediction regarding the relation between open market purchases and subsequent returns is tested to see if the findings change with the experience of the recent financial crisis. Furthermore, to our knowledge, this chapter provides the first attempt that combines in the same framework the identity and personal attributes of trading executive directors, firm-

level corporate governance features, the nature of purchase transactions, and the trading period characteristics. Last but not least, our analysis makes a clear distinction between the immediate and gradual reaction to insider trading by considering both the short-term market reaction to insider trading and the long-term informativeness of the trade carried by CEOs and CFOs.

The remainder of the chapter proceeds as follows. In the next section we discuss the regulatory framework which sets out the rules with regard to directors' dealings in the UK. Section 2 outlines the regulations on directors' dealings in the UK. Section 3 explains the main variables and provides a description of the data used in the analysis. In Section 4, we provide a descriptive analysis of the returns to insider trading. In Section 5, we discuss the regression results and Section 6 concludes the chapter.

2.2. The Regulatory Framework on Directors' Dealings in the UK

In the UK, dealing by directors is generally defined as buying and selling of securities and rights or obligations, including the grant and exercise of options and pledging shares as security for a loan. Open market purchases made by directors, which this study is concerned with, are regulated indifferently from other types of directors' deals. The regulatory framework regarding the dealings of directors in the UK is primarily contained in the Companies Act, which is the main legislation and source of company law in the UK. Under the law, directors are required to notify the company of any dealings in its shares as soon as possible and no later than on the fifth business day following the transaction. Companies must in turn notify the Company Announcements Office of the London Stock Exchange without delay and

no later than the end of the business day following receipt of the information by the company.

In addition, the Model Code on directors' dealings, set out in Chapter 9 of the Listing Rules (LR9 Annex 1)[4], provides further guidance for companies and directors in relation to directors' dealings. For example, regarding the purpose of their dealings, the Code requires directors not to deal in any securities of the company on considerations of a short-term nature. Also, directors not must to deal during "close period" that is the period of two months preceding the announcement of the company's annual or half-yearly results. Furthermore, directors must not deal at any time when they are in possession of unpublished price-sensitive information in relation to the security. Finally, directors are required not to trade without advising the designated director (usually the chairman) in advance and receiving clearance.

Since vast majority of the literature on insider trading is based on US data, it is important to note that the regulations of the trading in the US vary significantly from the UK regulations[5], which are applicable to the trading analysed in this chapter. Specifically in relation to the performed analysis, two main differences should be noted. First, there is no "close period" for trading in the US. Instead US insiders must release undisclosed information before they trade, or refrain from trading. Second, reporting of transactions in the US is slower than in the UK. Specifically, US insiders must report their deals within the first 10 days of the month following the month of transaction. Due to those differences in regulatory framework, analysed in this paper insider dealings in the UK are expected to contain

[4] See http://www.fsa.gov.uk/library/policy/listing_rules for an extensive analysis of the current and historic Listing Rules in the UK.

[5] For a detailed discussion on the differences between the UK and the US regulatory framework covering insider trading see Fidrmuc et al. (2006).

more information and trigger larger market reaction closer to the announcement day than in the US. This in turn may justify our perception of 90 days as a long-term reaction period.

2.3. Data

Our primary data on insider trades are collected from the Morningstar UK database, which provides information on trade characteristics (i.e. type, size, date) and the identity of trading directors (i.e. name, role). The database also provides information on the equity ownership of insiders prior to their transactions. Additional information on the managerial and corporate governance characteristics is sourced from BoardEx. Using financial data provided by Datastream (Thomson Reuters) we analyse stock returns for up to 90 days before and after each transaction. All the returns used in the regression analysis are market-adjusted, and the FTSE All-Share index is used for the adjustment. In line with the majority of earlier research, we base our analysis only on purchases as they are most likely to represent actions taken as a result of private information[6]. All other types of insider transactions (e.g., exercises of options, and sales) are excluded.

Several sample selection criteria are applied. First, in line with previous research (e.g. Fidrmuc et al., 2006), transactions performed by directors of financial institutions are excluded. Second, small transactions with a value lower than £10 are excluded to avoid unnecessary noise in the estimation of returns. Furthermore

[6] Purchase transactions are expected to contain more private information than sales. Since managerial compensation packages contain equity holdings, sale transactions of directors are likely to be driven by their liquidity needs, instead of inside information (Wang et al., 2012) that is investigated in this chapter.

Table 2.1 Sample Selection Stages

This table describes the sampling procedure and reports the number of insider purchases in our sample. It also provides information on the number of distinct firms and executives that make the transactions. The final sample is presented on the basis of the identity of the trader and divided into three further sub-periods: 2000-06 (*Pre-crisis*); 2007-08 (*Crisis*); and 2009-10 (*Post-crisis*).

		Number of purchase transactions		
Stage	Description	CFO	CEO	Total sample
1	Number of purchase transactions performed by CEOs or CFOs	8,750	10,548	19,298
2	Number of transactions performed by the same manager on the same day cumulated into one record	8,354	10,054	18,408
3	Final sample			
	Number of transactions after matching with available board, managerial, and financial characteristics; and excluding outliers and transactions smaller than £10.00	**5,450**	**4,780**	**10,230**
	Pre-crisis	*2,511*	*1,946*	*4,457*
	Crisis	*1,437*	*1,493*	*2,930*
	Post-crisis	*1,502*	*1,341*	*2,843*
	Number of distinct firms	**550**	**553**	**679**
	Pre-crisis	*323*	*301*	*406*
	Crisis	*325*	*351*	*455*
	Post-crisis	*313*	*323*	*428*
	Number of distinct executives	**715**	**734**	**1,477**
	Pre-crisis	*385*	*375*	*759*
	Crisis	*332*	*368*	*699*
	Post-crisis	*321*	*335*	*656*

multiple purchases made by the insider on the same day are combined into a single data point, assuming that they are motivated by the same information.

Table 2.1 presents the stages to derive the final sample of firms and directors used in the study. Our initial sample includes 19,298 open-market purchase transactions, of which 10,548 (8,750) were made by CEOs (CFOs) during the sample period. In our final sample, we have 10,230 observations for purchase transactions in which there are 4,780 and 5,450 purchases carried out by CEOs and CFOs respectively. Of these purchases, 2,930 transactions are recorded during the crisis period, compared to 2,843 purchases made in the post-crisis period. Furthermore, the final sample used in the empirical analysis provides us with transactions performed by 1,477 distinct executives from 679 different firms. In any sub-periods, we have at least 406 firms and 656 executives to consider.

2.3.1. Dependent Variable: Market Adjusted Returns

In calculating the post-trading returns, which is the main variable of interest, we follow a similar procedure that is widely used in prior research (see, e.g., Brown and Warner, 1985; Kothari and Warner, 1997; and Ravina and Sapienza, 2010). Following each director-trading day we compute market-adjusted buy-and-hold-returns (*MBAHR*), inclusive of dividends, for up to 5, 10, 60, and 90 days. Specifically, we first estimate the abnormal return for firm *i* on day *t* as $AR_{i,t} = R_{i,t} - R_{m,t}$, where $R_{i,t}$ is the daily return for the traded share *i* on day *t* and $R_{m,t}$ is the return on the value-weighted FTSE All-

Share[7] index on the same day. We then define various *MBAHR*s, namely *RET*_5, *RET*_10, *RET*_60 and *RET*_90, by taking the difference between firm returns over the relevant window and returns on the value-weighted FTSE All-Share index, where both returns are compounded over the same relevant period. Specifically, using daily return data we estimate $MBHAR_i = \prod_{t=1}^{T}(1+RET_{i,t}) - \prod_{t=1}^{T}(1+RET_{m,t})$ where T takes the value of 5, 10, 60, or 90 days.

2.3.2. Explanatory Variables: Managerial and Corporate Governance Variables

In our empirical analysis we focus on three groups of variables, namely trade and managerial characteristics, and the corporate governance attributes of firms. Furthermore, we control for several firm-specific variables including size, book-to-market and information on past returns. A full description of the variables is given in Table 2.2.

2.3.2.1. Transaction Characteristics.

To differentiate between routine and opportunistic purchase trades, we classify the insider transaction as routine if an executive director trades in the same month over

[7] FTSE ALL-Share Index represents about 99 percent of UK market capitalization, aggregating of the FTSE 100, FTSE 250 and FTSE Small Cap Indices (http://www.ftse.com/Indices/UK_Indices). Each company in the Index is first weighted using the number of shares-in-issue and the share price. Then, the free float factor is incorporated to arrive at the final weight, considering only the shares available for trading and hence ignoring those shares held by restricted shareholders such as family owners.

Table 2.2 Definitions of Variables

Variable name	Definitions
RET	Market-adjusted stock returns estimated up to 90 trading days before and after the purchase transactions take place.
Opportunistic	Dummy variable which takes the value of 1 if a trade is opportunistic, and 0 if it is routine. CEO_Opportunistic, CFO_Opportunistic, CEO_Routine represent routine or opportunistic transactions performed by the CEO or the CFO accordingly.
Trade_Size	The natural logarithm of the value purchase transaction.
Past_Trades	The number of trades made by the executive prior to the purchase transaction.
Holdings	The percentage holding of the trading executive on the day of a transaction.
Tenure	Time on a board of the trading executive in the year of a trade.
Retirement	Time remaining to retirement expressed in number of years.
Affiliations	Dummy variable, which takes the value of 1 if an executive is a member of at least one board of directors except the analyzed one, and 0 otherwise.
Board_Size	Total number of executives on the board of directors.
Board_Ind	The ratio of non-executive directors to board size.
Inst_Own_Cont	The percentage sum of institutional shareholdings, whose individual ownership is higher than 3% of market capitalization.
Pre-crisis	Dummy variable, which takes the value of 1 if a transaction was made before year 2007, and 0 otherwise.
Crisis	Dummy variable, which takes the value of 1 if a transaction was made during the years 2007 or 2008, and 0 otherwise.
Post-crisis	Dummy variable, which takes the value of 1 if a transaction was made during the years 2009 or 2010, and 0 otherwise.
Size	The natural logarithm of total assets expressed in constant prices.
Book_to_Mkt	The ratio of the book value of equity to market capitalization.
Return_Volatility	Standard deviation of the daily market-adjusted returns of a stock measured over the period between 90 and 10 trading days prior to a transaction.
Industry	Categorical variable representing different industries based on Industry Classification Benchmark (ICB code).

the past three consecutive years prior to the transaction that is considered. Otherwise, the trade is classified as opportunistic. We predict that the relation between opportunistically made trades and subsequent returns is positive. Also, the relation is expected to be stronger than that between routine trades and returns. Additionally, we test if subsequent purchase returns are also impacted by the size of the trade transaction by incorporating in the analysis the natural logarithm of the value of purchase transactions. Obviously, the impact of larger purchases on subsequent returns is expected to be greater. Finally, the number of past trades made by the trading director prior to the purchase transaction date is considered. Although we do not have a clear-cut prediction, we postulate that the impact of purchases on returns is likely to get smaller when it is preceded by a greater number of trades by the same director as it is less likely to be based on significant informational advantage.

2.3.2.2. Managerial Characteristics.

We consider four important characteristics of trading directors in the empirical analysis. First, we argue that managers with longer tenure in their firms are more likely to have superior knowledge about the firm's prospects and the internal processes within the firm, leading them to have greater power and influence in the company. The impact of tenure on subsequent returns can be positive as tenure improves access to relevant information (Bebchuk et al., 2010). Nevertheless, it is also possible that the relation is negative as longer tenure is likely to lead to excessive managerial power, which can be perceived negatively by the market. Second, it is argued that greater equity ownership not only increases the ability of directors to influence firm decisions, but also provides them with more flexibility to trade (Denis et al., 1997; and Eckbo and Thorburn, 2003).

We then expect that the informative content of director transactions increases with higher equity ownership. However, as also discussed in (Fidrmuc *et al.*, 2006), an increase in the equity ownership of directors would not significantly impact the informative content of purchase transactions if it is made by executives who already hold large stakes. Finally, we consider in the analysis the amount of time directors have before their retirement, which can potentially capture the experience and risk attitude of the trading director.

2.3.2.3. Corporate Governance Characteristics.

Corporate governance literature suggests several mechanisms that can limit the adverse effects of the information asymmetry between insiders and outsiders in the presence of costly agency incentives. In this chapter we consider three corporate governance characteristics which may affect the informative content of insider trading, namely board size, board independence and institutional ownership concentration. A positive relation is expected between board size and the effective monitoring of executives as a greater number of board members is expected to increase both the quantity and quality of advice and expertise they provide firms with (Fitch and Slezak, 2008). Acharya and Johnson (2010) analyze the impact of the number of insiders on the frequency of their trades and suggest that a greater number of insiders lead to more insider trading. Even if large boards are less effective in monitoring corporate financial decision-making they are expected to be more effective in terms of decreasing the information gap between insiders and outsiders. Therefore, we expect board size to have a negative effect on the informative content of CEO and CFO trades.

Another aspect of corporate governance that may influence the returns on insider trading relates to board independence. We argue that the monitoring of executive directors in firms with less independent boards is weaker. This in turn makes it more likely for executive directors to use private information and generate abnormal returns. Accordingly, a negative relation is expected between the returns from director trades and board independence. However, non-executive directors may choose to play a less confrontational role as they lack sufficient incentives to provide an effective monitoring of executives. Furthermore, the reduced ability of corporate governance codes to enforce the duties of directors may cause non-executive directors to be less active. To the extent that this happens, the impact of non-executives on the returns from insider trading can be weaker or insignificant.

The last corporate governance attribute we consider is the institutional ownership concentration. Large investors have greater voting power as well as more incentives to monitor management, promoting good corporate governance (Agrawal and Knoeber, 1996; and Shleifer and Vishny, 1997). Also, institutional investors are better than other investors at collecting and processing information. Although they may also trade on the basis of noise, they are expected to make their decisions based on relevant and superior information (e.g. Ke and Petroni, 2004; and Yan and Zhang, 2009). Therefore, in the presence of large shareholders the degree of information asymmetry between insiders and outsiders is likely to be reduced, resulting in a lower predictive power of the insider trading and smaller profitability.

2.3.2.4. Other Firm-Specific Control Variables.

In our analysis, we also control for firm-specific characteristics including size, growth opportunities, industry and past returns, which can influence stock returns irrespective of the identity of the trader. To this end, based on previous research, which shows that managers may exhibit contrarian behavior (Jiang and Zaman, 2010; Lakonishok and Lee, 2001; and Rozeff and Zaman, 1998), we expect a negative relation between the past returns and the subsequent returns on purchase transactions. Additionally, similar to earlier studies, we expect an inverse relation between firm size and the profitability of insider trading (Jeng *et al.*, 2003; and Seyhun, 1986) as the scrutiny of investors in larger firms is much greater and in smaller firms the ability of top executives to access valuable information is greater, which in turn reduces the informational advantage of executives. The next control variable used in the study is book-to-market ratio, which is a proxy for the firm's growth opportunities, and is generally taken as a predictor of future stock returns (Baker *et al.*, 2003). It is expected that the book-to-market ratio will exert a positive impact on returns from insider trading by executives.

2.4. Descriptive and Univariate Analysis

In presenting our descriptive statistics and the results, we consider three sub-periods, as well as reporting results for the whole sample period of 2000 to 2010. The three sub-periods are as follows: 2000-2006 (*pre-crisis*); 2007-2008 (*crisis*); and 2009-2010 (*post-crisis*).

2.4.1. Descriptive Analysis of Independent Variables

Table 2.3 provides summary statistics of the variables that are used in the subsequent empirical analysis. We report these statistics by grouping them into firm, corporate governance, managerial, and transaction characteristics. The average (median) book-to-market value during the whole sample period is 0.60 (0.46). However, as would be expected, there are significant differences across different sub-periods. The mean book-to-market value during the crisis drops to 0.46 whereas in the post-crisis it increases to 0.86, possibly suggesting that there are more value firms during the period following the crisis. The average board size for the total sample is 7.7 and remains similar in the three sub-periods. The average firm has 55 percent of their board members as non-executive directors. Notably, the ratio of the number of non-executive directors to total board size increases from 53 percent in the pre-crisis period to 58 percent after the crisis. The concentration of institutional ownership, *Inst_Own_Cont*, is relatively stable across the sub-periods with an average value of 22.59 percent in the pre-crisis period and 27.66 and 26.96 percent in the crisis and post-crisis periods respectively. The average (median) concentration for the whole sample is 25.12 (23.15) percent.

Moving on to directors' characteristics, we observe that the average holdings of both CEOs and CFOs increase over time. Specifically, the mean value of CEO (CFO) holdings increases to 2.28 (0.39) percent in the post-crisis period from 1.72 (0.33) percent observed in the pre-crisis period. The findings suggest that on average CEOs have a longer tenure than CFOs in their current firm at the time of their trading. The average tenure for a CEO (CFO) during the sample period is just over 6 (5) years. Furthermore, CEOs are relatively closer to retirement than CFOs, who have on average

Table 2.3 Summary Statistics

This table presents descriptive statistics (mean, median, standard deviation) of the explanatory variables used in the analysis. The descriptive statistics are additionally presented for three sub-categories depending on the transaction date, i.e., 2000-06 (*Pre-crisis*); 2007-08 (*Crisis*); and 2009-10 (*Post-crisis*). Definitions of all variables can be found in Table 2.2.

		Total sample			**Pre-crisis**			**Crisis**			**Post-crisis**		
		Mean	Median	Std.dev	Mean	Median	Std.dev	Mean	Median	Std.dev	Mean	Median	Std.dev
Firm characteristics													
Size		12.07	11.9	2.18	12.33	12.15	2.12	11.79	11.59	2.17	11.86	11.57	2.42
Book_to_Mkt		0.6	0.46	0.54	0.55	0.45	0.46	0.46	0.37	0.39	0.86	0.64	0.71
Corporate governance characteristics													
Board_Ind		0.55	0.57	0.14	0.53	0.53	0.14	0.56	0.57	0.14	0.58	0.6	0.14
Board_Size		7.7	7	2.44	8.19	8	2.58	7.34	7	2.28	7.15	7	2.13
Inst_Own_Con		25.12	23.15	17.35	22.59	20.41	17.08	27.66	26.16	17.59	26.96	26.08	16.98
Managerial characteristics													
Holdings	CEO	2.12	0.16	6.08	1.72	0.08	5.44	2.62	0.24	7.59	2.28	0.27	5.17
	CFO	0.36	0.05	1.50	0.33	0.04	1.23	0.39	0.05	1.57	0.39	0.07	1.88
Tenure	CEO	6.09	4.70	5.26	5.85	4.70	5.00	6.26	4.55	5.53	6.33	4.70	5.39
	CFO	5.11	3.50	4.77	5.44	3.85	4.93	4.66	2.95	4.58	4.88	3.50	4.59
Retirement	CEO	14.43	14.50	6.58	14.39	14.30	6.84	14.76	15.20	6.50	14.11	14.50	6.19
	CFO	16.93	17.00	6.81	17.00	17.30	6.98	17.28	17.50	6.60	16.40	16.00	6.67
Affiliations	CEO	0.21	0.00	0.40	0.24	0.00	0.43	0.18	0.00	0.39	0.18	0.00	0.38
	CFO	0.12	0.00	0.33	0.14	0.00	0.35	0.09	0.00	0.28	0.13	0.00	0.33
Transaction characteristics													
Opportunistic	CEO	0.66	1	0.47	0.71	1	0.45	0.72	1	0.45	0.52	1	0.50
	CFO	0.62	1	0.49	0.65	1	0.48	0.62	1	0.49	0.55	1	0.50
Past_Trades	CEO	7.50	3.00	13.98	5.14	2.00	8.30	7.87	3.00	13.83	11.15	4.00	19.91
	CFO	9.50	3.00	22.36	7.49	2.50	17.90	10.71	3.00	29.17	12.30	3.00	21.88

2.5 more years than CEOs to retire at the time of their trades. The average number of external affiliations of the trading directors also differs significantly. On average, 21 percent of the CEOs in the sample are linked to another firm as a director, whereas the mean percentage value for the CFOs is only 12. More interestingly, the external affiliations of both director groups decrease during the crisis compared to the pre-crisis period, from 24 (14) for the CEOs (CFOs) to 18 (9) percent.

Although the ratio remains unchanged for the CEOs during the post-crisis period, it increases for the CFOs, to a level that is even higher than its pre-crisis value. The average number of times CEOs and CFOs trade, *Past_Trades*, during the sample period are 7.5 and 9.5 respectively. The frequency of CFO trading is consistently greater than that of CEO trading in all periods. In line with the findings of previous research (Cohen *et al.*, 2012), there are more opportunistic purchases for both executives in all periods. However, while the percentage of opportunistic trades is 68 and 67 percent respectively in the pre-crisis and the crisis periods, it drops to 54 percent during the period following the crisis. This holds for both CEOs (52 percent) and CFOs (55 percent). It is likely that the number of profit-making opportunities during the crisis remains high due to lower market prices and possibly undervalued assets, which may partially explain why the percentage of opportunistic trades remains almost unchanged during this period. Similarly, once the market has corrected itself in the subsequent period, the sharp drop in the ratio of opportunistic to total trades may indicate either the unwillingness of directors to use private information in trading or a lack of relevant private information. We explore these possibilities later in the chapter.

In Table 2.4, we provide further information on the purchase transactions that are made by both types of directors in both types of trade. There are several observations that arise from the analysis of the results. First, the value of the average opportunistic trade during the whole sample is much greater, at about £46K, than the average routine trade, which is about £11K. The significant difference holds across all sub-periods, where it is the largest during the post-crisis period with the mean value of the routine trades (about £9.9K) being less than 15 percent of that of opportunistic ones (about £68.8K). Second, comparing the value of the purchase transactions across different periods, we observe that the mean value of transactions increases from £24.7K in the pre-crisis period to £38.7K during the crisis and continues to increase to £41.5K in the post-crisis period. This is despite the fact that the number of purchase transactions drops sharply during the same period from 4,457 in the pre-crisis period to 2,843 in the post-crisis period (see Panel B). Furthermore, while the average value of the opportunistic trade increases by about 127 percent from £30.4K in the pre-crisis period to £68.8K in the post-crisis period, the average routine trade value decreases by about 23 percent during the same period, from £12.8K to 9.9K.

Interestingly, this does not hold for the CEO routine trades, whose value increases first sharply during the crisis period, from £10.9K to £15.3K, and then drops again to £11.9K, which is still above the pre-crisis level. The only mean trade value which drops below the corresponding average level of the pre-crisis period is that of the CFO routine trade in which the values are about £14K and £7.9K respectively, representing a drop of about 44 percent. Overall, we conclude that while the volume of purchase trades increases during the sample period the observed increase seems to result

Table 2.4 Characteristics of Purchase Transactions

This table presents the descriptive statistics on the size (in real values), and the number of purchase transactions. The total sample is divided into sub-categories depending on the timing (i.e., 2000-06 (*Pre-crisis*); 2007-08 (*Crisis*); and 2009-10 (*Post-crisis*)) and the type (i.e., *opportunistic* vs *routine*) of the transaction. Definitions of all variables can be found in Table 2.2.

		Purchases			**Opportunistic**			**Routine**		
		CFO	CEO	Total	CFO	CEO	Total	CFO	CEO	Total
Panel A. Size of purchase transactions in real values (£)										
Total	Mean	20,500	48,015	33,356	27,068	66,463	46,135	9,982	12,464	11,069
	Std. dev	169,027	365,836	279,170	211,027	445,551	345,586	53,257	85,521	69,266
Pre-crisis	Mean	14,872	37,346	24,685	15,350	48,201	30,365	13,977	10,945	12,783
	Std. dev	56,849	235,652	161,814	49,471	276,348	191,020	68,608	62,582	66,295
Crisis	Mean	26,613	50,316	38,691	39,127	64,157	52,784	6,193	15,305	10,170
	Std. dev	271,140	207,510	241,077	342,398	235,816	289,344	39,791	98,286	71,576
Post-crisis	Mean	24,059	60,936	41,453	37,296	106,077	68,798	7,884	11,934	9,858
	Std. dev	166,964	590,277	423,492	221,769	810,873	573,348	37,459	93,712	70,714
Panel B. Number of purchase transactions (N)										
	Total	5,450	4,780	10,230	3,355	3,147	6,502	2,095	1,633	3,728
	Pre-crisis	2,511	1,946	4,457	638	1,379	3,017	873	567	1,440
	Crisis	1,437	1,493	2,930	891	1,070	1,961	546	423	969
	Post-crisis	1,502	1,341	2,843	826	698	1,524	676	643	1,319

from the significant rise in the mean transaction value of opportunistic trades rather than an increase in the number of transactions.

2.4.2. Descriptive Analysis of Returns

In Table 2.5 we provide an analysis of adjusted returns by focusing on the differences in returns on the CEO and CFO trades. In doing so, we attempt to see whether the crisis period of 2007 and 2008 makes any difference in the impact of insider trades on the subsequent stock returns. In general, the findings suggest that the opportunistic CEO trades generate greater adjusted returns regardless of the sub-period.[8] When we differentiate between the returns in different periods, we note that the return on routine CEO trades is always positive and greater than that on CFO trades in the crisis period. Furthermore, the returns on CFO trades during the same period are mostly negative. Also, we note that the longer-term routine CEO trade returns (*RET_60* and *RET_90*) are higher than the corresponding opportunistic CEO trades in the crisis period.

Moving on to the return during the post-crisis period, all adjusted opportunistic returns are greater than the corresponding ones in the crisis period. Similarly, the returns on routine CFO trades in the post-crisis period are greater except for *RET_5*. However, the observed returns on routine CEO trades drop significantly in this period and the shorter-term returns, *RET_5* and *RET_10*, turn negative.

[8] The only exception relates to the returns for *RET_60* in the pre-crisis period in which the mean value of CEO opportunistic trades (2.86 percent) is lower than it is for the CFOs (3.18 percent).

Table 2.5 Descriptive Statistics of Returns in Three Sub-periods

This table presents the descriptive statistics of market-adjusted returns from CEO and CFO purchase transactions (RET 5, RET 10, RET 60, RET 90) for three sub-periods: 2000-06 (*Pre-crisis*); 2007-08 (*Crisis*); and 2009-10 (*Post-crisis*).). We compare the mean values of returns between CEO and CFO trades using a two-tailed t-test of the difference in means, under the null hypothesis that the mean values of the CEO and CFO returns are equal. *, ** indicate statistical significance at 5%, and 1% levels, respectively. Definitions of all variables can be found in Table 2.2.

		Pre-crisis				**Crisis**				**Post-crisis**			
		RET 5	RET 10	RET 60	RET 90	RET 5	RET 10	RET 60	RET 90	RET 5	RET 10	RET 60	RET 90
Total sample													
	Mean	0.69	0.83	2.79	3.4	0.42	0.17	-1.61	-2.01	0.61	0.68	2.56	3.14
	Median	0.17	0.37	2.16	2.89	0.11	-0.11	-1.4	-1.43	0.05	0.17	0.94	1.63
CFO	Std. dev	4.87	6.3	14.79	18.02	6.4	8.34	17.4	21.62	5.86	7.64	17.91	21.24
	Mean	0.87	1.07	2.36	3.54	1.06	0.82	-0.14	-1.01	1.02	1.05	2.81	3.28
	Median	0.23	0.43	1.73	2.93	0.44	0.12	-0.85	-1.22	0.18	0.17	1.01	1.39
CEO	Std. dev	5.55	7.25	15.68	20.49	7.6	9.59	18.49	22.97	6.73	8.17	19.27	23.33
	t-test	-1.15	-1.18	0.95	-0.25	-2.46*	-1.95*	-2.21*	-1.22	-1.72	-1.25	-0.36	-0.16
Opportunistic													
	Mean	0.99	1.12	3.18	3.78	0.58	0.32	-1.97	-3.19	1.21	1.14	3.46	3.93
	Median	0.31	0.47	2.29	3.1	0.09	-0.24	-2.34	-2.53	0.34	0.55	1.2	1.57
CFO	Std. dev	5.46	6.96	16.36	19.99	6.92	8.9	17.55	21.66	6.68	8.44	19.61	22.42
	Mean	1.26	1.44	2.86	4.19	1.39	0.94	-0.69	-2.44	2.02	2.13	4.55	5.54
	Median	0.57	0.68	2.11	3.36	0.72	-0.04	-1.56	-2.9	0.48	0.7	2.51	3.05
CEO	Std. Dev	6.28	8.19	17.71	23.27	8.41	10.51	19.76	24.21	8.32	9.84	22.81	27.38

	t-test	-1.27	-1.18	0.51	-0.52	-2.30*	-1.40	-1.51	-0.72	-2.10*	-2.12*	-1.01	-1.27
Routine													
	Mean	0.14	0.29	2.08	2.68	0.15	-0.08	-1.01	-0.1	-0.12	0.13	1.46	2.18
	Median	-0.04	0.2	2.02	2.39	0.13	0.11	-0.13	-0.14	-0.31	-0.28	0.32	1.75
CFO	Std. dev	3.44	4.76	11.24	13.55	5.44	7.35	17.14	21.43	4.58	6.5	15.52	19.68
	Mean	-0.07	0.16	1.13	1.97	0.22	0.5	1.24	2.62	-0.07	-0.12	0.93	0.82
	Median	-0.27	-0.01	1.21	2.39	0.13	0.67	0.42	1.11	-0.08	-0.28	-0.49	-0.02
CEO	Std. dev	2.96	4.03	8.88	10.99	4.94	6.69	14.75	19.02	4.14	5.61	14.26	17.61
	t-test	1.17	0.53	1.69	1.04	-0.21	-1.27	-2.15*	-2.05*	-0.23	0.74	0.65	1.32

2.5. Regression Results

2.5.1. The Determinants of Returns – Baseline Model

In Table 2.6 we report the findings for our baseline model in which the regression results are obtained using the whole sample period. We distinguish between different sub-periods by incorporating period time dummies in the analysis, *Crisis* and *Post-crisis*. In addition to other executive director characteristics, we also include dummy variables to test the impact of different types of trade on the observed adjusted returns. Specifically, we examine whether the subsequent returns to opportunistic and routine trades by CEOs and opportunistic trades by CFOs are significantly different from the returns following routine trades by CFOs. Accordingly, the CFO routine trades that are made in the pre-crisis period serve as the baseline category in the model, captured by the constant term. The regression results relate to four types of return. The first two, *RET_5* and *RET_10*, capture the short-term cumulative market-adjusted returns from insider trading, whereas *RET_60* and *RET_90* are included to reflect the long-term impact of the trades made by directors.

Turning to the results, we find that the trades by both CEOs and CFOs lead to positive market-adjusted returns in the short term. Specifically, the 5-day and 10-day returns on CFO routine purchases in the pre-crisis period, captured by the constant term, are positive and significant at the 1% level. The estimated coefficients for the other sub-groups of trades, namely *CEO_Opportunistic*, *CEO_Routine* and *CFO_Opportunistic*, are not statistically different from those estimated for the *CFO_Routine* dummy. The findings suggest that the market perceives inside purchases as informative about the

Table 2.6 OLS Regression Results – Baseline Model

This table presents regression results for the determinants of market-adjusted returns cumulated in the 5, 10, 60 and 90 days subsequent to the transaction date. The sample period is 2000 to 2010. Definitions of all variables used in the models are presented in Table 2.2. Standard errors are presented in parentheses. **, * indicate that the coefficient is significant at the 1% and 5% level respectively.

	RET 5	RET 10	RET 60	RET 90
CEO_Opportunistic	0.019	-0.181	0.596	0.811
	[0.198]	[0.265]	[0.625]	[0.773]
CEO_Routine	-0.088	-0.1	0.141	0.253
	[0.152]	[0.205]	[0.484]	[0.606]
CFO_Opportunistic	-0.152	-0.328	0.569	0.561
	[0.180]	[0.235]	[0.559]	[0.685]
Trade_Size	0.151**	0.206**	0.167*	0.218**
	[0.028]	[0.035]	[0.084]	[0.102]
Past_Trades	-0.249**	-0.343**	-0.239	0.047
	[0.072]	[0.090]	[0.203]	[0.244]
Holdings	0.026	0.019	0.085	0.227
	[0.030]	[0.039]	[0.118]	[0.175]
Tenure	-0.261*	-0.006	0.31	-0.182
	[0.116]	[0.145]	[0.323]	[0.409]
Retirement	-0.327**	-0.216	-0.52	-0.558
	[0.113]	[0.143]	[0.317]	[0.342]
Affiliations	-0.039	-0.123	-1.781**	-2.552**
	[0.156]	[0.208]	[0.456]	[0.556]
Book_to_Mkt	0.334	0.466*	1.432**	1.935**
	[0.182]	[0.227]	[0.469]	[0.599]
Size	-0.058	-0.089	0.302*	0.662**
	[0.063]	[0.077]	[0.174]	[0.215]
Return_Volatility	0.03	-0.097	0.521*	0.774**
	[0.076]	[0.092]	[0.237]	[0.275]
RET_minus30_10	-0.057**	-0.053**	-0.015	-0.012
	[0.010]	[0.011]	[0.023]	[0.027]
RET_minus90_30	-0.020**	-0.015*	0.008	0.009
	[0.004]	[0.006]	[0.013]	[0.016]
Board_Size	-0.930*	-0.435	-0.94	-0.438
	[0.414]	[0.519]	[1.006]	[1.242]
Board_Ind	-0.875	-0.601	-1.741	-4.385*
	[0.633]	[0.774]	[1.737]	[2.081]
Inst_Own_Con	-0.012*	-0.020**	-0.006	0.01
	[0.005]	[0.006]	[0.013]	[0.016]
Crisis	-0.152	-0.422*	-4.144**	-6.045**
	[0.165]	[0.210]	[0.461]	[0.564]
Post-crisis	0.186	0.276	-0.763	-1.748**
	[0.173]	[0.220]	[0.487]	[0.609]
Const	4.796**	3.783**	0.209	-4.135
	[1.080]	[1.345]	[3.018]	[3.645]
N	9413	9413	9413	9413
R^2	0.048	0.03	0.028	0.037

future prospects of the company and reacts accordingly in the early subsequent days regardless of the type of trade and executive director. However, there is no significant relation between inside purchases and the returns in 60 and 90 days. These results remain unchanged when we change the baseline category to capture, for example, the CEO opportunistic trades in the pre-crisis period.

Although the different types of purchases do not reveal significant differences, transaction size (*Trade_Size*) and the number of previous trades (*Past_Trade)* by directors affect the adjusted returns, albeit differently. All market-adjusted returns are significantly greater for larger transactions, suggesting that the size of purchases made by directors impacts the market's perception of how significant inside purchases are, supported by the results in relation to RET_5 and RET_10, and how informative they are, supported by the results in relation to RET_60 and RET_90. However, the number of previous trades does not seem to increase the informativeness of purchases. The greater the number of purchases made by directors, the lower the return they lead to in the short term, while the impact is insignificant in the longer term. Similarly, we find mixed results in relation to the director characteristics. The holdings of directors prior to the transaction do not affect the subsequent returns. On the other hand, the amount of time they sit on the board, *Tenure*, has a significant impact only on the return in 5 days and the impact is negative. It has no bearing on longer subsequent returns. Additionally, the longer the time to retirement, the lower the effect we observe on subsequent returns, and the relation is significant only for 5-day returns. This is not in line with what we would normally expect to hold. The only director characteristic that seems to be relevant in the medium term relates to their outside experience. The adjusted returns on the

trades made by directors who have external affiliations are lower, reflected in the negative and significant estimated coefficients for 60- and 90-day returns.

Purchases in value firms with higher book-to-market ratios lead to positive and significant returns both in the short term and in the long term. It seems that executive directors have superior information about the market value of their companies supported, by the stronger results (both economically and significantly) with regard to long-term returns. The findings for firm size are, however, mixed. Although the adjusted returns are insignificant in the short term, purchases in larger firms seem to be informative in the longer term.

Although we do not test directly the hypothesis that the behavior of directors is contrarian, we provide some evidence that there is a relation between the short-term returns on director purchases and the returns observed prior to their trades. Purchases made by directors following higher past 30- and 90-day returns lead to negative adjusted returns in the short term with no significant impact in the long term. Similarly, those purchases following negative recent returns lead to gains above the market return in the short term.

Turning to the findings on the relation between corporate governance characteristics and the market-adjusted returns, we find that board characteristics and institutional ownership play a limited role in determining the subsequent returns. Purchases by directors sitting on larger boards lead to smaller-than-the-market returns in 5 days with no significant impact on other returns. Moreover, board independence does not impact the adjusted returns except in the long term and only for 90-day returns. Purchases by directors in firms with more independent boards are associated with negative adjusted

returns in the long term. To the extent that board independence is a desirable and effective corporate governance feature, the executive directors have limited or no ability to access private (superior) information in companies with more independent directors and any attempts to gain from trading in those companies do not pay off. Similarly, purchases in the companies with greater concentration of institutional ownership lead to negative adjusted returns in the short term and no significant gains or losses in the long term.

Finally, in line with our earlier descriptive results, the adjusted returns associated with purchases during the crisis are significantly lower than in the pre-crisis period. However, the post-crisis and the pre-crisis period returns are similar except for the average 90-day adjusted return. During the post-crisis period, purchases made by directors are associated with lower market-adjusted returns in the long term compared to the pre-crisis period.

2.5.2. The Determinants of Returns in the Sub-periods

Although the above analysis controls for the possibility that adjusted returns differ across different periods, it does not allow the impact of the determinants of adjusted returns to change between the periods. In Table 2.7 we estimate the same model for three different sub-periods to test this possibility.[9]

The results for the pre-crisis period are overall similar to those provided for the baseline model in Table 2.6. More specifically, the adjusted returns subsequent to purchase transactions are positive and significant in the short term and purchases do not

[9] We focus on director, trade and corporate governance characteristics and hence do not report in the following tables the findings in relation to firm-specific characteristics and the past returns for brevity.

Table 2.7 OLS Regression Results – Sub-periods

This table presents regression results for the determinants of market-adjusted returns cumulated in the 5, 10, 60 and 90 days subsequent to the transaction date in three sub-periods: 2000-06 (*Pre-crisis*); 2007-08 (*Crisis*); and 2009-10 (*Post-crisis*). Definitions of all variables used in the models are presented in Table 2.2. Standard errors are presented in parentheses. **, * indicate that the coefficient is significant at the 1% and 5% level respectively.

	Pre-crisis				**Crisis**				**Post crisis**			
	RET 5	RET 10	RET 60	RET 90	RET 5	RET 10	RET 60	RET 90	RET 5	RET 10	RET 60	RET 90
CEO_Opportunistic	0.084	0.065	-0.116	0.600	-0.210	-0.418	-0.627	-2.276	0.336	-0.087	4.244**	6.630**
	[0.240]	[0.324]	[0.751]	[0.929]	[0.438]	[0.578]	[1.186]	[1.478]	[0.431]	[0.585]	[1.582]	[1.873]
CEO_Routine	0.044	0.068	-0.605	-0.235	-0.048	0.233	2.080	2.716*	-0.133	-0.457	0.033	-0.72
	[0.198]	[0.262]	[0.594]	[0.722]	[0.378]	[0.497]	[1.086]	[1.341]	[0.244]	[0.341]	[0.825]	[1.008]
CFO_Opportunistic	0.028	-0.018	0.535	0.695	-0.759	-0.759	-1.112	-1.835	0.415	0.009	3.621**	4.981**
	[0.212]	[0.294]	[0.675]	[0.826]	[0.434]	[0.537]	[1.160]	[1.428]	[0.369]	[0.491]	[1.304]	[1.596]
Trade_Size	0.104**	0.149**	0.218*	0.283*	0.110	0.143	0.011	-0.065	0.235**	0.350**	0.250	0.410
	[0.035]	[0.047]	[0.103]	[0.131]	[0.066]	[0.077]	[0.162]	[0.195]	[0.053]	[0.070]	[0.193]	[0.221]
Past_Trades	-0.182*	-0.346**	-0.555*	-0.653*	-0.219	-0.247	-0.095	0.311	-0.400**	-0.421*	0.187	0.888
	[0.091]	[0.115]	[0.254]	[0.326]	[0.177]	[0.213]	[0.403]	[0.459]	[0.144]	[0.180]	[0.515]	[0.601]
Holdings	0.070	0.033	0.013	0.115	-0.008	-0.019	0.227	0.494	-0.027	0.053	-0.126	-0.171
	[0.054]	[0.052]	[0.098]	[0.117]	[0.038]	[0.064]	[0.219]	[0.324]	[0.066]	[0.118]	[0.237]	[0.288]
Tenure	-0.469**	-0.244	0.677	0.334	-0.321	0.278	-1.244*	-1.459	0.239	0.252	1.676**	0.918
	[0.155]	[0.197]	[0.428]	[0.557]	[0.263]	[0.322]	[0.630]	[0.823]	[0.206]	[0.261]	[0.650]	[0.750]
Retirement	-0.065	-0.034	0.014	-0.151	-0.768*	-0.248	-2.754**	-2.259**	-0.495*	-0.794**	-0.195	-0.627
	[0.125]	[0.160]	[0.342]	[0.425]	[0.334]	[0.413]	[0.843]	[0.745]	[0.198]	[0.250]	[0.679]	[0.740]
Affiliations	0.089	0.108	-1.804**	-2.112**	-0.302	-0.592	-0.659	-1.858	0.427	0.607	-0.189	-0.230
	[0.195]	[0.248]	[0.564]	[0.687]	[0.406]	[0.528]	[0.979]	[1.211]	[0.290]	[0.400]	[0.982]	[1.159]
Board_Size	-0.547	-0.194	-2.800*	-2.638	-1.133	-1.03	0.341	2.496	-1.043	0.078	0.620	-0.360
	[0.471]	[0.594]	[1.377]	[1.737]	[0.992]	[1.260]	[1.890]	[2.450]	[0.868]	[0.993]	[2.515]	[2.847]
Board_Ind	-0.241	-0.576	-0.500	-3.860	1.337	3.617*	9.711**	12.904**	-3.803*	-4.941**	-12.593**	-17.402**
	[0.741]	[0.988]	[2.196]	[2.804]	[1.515]	[1.835]	[3.513]	[4.068]	[1.497]	[1.678]	[4.514]	[5.045]
Inst_Own_Con	-0.008	-0.023**	-0.030	-0.035	-0.014	-0.021	0.000	0.006	-0.008	-0.006	0.023	0.062
	[0.006]	[0.009]	[0.018]	[0.024]	[0.010]	[0.012]	[0.024]	[0.028]	[0.009]	[0.012]	[0.029]	[0.034]
const	4.280**	4.745*	1.489	-2.069	5.818*	3.506	0.695	-10.333	4.243*	3.104	-2.212	-1.053
	[1.481]	[1.900]	[3.617]	[4.814]	[2.452]	[3.040]	[5.568]	[6.964]	[2.023]	[2.355]	[7.295]	[7.913]
N	3952	3952	3952	3952	2755	2755	2755	2755	2706	2706	2706	2706
R^2	0.078	0.056	0.050	0.066	0.044	0.028	0.048	0.083	0.081	0.063	0.059	0.078

seem to be informative in the long term. Whether trades are opportunistic or routine and made by CEOs or CFOs does not seem to matter. One noticeable change in the results, however, is that the estimated impact of transaction size is positive and significant for all returns both in the short term and in the long term during the pre-crisis period. That is, the market reacts positively to larger purchases and they seem to be informative.

The results regarding the crisis period reveal that the routine purchases made by CEOs are more informative than all other purchase transactions. The estimated coefficient of *CEO_Routine* is positive and significant only for 90-day returns. The findings reveal that the CEO routine purchases yield a market-adjusted return in 90 days which is 2.71 percent more than the routine purchases made by CFOs. There is some evidence that opportunistic trades are neither well received by the market in the short term nor informative in the long term during the crisis. Although the results are insignificant, the estimated coefficients associated with opportunistic trades are negative regardless of the return and the executive. Also, in the crisis period the importance of transaction size and the number of previous trades are reduced substantially. In addition, we find that the time directors spend on the board affects the adjusted returns in the long term negatively. The negative and significant results regarding the variable which is proxy for the board experience of directors are more difficult to explain for the long-term adjusted returns. In contrast to the pre-crisis period, when purchases are made by directors who have other board experience the adjusted returns for all types are insignificant, reflected in the estimated coefficient of the variable *Affiliations*. However, the amount of time directors have to retire exerts a significant effect for returns both in

the short term and the long term. The longer the amount of time to retire the less likely that the inside purchase is informative. To the extent that this variable also captures the experience and age of directors, the findings are in line with the view that more experienced directors are more likely to access private information and use it in trading. Finally, our results suggest that the influence of corporate governance characteristics of firms on the adjusted returns changes during the crisis period. What seems to matter most as a governance mechanism is the degree of board independence. The findings reveal that inside purchases by directors of firms with relatively more independent directors are likely to be more informative in the long term. The positive relation between board independence and adjusted returns is at odds with the view that the likelihood of directors having private information and using it in their trading is lower in a *good* corporate governance environment. Accordingly, board independence should not lead to positive market-adjusted returns subsequent to director transactions. As for the effect of institutional ownership on adjusted returns during the crisis, we find that the negative effect, albeit moderate, that we observe in the pre-crisis period recedes largely in the crisis years.

Finally, in Table 2.7 we present the regression results in the post-crisis period, which provide us with stronger results than the findings reported for the earlier periods. First, it is clear that the opportunistic purchases made by CEOs and CFOs generally lead to greater returns in the long term. Also, the market reacts positively to inside trades in the short term as evidenced by the significant constant term for *RET_5*. The findings imply that the market-adjusted returns on routine trades made by CFOs are positive, albeit significant only for *RET_5*, and the returns on other types of trade are not significantly

different. This provides some evidence on the relevance of inside trades at least in the short term. However, findings regarding the informativeness of purchases in the long term are unambiguous. The cumulative adjusted returns on the opportunistic trades by both CEOs and CFOs after transactions over 60 and 90 days are significantly higher. More importantly, the CEO opportunistic trades in the post-crisis period yield greater returns than those made by CFOs. Specifically, the adjusted returns from CEO (CFO) opportunistic trades in 60 and 90 days are respectively about 4.25 and 6.63 (3.62 and 4.98) percent greater than the return on CFO routine trades. The difference between CEO and CFO returns during these subsequent trading days is 0.63 percent in 60 days and 1.65 percent in 90 trading days. Overall, the findings are strongly in favor of the opportunistic trades by both directors for their ability to convey relevant information to the market, with some evidence that CEO opportunistic trades are more effective in doing so.

Another important finding in Table 2.7 relates to the impact of board independence. Contrary to the positive effect it has on returns during the crisis period, the role of board independence in determining the returns associated with purchase transactions in the post-crisis period seems to have changed substantially. There is strong evidence that the returns are significantly lower in firms in which board independence is stronger. This implies that board independence is an effective mechanism in mitigating the asymmetric information between insiders and outsiders, which renders the trades by insiders much less informative. That is, it substitutes the role played by insider trading in conveying private information, suggesting that directors can neither signal private information to outsiders nor profit from their trades.

2.6. Summary and Conclusions

Insider trading has received considerable attention in the literature because insiders are believed to trade on private information and hence outsiders who mimic these trades have an opportunity to make abnormal profits. Prior studies provide evidence that buy-and-hold trading strategies yield abnormal returns, suggesting that the predictive power of insider trades regarding the future stock returns is high. Until recently, insider trades were mostly treated homogeneously without distinguishing between the directors who trade and the type of trades they make. In this study, in contrast to prior research, we provide a unified framework that enables us to analyse simultaneously both the distinction between CEO and CFO open market purchases, and whether they trade routinely and opportunistically. In line with earlier studies, we consider only purchase transactions as they are more likely to be driven by information and predict that routine trades are less likely to be based on private information as they are made regularly around the same time during the year. More importantly, we investigate the impact of the recent global financial crisis on the relationship between insider purchases and subsequent returns.

We observe that CFOs make more purchases than CEOs; there are more opportunistic purchases than routine ones regardless of the specific director and the sub-period; and the average value of opportunistic purchases is significantly greater than that for routine purchases. Our empirical analysis reveals that the subsequent market-adjusted returns to insider open market purchases are generally positive. Importantly, the findings imply that there are no significant differences between opportunistic and routine trades. Nonetheless, the results change when we distinguish between the two

executives and carry out the analysis for different sub-periods. We then find that the opportunistic trades made by both CEOs and CFOs are more informative, albeit only in the post-crisis period. Interestingly, the market reacts more positively to routine trades made by CEOs in the short term during the crisis period. Overall, the strongest results for the positive impact of insider purchases on returns relates to the trades made by CEOs in the post-crisis period. We also show that the market-adjusted returns increase with the size of trade and decrease with greater external affiliations of executives and the number of past trades. Our results reveal that board independence affects the returns positively during the crisis and negatively in the post-crisis period.

Taken as a whole, our analysis suggests that the position of the trading director and the nature of their trades are important in investigating the impact on returns of insider trades. Contrary to the findings of prior research, we find that CEO purchases are on the whole more informative than CFO purchases and opportunistic purchases, in particular those made in the post-crisis period, have a greater impact on subsequent returns. It seems that the recent financial crisis has changed the market's perception of insider trades regarding their informative content. However, we note that our analysis cannot shed light on whether insiders have also changed their trading strategies incorporating the shift in the market sentiment. This awaits further research.

CHAPTER 3. INSIDERS' SHARE DEALINGS AND CORPORATE INSOLVENCIES

3.1. Introduction

Corporate bankruptcies[10] are costly and have serious consequences for creditors as well as owners of firms. When a firm goes bankrupt, the value of shareholders' claims on the firm's assets normally becomes zero and creditors can expect to recover their claims only partially as a result of direct and indirect costs of bankruptcy. These costs are significant and determined mainly by the nature of the bankrupt firm's assets, the complexity of its business and financial structure, the firm's size and agency conflicts between directors, shareholders and debt holders (see Altman, 1984; Altman and Hotchkiss, 2006; Ang et al., 1982; Bris et al., 2006; Pindado and Rodrigues, 2005; Warner, 1977 among others). Hence, significant expected bankruptcy costs lead to the obvious question – can bankruptcies be predicted? This question has received a great deal of attention in both the academic literature and the financial press. While there has been considerable research examining the factors contributing to the likelihood of bankruptcy (see e. g., Altman, 1968; Campbell et al., 2008; Hillegeist et al., 2004; Ohlson, 1980), the extent to which insider trading is relevant in predicting corporate bankruptcies is largely unknown. This chapter aims to address this gap by investigating empirically, the relation between directors' inside trading and the likelihood of bankruptcy.

[10] Corporate bankruptcy is referred to as insolvency in the United Kingdom. We use these terms interchangeably in the paper.

Insider trading is relevant to the investigation of corporate bankruptcies for at least two reasons. First, it is recognised that insiders, who are in a unique position to have a better insight into their companies' prospects, have informational advantage over outside investors. Therefore, while insiders trade on the superior information they hold, outsiders can make abnormal profits by replicating insiders' trading strategies. Prior studies of insider trading indeed provide strong evidence in support of this view. It is shown that buy-and-hold returns from trades that mimic insiders generate abnormal profits in the long-term, taken as evidence that insiders trade on superior inside information (see e.g. Jiang and Zaman, 2010; Lakonishok and Lee, 2001; Ozkan and Trzeciakiewicz, 2014; Seyhun, 1986). Second, it is also shown that the market's reaction to directors' dealings is significant. While purchases made by directors are seen as a signal of positive information, the market's reaction to sale transactions is generally negative (see for example Fidrmuc et al., 2006; Friedrich et al., 2002; Jaffe, 1974; Korczak et al., 2010; Sylvain et al., 2002). Accordingly, to the extent that insider trading is informative for the firm's future performance and the market reacts to trades significantly in the short-term, trading behaviour of corporate directors is likely to be relevant in predicting corporate bankruptcies.

In light of the above discussion, directors are expected to sell their stocks prior to insolvency as the value of their holdings is expected to reduce to zero, which leads to a positive association between sale transactions by directors and the likelihood of insolvency. Furthermore, the motives of directors for doing so are expected to be stronger in the period preceding the announcement of insolvency. However, it is also possible that insiders may signal through trading in an attempt to affect the firm's stock price favourably, by influencing the market's perception of the firm's financial health. Alternatively, trades can be motivated by the directors'

view that the firm is undervalued.[11] In both cases, directors are expected to purchase shares prior to insolvency, which may generate a positive relationship between share purchases prior to insolvency and the likelihood of insolvency.

In this chapter, we examine empirically the relation between directors' dealings and the probability of insolvency. To do so, we use a unique dataset of 474 non-financial UK firms, of which 117 filed for insolvency during the period 2000 to 2010. The analysis is carried out in two stages. First, to shed light on the patterns of directors' dealings before the event of insolvency, we provide a detailed analysis of open-market purchases and sales, which are made by the directors of insolvent firms prior to insolvency. We also compare these trades with those made during the same period by the directors of solvent firms in the same industry. Second, we examine the relevance of the trading characteristics of directors in determining the likelihood of insolvency. For this, we employ a logistic regression with a dichotomous dependent variable, taking the value of one if the firm goes bankrupt during the sample period and otherwise zero. While in the first stage we examine mainly the patterns of trading characteristics before insolvencies, the main question the current chapter aims to address is investigated in the second stage of our analysis by empirically establishing the link between directors' share dealings and the likelihood of insolvency.

In both stages of our empirical analysis, three non-overlapping windows are considered to examine whether the trading patterns of directors change as insolvency approaches. The most relevant period for understanding the trading motives of

[11] It is shown in the literature that that insiders of solvent firms also trade on the basis of their contrarian beliefs, buying (selling) undervalued (overvalued) shares in an attempt to take advantage of any perceived misevaluation (Jiang and Zaman, 2010).

insiders in this respect is likely to be the six-months leading to the point in time when the last trade is observed (i.e. 0–6 months). We also examine earlier trading information in two more windows (i.e. 6–12 and 12–24 months before the last recorded insider trading activity, respectively).

Our analysis in the first stage shows that in the last trading period closest to the insolvency date insiders change their trading patterns considerably.[12] First, we find that during the last-trading window a significantly greater number of directors trade. Second, both the total and average number of trades per director increase sharply. However, the changes observed during this period are largely driven by purchase transactions. While the sale transactions are stable across the last two trading periods, both the number of directors who purchase stocks and the total number of their purchase transactions increase significantly in the last trading period. Moreover, in this trading period the average purchase transaction value goes up by more than half while the average value of sales drops by more than two-thirds.

The logistic regression analysis shows that insider trading, where the main variable of interest is the net purchase made by directors, increases the explanatory power of the insolvency model. However, the positive relation between net purchase and the likelihood of insolvency is observed only in the last trading period before insolvency. In more distant periods, the relationship is negative and insignificant. The findings also reveal that increases in both the volume of trade and the number of

[12] Our findings contrast those reported in early literature. A few early studies present evidence on the abnormalities in insider trading patterns ahead of corporate bankruptcies in the US where the corporate bankruptcy law depicts distinct characteristics (e.g. Gosnell et al., 1992; Loderer and Sheenhan, 1989; Ma, 2001; Seyhun and Bradley, 1997). They generally find that the directors' insider trading decline before the bankruptcy announcement. However, it is also shown that insiders increase the volume of sales and thereby attempt to avoid significant losses in their holdings.

trading directors in the period leading to insolvency are associated with a greater probability of insolvency. Conversely, a higher number of active insiders and volume of trade in earlier periods reduce the likelihood.

This study contributes to the literature on insider trading and corporate bankruptcies in several important ways. First, to our knowledge, this is the first attempt in the literature to explore the association between insider trading and the likelihood of insolvency. We do not argue in the chapter that insider trading directly affects the probability of insolvency. Instead, we conjecture that the way in which directors deal in their own shares prior to insolvency may be associated with the subsequently observed insolvency and incorporating information on directors' dealings in bankruptcy prediction models would therefore enhance their predictive power. By examining this relationship, this study not only provides further insights into our understanding of bankruptcy prediction models, but also extends the literature on insider trading. In contrast to the insider trading studies in the literature, we do not test the informative content of insider trading by analysing the relation between insider trading and subsequent stock returns. Rather, our approach is to examine the informative content of insider trading for insolvencies by focusing on the link between the event of insolvency and preceding insider trading.

Secondly, our study contributes to efforts to understand the interaction between corporate governance characteristics and corporate insolvencies. We note that prior research investigating the role of corporate governance in determining the probability of bankruptcy is dominated by studies carried out for US firms (Daily and Dalton, 1994a; b; Fitch and Slezak, 2008; Gilson, 1990; Platt and Platt, 2012). Although the corporate governance characteristics in the UK and the US are said to be generally similar, there exist important differences concerning the ways in which

the corporate governance system functions in relation to monitoring and disciplining the management of firms. In line with the existing research on corporate governance and insolvency, we find that board independence diminishes the probability of insolvency. Nevertheless, our analysis reveals several other interesting results. First, board size has a negative effect on the likelihood of insolvency, which is not consistent with the classic view that small boards lead to better overall firm performance. Second, in contrast to the results from US companies, the impact of institutional ownership on insolvency is found to be positive. We argue that these findings may arise from the differences between the US and the UK corporate governance systems, possibly providing further evidence that institutional investors in the UK are not effective in monitoring firms' management and hence reducing the agency conflicts between managers and shareholders.

The remainder of the chapter is organized as follows. In Section 2, we discuss the regulatory framework, which sets out the rules regarding directors' dealings. Sections 3 and 4, respectively, describe the methodology and data used in the study. Section 5 presents the results of univariate and multivariate analyses, and section 6 provides a discussion on the findings and section 7 concludes the chapter.

3.2. The Regulatory Framework on Directors' Dealings in the UK

The main legislation and source of company law in the UK, which regulates the dealings of directors, including stock purchases and sales by directors, is the Companies Act 2006. Under the law, directors are required to notify the company of any dealings in its shares no later than on the fifth business day following the transaction. Companies must in turn notify the Company Announcements Office of the London Stock Exchange without delay and no later than the end of the next

business day following receipt of the information by the company. In addition, the Model Code on directors' dealings, set out in Chapter 9 of the Listing Rules (LR9 Annex 1)[13], provides further guidance for companies and directors in relation to directors' dealings. Several of the requirements are of particular importance in the context of insider trading prior to insolvency. For example, regarding the purpose of directors' dealings, it states that directors must not deal in any securities of the company on considerations of a short-term nature. The Code also requires directors not to deal during "close period" (also known as the blackout period) that is the period of two months preceding the announcement of the company's annual or half-yearly results. More importantly, directors must not deal at any time when they are in possession of unpublished price-sensitive information in relation to the security.

There is, to our knowledge, no separate legislation regulating directors' dealings in financial distress prior to insolvency. However, the wrongful trading provision in the Insolvency Act 1986 (Section 214) should provide a benchmark that directors can use to judge whether a wrongful trading claim can be brought forward against them as a result of their trades in their own shares when their company is in financial distress. Under the law, directors will incur liability for wrongful trading if they continued to carry on their business when they knew that there was no reasonable prospect of the company avoiding insolvent liquidation. It is, therefore, reasonable to assume that directors would stop trading in their shares once they have established that their company faces insolvency and hence a wrongful trading claim can be put forward against them in insolvent liquidation.

[13] See http://www.fsa.gov.uk/library/policy/listing_rules for an extensive analysis of the current and historic Listing Rules in the UK.

3.3. Methodology and Determinants of Insolvency Likelihood

We model the probability of insolvency using a logistic regression where the dependent variable is binary, taking the value of 1 if the firm goes insolvent and 0 otherwise. We estimate the following model.

$$\Pr(y=1|x_i)=G(\beta_0+\beta_1 x_1+\ldots+\beta_k x_k) \quad (1)$$

where $P(x)$ is the probability of the insolvency outcome occurring (i.e. the outcome $y = 1$) given the vector of explanatory variables x_i. Although statistically significant logit coefficients of the independent variables indicate that they have influence on the predicted probability of insolvency, their economic interpretation is not as straightforward as, for instance, it is for OLS estimates. While OLS beta coefficients show the effect of a marginal change in explanatory variables on dependent variable, logit beta coefficients are expressed in terms of log-odds units, specified by

$$\Pr(y=1|x)=e^{(\beta_0+\beta_1 x_1+\ldots+\beta_k x_k)}/(1+e^{(\beta_0+\beta_1 x_1+\ldots+\beta_k x_k)}) \quad (2)$$

The signs of estimated coefficients indicate whether higher values of independent variables lead to a lower or higher likelihood of a $y = 1$ outcome. To assess how different values of x influence the likelihood of insolvency, one can use either odds ratios or fitted probabilities. The odds ratio shows how the likelihood of a $y = 1$ outcome (i.e. insolvency) changes between two values of an explanatory variable. However, given that the odds ratio requires a benchmark value of an independent variable, it is not helpful to estimate predicted values of a $y = 1$ outcome for a given value of x. Instead, the preferred method is first to substitute the desired values of explanatory variables in the estimated logit model to calculate logit odds value for the model. It is then, by substituting this value in Equation 2, to derive the

probability of insolvency for a specific value of an explanatory variable while holding all other independent variables at their mean values.

To examine the trading motives of insiders prior to insolvency, we consider the following proxies of insider trading: 1) net purchase, measured as the difference between aggregate purchases and sales in each window where a positive value indicates greater purchase than sale activities and *vice versa*; 2) number of transactions, given by the total number of purchases and sales made by insiders; and 3) the percentage of actively trading members on the board of directors. While the first variable is to capture the impact of the type directors' transactions, the last two variables are included to test the extent to which the trading activities of directors impact the likelihood of insolvency.

In our investigation, similar to the earlier studies on bankruptcy prediction, we also control for several important accounting and market characteristics as potential determinants of the likelihood of going bankrupt (e.g., Altman and Narayanan, 1977; Charitou et al., 2004; Shumway, 2001). It is shown in this strand of the literature that leverage, firm size, stock returns and their volatility are the main factors that impact on the probability of bankruptcy. In addition, following studies exploring the relation corporate governance attributes and the probability of bankruptcy, we consider four measures, namely board size and independence, managerial and institutional ownership. In doing so, we acknowledge the potential role of corporate governance in reducing the agency and asymmetric information problems within corporations and hence the likelihood of bankruptcy (Lajili and Zéghal, 2010; Poletti-Hughes and Ozkan, 2014; Sudarsanam et al., 2011).

3.4. Data

3.4.1. Sample Selection

This study is based on a unique set of data, which combines information from three different sources, namely Companies House, DataStream, and Morningstar UK. We start by identifying the non-financial UK firms that entered insolvency procedures over the period 2000 to 2010. For this purpose, we used the current activity status of companies posted on the Companies House website (http://www.companieshouse.gov.uk). We classify a firm as insolvent by using a binary variable, with 1 representing its status as one of the following insolvency procedures: administration, liquidation, receivership, or voluntary administration; and 0 otherwise. Consequently, we identify 234 listed non-financial firms that went insolvent during the sample period. In addition to the registration number of firms, their full name and status, the Companies House website also contains the date of filing for insolvency.

We also observe that there are firms that stop producing financial statements well before entering insolvency and hence we restrict our sample to those companies for which the gap between the date of the last available financial statements with fully available information and the date of entering insolvency does not exceed three years. Subsequently, using International Securities Identification Numbers (ISINs), we merge the Datastream accounting and market data and the Morningstar UK corporate governance and insider trading information. As a result, we lose about half of the firms in our initial sample, and finalise the dataset with 117 insolvent companies with the complete set of information.

The insider trading data obtained from Morningstar UK includes information on the transactions of all directors and other major shareholders. For our analysis, we select open market purchases and sales performed by only executive and non-executive directors on the board as they are more likely to be better informed than others. Trading data were collected up to two years before the last observed trading date that is taken as the point in time when directors are assumed to stop trading due to expected insolvency concerns. We find that the amount of time between the last trading date of directors and the date of insolvency filing is on average two years.[14] Finally, we aggregated the characteristics of multiple transactions for three non-overlapping windows, namely the six-month period prior to the last observed director trading date (0–6m); the earlier six-to-twelve month period (6–12m); and the preceding one-to-two year period (12–24m).

To examine the likelihood of insolvency, we match the insolvent companies with those in the control sample, created using the following procedure. Each insolvent firm in the sample was matched with as many as possible (but up to ten, chosen on the basis of matching by size of total assets) solvent firms as possible coming from the same industry classified by Industry Classification Benchmark (ICB) Codes, which have insider trading and financial data available for the same period under consideration. Consequently, for our analysis we generated a sample of 474 firms of which 117 were insolvent.

[14] This is in line with the findings of previous research (e.g., see, Hernandez Tinoco and Wilson, 2013). However, it should be noted that our analysis refers to the date of the last share transaction (purchase or sale) by the directors of insolvent firms. This date does not necessarily correspond to the date when the financial distress is observed externally. The directors of insolvent firms are likely to stop trading much earlier to avoid accusations that they trade in company shares when they are in possession of unpublished price-sensitive information.

Table 3.1 The Solvent and Insolvent Firms by Year and Industry

This table presents the distribution of solvent (control) and insolvent firms. Panel A presents the frequency of firms across years. Panel B shows the distribution of firms across the industries on the basis of the Industry Classifying Benchmark (ICB).

A. Number of firms by year

Year	Solvent	Insolvent	Total sample
2000	28	14	42
2001	30	11	41
2002	49	14	63
2003	45	23	68
2004	24	7	31
2005	8	6	14
2006	39	9	48
2007	42	11	53
2008	37	11	48
2009	22	3	25
2010	33	8	41
Total	**357**	**117**	**474**

B. Number of firms by industry

ICB name	ICB code	Solvent	Insolvent	Total sample
Basic Materials	1000	28	6	34
Consumer Goods	2000	89	33	122
Consumer Service	3000	63	19	82
Health Care	4000	38	7	45
Industrials	5000	86	29	115
Technology	6000	5	8	13
Telecommunication	9000	48	15	63
Total		**357**	**117**	**474**

Table 3.2 Definitions of Variables

This table gives the definitions of the variables used in the analysis. The definitions are grouped in four categories, namely accounting, market, corporate governance and insider trading variables.

Variable name	Definition
Insolvency dummy	Dummy variable that is equal to one if a company enters insolvency procedures and zero otherwise.
Accounting	
Size	Natural logarithm of total assets in constant prices.
Leverage	The ratio of total debt to total assets.
Dividend	Dummy variable that is equal to one if a company pays dividends to its shareholders and zero otherwise.
KZ Index	A measure of financial constraint, estimated using the following equation as described in Baker et al. (2003): $$-1.002 \times \frac{\text{cash flow}_{it}}{A_{i,t-1}} + 0.283 \times Q_{it} + 3.139 \times \text{leverage}_{it} - 39.368 \times \frac{\text{dividends}_{it}}{A_{i,t-1}} - 1.315 \times \frac{\text{cash holdings}_{it}}{A_{i,t-1}}$$ where *A* is the book value of total assets, *Cash Flow* is defined as the sum of EBIT and Depreciation; *Q* is the market value of equity plus the book value of total assets minus the book value of equity divided by the book value of total assets; *leverage* is the ratio of the sum total debt to total assets; *dividends* are the cash dividends paid; *cash holdings* are cash balances.
Market	
Stock return	Aggregated monthly returns minus the aggregated value-weighted monthly FTSE all-share index return in the same year.
Return volatility	Standard deviation of the regression of monthly stock returns in a year on the value-weighted FTSE all-share index for the same year.
Corporate governance	
Board size	Total number of directors on the board.
Board independence	The ratio of non-executive directors to board size.
Board ownership	The percentage holding of executive and non-executive directors.
Institutional portfolio	Average institutional portfolio percentage.
Insider trading	
Net purchase	The value of aggregated net purchases (purchases–sales) made by insiders over market capitalization in:
	0–6 m six-months period prior to insolvency
	6–12 m six- to-twelve-months period prior to insolvency
	12–24m one- to two-year period prior to insolvency
No. of trades	Total number of purchases and sales made by all insiders in:
	0–6 m six-months period prior to insolvency
	6–12 m six- to-twelve-months period prior to insolvency
	12–24m one- to two-year period prior to insolvency
Active insiders	The ratio of number of trading directors (who make open market purchases or sales) to board size in:
	0–6 m six-months period prior to insolvency
	6–12 m six- to-twelve-months period prior to insolvency
	12–24m one- to-two-year period prior to insolvency

Table 3.1 presents the composition of the sample dataset. Specifically, Panel A of the table shows the number of insolvent and solvent firms over the sample period. The highest number of firms during the period is 68 in 2003, 23 of which are insolvent. On the other hand, there are only 14 observations in 2005, with eight solvent and six insolvent firms. It is also worth mentioning that there are only three insolvent firms included in the sample in 2009, while the total number of firms is 25. Panel B presents the distribution of firms across the industries classified on the basis of Industry Classification Benchmark. The distribution is generally well balanced with the exception of the technology sector, represented by only 13 (five solvent and eight insolvent) firms.

3.4.2. Characteristics of Transactions

Table 3.3 presents information on several important characteristics of the open-market purchases and sales carried out by the directors in both solvent and insolvent firms. Panel A reports the average size of a single transaction, while Panels B and C present the total numbers of observed individual transactions and trading directors respectively. Although the characteristics are presented across the three sub-periods used in the empirical analysis, in discussing the results we focus on the last two six-month trading windows, namely 0–6m and 6–12m periods. The objective in doing so is to underline the change in the pattern of trading within the last 12 months of insiders' activity.

Our investigation leads to several important observations. Firstly, it is clear that both the number of purchase transactions (Panel B) and the number of directors (Panel C) who make purchases increase during the last trading period. While the increase is observed for both solvent and insolvent firms, the changes for the

insolvent sub-sample of firms are significantly greater. Specifically, the number of purchase transactions (the number of trading directors) in insolvent firms increase from 152 (95) in the 6–12m window to 413 (296) in the 0–6m trading window, suggesting about a 172 (212) percent increase. The percentage increases for the same variables in solvent firms are 11 and 5 percent respectively. Secondly, compared to purchases, there are only several open-market sale transactions during the last trading window. There are 48 (36) sales made by the insolvent-firm directors in the 0–6m (6–12m) window, corresponding to a 33 percent increase. The number of directors engaging in sale transactions is also small, increasing from 26 in the 6–12m window to 33 during the last-trading period. Interestingly, compared to the previous six-month period, in solvent firms both the number of sale trades and the number of directors making these trades fall during the last-trading window, from 200 to 170 and from 146 to 135 respectively. Finally, it is worth noting that, as shown in Panel A, the ratio of the value of purchase (sale) transactions to the market capitalisation of insolvent firms increase from about 0.27 (0.71) percent in the 6–12m window to about 0.34 (0.95) percent during the last six-month period. However, we have mixed findings for solvent firms during the same windows. That is, while the sale trades ratio for solvent firms increases from about 0.40 percent in the 6–12m window to 0.49 percent in the last-trading window, the purchase trades ratio drops from 0.12 percent to about 0.10 percent between the two six-month periods.

Comparing directors' trading in the 12–24m period with those in the 0–12m period (i.e. the sum of the 0–6m and 6–12m periods) in Panel B also leads to similar

Table 3.3 Characteristics of Directors' Insider Trading

This table reports the characteristics of the insider trading activity by distinguishing between purchase and sale transactions across both solvent and insolvent firms. Panel A reports the mean value of the ratio of the value of individual transactions to market capitalisation. Panel B shows the total number of single transactions. Finally, Panel C reports the number of trading directors who make these transactions.

		Insolvent	**Solvent**
Panel A. An average size of a single transaction as a percentage of market value			
Purchases	0-6 m	0.341	0.098
	6-12 m	0.267	0.120
	12-24 m	0.177	0.177
	Full period	0.264	0.141
Sales	0-6 m	0.948	0.492
	6-12 m	0.714	0.404
	12-24 m	1.643	0.455
	Full period	1.148	0.450
Panel B. Total number of observed transactions			
Purchases	0-6 m	413	914
	6-12 m	152	823
	12-24 m	245	1587
	Full period	810	3324
Sales	0-6 m	48	170
	6-12 m	36	200
	12-24 m	51	432
	Full period	135	802
Panel C. Total number of observed trading directors			
Purchases	0-6 m	296	500
	6-12 m	95	476
	12-24 m	177	819
	Full period	428	1251
Sales	0-6 m	33	135
	6-12 m	26	146
	12-24 m	37	287
	Full period	77	433

findings. Specifically, net purchases are significantly larger in insolvent firms as insolvency gets closer. However, there is no evidence to suggest that a distinct pattern exists either for the sale transactions in insolvent firms or the transactions in solvent firms regardless of the type of transaction. Consequently, we argue that the evidence regarding the purchase behaviour of the insolvent-firm directors is unique and sufficiently unambiguous. Overall, the analysis in this section suggests that the characteristics of directors' dealings, in particular purchase trades, during the period prior to insolvency can be informative in predicting the subsequent event of insolvency.

3.5. Results

3.5.1. Summary Statistics and Univariate Analysis

In Table 3.4 we report the mean values and their standard deviations for the whole sample and separately for the solvent and insolvent firms. Furthermore, the mean difference t-test results for each variable are reported, where the null hypothesis is that the mean values of the variables across the solvent and insolvent groups are equal. We present our findings by grouping the variables in four categories: corporate governance, accounting and market variables, and directors' trading.

Starting with the discussion of the corporate governance characteristics, the results reveal significant differences between solvent and insolvent firms with respect to board size, independence and institutional ownership. We find that the companies that filed for insolvency have on average smaller boards, with about six members, compared to approximately seven directors sitting on the average solvent

Table 3.4 Descriptive Statistics and Mean Comparisons of Variables Between Insolvent and Solvent Firms

This table reports the descriptive statistics of the independent variables used in the study. The statistics are provided for the whole sample and insolvent and solvent firms separately. The mean difference t-test compares the mean values of the variables between insolvent and control firms under the null hypothesis that the mean values of the variables across the two sub-samples are equal. ***, **, * indicate that t-test is significant at 1%, 5%, and 10% respectively. The definitions of variables are provided in Table 3.2.

	Full sample			**Insolvent**	**Solvent**	
	N	Mean	Std. dev.	Mean	Mean	**t-test**
Corporate governance characteristics						
Board size	474	6.538	2.157	*5.701*	*6.812*	4.96***
Board independence	474	0.508	0.157	*0.466*	*0.522*	3.39***
Board ownership	474	0.132	0.172	*0.131*	*0.132*	0.01
Institutional portfolio	474	0.231	0.300	*0.306*	*0.207*	-3.14***
Accounting variables						
Size	474	17.812	1.892	*17.142*	*18.032*	4.50***
Leverage	474	0.187	0.196	*0.279*	*0.157*	-4.98***
Dividend	474	0.593	0.492	*0.342*	*0.675*	6.64***
KZ Index	457	0.537	7.558	*2.326*	*-0.05*	-2.92***
Market variables						
Return volatility	474	0.133	0.086	*0.171*	*0.121*	-5.67***
Stock return	474	-0.006	0.598	*-0.317*	*0.096*	6.78***
Directors' trading						
Net purchase 6m	474	0.004	0.092	*0.022*	*-0.002*	-2.52**
Net purchase 6–12m	474	0.003	0.072	*0.014*	*0.000*	-1.79*
Net purchase 12–24m	474	-0.001	0.037	*-0.001*	*-0.001*	-0.05
No. of trades 0–6m	474	3.259	4.549	*3.940*	*3.036*	-1.87*
No. of trades 6–12m	474	2.555	4.283	*1.607*	*2.866*	2.78***
No. of trades 12–24m	474	4.884	6.334	*2.530*	*5.655*	4.74***
Active insiders 0–6m	474	0.316	0.283	*0.513*	*0.251*	-9.46***
Active insiders 6–12m	474	0.236	0.259	*0.176*	*0.256*	2.91***
Active insiders 12–24m	474	0.414	0.325	*0.321*	*0.445*	3.63***

firm's board. We also show that the composition of the board across the two samples is significantly different. Specifically, the non-executive directors of insolvent firms constitute on average about 47 percent of the board, compared with more than 52 percent in solvent firms. The results suggest that the boards of solvent firms in our sample tend to be more independent than the insolvent firms. Despite the differences in the total number of directors represented on the board, the equity ownership of board members is almost the same in both groups at about 13 percent. Finally, we find that the average institutional ownership portfolio in the insolvent sample of firms is significantly higher than that for the control firms, about 31 and 21 percent respectively.

There are also significant differences between the two samples regarding the accounting variables used in the analysis. Not surprisingly, the mean leverage ratio (about 28 percent) for insolvent firms is significantly higher than for the solvent firms (about 16 percent). In line with this finding, the statistics show that the average KZ Index for insolvent firms is significantly higher at about 2.33, compared to an average score of -0.05 for the firms in the control group. Finally, compared to the firms in the solvent sub-sample, insolvent firms are significantly smaller and a smaller percentage of them pay out dividends to shareholders during the sample period. As for the market variables, the stock return for insolvent firms prior to the event of insolvency is negative, approximately -32 percent, and significantly lower than the average return on the solvent firms' stocks, which is just under 10 percent. The volatility of past returns is expectedly higher for insolvent firms. Overall, the comparison of the relevant accounting and market variables indicates that the insolvent firms used in the analysis exhibit greater risk and a higher degree of

financial constraint. Moreover, the differences seem to be perceived by the market correctly, reflected in lower returns and greater stock return volatility.

Turning to the results on insider trading measures, we present important differences between the two samples with regard to the mean values of the size of net purchase, the number of trades and board activity before the insolvency event, with the exception of the net-purchase during the last period (i.e. 12–24m) prior to insolvency. The results indicate that in firms filing for insolvency, the insider trading activity is smaller during the 12–24m period in comparison to the solvent firms. For example, on average in this period we observe 2.53 trades in insolvent firms performed by 32.1 percent of the board, whereas in the solvent firms on average about 5.66 transactions were performed by about 45 percent of the board. This is in line with the findings of Ryan (2005), who reports that in situations of increased interest from analysts, insider trading volume decreases. However, in the last six-months the situation is reversed. In the insolvent group, we observe a greater frequency of trading with an average of 3.94 transactions carried out by 51.3 percent of the board, in comparison to an average of 3.04 trades performed by 25.1 percent of directors in the solvent group. Additionally, in the short-term period we observe a significant discrepancy between net purchases across the two groups. The net purchase in insolvent firms equals 2.2 percent of market value. This is in contrast to the findings of Seyhun and Bradley (1997) who find that insiders mostly sell their stocks prior to insolvency. The net purchase ratio is -0.2 percent in the solvent group, suggesting that on aggregate there are more sales than purchases made by the directors of these firms during the same period.

Our preliminary findings indicate that the patterns of directors' dealings differ significantly between the insolvent and solvent groups of firms during the

relatively long period before the insolvency event. The striking finding from our analysis is that the directors of firms in the insolvent group increase the volume and number of their purchases nearer the insolvency. Combined with the findings in the previous section, our descriptive analysis suggests that the way in which the directors of insolvent firms trade in their own shares may prove to be relevant in estimating the probability of insolvency.

3.5.2. Multivariate Logit Analysis

This section investigates the determinants of the likelihood of insolvency. In Table 3.5 we present the results from four different logit specifications. Model 1 is our baseline model, estimating the likelihood of insolvency as a function of only the accounting, market and corporate governance variables. In Models 2 to 4 we incorporate our three measures of directors' insider trading, which are the main variables of interest in our analysis.

3.5.2.1. Corporate Governance, Accounting and Market Variables and the Likelihood of Insolvency

Starting with Model 1, we find that the majority of the estimated coefficients are generally significant and in line with the predictions as to their impact on the likelihood of insolvency. Specifically, the findings for the corporate governance characteristics suggest that firms with larger and more independent boards are less likely to be insolvent. The negative and significantly estimated coefficient of board size is not consistent with the traditional view (see e.g. Yermack, 1996) that small boards are more efficient and better organized than larger boards, which should lead to better firm performance and hence a lower probability of insolvency. Instead, firms with larger boards are less likely to be insolvent, supporting the evidence

Table 3.5 Logit Models: Insider Trading and the Likelihood of Insolvency

This table presents the results of the logistic regressions between the dichotomous insolvency variable and the insider trading variables. All models include time and industry dummies.. ***, **, * indicate that the estimated coefficient is significant at the 1%, 5%, and 10% levels respectively. Standard errors are reported in brackets. The definitions of variables are provided in Table 3.2.

	(1)	(2)	(3)	(4)
Board size	-0.218 **	-0.218 **	-0.25 **	-0.28 **
	[0.094]	[0.096]	[0.105]	[0.113]
Board independence	-1.763 *	-1.65 *	-1.23	-1.28
	[0.970]	[0.989]	[1.049]	[1.138]
Board ownership	-0.14	-0.143	0.055	-0.19
	[0.867]	[0.897]	[0.899]	[0.957]
Institutional portfolio	1.612 ***	1.756 ***	1.785 ***	1.764 ***
	[0.427]	[0.439]	[0.463]	[0.488]
Size	-0.147	-0.154	-0.18	-0.11
	[0.128]	[0.131]	[0.144]	[0.150]
Leverage	3.168 ***	3.08 ***	2.982 ***	2.819 ***
	[0.745]	[0.763]	[0.800]	[0.852]
Dividend	-0.641 *	-0.619 *	-0.42	-0.41
	[0.333]	[0.339]	[0.371]	[0.389]
Return volatility	6.055 ***	6.04 ***	6.536 ***	7.453 ***
	[1.814]	[1.852]	[2.055]	[2.129]
Stock return	-1.562 ***	-1.521 ***	-1.72 ***	-1.84 ***
	[0.274]	[0.278]	[0.316]	[0.342]
Net purchase 0–6m		22.164 **		
		[9.300]		
Net purchase 6–12m		-12.901		
		[11.141]		
Net purchase 12–24m		-2.383		
		[3.544]		
No. of trades 0–6m			0.23 ***	
			[0.047]	
No. of trades 6–12m			-0.17 ***	
			[0.057]	
No. of trades 12–24m			-0.26 ***	
			[0.057]	
Active insiders 0–6m				3.604 ***
				[0.623]
Active insiders 6–12m				-1.2 *
				[0.657]
Active insiders 12–24m				-2.6 ***
				[0.565]
Constant	2.686	2.763	2.669	1.567
	[2.121]	[2.159]	[2.351]	[2.445]
N	474	474	474	473
Log-likelihood value	-178.04	-173.7	-153	-141
Pseudo R^2	0.3279	0.3443	0.424	0.465

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provided by Platt and Platt (2012) that larger boards probably provide firms with more business contacts, enabling them to avoid insolvency. However, it should be noted that financially distressed, in particular near-insolvent, firms are likely to lose directors prior to the insolvency (Darrat et al., 2010). This may then lead to a negative relation between the number of directors and the insolvency event by construction, possibly partly explaining our finding.

The results also reveal that the likelihood of insolvency decreases with board independence. This is consistent with the findings of prior research showing that the market reacts more positively to decisions taken by outsider-dominated firms (Borokhovich et al., 1996) and more independent boards are likely to be better monitors (Shleifer and Vishny 1997). To the extent that boards with greater non-executive director representation are more likely to make better decisions and act in shareholders' interests, greater board independence should lead to better performance, lower cost of capital, and hence lower the probability of financial distress. Furthermore, financially distressed firms should have a better chance of survival as the access of independent boards to external finance is expected to be easier, which is essential to avoid bankruptcy.

As for the impact of equity ownership variables, we do not find a significant relation between board ownership and the likelihood of insolvency, while the negative sign is consistent with our predictions. This finding does not support the view that board ownership is expected to align the interests of managers and owners and therefore to reduce the costs of agency problems within corporations (Jensen and Meckling 1976). However, the relation between institutional ownership and the likelihood of insolvency is positive and highly significant. This provides further support for the argument that financial institutions, despite their large ownership

position, do not take an active role in corporate governance in the UK, adopt a passive stance towards monitoring and disciplining firms' management, and hence have little influence on managers (Franks et al., 2001). Not surprisingly, we find a highly significant association between leverage and the likelihood of insolvency.

The estimated negative relation between dividend policy and the probability of insolvency, albeit rather weak, may arise because the firm's dividend policy can indicate its flexibility to resort to internal resources when needed and be seen as an inverse proxy for the degree of financial constraint. Dividend paying firms are also expected to be more profitable, which would also lower the probability of insolvency. We find that past stock returns exert a negative and significant effect on the likelihood of insolvency. In addition, the volatility of stock returns is positively related to the likelihood of insolvency. While the high stock return volatility can increase the likelihood of insolvency *per se*, we also note that the volatility, observed during the period prior to the insolvency, may be the outcome of the expected insolvency. We do not investigate this issue further as we do not examine financial distress separately from insolvency. Finally, one result that is inconsistent with a priori expectations relates to firm size. Although the sign of the estimated coefficient of firm size is expectedly negative, suggesting a lower probability of insolvency for larger firms, the relation is not statistically significant. Our findings in relation to the control variables from the baseline model hold robustly and hence we do not discuss them again in the rest of the chapter.

3.5.2.2. Trading Activity of Directors and the Likelihood of Insolvency

As explained earlier, in estimating the relation between insider trading and the likelihood of insolvency we use three different proxies in relation to the trading

activity of directors. Moreover, as explained earlier, each proxy is measured over three different windows to test if the nature of directors' dealings changes as the insolvency approaches, namely the six-months (0–6m), the six-to-twelve-months (6–12m), and the one-to-two-years periods prior to the date when the last trading was observed. In Model 2 we examine the impact of net purchase, which is defined as the ratio of the difference between the sum of purchases and sales made by board members to the market capitalization of the firm. The results reveal that the influence net purchase exerts on the likelihood of insolvency is positive and significant only during the last six-months period of trading. Although the estimated relation in the earlier periods is negative, it is statistically insignificant. The findings are in support of the earlier descriptive analysis that directors increase their purchase transactions before they cease trading completely, possibly to reduce the risk of litigation related to insider trading.

In Model 3 we estimate the relation between the likelihood of insolvency and the total number of trades performed by insiders, used as a proxy for trading activity, without distinguishing between purchases and sales. The estimated coefficient of this variable in the first window (0–6m) is positive and significant at the 1 percent level. As shown earlier, the observed increases in the last trading period are mainly due to open market purchases rather than sales. It is therefore likely that the positively estimated relation between the number of insider transactions and the likelihood of insolvency provides further support for the suggestion that insiders become significantly more active in purchasing shares before they stop trading. However, this does not seem to be the case during the earlier windows (i.e. the 6–12m and 12–24m periods). The impact of the number of trades becomes negative and significant, having an opposite impact on the probability of insolvency. This is in line with the

view that insiders would be more cautious and diligent when trading ahead of adverse events such as insolvency.

In Model 4 we investigate the relation between the activity of the board, measured by the ratio of the number of trading directors to board size, and the likelihood of entering insolvency. The results are very similar to those we report above with respect to the impact of the number of transactions on insolvency. Specifically, we find that while insider activity exerts a negative influence on the estimated likelihood of insolvency during the last six-months (0–6m), the relation is reversed during the earlier two windows. In summary, the results in Table 4 provide strong evidence in support of the view that the trading behaviour of directors before insolvency is significantly associated with the likelihood of insolvency. More importantly, the estimated relation is not homogeneous and changes in the opposite direction between the last six-months trading period and the two earlier periods.

3.5.3. Sensitivity Analysis: Insider Trading and the Probability of Insolvency

As discussed earlier, the reported coefficients in Table 3.5 are not helpful to evaluate the marginal impacts of the changes in the variables of interest on the probability of insolvency. Therefore in Figures 3.1 to 3.3, we provide a sensitivity analysis by evaluating the predicted probabilities of insolvency against insider trading variables during the three trading periods. In all of the figures, we plot the probabilities using the models reported in Table 3.5. For example, in estimating and plotting the probability of insolvency at different levels of net purchase in Figure 3.1, we use the estimated results for Model 2. We evaluate the rest of the independent variables at their mean values except the categorical control variables (i.e. year and

industry dummies), which are evaluated as though there are equal number of observations in each category, and therefore are equally probable.

Overall, the plots suggest that the probability of insolvency is generally more sensitive to changes in insider trading measures in the last trading period (0–6m) regardless of the variable used in estimating the probabilities. Furthermore, the upward and downward sloping curves plotted in Figures 3.1–3.3 are expectedly in line with the estimated coefficients regarding each aspect of insider trading. Figure 3.1 shows that the sensitivity of the probability of insolvency, given by the slope, increases significantly in the 0–6 month period as the value of net purchases increases. For example, the probability increases from about 6 percent to around 38 percent as the value of net purchases ratio ranges from -0.05 percent, which implies greater sales than purchases made by insiders, to 0.05 percent. However, the probability of insolvency is much less sensitive to changes in net purchases in the earlier windows. The estimated probability curve is now downward sloping in the earlier 6–12 month window. For the same change in the net purchases ratio, the probability of insolvency drops to about 11 percent from 31 percent. While the curve is still negatively sloped in the last period, the sensitivity is even lower, where the decrease in the probability for the same range of change in net purchase is only three percentage points.

Figure 3.1 The Relationship Between Probability of Insolvency and Net Purchase

The graphs plot the probabilities of insolvency for values of net purchase across three windows, i.e. 0–6 months, 6–12 months, and 12–24 months. The probabilities are estimated using the logistic estimates reported in Table 3.5 (Model 2). The remaining independent variables are evaluated at the sample mean, with the exception of categorical variables (year and industry) that are treated as though they are equally probable. The definitions of all variables are provided in Table 3.2.

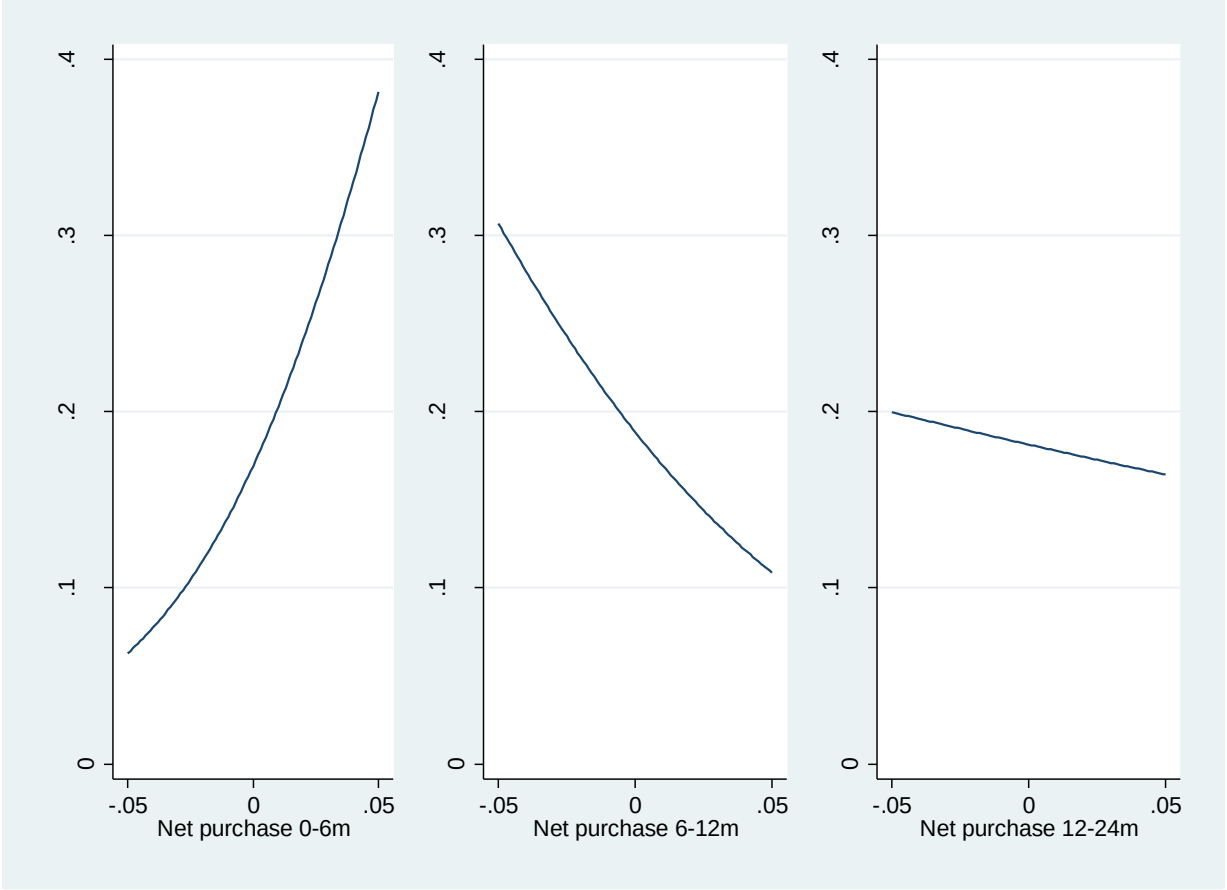


Figure 3.2 The Relationship Between Probability of Insolvency and Number of Trades

The graphs plot the probabilities of insolvency for values of net purchase across three windows, i.e. 0–6 months, 6–12 months, and 12–24 months. The probabilities are estimated using the logistic estimates reported in Table 4 (Model 3). The remaining independent variables are evaluated at the sample mean, with the exception of categorical variables (year and industry) that are treated as though they are equally probable. The definitions of all variables are provided in Table 3.2.

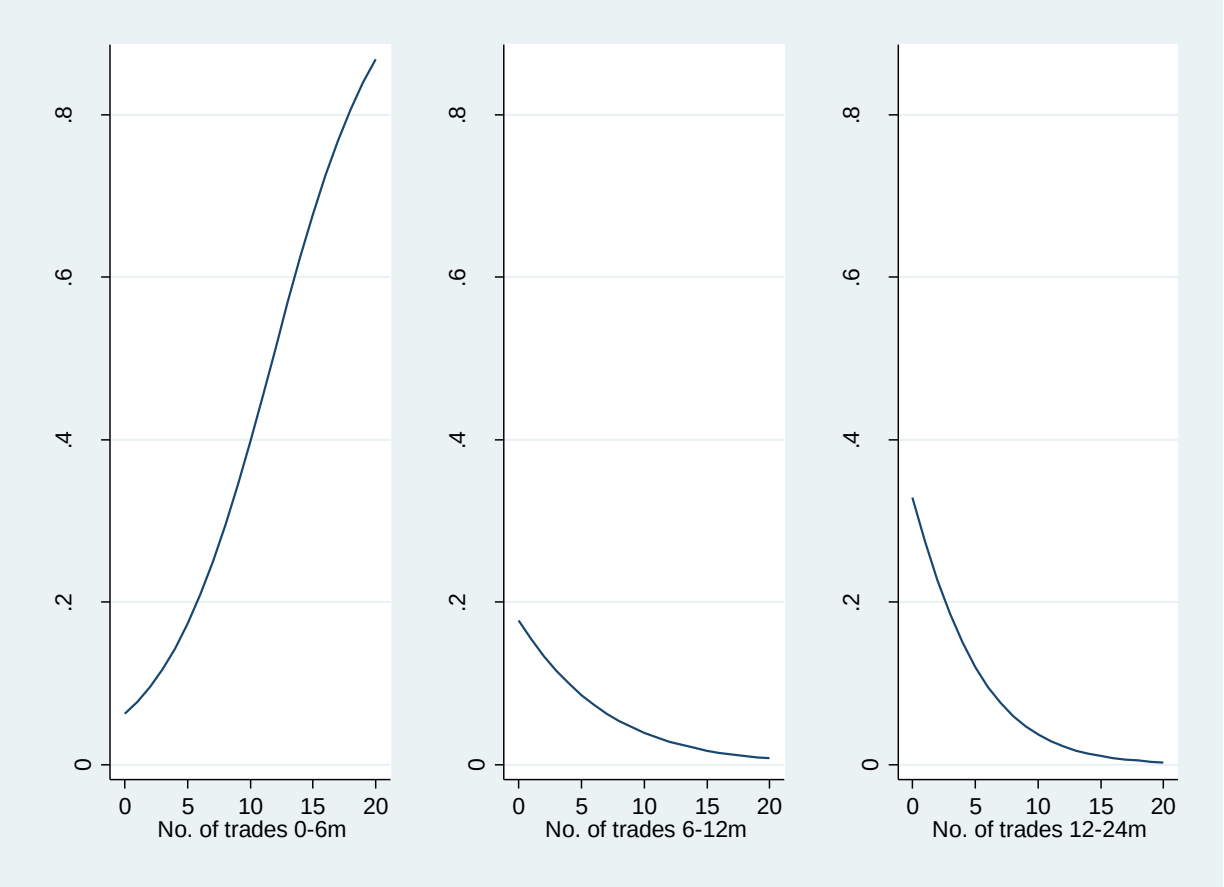
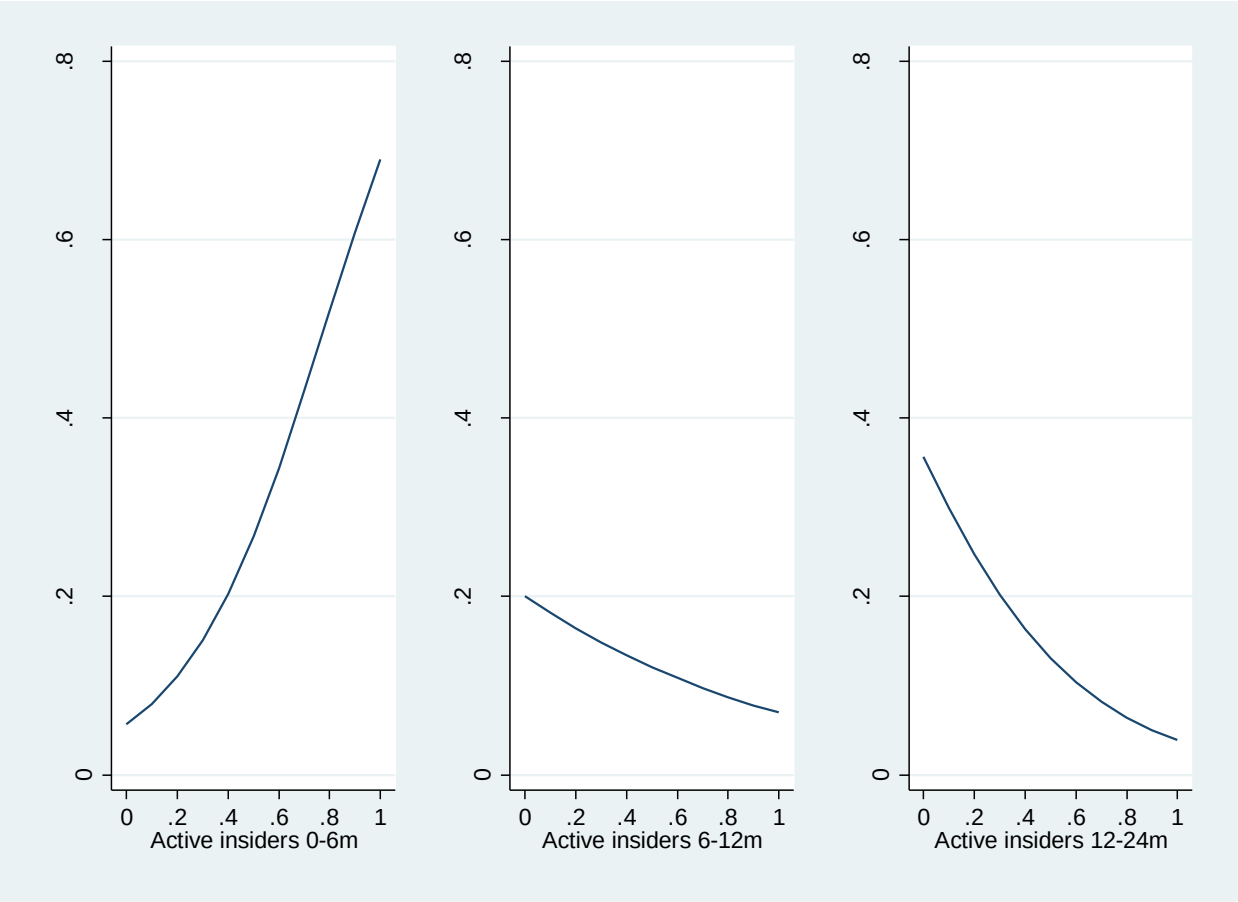


Figure 3.3 The Relationship Between Probability of Insolvency and Ratio of Active Insiders

The graphs plot the probabilities of insolvency for values of net purchase across three windows, i.e. 0–6 months, 6–12 months, and 12–24 months. The probabilities are estimated using the logistic estimates reported in Table 4 (Model 4). The remaining independent variables are evaluated at the sample mean, with the exception of categorical variables (year and industry) that are treated as though they are equally probable. The definitions of all variables are provided in Table 3.2.



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Figures 3.2 and 3.3 present a similar analysis for the number of transactions and active insiders respectively. Specifically, as shown in Figure 3.2, the probability of insolvency increases from about 8 percent to above 80 percent as insiders in a typical firm increase the number of their trades from 0 to 20 during the last six-months trading period. However, in the earlier two periods the slope is negative, suggesting that the probability of insolvency decreases as the number of trades increases. Finally, the probability of insolvency increases from about 8 to just under 70 percent as the ratio of directors engaged in trading goes up from 0 to 100 percent. On the contrary, but in line with the trends reported in Figure 3.1 and 3.2, in the earlier windows an increase in the ratio of active traders decreases the probability of insolvency and at a much lower magnitude. For example, as the ratio increases from 0 to 100 percent, the probability of insolvency decreases from about 20 (40) to less than 10 (5) percent in the 6–12m (12–24m) period. To sum up, the findings of the sensitivity analysis are in line with the regression results presented earlier. The results confirm our earlier suggestion that the impact of insider trading on the probability of insolvency during the last trading period differs significantly from that in the earlier periods.

3.5.4. Additional Tests

To ensure the robustness of our results, we carried out a series of checks. First, in estimating the likelihood of insolvency we replace the market and accounting variables with the KZ Index, which is generally used in previous research as a proxy for the probability of financial distress and financial constraint (Almeida et al., 2004; Baker et al., 2003). The results are not reported separately but they are consistent with our a priori expectations that the relationship between the KZ Index

and the likelihood of bankruptcy is positive. The influence of insider trading variables also remains in line with the main findings reported in Table 3.5.

3.5.4.1. Type of Transaction: Purchases vs. Sales

In Table 3.6, we first examine if the positive relation between net purchase ratio and the likelihood of insolvency is mainly caused by transaction type. To do so, instead of using the net purchase measure, in Model 1 we incorporate purchase and sale transactions made separately during each period. For brevity, we only report the findings on the insider trading variables as the results for the rest of the variables remain qualitatively similar. The findings indicate that the positive relation between the transactions in the last period and the likelihood of insolvency is driven by purchase transactions. Specifically, the estimated coefficient of purchases made in the last trading period is positive and significant at the 1 percent level. The coefficients for the remaining windows are negative, albeit significant at the 10 percent level. In contrast, we do not find any significant relation between sales transactions and the insolvency likelihood in any of the periods.

We next perform a similar exercise in Model 2, where we estimate the relation between the number of transactions and the likelihood of insolvency, by distinguishing between number of sales and purchases. We find that the number of sale transactions made by directors exerts little influence on the likelihood of insolvency. The estimated coefficients are not significant in the first two windows, whilst the coefficient in the last window is negative and significant at the 1 percent level in the 12–24m period. The findings on the number of purchases, however, reveal a much more significant relationship between purchase trades and the

Table 3.6 Robustness Checks

This table presents the results of the logistic regressions between the dichotomous insolvency variable and the insider trading variables by incorporating purchase and sale transactions separately in Models 1 and 2, and the trades carried out by executives and non-executive directors in Model 3. For brevity, we do not report accounting, market and corporate governance variables that are included in the models as control variables. All models include time and industry dummies. ***, **, * indicate that the estimated coefficient is significant at the 1%, 5%, and 10% levels respectively. Standard errors are reported in brackets. The definitions of variables are provided in Table 3.2.

	(1)		(2)		(3)
Size of purchases 0–6m	45.687***	No. of purchases 0–6m	0.243***	Active executives 0–6m	2.057**
	[13.876]		[0.049]		[0.809]
Size of purchases 6–12m	-33.941*	No. of purchases 6–12m	-0.198***	Active executives 6–12m	-0.816
	[18.849]		[0.065]		[0.914]
Size of purchases 12–24m	-12.592*	No. of purchases 12–24m	-0.223***	Active executives 12–24m	-1.049
	[7.612]		[0.060]		[0.853]
Size of sales 0–6m	-1.207	No. of sales 0–6m	0.136	Active non-executives 0–6m	5.317***
	[4.659]		[0.156]		[1.038]
Size of sales 6–12m	-6.625	No. of sales 6–12m	-0.008	Active non-executives 6–12m	-2.176*
	[17.563]		[0.183]		[1.200]
Size of sales 12–24m	-1.155	No. of sales 12–24m	-0.403***	Active non-executives 12–24m	-3.35***
	[4.391]		[0.148]		[1.182]
Constant	2.561		2.727		0.861
	[2.238]		[2.359]		[2.451]
N	474		474		474
Log-likelihood value	-167.927		-151.396		-144.246
Pseudo R^2	0.366		0.429		0.455

likelihood of insolvency. They are also in line with our earlier interpretation of the results with regard to the net purchase variable (in Model 2 of Table 4) and the size of purchases variable (in Model 1 of Table 5).

3.5.4.2. Type of Director: Executive vs. Non-executive

As a final robustness test in Table 3.6, we consider the possibility that the relation between the percentages of directors engaged in trading and the insolvency probability changes depending on whether the trading insider is an executive or a non-executive director. In Model 3, we hence incorporate the percentage of executive and non-executive active trading directors separately. Similar to the findings for other insider trading characteristics, we find an asymmetry with respect to the impact of the percentage of active traders on the likelihood of insolvency across different windows. However, while the estimated coefficients in the 0–6m period for both types of directors are positive, the statistical significance of the estimation on the active non-executive ratio is greater. More importantly, in the last two periods the estimated impact of the active directors' ratio on the probability of insolvency is significant only for non-executive directors.

Finally, we also recognise that the impact of types of transaction (i.e. sales and purchases) may also vary with the types of directors who trade. To address this possibility we run a number of regressions by further classifying each type of transaction into two groups identified by director type. The results are in line to our earlier findings and hence are not reported separately. Specifically, the impact of sale transactions is insignificant regardless of director type and the significant impact of purchases remains unchanged.

3.5.4.3. Trading of Chief Executive Officers and Chief Financial Officers

As a final robustness test we consider the possibility that the most influential trading comes from two the most powerful executives in a firm, i.e. the Chief Executive Officer (CEO) and the Chief Financial Officer (CFO). If there appears a risk of insolvency, the first informed executives would be the CFO and/or the CEO. Therefore it may be expected that their trading is the most influential on the market perception among all insiders.

To test this prediction we estimate 3 additional models, which in addition to standard financial and corporate governance characteristics used in the previous estimations, add different measures of trading, made solely by the CEOs and the CFOs. In particular we include the following measures of the CEOs' and the CFOs' trading; in model 1 values of net-purchases performed by the two top executives, in model 2 total number of sale and purchase transactions, and in model 3 dummy variables equal to one if during the indicated period CEO or CFO made at least one purchase or sale. As reported in Table 3.7 we find no significant results in terms of impact of the top executives' net purchases value, as well as number of transactions. It suggests that even though CEOs and CFOs in normal times may be more informative, when they find themselves on the verge of bankruptcy they are heavily scrutinised that may discourage them from trading.

The results presented in the third model, where we consider CEOs and CFOs activity, are the most significant. Additionally, model 2 shows significant association between number of CFOs transactions and insolvency. Overall, we find that impact of the CEOs as well as the CFOs trading activity (no matter if it is purchasing or selling) on the likelihood of insolvency during the 12-24 months period

Table 3.7 Robustness Table for CEO and CFO Transactions

This table presents the results of the logistic regressions between the dichotomous insolvency variable and the insider trading variables by incorporating value of net-purchases of the CEO and the CFO separately in Model 1; number of purchases and sales of the CEO and the CFO separately in Model 2; and in Model 3 incorporating the dummy variables equal to one if during the analysed period the executive made at least one transaction of purchase or sale, and zero otherwise. For brevity, we do not report accounting, marketing and corporate governance variables that are included in the models as control variables. The findings regarding the control variables are in line with the previous findings. All models include also time and industry dummies. The definitions of variables are provided in Table 3.2. ***, **, * indicate that the estimated coefficient is significant at the 1%, 5%, and 10% levels respectively. Standard errors are reported in brackets.

	(1)		(2)		(3)
CEO's net purchase 0–6m	-30.106	**CEO's no. of trades 0–6m**	0.114	**Active CEO 0–6m**	0.883***
	[28.643]		[0.136]		[0.340]
CEO's net purchase 6–12m	11.692	**CEO's no. of trades 6–12m**	0.011	**Active CEO 6–12m**	-0.261
	[26.128]		[0.182]		[0.439]
CEO's net purchase 12–24m	-2.387	**CEO's no. of trades 12–24m**	-0.063	**Active CEO 12–24m**	-0.435
	[11.220]		[0.132]		[0.356]
CFO's net purchase 0–6m	-45.942	**CFO's no. of trades 0–6m**	0.526***	**Active CFO 0–6m**	0.858***
	[137.203]		[0.193]		[0.323]
CFO's net purchase 6–12m	-120.403	**CFO's no. of trades 6–12m**	-0.161	**Active CFO 6–12m**	-0.218
	[175.939]		[0.268]		[0.418]
CFO's net purchase 12–24m	45.908	**CFO's no. of trades 12–24m**	-0.631***	**Active CFO 12–24m**	-0.893***
	[72.742]		[0.223]		[0.339]
Constant	2.776		2.761		2.998
	[2.159]		[2.193]		[2.231]
N	474		474		474
Log-likelihood value	-176.035		-168.173		-164.896
Pseudo R^2	0.335		0.365		0.378

provides further evidence that trading can be motivated by the superior information insiders hold. On the other hand, trades closer to insolvency can possibly be initiated from rational insider's motives to influence the market perception of the firm in attempt to avert insolvency, or their irrational overconfidence (for further details see the discussion below).

3.6. Discussion: Motivations of Directors to Purchase Prior to Insolvency

There are two important findings of our analysis. First, we show that the directors of insolvent firms increase their purchases of their own shares as the formal filing for insolvency approaches. Second, we establish that there is clearly a positive association between purchase transactions and the likelihood of insolvency. These findings are not in line with what would normally be expected of the directors of insolvent firms. As we discussed earlier, if insiders are better informed then outsider they should not purchase stocks prior to insolvency. In that case, purchase transactions should be associated negatively with the probability of insolvency. This superior information prediction is also supported with the evidence provided in the literature, which shows that the changes in the trading patterns of insiders before major price-relevant corporate announcements are consistent with the subsequent event (e.g. seasoned equity offerings (Karpoff and Lee, 1991), dividend initiations and/or cuts (Kose and Lang, 1991), stock repurchases (Lee, Mikkelson and Partch 1992), and mergers and acquisitions (Seyhun, 1990)). Accordingly, we conclude that the purchase transactions of directors prior to insolvency are unlikely to be driven by directors' superior information about the imminent insolvency. In the following, we

explore several potential reasons for the directors of insolvent firms to trade in their own shares and in particular to increase their purchases notably.

One explanation relates to the possibility that insiders may purchase shares in an attempt to affect the market's perception of the firm's financial situation. This is more likely to happen in financial distress and when the probability of insolvency is significantly high. Clearly, the necessary condition for this to happen is the existence of information asymmetry between insiders and outsiders as to the financial state of the company. Insiders may have a view - possibly formed by privately held information - that the future prospects of their firms are better than what the current market value suggests. Alternatively, the insiders may be aware of the imminent insolvency but observe that this is not fully incorporated in the market price. In both cases, it may be reasonable to expect directors to purchase their own shares if there is any scope for avoiding (in the former case) or delaying (in the latter case) the insolvency by doing so. At least, given the evidence in the literature in favour of the positive short-term reaction of the market to purchase transactions by insiders, the efforts of directors to impact the market's perception of the firm through purchases can be seen to some extent reasonable and desirable.

It is also well established in the literature that insolvencies are costly to all the stakeholders of the firm. However, the costs that managers bear are significantly higher as they also have their human capital invested in the firm (Eckbo et al., 2012; Gilson, 1989). It is therefore reasonable to assume that directors may have incentives to affect the market's sentiment through their purchase activities if doing so likely to reduce the probability of insolvency or delay it. It is important to note that these incentives are likely to be stronger in the UK for at least two reasons. First, compared to many other bankruptcy codes, in particular to the US code, the UK

insolvency code is known to be more favourable to creditors, leading to a greater probability of insolvency when companies are in financial distress (Acharya et al., 2011; Ozkan, 1996). Second, in contrast to the US where under Chapter 11 the incumbent management is allowed to maintain control of the firm's assets and its operations, in the UK the managers of insolvent firms surrender control to insolvency practitioners.

The directors of financially distressed firms may also want to reduce their sale and/or increase their purchase transactions before insolvency to minimise the risk of litigation. As we discussed earlier, the relevant risk in the UK in this respect is that of wrongful trading, which can be brought forward against directors if it can be shown that they traded when they knew that there was no reasonable prospect of the company avoiding insolvent liquidation. Also in line with the litigation risk view of insider trading, it is shown in prior studies that insiders, in an attempt to reduce their risk exposure, decrease their timely trades before major events. Specifically, insiders reduce sales and increase purchases ahead of negative and positive news respectively (see, e.g., Chen et al., 2013; Seyhun, 1992).

The above explanations of directors' incentives to purchase prior to insolvency are based on the assumption that directors are generally rational. In that framework, directors act rationally in their own best interest by exploiting the asymmetric information with regard to the likelihood of insolvency, though not necessarily, at the expense of outsiders. Clearly, it is also possible that directors may be irrational and therefore biased in their perception of the likelihood of insolvency and the future prospects of their firms. For example, overconfident directors might underestimate the likelihood of insolvency and/or overestimate the expected future returns as a consequence of their illusion of control and the commitment to good

outcomes (Malmendier and Tate, 2005). Insiders may then choose to purchase shares, believing that the firm is undervalued and its chance of survival is significant enough. Effectively, investors trading in these circumstances would expect to earn abnormal returns.

While we do not test in the chapter these competing explanations, the significantly different trading patterns and results observed in the last trading period are relatively more supportive of the view that increasing purchase activities prior to insolvency are due to rational incentives. It seems that directors trade shares in earlier periods on the basis of information that is relevant to firm value and/or the probability of insolvency, evidenced by the negative relation between net purchase and the likelihood of insolvency. Unless directors are rational in earlier period and become irrational as the firm approaches insolvency it is difficult to argue that directors purchase their own shares due to their biased view of the firm's value and likelihood of survival.

3.7. Conclusion

This chapter provides an empirical investigation on the determinants of the likelihood of insolvency. The main objective is to examine if insider transactions performed by company directors before insolvency are associated with the event. To do so, the study distinguishes between open-market purchase and sale transactions made by the directors of a sample of both solvent and insolvent firms in the UK during the period 2000 to 2010. Furthermore, the trading period prior to insolvency is divided into three distinct sub-periods to investigate whether the trading behaviour of directors change nearer the insolvency event.

Our analysis provides clear-cut evidence that in the period leading to insolvency insiders in insolvent firms increase their purchase transactions significantly. The results from the logistic regression analysis also support this finding, revealing a positive relationship between net purchase and the probability of insolvency only in the six-months trading period before the insolvency. In more distant periods the relation is negative and insignificant. The results hold when the analysis is repeated by incorporating purchase and sale trades separately in estimations. Specifically, there is a positive relation between purchases and the likelihood of insolvency only during the last trading period. However, there is no convincing evidence for the existence of a significant relation between sale transactions and the likelihood of insolvency during the same window of trading. Finally, we find that the relation between insider trading characteristics and the likelihood of insolvency is similar across executive and non-executive directors' dealings.

We also find that board size and independence, and the equity ownership of institutional investors are significant corporate governance characteristics in determining the probability of insolvency. Interestingly, the negative impact of board size and the positive influence of institutional ownership on insolvency are not consistent with what previous corporate governance and bankruptcy prediction studies show. We argue that the differences in the interplay between these firm-specific governance features and the likelihood of insolvency are due to the specific characteristics of the corporate governance system in the UK.

Overall, the findings of our study point to the importance of insider trading characteristics in determining the probability of insolvency. An avenue for future research is to further distinguish between different directors by focusing on the

potential differences regarding their incentives. It is also important to incorporate country-specific information in the analysis with regard to insider trading, bankruptcy procedures, and corporate governance characteristics to provide more insights into bankruptcy prediction models. Additionally, it would be interesting to extend the current work by focusing on firms facing financial distress, and explore whether insider dealings can help these firms to escape insolvency.

Finally, the findings of our analysis may partly arise from the biased view of irrational investors. Distinguishing between rational and irrational trading motives of directors is hence important in investigating the relationship between directors' dealings and the likelihood of insolvency. Equally, it is important, though challenging, to test if the increasing efforts of insiders in insolvent firms to influence the market's perception during the period preceding the insolvency are successful for some firms in avoiding bankruptcy. This awaits future research.

CHAPTER 4. MANAGERIAL HETEROGENEITY, AGENCY CONFLICT, AND LEVERAGE

4.1. Introduction

Since the seminal work of Modigliani and Miller (1958) the relevance and the determinants of capital structure have been a central concern in the corporate finance literature. Among other explanations it has been shown that, in addition to the expected tax benefits and bankruptcy costs of debt financing, the costs associated with the agency conflicts among different claimholders within corporations are significantly relevant in impacting the corporate capital structure decision. In this chapter, we focus on the agency issues between managers and shareholders, which arise mainly in firms that are characterised with dispersed ownership structure and strong management. Specifically, we consider agency issues arising from the separation of ownership and control of companies, in that equity ownership belongs to shareholders and the decision making authority is held by managers where the agency costs arise as a result of misaligned interests of shareholders and managers. Managers typically choose to maximise their own wealth rather acting in the best interests of shareholders as they are contracted to do (Jensen and Meckling, 1976).

The interests and objectives of managers and shareholders also differ with regards to the desired level of debt in the capital structure. Overall, it is argued that managers want to avoid high levels of debt and prefer significantly lower leverage than the one favoured by shareholders (see e. g. Berger et al., 1997; De Jong and Veld, 2001; Florackis and Ozkan, 2009b; Graham, 2000; Morellec, 2004). Prior research provides several reasons for the lower-leverage preference of managers.

Firstly, high levels of leverage constraints managers in their actions by limiting free cash flow at their discretion (Jensen, 1986). Although this is desirable from shareholders' point of view, limited free cash flows would have a negative impact on managers' wealth by reducing the value of non-pecuniary benefits. Secondly, high leverage increases the probability of financial distress and bankruptcy and hence puts managers' human capital at risk (Fama, 1980). Paying interest payments (and the principal amount) are contractual obligations, and defaulting on them may result in formal bankruptcy of the company which is costly to managers and shareholders alike. The costs managers incur are however, expected to be higher as their human capital is not diversified to the extent that shareholders' capital is. Thirdly, managers may prefer financing via issuing equity instead of debt in an attempt to increase resources under their control (Stultz, 1990). Equity capital does not have a specific maturity whereas debt financing matures and needs to be renewed on a regular basis. In line with the above arguments, shareholders would normally prefer to have more debt in the capital structure than managers and expect leverage to play an internal governance role. Furthermore, debt disciplines managers as it exposes them to external monitoring by banks and larger bondholders. This in turn can limit the expected costs of the manager-shareholder agency conflicts, reduce the cost of financing and consequently increase firm value (Jensen, 1986; Jensen and Meckling, 1976; Lasfer, 1995).

In this chapter, we attempt to provide important insights into the role of agency issues between managers and shareholders in determining the corporate leverage decision. To do so, we focus on the factors that affect the ability of managers to act independently in a self-interested manner and hence influence the magnitude of the shareholder-manager conflict. First, we consider the quality of

monitoring within firms, which help to control the managerial discretion. Second, we argue that personal characteristics of managers determine the extent to which they are able to implement their preferred leverage policy. In doing so, we follow the findings of Bertrand and Schoar (2003) who state that managers vary considerably in their styles of management and thus cannot be treated homogeneously as the traditional agency theory normally assumes. That is, in a similar manner, we argue that managers may differ in terms of their general ability to act independently in managing the firm and making corporate policies including the firm's capital structure. More importantly, contrary to the majority of the studies in the literature, we do not assume that these characteristics are stable over time. We recognise that the ability of managers as well as their other characteristics evolve over time.

In our empirical analysis of the interactions between leverage and the manager-shareholder agency conflicts, we consider two executive managers who are the most likely directors to decide on the capital structure, namely Chief Executive Officers (CEOs) and Chief Financial Officers (CFOs) of firms.

There is a growing literature claiming that the CEO is the principal corporate decision-maker and a key element for our understanding of firms (Adams, et al., 2005; Bennedsen et al., 2008; Bertrand and Schoar, 2003; Daily and Johnson, 1997; among others). The research finds that among all executives he should have the greatest influence on the firm's financial policies. It has been acknowledged that measurable CEO's characteristics have a significant explanatory power in terms of firms financial decisions and general performance (Gabaix and Landier, 2008; Kaplan et al., 2012). Furthermore, in relation to the capital structure decisions prior research suggests that the managerial attitude towards debt develops from early life experiences. For instance, the stability of financial markets during the time a

manager was born was found to have an impact on his preferences towards corporate leverage. In particular, Malmendier et al (2011) find that growing up during the Great Depression affects CEOs to manage debt conservatively. Additionally, the type of education managers have is also found to be important. That is, CEOs with financial background or MBA degree are more likely to manage firms with higher leverage (Graham et al., 2013). Other research suggests that CEO's tenure (Berger et al., 1997), general ability and ownership (Bhagat et al., 2011) are negatively associated with leverage, whereas their overconfidence leads to an increase of debt financing in the capital structure (Malmendier et al., 2011).

We note that the other influential executive regarding the capital structure decision is a firm's CFO. Indeed, the CFO's duties and expertise concerning the financial reporting processes provide them with a considerable insight into the firm's financial issues including leverage. Still, the vast majority of empirical studies analysing the impact of managerial characteristics on financing decisions focus on the impact of the CEO rather than the CFO. What is more, the empirical studies based on surveys, despite of addressing their questions to the CFOs, do not consider the relevant CFOs characteristics in investigating the debt financing decision of firms (Brounen et al., 2006; Graham and Harvey, 2001). The implicit assumption in these studies seems to be that although the CFO is more informed and responsible for determining the firm's financing policies, the leverage decision is ultimately approved and made by the CEO. Either way, the empirical evidence concerning the importance of the CFO in determining leverage is limited and mixed. On one hand, Chava and Purnanandam (2010) show that CFO incentives do not impact leverage significantly. On the other hand, Frank and Goyal (2007) in their analysis of managerial turnover support the view that the CFO plays at least as important role in

determining corporate leverage as the CEO. Moreover, they report that female CFOs with longer tenure and technical education are associated with lower leverage. Furthermore Malmendier and Zheng (2012) argue that overconfident CFOs use more debt, even in financing deficit.

In this study, while incorporating both CEO and CFO characteristics in the capital structure analysis, we note that the two executives are likely to differ in their attitude towards the leverage decision. Specifically, we argue that the CEO, in line with the prediction of the traditional agency theory, generally aims at a lower leverage whereas the CFO's priority is generally to achieve and maintain a level of leverage, which tends to be higher and maximises firm value. Accordingly, we assert that the CFO is less likely to deviate from the firm's optimal leverage policy. This happens as a result of better aligned incentives between CFOs and shareholders.

The greater alignment of the CFO and shareholders with regard to the optimal leverage policy can be justified by differences in incentives, which the two executives are expected to have in general and specifically in relation to debt financing. To name a few, the CFO is not at the top of a company's hierarchy and hence the promotional incentives are of special importance to him. Therefore, compared to the CEO, the CFO has additional reputational concerns that may motivate him more to align his actions and incentives with those of shareholders. This would encourage him to adhere to an optimal leverage policy (Jian and Lee, 2011). Furthermore, the CFO's performance appraisal is generally focused on the value of financial policies. Consequently, the CFO is expected to pay closer attention to the relevance and impact of the leverage policy on firm value, for example. On the other hand, the assessment of the CEO is likely to be focused on overall firm

performance, generally measured by profit and value-related performance indicators. Although the capital structure is relevant to the firm's overall performance its impact on value is not observable easily and may not be clear-cut. Therefore, achieving a shareholder's wealth maximising leverage policy may not be among the CEO's top priorities.

The differentiation between the objectives of the CEO and the CFO regarding leverage may be more visible in firms that are managed by strong and possibly entrenched CEOs and/or less strong CFOs. We argue that in such firms the CFO is likely to use leverage as a monitoring mechanism to possibly reduce the extent to which the CEO is entrenched. Higher leverage could constrain CEOs mainly by limiting the free cash flow available to them and increasing the disciplinary pressure through increased probability of default and hence leads to bankruptcy. In this respect, increasing leverage can be used by the CFO as a corporate governance mechanism against the CEO's self-serving behaviour in a similar manner to the corporate governance role; for example, which independent boards can play. Accordingly, we argue that the level of leverage targeted by the CFO is closer to the level desired by shareholders in comparison to the one preferred by the CEO.

To test the extent to which the attributes of CEOs and CFOs affect leverage, and whether their personal characteristics lead to significantly different leverage policies, we provide an empirical analysis explicitly incorporating the impact of their corresponding ability to act independently and to influence the board of directors (hereafter referred to as director ability). To derive a measure of the ability of each director we employ a principal component analysis which compresses into an index three observable director characteristics, i.e. tenure, ownership, and external affiliations. We then estimate the relation between this index and the level of

leverage. In addition to using a single measure, we also investigate separately the impact of each individual component of the ability index on leverage.

By including the CEO's and the CFO's characteristics in the study simultaneously, we are able to address two important and related questions. First, by incorporating in the analysis a proxy for director ability we explicitly investigate whose impact, the CEO's or the CFO's, is more significant in determining the capital structure decision. Second, we test whether the impact on leverage of managerial tenure, ownership, and whether the number of director external affiliations is homogenous or varies depending on the identity of director.

While we focus on the impact of senior executives on leverage, our empirical analysis also casts light on the relationship between internal corporate governance mechanisms and capital structure. It is argued that good corporate governance practices endorse higher leverage as a disciplining mechanism, and therefore limit agency costs (Jensen, 1986; Shleifer and Vishny, 1997). Prior research also suggests that good corporate governance is perceived favourably by the market and leads to lower costs of debt financing (Klock et al., 2005). This would in turn enable firms to raise and afford higher amounts of debt.

The nature of the empirical analysis used in this study is similar to the framework provided by the traditional trade-off theory, which states that there exists an optimal (target) level of leverage resulting from a trade-off between the expected benefits and costs of debt financing (Flannery and Rangan, 2006; Frank and Goyal, 2009; Huang and Ritter, 2009; Leary and Roberts, 2005). We use the industry mean leverage as the proxy for a firm's target debt ratio and measure the firm's deviation from this target by taking the difference between the target and observed levels of leverage. By doing so, we obtain the main proxy for leverage used in our empirical

analysis as the dependent variable, i.e. industry adjusted leverage. Additionally, in order to examine if all suboptimal capital structures are affected similarly by managerial and corporate governance characteristics, we divide the firms, on the basis of our measure of deviation, into underleveraged and overleveraged firms. By focusing on the direction and the extent of deviation from target leverage, we are able to explore the potential factors which determine the ability of firms to achieve their target level of leverage plus its relation to director-specific characteristics.

The empirical investigation is performed using data from 514 UK non-financial companies, managed by 1,464 executives (736 CEOs and 728 CFOs) during the period 2000 to 2010. The United Kingdom provides us with an interesting environment to examine the effects of managerial characteristics for at least two reasons. The first reason lies in differences in managerial attitudes between the UK and US managers who were the subject of vast majority of papers in this area of research (see Graham et al., 2013). The second reason relates to the UK corporate governance system that provides managers with a greater discretion. Specifically, in one of the earlier studies, based on the data from years 1988-1993, Franks et al. (2001) suggest that the reason for the excessive managerial discretion in the UK lies in the passive approach of the financial institutions, which are major shareholders of the UK firms, and an insufficient monitoring by the boards of directors. Still, over the two decades after the Cadbury report which has significantly changed the corporate governance emphasis in the UK and further developments provided by the Combined Codes, along with increasing trend of compliance to them (Arcot et al., 2010), it seems that the managerial-shareholder agency problem and the costs associated with it prevail (McKnight and Weir, 2009). Furthermore, some of the policy recommendations were not found to fit the purpose; for instance Hahn and

Lasfer (2013) show that greater independence and diversity of the boards weaken the internal monitoring and increase the agency problem.

The sample period (from year 2000 to 2010) we use in the study gives us a unique opportunity to empirically test if the relation between managerial, as well as corporate governance characteristics, and leverage is affected by the financial crisis of 2007-2008. We expect that the role and functioning of corporate governance mechanisms are likely to change during the crisis period as the severity and nature of information asymmetry between managers and shareholders increases significantly. We also argue that the influence of executive directors' characteristics on leverage can evolve with the financial crisis. This may arise, for instance, due to the fact that directors may focus on different objectives than achieving optimal leverage and/or individual directors may change their perception of what optimal leverage is.

Our empirical analysis reveals several important findings that enrich our understanding of the importance of the characteristics of top executives and corporate governance mechanisms in shaping corporate leverage policy. First, our analysis shows that compared with the characteristics of CFO, CEO characteristics exert a greater influence in the leverage decision. The findings regarding the greater CEO impact hold during the whole period of our analysis. Second, by distinguishing between under- and overleveraged firms, we find that the observed negative impact of the CEO ability on leverage is driven mainly by the relation between director ability and debt financing in underleveraged firms. In other words, our results suggest that firms with stronger CEOs are more likely to deviate from their target capital structure by issuing less debt rather than deviating from it by adopting a higher than optimal level of leverage. In line with this finding, when we consider individual director characteristics separately, we find that the characteristics of CEOs

are more significantly associated with the deviation from target, and hence leverage itself, in underleveraged firms. Third, we observe that during and after the financial crisis, the CFO's tenure, ownership and affiliations become more significant in determining corporate leverage. However, the findings are more significant for the sample of underleveraged firms. The number of CFO affiliations and his equity ownership reduce the deviation from target leverage, especially in the post-crisis period. However, the CFO's tenure impacts negatively the level of leverage in firms in the underleveraged sub-sample and hence increases the suboptimality of leverage. Fourth, the impact of corporate governance mechanisms is also not symmetrical. In particular, more independent boards have a positive (negative) effect on leverage (the deviation from target) in underleveraged companies whereas their influence in the overleveraged firms is not significant in crisis and post crisis period. On the other hand, board size influences only the leverage decision of overleveraged firms where the estimated relation is significantly positive.

This research strongly contributes to the literature on capital structure in several ways. Specifically, to the best of our knowledge, this is the first attempt in the literature which simultaneously analyses the impact of the CEO and the CFO characteristics on the leverage decision in the UK. In doing so, we contribute to the recently emerging literature that compares CEOs and CFOs in terms of their characteristics and impact on corporate policies, including Chava and Purnanandam (2010) who examine the association between director risk-taking incentives and corporate policies and Graham et al. (2013) who survey the attitudes of CEOs and CFOs towards corporate actions. At the same time, we extend the existing empirical work exploring the impact of managerial attributes on leverage (see for example Berger et al., 1997; De Miguel et al., 2005; Florackis and Ozkan, 2009b) by allowing

managers to differ in terms of their approach and ability towards the optimal level of debt. Furthermore, by introducing the heterogeneity among executives, this study contributes to the strand of the corporate governance literature that focuses on the executive part of the board of directors from a corporate governance point of view (Acharya et al., 2011; Fracassi and Tate, 2012; Landier et al., 2013; Masulis and Mobbs, 2011). Finally, in this chapter, we shed further light on the impact of managerial and corporate governance characteristics on leverage during the financial crisis. This develops the idea initiated by Landier, Sraer and Thesmar (2013) who argue that in unstable economic conditions the presence of strong executives from a corporate governance point of view becomes more relevant than the independent boards of directors.

The remainder of the chapter is structured as follows. Section 4.2 provides a discussion on the expected relations between director characteristics and leverage. Section 4.3 presents and describes the data. Section 4.4 presents the empirical analysis and the final section concludes the chapter.

4.2. Director Characteristics and Leverage

In this study we argue that the leverage preferences of directors are likely to depend on the identity of an executive. As mentioned earlier, CEOs are generally expected to aim at lower than optimal leverage, whereas CFOs are more likely to favour having a near-optimal leverage ratio. Given the directors' differences in preferences regarding the level of leverage, we predict that the debt financing of a firm should be determined by the distribution of decision-making power between its CEO and CFO. In order to establish the spread of power we consider two categories of executives, i.e. weak and strong. An executive is classified as weak when he does

not have sufficient persuasive power on the board due to, for example, lack of adequate experience and relatively poor past performance. On the other hand, an executive is categorised as strong when he is likely to be capable of influencing the board to the extent that he dominates the decision making process.

Considering both the CEO and the CFO of a firm, Figure 4.1 presents different combinations of directors with regard to their perceived power and ability. The first combination (*case 1*) represents a firm in which both the CEO and the CFO are weak in terms of their ability to influence the board and hence the decisions. In this case, we predict that the chosen capital structure is likely to be closer to optimal as the influence of the board of directors is expected to be greater. This prediction is derived under the assumption that *ceteris paribus* relatively independent board of directors act in the best interest of all shareholders. The second case *(case 2)* shows a firm, which is managed by a strong CFO and a weak CEO. This combination may occur in a firm that may, for example, have recently appointed a new CEO who relies on an established CFO (Acharya et al., 2011). Thus, under case 2 the level of leverage would be established more in line with the CFO's preferences and therefore would be expected to be closer to optimal. This also implies a higher leverage than one would expect to have in firms with a stronger CEO. The third combination (*case 3*) refers to a situation in which a strong CEO is combined with a weak CFO, which may prevail when a powerful CEO is interfering with the recruitment process and chooses a CFO that would not oppose his views. Under case 3, as the leverage policy is expected to be mainly determined by the strong CEO's preferences, we predict leverage to be generally lower and, in particular, lower than optimal. Finally, *case 4* represents firms managed by the two strong executives. In these circumstances, due

to a hierarchy that places the CEO at the top of the company, we expect leverage to be lower than optimal, although not as low as the level expected under c*ase* 3.

Figure 4.1 The Combinations of Types of Executives

		CFO type	
		weak	***Strong***
CEO type	***weak***	***case 1***	***case 2***
	strong	***case 3***	***case 4***

As ability is not a directly observable characteristic, for each of the analysed executives, we combine on annual basis three observable managerial features into one index of ability[15]. These characteristics are tenure, equity ownership and external affiliations of directors. In what follows, we explain the direct impact of each feature on leverage, and its role in determining the ability index.

Tenure. Managerial tenure has been extensively used in prior empirical studies (Bebchuk et al., 2010; Berger et al., 1997; Bhagat et al., 2011; Brookman and Thistle, 2009 among others). In general, it is argued that managers with longer tenure in their firms are more likely to have greater experience and knowledge about the firm's prospects and the internal processes within the firm. Additionally, the market may perceive longer tenure as a sign of managerial entrenchment, and hence increase the cost of borrowing. Consequently, we predict a negative relation between tenure and the amount of debt in the capital structure. By the same token, the capability of firms to issue debt should be negatively correlated with director tenure, which in turn would make for directors to attain their optimal leverage policy.

[15] The generation of the index is described in section 4.4.

As suggested above, longer tenure is likely to increase the executive's understanding of the processes within a firm, and therefore provides greater insight into company's inside information. Therefore, the CEO and/or the CFO with a longer tenure are more capable of influencing the board to make decisions aligned with their preferences. While providing the CEO with a greater expertise, longer tenure also increases his experience, which consequently decreases his reliance on the subordinates, making the delegation of decisions (including delegating capital structure decision to the CFO) less common (Berger et al., 1997; Frank & Goyal ,2007; Graham et al., 2013). Finally, as during his tenure the CEO contributes to more recruitment processes the independence of the board declines, that is, inside directors chosen by the CEO become less likely to act against him. Therefore, we predict managerial tenure to increase the ability of managers and hence positively influence the ability index.

Ownership. The second director feature included in our analysis is managerial equity ownership. Since the seminal paper Jensen and Meckling (1976), who argue that managerial ownership can mitigate the agency problem between managers and shareholders, the literature has developed significantly. It is shown that ownership indeed aligns managers' interests with those of shareholders at moderate levels of ownership. However, it should be noted that at higher levels of managerial ownership managers can get entrenched and choose to deviate from the optimal level of leverage (Florackis et al., 2009; Lasfer, 2006; Morck et al., 1988; Short and Keasey, 1999). With regards to the influence of ownership on managerial power we assume that equity ownership improves manager's ability to influence the board of directors and other shareholders. Consequently, we expect a positive relation between ownership and the director ability index.

Affiliations. The last managerial feature we consider in the analysis is the number of external directorships in listed companies[16]. In general, a larger number of affiliations leads to greater exposure of an executive to outside business and provides incentives to act in the best interest of shareholders mostly due to reputational concerns (Masulis and Mobbs, 2011). We thus predict that the number of managerial affiliations is positively associated with leverage.

However, the impact of the affiliations on the ability index is not clear cut. It can influence the ability positively as it increases the reputation of an executive. As discussed above, greater exposure through getting connected to larger number of affiliations provides directors with stronger incentives to act in the best interest of shareholders. However, it can also decrease the ability by limiting the executive's attention to the company of analysis and in effect reduce the time available to implement the preferred policy. We note that the above argument can be used to explain the relation between the CEO's affiliations and his ability rather than that between the CFO's affiliations and his ability to influence corporate policies. Differently from the CEO, the CFO has at least two additional incentives. First, the CFO's external directorships provide him with greater independence from the CEO. This particularly applies to career development as external affiliations create additional opportunities for promotion (Fama and Jensen, 1983; Jian and Lee, 2011; Masulis and Mobbs, 2011). The CFO with external directorships also has a greater impact on the CEO as he is more likely to be promoted within the firm assuming that holding external affiliations lead to higher reputation and hence better prospects for internal promotion. Therefore, the generated risk of replacement negatively affects

[16] In this chapter external directorships are not classified in any other way than directorship in a listed firm, i.e. there is no difference between non-executive and executive directorship. Hence, this may be an interesting direction for further research.

the CEO's ability, which ultimately leads to greater CFO's ability to influence leverage. We predict that the number of external affiliations decreases the power of CEOs whereas it increases the ability of the CFO.

4.3. Sample Selection and Data Description

To conduct our empirical investigation we employ a unique dataset comprising 3,396 firm-year observations on 514 UK firms which provide us with 728 distinct CFOs and 736 CEOs. The sample covers the period from 2000 until 2010. Accounting and market variables are obtained from DATASTREAM database. DATASTREAM is specifically used to collect information on total debt, earnings before interest and taxes, total assets, market value of equity, property plant and equipment expenses, number of shares outstanding and industry classification. The data on managerial characteristics and corporate governance features are obtained manually from Thomson One Banker, Morningstar UK and BoardEx. In particular, these sources are used to extract the following information on CEOs and CFOs: tenure, ownership, number of affiliations; plus the corporate governance features as board independence, board size, and institutional ownership. Definitions of all variables used in the analysis together with specified data sources are presented in Table 4.1.

Several screening criteria were applied to the data before carrying out the empirical analysis. Firstly, all firms from the financial sector were excluded because of their regulatory conditions and difference from corporations' policies and financial ratios.

Table 4.1 Definitions of Variables
(*) indicates availability of the corresponding variable for CFO

Variable name	Definition
TDA	ratio of total debt to total assets;
$TDA_{\text{industry adjusted}}$	ratio of total debt to total assets adjusted by mean value of industry TDA in a particular year of analysis; Industries are classified on the basis of ICB codes;
Profitability	ratio of earnings before interest and tax to total assets;
MKTB	ratio of (total assets - book value of equity + market value of equity) to total assets;
Size	logarithm of total sales;
Tangibility	ratio of property plant and equipment to total assets;
CEO Tenure*	numeric variable which express number of years while CEO keeps the title in an analysed company; In regression and principal component analysis natural logarithm is used;
CEO Ownership*	number of ordinary shares owned by CEO divided by number of shares outstanding;
CEO Affiliations*	number of quoted boards in which the CEO participates, including the one analysed; In regression and principal component analysis natural logarithm is used;
CEO Index*	index of ability; developed in section 4.4;
Board Independence	ratio of total number of non-executive directors to board size;
Board Size	total number of executives on the board of directors;
Inst_Own_Cont	the percentage sum of institutional shareholdings, whose individual ownership is higher than 3 percent of market capitalization;
ICBIC	categorical variable representing different industries based on Industry Classification Benchmark (ICB code);
Year	categorical variable representing different years of analysis;
Crisis	categorical variable representing different time periods, i.e. 1 – *pre-crisis* - period between year 2000 and 2006; 2 - *crisis* - period between year 2007 and 2008; 3 – *post-crisis* – period between 2009 and 2010.

Secondly 1% of the most extreme observations in the dataset were winsorised. Finally, to allow for an unbalanced panel data analysis, only those corporations that had a minimum of four consecutive years of observations were kept in the dataset.

4.3.1. Descriptive Statistics

In Table 4.2 we present the main descriptive statistics (i.e. mean, median, and standard deviation) of the variables used in the analysis. In order to control for cross-period differences in leverage and its determinants we consider three sub-periods, i.e. the *pre-crisis* period that contains data from 2000 until 2006; the *crisis* period includes data from 2007 until 2008; and finally the *post-crisis* period covers years from 2009 to 2010. Analysis of periods instead of individual years allows to underline the differences caused by the crisis period. Descriptive statistics from the total sample are generally in line with the existing literature (Florackis and Ozkan, 2009b; Lemmon et al., 2008). It is observed that the average total debt ratio is 17.4 percent. Firms' profitability is 5.1 percent and average tangibility ratio equals to 23.6 percent. Proxy of growth opportunities (MKTB) has a mean value of 1.69, and size measured as the logarithm of total sales value is about 11.82.

The analysis of the descriptive statistics on the CEO and the CFO characteristics reveals significant differences between these two directors. On average, CEOs have longer tenure than CFOs and the average CEO tenure is about 5.6 years whereas it is 4.82 years for CFOs. Significant differences are visible in their equity ownership. Specifically, the CEO holds 3.2 percent of shares outstanding, which is over ten times greater than equity ownership of the CFO, who holds on average 0.2 percent of outstanding shares.

Table 4.2 Descriptive Statistics

This table presents descriptive statistics (mean, median, standard deviation, minimum and maximum value) of the explanatory variables used in the analysis. The sample includes observations between year 2000 and 2010. Definitions of all variables can be found in Table 4.1.

	Mean	Median	Std. dev.	Min	Max
Firm level characteristics					
TDA	0.174	0.156	0.151	0.000	0.590
TDA (industry adjusted)	0.000	-0.020	0.143	-0.272	0.509
MKTB	1.685	1.402	0.933	0.640	5.943
Profitability	0.051	0.073	0.138	-0.561	0.297
Tangibility	0.236	0.169	0.211	0.006	0.834
Size	11.824	11.907	1.909	7.020	15.896
Managerial characteristics					
CEO Affiliations	1.202	1.000	0.462	1.000	3.000
CEO Tenure	5.605	4.000	5.305	0.100	29.400
CEO Ownership	0.031	0.001	0.085	0.000	0.517
CFO Affiliations	1.090	1.000	0.286	1.000	2.000
CFO Tenure	4.815	3.300	4.605	0.000	21.100
CFO Ownership	0.002	0.000	0.006	0.000	0.047
Corporate governance characteristics					
Institutional Ownership Con.	0.243	0.226	0.176	0.000	0.690
Board Size	7.094	7.000	1.937	4.000	14.000
Board Independence	0.520	0.500	0.125	0.200	0.750

Table 4.3 Descriptive Statistics across Periods

This table presents descriptive statistics (mean, median, standard deviation) of the explanatory variables used in the analysis. The descriptive statistics are presented for three sub-categories depending on the transaction date, i.e., 2000-06 (*Pre-crisis*); 2007-08 (*Crisis*); and 2009-10 (*Post-crisis*). Definitions of all variables can be found in Table 4.1.

	Mean	*Median*	*Std. dev.*	*Mean*	*Median*	*Std. dev.*	*Mean*	*Median*	*Std. dev.*
	Pre-crisis			**Crisis**			**Post-crisis**		
Firm level characteristics									
TDA	0.178	0.162	0.153	0.172	0.151	0.151	0.162	0.143	0.145
TDA (industry adjusted)	0.000	-0.018	0.145	0.000	-0.025	0.143	0.000	-0.024	0.138
MKTB	1.778	1.462	0.986	1.617	1.371	0.870	1.433	1.216	0.742
Profitability	0.049	0.075	0.144	0.057	0.076	0.131	0.049	0.064	0.125
Tangibility	0.259	0.192	0.220	0.201	0.129	0.192	0.196	0.124	0.187
Size	11.792	11.832	1.878	11.770	11.975	1.959	12.007	12.093	1.948
Managerial characteristics									
CEO Affiliations	1.217	1.000	0.490	1.171	1.000	0.418	1.186	1.000	0.407
CEO Tenure	5.282	3.800	5.219	5.649	4.150	5.342	6.730	5.200	5.420
CEO Ownership	0.029	0.001	0.083	0.034	0.001	0.090	0.033	0.002	0.087
CFO Affiliations	1.092	1.000	0.289	1.078	1.000	0.268	1.099	1.000	0.299
CFO Tenure	4.798	3.250	4.615	4.547	3.000	4.521	5.227	3.700	4.653
CFO Ownership	0.002	0.000	0.006	0.003	0.000	0.007	0.003	0.000	0.006
Corporate governance characteristics									
Institutional Ownership Con.	0.227	0.204	0.172	0.274	0.266	0.184	0.265	0.257	0.174
Board Size	7.256	7.000	2.029	6.883	7.000	1.810	6.772	7.000	1.669
Board Independence	0.508	0.500	0.122	0.532	0.556	0.126	0.552	0.571	0.125

With regards to the number of affiliations, on average the CEO holds slightly more directorships than the CFO (average CEO holds 1.20 positions, and average CFO holds 1.09). It is also important to note that there are interesting dynamics across the periods relating to the characteristics of executives (see Table 4.3). For example, changes in the mean values of tenure suggest that in the period of crisis firms seem to replace their CFOs, more than CEOs. The mean value of CEOs tenure in the pre-crisis period is 5.28 years and it rises to 5.65 years during the crisis. However, the average CFO tenure during pre-crisis period is 4.80 years and it drops to 4.55 years during the crisis. The number of external affiliations decreases slightly in case of both executives (CEOs from about 1.22 to 1.17; CFOs from about 1.10 to 1.08), possibly suggesting that the crisis enforced greater discipline in firms and simultaneously required greater focus of executives on the roles they perform. The change is also observed with regards to managerial holdings in that it rises from the pre-crisis to crisis period (the CEO ownership during the pre-crisis is almost 3 percent and it rises to 3.4 percent in the crisis period, and the CFO ownership during the pre-crisis is 0.2 percent and it rises to 0.3 percent.

Moving on to the corporate governance variables (see Table 4.2), non-executive directors on the board constitute on average 52 percent of the board that on average consists of 7 directors. The analysis across different time periods indicates a tendency among firms that boards become more independent and smaller over time. In an average firm, 22.7 percent of the outstanding shares belong to large institutional investors and during the crisis their ownership raises to 27.4 percent.

4.4. Empirical Analysis

4.4.1. Generation of CEO Index and CFO Index

As mentioned earlier, one of the objectives of this study is to identify the ability of CEOs and CFOs to capture the board and influence the capital structure decision in line with their own preferences. Even though the analysis of individual characteristics provides interesting insights, it makes it more difficult to interpret the results clearly as they may capture similar effects regarding managerial ability and incentives. Additionally in an attempt to avoid this issue and a potential multicollinearity problem, we construct both a CEO and a CFO Index which provide us with proxies for their ability. To do so, we compress the managerial characteristics discussed earlier into time-variant individual indices for all CEOs and CFOs in the sample. For this purpose, following existing literature (Florackis, 2008; Florackis et al., 2009; Masulis and Mobbs, 2011 among others), we apply Principal Component Analysis (from now on PCA).

PCA is a factor analysis that is performed on the correlation matrix of variables. It seeks a linear combination of components by applying weights to each of them. The procedure firstly extracts a combination with the maximum variance, which results in the first principal component. In this chapter, the first principal component is taken as an index in both instances. The validity of the components is confirmed by the Kraiser criterion[17].

Table 4.4 presents the summary of the Principal Component Analysis used to create the ability indices. In Panel A we report the correlation coefficients of the

[17] *Kaiser criterion* (Guttman, 1954; Kaiser, 1960) is a common rule of thumb for dropping unimportant components in the principal component analysis. In particular it suggests dropping components for which Eigen values are smaller than 1.0.

components used for the CEO Index, i.e. tenure, affiliations and ownership. In the last column of Panel A, we provide the loadings to the index. With regards to the CEO Index we find that the number of affiliations affects the index negatively with a loading of -0.378, while the impact of tenure and ownership is positive, with loadings of 0.542 and 0.751 respectively. The loadings to the CEO Index are in line with our predictions. That is, as CEOs are affiliated with more companies they are expected to have smaller ability to influence the board as they have less time to focus on the board's decisions. Longer tenure provides them with greater expertise to influence the decisions. Finally, equity ownership, which possibly captures the alignment feature of the manager-shareholder conflict, impacts the ability positively. Executives are rewarded with share ownership. Therefore more experienced, powerful, and therefore able to influence the board of directors managers are expected to have greater ownership.

The index is estimated for each executive on annual basis, which allows time variation. In particular, we observe the following change in the mean value of the CEO Index across periods, i.e. from the pre-crisis (-0.068) to the post-crisis period (0.181). In Panel B, we reveal corresponding details for the CFO Index. Similar to the CEO Index, we find loadings to be in line with our hypotheses developed earlier. The results reveal a positive (opposite to the result for the CEO) impact of affiliations on the CFO Index (0.202), suggesting that external directorships may improve the independence of the executive and therefore make the CFO more likely to take a stance on the board and so to enforce his/her favoured policies. The results also indicate that, similarly to what we observe for the CEO, tenure and ownership increase the CFO's ability with, unsurprisingly, different loadings. However, the

Table 4.4 Generation of CEO and CFO Indices using Principal Component Analysis

CEO/CFO tenure is a numeric variable that measures in years the time in role of the CEO/CFO in the analysed firm. *CEO/CFO ownership* is ownership of CEO/CFO presented as a percentage of shares outstanding. *CEO/CFO affiliation is* a number of affiliations a director holds. *, **, *** indicate statistical significance at 10%, 5%, and 1% levels, respectively.

A. CEO Index

Correlation coefficients

	CEO Affiliations		CEO Tenure		CEO Index loadings
CEO Affiliations	1				-0.378
CEO Tenure	0.048	**	1		0.542
CEO Ownership	-0.113	***	0.137	***	0.751

Descriptive statistics

	Mean	Median	Std. dev.
CEO Index			
Pre-crisis	-0.068	-0.195	1.065
Crisis	0.052	-0.103	1.099
Post-crisis	0.181	0.014	1.057
Total sample	0.000	-0.131	1.075

B. CFO Index

Correlation coefficients

	CFO Affiliations		CFO Tenure		CFO Index loadings
CFO Affiliations	1				0.202
CFO Tenure	0.093	***	1		0.746
CFO Ownership	-0.063	***	0.137	***	0.635

Descriptive statistics

	Mean	Median	Std. dev.
CFO Index			
Pre-crisis	-0.034	-0.156	1.053
Crisis	-0.007	-0.150	1.107
Post-crisis	0.133	-0.008	1.071
Total sample	0.000	-0.132	1.070

main component of the index for the CFO is tenure with a loading of 0.746, whereas in case of the CEO it is an ownership with a loading of 0.75**1.**

4.4.2. Ability Matrix

The crux of this analysis is to examine the impact of the CEO and the CFO on leverage policy, where leverage is industry and year adjusted. Figures 4.2 and 4.3 present our initial insights by tabulating leverage with quartiles of the ability indices. Examination of the graphs 1 and 2 reveals that the variation in leverage with the changes in the ability of CEOs is significantly greater than that in the ability of the CFO, which may suggest that the CFO's influence on the leverage policy is smaller. This relation holds for all periods in the analysis, as it is presented on graphs 5 and 6. Moreover, the graphs on the CEO Index (graphs 1 and 4) imply a negative impact of the CEO's ability on leverage. The strongest CEOs (the fourth quartile of the index) are more associated with underleverage, and the weakest ones seem to manage overleveraged firms. As presented on graph 4 the relation is the strongest in the pre-crisis period and decreases in crisis and post-crisis period. Graphs 3 and 6 are based on the ability matrix described in Section 4.2, where we consider four possible scenarios depending on the ability strength of the CEO and the CFO. The graphs report that when the CEO is strong (bars 3 and 4) there is almost no influence of the CFO's ability on leverage as though the CEO dominates the decision on his own. However, when the CEO is weak (bar 1 and 2), the CFO seems to be able to make a difference when his ability is strong. As the second bar of graph 3 presents, firms managed by strong CFOs and weak CEOs are overleveraged, while firms dominated by the CEOs (bar 3) are underleveraged. When we observe the dynamics between the periods (graph 6), the greatest changes are observed in companies managed by

Figure 4.2 Levels of Leverage Depending on the Ability of CEO and CFO

The presented graphs display mean values of industry adjusted measure of leverage (TDA $_{\text{industry adjusted}}$) depending on strength of discussed executives, i.e. quartile of CEO Index in graph 1, and of CFO Index in graph 2, where 1 represents the lowest values of the index and 4 the greatest values of the index. Graph 3 shows levels of TDA $_{\text{industry adjusted}}$ in combination of strong/weak executives. An executive is treated as strong if his index is in the fourth quartile and as weak when the index is in the first quartile. Specifically bar 1 represents situation where CEO and CFO are both weak; bar 2 where CEO is weak and CFO is strong; bar 3 where CEO is strong and CFO is weak; and finally bar 4 where CEO and CFO are both strong.

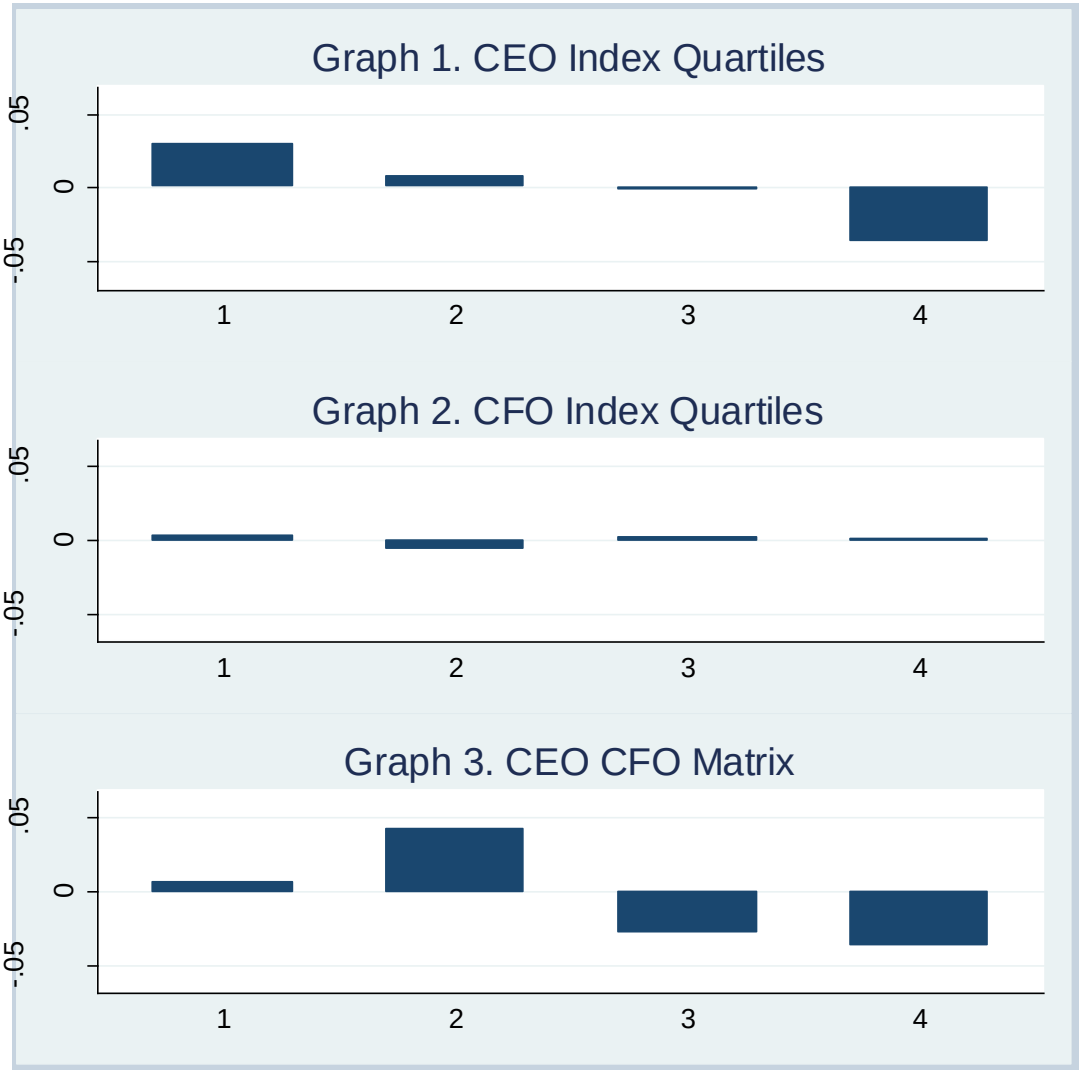
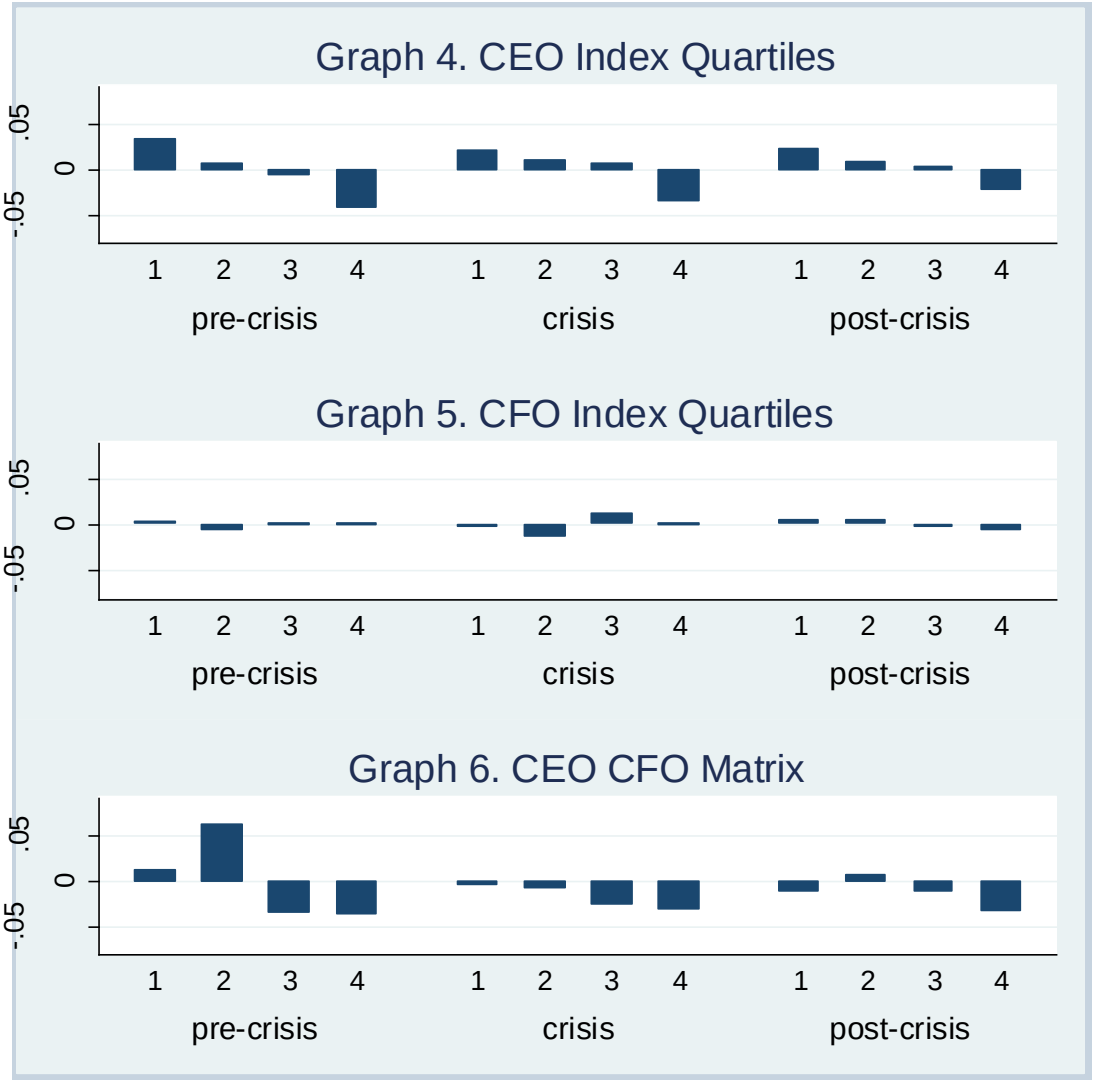


Figure 4.3 Levels of Leverage Depending on the Ability of CEO and CFO During the Three Sub-periods

The presented graphs further explore relations presented on Figure 4.2 by distinguishing between the periods of analysed data. They display mean values of industry adjusted measure of leverage (TDA $_{\text{industry adjusted}}$) depending on strength of discussed executives, i.e. quartile of CEO Index in graph 4, and of CFO Index in graph 5, where 1 represents the lowest values of the index and 4 the greatest values of the index. Graph 6, similarly to graph 3 from Figure 4.2 shows levels of TDA $_{\text{industry adjusted}}$ in combination of strong/weak executives. An executive is treated as strong if his index is in the fourth quartile and as weak when the index is in the first quartile. Specifically, bar 1 represents situation where CEO and CFO are both weak; bar 2 where CEO is weak and CFO is strong; bar 3 where CEO is strong and CFO is weak; and finally bar 4 where CEO and CFO are both strong. The periods are defined as follows: pre-crisis period for years 2000-2006, crisis period for years 2007-2008, and post-crisis period 2009-2010.



strong CFOs and weak CEOs (bar 2). Before the period of financial crisis these are the most overleveraged firms whereas during the crisis period the deviation from the optimal level of leverage decreases significantly and is close to optimal

This preliminary analysis suggests that the CEO plays a more important role in deciding on leverage policy than the CFO and the ability of the CFO matters only when the CEO is weak. Additionally, it is important to note that when both CEO and CFO are weak, the level of leverage is closest to the optimal level, and this relation holds during all analysed periods.

4.4.3. Univariate Analysis

In this section we explore the differences between the mean values of variables across the quartiles of industry adjusted leverage. In Table 4.5 we report the univariate tests based on the total sample. In panel A we present the mean values of leverage and its determinants across quartiles determined by the values of industry adjusted leverage. More specifically, the first quartile includes firms with the greatest negative deviation from the optimal (deepest under-leverage) and the fourth quartile contains companies with the largest positive deviation (greatest over-leverage). Panel B presents differences between the mean values in the first and the fourth quartile across periods, which shows us the differences in mean values of the variable for over and underleveraged firms. In particular, the first column of panel B presents these differences between means for the whole period (as reported in Panel A), and it is followed by three columns for each period, i.e. the pre-crisis, crisis and post-crisis periods. The statistical significance of the differences is indicated at 10% (*), 5% (**), and 1% (***) levels.

Table 4.5 Univariate Analysis of Full Sample

Table in panel A displays the mean values of variables from the total period used in the analysis in quartiles defined by leverage ($TDA_{industry\ adjusted}$). I part B the table presents mean differences, which compare the mean values of the variables between firms from the first (Q1) and the fourth (Q4) quartile under the null hypothesis that the mean values of the variables across the two sub-samples are equal. *, **,*** indicate statistical significance at 10%, 5%, and 1% levels, respectively, based on a two-tailed t-test of the difference in means. The comparisons of means from Q1 and Q4 are presented separately for the total period of 2000-2010, pre-crisis (2000-2006), crisis (2007-2008), and post-crisis (2009-2010). Definitions of all variables are provided in Table 4.1.

	Panel A. Mean values of quartiles defined on the basis leverage				**Panel B. Mean differences (Q1-Q4)**			
	Q1	Q2	Q3	Q4	Full period	*Pre-crisis*	*Crisis*	*Post-crisis*
Firm level characteristics								
TDA	0.024	0.084	0.208	0.378	-0.354***	-0.356***	-0.354***	-0.345***
$TDA_{industry\ adjusted}$	-0.166	-0.065	0.033	0.198	-0.364***	-0.366***	-0.365***	-0.354***
MKTB	1.928	1.822	1.465	1.527	0.400***	0.463***	0.371***	0.193**
Profitability	0.066	0.041	0.048	0.049	0.018**	0.023***	0.011	0.004
Tangibility	0.185	0.185	0.257	0.316	-0.131***	-0.145***	-0.114***	-0.104***
Size	11.140	11.357	12.272	12.524	-1.384***	-1.416***	-1.464***	-1.141***
Managerial characteristics								
CEO Affiliations	1.119	1.158	1.236	1.295	-0.176***	-0.186***	-0.127***	-0.209***
CEO Tenure	6.244	5.486	5.494	5.198	1.046***	1.453***	0.526	0.259
CEO Ownership	0.050	0.032	0.025	0.016	0.034***	0.028***	0.046***	0.041***
CFO Affiliations	1.059	1.077	1.122	1.102	-0.043***	-0.047***	-0.053*	-0.014***
CFO Tenure	4.998	4.281	5.041	4.944	0.054	-0.107	0.031	0.724
CFO Ownership	0.003	0.002	0.002	0.002	0.001***	0.001*	0.002**	0.002**
CEO Index	0.290	0.038	-0.079	-0.248	0.538***	0.527***	0.564***	0.553***
CFO Index	0.040	-0.062	0.044	-0.022	0.062	0.004	0.102	0.235*
Corporate governance characteristics								
Institutional Own. Con.	0.224	0.247	0.249	0.254	-0.029***	-0.018*	-0.047**	-0.046**
Board Size	6.691	6.879	7.208	7.595	-0.905***	-0.989***	-0.866***	-0.656***
Board Independence	0.486	0.522	0.532	0.541	-0.055***	-0.044***	-0.074***	-0.069***

Table 4.6 Univariate Analysis of Over- and Underleveraged Firms

This table presents mean differences of overleveraged (panel A) and underleveraged firms (Panel B). Similarly to panel B of Table 4.5, panels A and B compare mean values of the variables between firms from the first (Q1) and the fourth (Q4) quartile of leverage under the null hypothesis that the mean values of the variables across the two sub-samples are equal. *, **,*** indicate statistical significance at 10%, 5%, and 1% levels, respectively, based on a two-tailed t-test of the difference in means. Quartiles measure the deviation from an optimal leverage, where the first quartile represents the smallest deviation and the fourth the greatest. The mean comparisons are presented for the total period of 2000-2010, and additionally for the pre-crisis (2000-2006), crisis (2007-2008), and post-crisis period (2009-2010). Definitions of all variables are provided in Table 4.1.

	Panel A. Mean differences in overleveraged firms				**Panel B. Mean differences in underleveraged firms**			
	Full period	*Pre-crisis*	*Crisis*	*Post-crisis*	Full period	*Pre-crisis*	*Crisis*	*Post-crisis*
Firm level characteristics								
TDA	-0.254***	-0.259***	-0.250***	-0.240***	0.136***	0.137***	0.136***	0.132***
$TDA_{\text{industry adjusted}}$	-0.251***	-0.254***	-0.250***	-0.237***	0.163***	0.167***	0.157***	0.155***
MKTB	-0.125**	-0.097	-0.106	-0.261**	-0.441***	-0.467***	-0.380***	-0.324***
Profitability	0.005	0.012	-0.030*	0.025	-0.035**	-0.040**	-0.008	-0.052***
Tangibility	-0.080***	-0.071***	-0.117***	-0.064**	0.074***	0.073***	0.090***	0.065**
Size	-0.373***	-0.235	-0.789***	-0.329	0.981***	1.101***	0.871***	0.608**
Managerial characteristics								
CEO Affiliations	-0.080**	-0.127**	-0.074	0.088	0.069***	0.059*	0.042***	0.153**
CEO Tenure	0.286	0.772*	-0.319	-0.667	-1.087***	-0.423	-2.139***	-2.463**
CEO Ownership	0.011**	0.003	0.026**	0.023**	-0.030***	-0.034***	-0.024*	-0.022
CFO Affiliations	0.034	-0.001	0.047	0.149***	0.041***	0.041**	0.011*	0.081*
CFO Tenure	-0.068	0.699*	-1.624**	-0.832	-0.425	0.310	-1.409**	-2.160**
CFO Ownership	0.001***	0.001**	0.002**	0.001	0.000***	0.000	0.001	0.000
CEO Index	0.203***	0.225**	0.257*	0.055	-0.396***	-0.355***	-0.465***	-0.496**
CFO Index	0.148**	0.231**	-0.034	0.086	-0.052	0.028	-0.192	-0.225
Corporate governance characteristics								
Institutional Ownership Con.	-0.012	-0.014	-0.019	0.005	0.030**	0.012	0.065***	0.046
Board Size	-0.660***	-0.459**	-1.009***	-0.966***	0.510***	0.499***	0.636***	0.444
Board Independence	-0.018*	-0.028**	-0.018	0.0242	0.061***	0.053***	0.076***	0.068***

This analysis provides valuable preliminary insights. The control variables behave in line with the findings of previous research (Florackis and Ozkan, 2009b; Ozkan, 2001; Rajan and Zingales, 1995). In particular, underleveraged firms are smaller, have fewer tangible assets, are more profitable, and have more growth opportunities than the overleveraged companies. In accordance with these statistics the firms classified as underleveraged seem to be constrained. The relations are in line with the prediction of the pecking order theory in that smaller firms with fewer tangible assets are expected to have less debt because of the strong influence of the information asymmetry between insiders and outsiders. Further evidence of the constraint is revealed by the corporate governance characteristics. Underleveraged firms are managed by significantly smaller and less independent boards and large institutional shareholders hold significantly smaller share of their equity. In line with the theory poor corporate governance practices seem to lead to a higher cost of debt, which constraint firms' ability to raise external finance.

Results regarding managerial characteristics indicate that overleveraged firms are managed by considerably different CEOs, in comparison to underleveraged firms. Specifically, the variation of the ability indices is statistically significant only in case of the CEO Index, and implies a negative relation. Hence, underleveraged firms are managed by stronger CEOs than the overleveraged ones. The explanation of this relation may be twofold. On one hand, it may be due to CEOs having the ability to act in their own interests. On the other hand, it may be that the market's negative attitude to excessively strong management may increase the cost of financing.

From these preliminary findings it is possible to conclude that the ability of the CFO influences the leverage policy only in post-crisis period, and similarly to the

CEO the relation is negative. Furthermore, when we consider the characteristics individually we find that underleveraged firms are managed by CEOs and CFOs with greater ownership, and fewer external directorships than firms with the adjusted leverage ratio greater than zero.

We precede with the univariate tests by distinguishing between under- and overleveraged firms. The findings of this analysis are presented in Table 4.6, where Panel A presents the findings for the sub-group with higher and Panel B with lower levels of leverage. Quartiles of industry adjusted leverage are sorted in an ascending order. That is, the first quartile (Q1) includes firms with the smallest deviation from the optimum, and the fourth quartile (Q4) includes firms with the largest deviation from the optimal level of leverage. Mean differences are estimated by subtracting the mean values of the fourth quartile from the means in the first quartile.

In comparison to the results from the total sample, the signs of all mean differences remain unchanged in the two sub-groups (underleveraged, overleveraged) except for two variables, i.e. market-to-book ratio and CFO affiliations. It seems that, in contrast to the findings from the analysis for the total sample in case of overleveraged firms, in companies with greater deviation from the target we observe a greater market-to-book ratio than in firms where leverage is closer to the target. This relation seems to be driven by the observations in the post-crisis period. With regards to the affiliations of the CFO, the analysis indicates that the executives with more external directorships are associated with firms which have debt levels close to optimum.

4.4.4. Regression Analysis

The dependent variable used in all specifications is leverage measured as the deviation from an optimal level of debt where the optimal debt is given by the relevant industry average leverage. The optimal level of debt for each firm is defined as the industry average ratio of debt to total assets for each year separately, that is, we let the optimal leverage ratio change over time.

Relying on the vast body of literature on the capital structure the following control variables are chosen for the leverage model: firm size, tangibility, profitability, and market-to-book ratio (for evidence see Frank and Goyal, 2009; Ozkan, 2001; Rajan and Zingales, 1995; Titman and Wessels, 1988 among others). These variables are included to control growth opportunities (market-to-book ratio, and profitability); available collateral (tangibility); the information asymmetry between the firm and the market (size); and year (time dummies). Definitions of all control variables are presented in Table 4.1.

In Table 4.7 we first report the findings from estimations that explore the relation between leverage and the explanatory variables without distinguishing between underleveraged and overleveraged firms. In addition to the estimation based on the full period of analysis, we provide models based on the three time periods (i.e. pre-crisis, crisis and post-crisis) in order to identify the effect of the recent financial crisis on the relationship between leverage and its determinants.

The coefficients of the estimated models imply relations that are in line with the existing literature on leverage. More specifically, we find that size and tangibility of assets are positively associated with leverage. Also, the profitability and market-to-book ratios impact leverage negatively. Furthermore, the estimated coefficients of

Table 4.7 OLS Regression Models

This table presents regression results for the determinants leverage ($TDA_{\text{industry adjusted}}$) during the full period of 2000-2010, pre-crisis (2000-2006), crisis (2007-2008), and post-crisis (2009-2010). All models include time and industry dummies. All independent variables are lagged by one year, and their definitions are presented in Table 4.1 4.1. Standard errors are presented in parentheses. ***, **, * indicate that the coefficient is significant at the 1%, 5%, and 10% level respectively.

	(1) *Pre-crisis*	*(2)* *Crisis*	*(3)* *Post-crisis*	(4) **Full period**	*(5)* *Pre-crisis*	*(6)* *Crisis*	*(7)* *Post-crisis*	(8) **Full period**
Size $_{t-1}$	0.023***	0.019***	0.009**	0.019***	0.022***	0.018***	0.009	0.019***
	[0.003]	[0.004]	[0.004]	[0.002]	[0.003]	[0.004]	[0.004]	[0.002]
Profitability $_{t-1}$	-0.125***	-0.104**	-0.075	-0.104***	-0.122***	-0.104**	-0.086*	-0.104***
	[0.026]	[0.042]	[0.047]	[0.020]	[0.027]	[0.043]	[0.048]	[0.020]
Tangibility $_{t-1}$	0.172***	0.209***	0.199***	0.182***	0.173***	0.21***	0.201***	0.182***
	[0.016]	[0.028]	[0.031]	[0.013]	[0.016]	[0.028]	[0.032]	[0.013]
MKTB $_{t-1}$	-0.01***	-0.017***	-0.013	-0.013***	-0.010***	-0.017***	-0.012	-0.013***
	[0.004]	[0.006]	[0.008]	[0.003]	[0.004]	[0.006]	[0.008]	[0.003]
Board Size $_{t-1}$	0.036**	0.047**	0.047*	0.042***	0.037**	0.047**	0.042	0.042***
	[0.014]	[0.023]	[0.026]	[0.011]	[0.014]	[0.023]	[0.026]	[0.011]
Board Ind $_{t-1}$	0.014	0.069	0.163***	0.052**	0.020	0.072	0.161***	0.054**
	[0.029]	[0.045]	[0.051]	[0.022]	[0.029]	[0.045]	[0.051]	[0.022]
Inst Own $_{t-1}$	-0.014	-0.029	0.013	-0.013	-0.013	-0.030	0.008	-0.012
	[0.020]	[0.029]	[0.033]	[0.015]	[0.020]	[0.030]	[0.033]	[0.015]
CEO Index $_{t-1}$	-0.008**	-0.006	-0.007	-0.008***				
	[0.003]	[0.005]	[0.006]	[0.002]				
CFO Index $_{t-1}$	0.002	0.002	0.001	0.002				
	[0.003]	[0.005]	[0.005]	[0.002]				
CEO Affiliations $_{t-1}$					0.028**	0.020	0.025	0.027***

					[0.011]	[0.019]	[0.022]	[0.009]
CEO Tenure $_{t-1}$					-0.005	0.005	0.006	-0.002
					[0.005]	[0.007]	[0.008]	[0.003]
CEO OS $_{t-1}$					-0.045	-0.092	-0.116	-0.069**
					[0.045]	[0.060]	[0.073]	[0.032]
CFO Affiliations $_{t-1}$					-0.018	0.013	-0.004	-0.009
					[0.016]	[0.028]	[0.028]	[0.012]
CFO Tenure $_{t-1}$					0.000	-0.004	-0.002	-0.001
					[0.005]	[0.007]	[0.008]	[0.003]
CFO OS $_{t-1}$					0.580	0.605	0.261	0.503
					[0.583]	[0.707]	[0.916]	[0.398]
Const	-0.374***	-0.339***	-0.31***	-0.348***	-0.373***	-0.335***	-0.296***	-0.344***
	[0.037]	[0.054]	[0.058]	[0.027]	[0.039]	[0.057]	[0.061]	[0.028]
N	1574	677	566	2817	1574	677	566	2817
R^2	0.197	0.211	0.165	0.189	0.200	0.214	0.170	0.191

two corporate governance characteristics, i.e. board size and independence exert a positive impact on leverage.

Finally, with regards to the main variables of our interest, the proxies for managerial ability to act independently in self-interested way, the findings reveal that the ability of the CEO has generally a negative impact on leverage (see models 1-4 in Table 4.7). This result seems to be driven by the years of prosperity (pre-crisis period), during which the attention of corporate governance mechanisms might have not been particularity strong (Schoar and Washington, 2011). Consequently, managers have generally greater discretion in making decisions compared with the discretion they would have during the period of financial crisis. In models 5-8 instead of including the indices of ability, we explore the impact of directly observable managerial characteristics on the level of leverage.

The results reveal that the significance of the impact of the CEO is driven by size of his share holdings and the number of his external affiliations, which is in line with the findings from the PCA analysis presented in section 4.1. In particular, we find a positive impact of number of the external directorships on leverage, which implies that the number of external affiliations increases the reputational incentives of the CEO to act in the best interest of shareholders. In addition, we find a negative impact of the CEO's ownership on leverage in the full period. Overall, the results presented in Table 4.7 are in line with the insights provided by the preliminary descriptive analysis provided earlier. That is, the CFO's characteristics are not significant in explaining the capital structure decisions of firms in our sample.

In Table 4.8 and Table 4.9 we provide further evidence by distinguishing between under- and overleveraged companies using the sign of the deviation from the estimated optimal leverage using industry averages. In line with the implications

of the univariate analysis presented earlier in the analysis, we treat the underleveraged firms as credit constrained, and overleveraged firms as fairly unconstrained.

Furthermore, in order to ease the interpretation of the results throughout the analysis, we transform the negative measures of leverage in the underleveraged firms presented in Table 4.8 by taking absolute values. Accordingly, the estimated coefficients reported in both tables show the impact on the deviation from the optimal level of leverage.

To the extent that firms analysed in Table 4.8 are credit constrained, the positive significance of the board independence (corporate governance characteristic) is not surprising. Indeed, prior research suggests that good corporate governance decreases the cost of debt, and consequently increases leverage (Florackis and Ozkan, 2009a; Klock et al., 2005). The results regarding the executive abilities indicate that the CEO's ability increases the degree of under-leverage. Strong CEOs are not perceived well by the market, which increases the cost of capital and simultaneously further constraints access to debt financing. Although we fail to provide evidence of a significant impact of the CFO ability on leverage, we show that there is a significant impact between the CFO personal characteristics and leverage. The relationship is particularly stronger during the post-crisis period. These results are in line with the existing studies which show that the leverage decision is more likely to be delegated to the CFO in adverse conditions when the CFO (a subordinate of the CEO) is better positioned by having informational advantage over the CEO (see for e.g. Chava and Purnanandam, 2010; Harris and Raviv, 2005; Malmendier and Zheng, 2012). In other words, the CFO becomes significant in firms with an increased need for financial expertise. Specifically, we find that in the post-

Table 4.8 OLS Regression Coefficients Based on Underleveraged Sub-sample

This table presents regression results for the determinants of industry adjusted leverage during the total period of 2000-2010, pre-crisis (2000-2006), crisis (2007-2008), and post-crisis (2009-2010). The dependent variable in all models is the absolute value of industry adjusted leverage. All independent variables are lagged by one year and their definitions are presented in Table 4.1. All models include year and industry dummies. Standard errors are presented in parentheses. ***, **, * indicate that the coefficient is significant at the 1%, 5%, and 10% level respectively.

	(1) *Pre-crisis*	*(2)* *Crisis*	*(3)* *Post-crisis*	*(4)* Full period	*(5)* *Pre-crisis*	*(6)* *Crisis*	*(7)* *Post-crisis*	*(8)* Full period
Size $_{t-1}$	-0.014***	-0.004*	0.000	-0.009***	-0.014***	-0.005**	0.000	-0.009***
	[0.001]	[0.002]	[0.002]	[0.001]	[0.002]	[0.002]	[0.002]	[0.001]
Profitability $_{t-1}$	0.051***	0.014	0.007	0.029***	0.054***	0.007	-0.002	0.027**
	[0.014]	[0.022]	[0.023]	[0.011]	[0.014]	[0.022]	[0.023]	[0.011]
Tangibility $_{t-1}$	-0.054***	-0.063***	-0.055***	-0.052***	-0.055***	-0.065***	-0.059***	-0.053***
	[0.012]	[0.019]	[0.020]	[0.009]	[0.012]	[0.019]	[0.020]	[0.009]
MKTB $_{t-1}$	0.002	0.008***	0.012***	0.005***	0.002	0.008***	0.015***	0.006***
	[0.002]	[0.003]	[0.004]	[0.001]	[0.002]	[0.003]	[0.004]	[0.001]
Board Size $_{t-1}$	0.004	-0.003	-0.014	0.001	0.006	-0.008	-0.016	0.000
	[0.008]	[0.013]	[0.015]	[0.006]	[0.008]	[0.014]	[0.015]	[0.006]
Board Ind $_{t-1}$	-0.024	-0.068***	-0.067**	-0.044***	-0.021	-0.063**	-0.068**	-0.043***
	[0.018]	[0.025]	[0.027]	[0.013]	[0.018]	[0.025]	[0.026]	[0.013]
Inst Own $_{t-1}$	0.032***	-0.005	-0.018	0.016*	0.037***	-0.01	-0.022	0.016*
	[0.012]	[0.017]	[0.018]	[0.009]	[0.012]	[0.017]	[0.018]	[0.009]
CEO Index $_{t-1}$	0.002	0.004	0.008***	0.004***				
	[0.002]	[0.003]	[0.003]	[0.001]				
CFO Index $_{t-1}$	-0.002	0.001	0.000	-0.001				
	[0.002]	[0.003]	[0.003]	[0.001]				
CEO Affiliations $_{t-1}$					-0.003	0.004	-0.019	-0.006

					[0.008]	[0.011]	[0.013]	[0.006]
CEO Tenure $_{t-1}$					-0.006**	0.006	0.003	0.000
					[0.003]	[0.004]	[0.005]	[0.002]
CEO OS $_{t-1}$					0.055**	0.023	0.067*	0.045***
					[0.022]	[0.031]	[0.038]	[0.016]
CFO Affiliations $_{t-1}$					-0.001	0.000	-0.034**	-0.009
					[0.010]	[0.018]	[0.016]	[0.008]
CFO Tenure $_{t-1}$					0.001	0.008*	0.011**	0.004*
					[0.003]	[0.004]	[0.005]	[0.002]
CFO OS $_{t-1}$					-0.502	-0.625	-1.083**	-0.496**
					[0.324]	[0.390]	[0.491]	[0.222]
Const	0.271***	0.163***	0.140***	0.209***	0.279***	0.167***	0.128***	0.206***
	[0.022]	[0.033]	[0.032]	[0.016]	[0.023]	[0.034]	[0.033]	[0.017]
N	839	369	318	1526	839	369	318	1526
R^2	0.286	0.254	0.208	0.230	0.295	0.272	0.243	0.234

Table 4.9 OLS Regression Coefficients Based on Overleveraged Sub-sample

This table presents regression results for the determinants of industry adjusted leverage during the total period of 2000-2010, pre-crisis (2000-2006), crisis (2007-2008), and post-crisis (2009-2010). All models include year and industry dummies. All independent variables are lagged by one year and their definitions are presented in Table 4.1. Standard errors are presented in parentheses. ***, **, * indicate that the coefficient is significant at the 1%, 5%, and 10% level respectively.

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*
	Pre-crisis	*Crisis*	*Post-crisis*	**Full period**	*Pre-crisis*	*Crisis*	*Post-crisis*	**Full period**
Size $_{t-1}$	0.000	-0.003	-0.003	-0.001	-0.001	-0.004	-0.002	-0.001
	[0.003]	[0.005]	[0.005]	[0.002]	[0.003]	[0.005]	[0.005]	[0.002]
Profitability $_{t-1}$	-0.088**	-0.005	-0.121*	-0.073***	-0.073**	-0.010	-0.137**	-0.074***
	[0.036]	[0.056]	[0.067]	[0.027]	[0.036]	[0.057]	[0.067]	[0.027]
Tangibility $_{t-1}$	0.069***	0.122***	0.091***	0.083***	0.064***	0.122***	0.098***	0.082***
	[0.017]	[0.028]	[0.032]	[0.013]	[0.017]	[0.029]	[0.032]	[0.013]
MKTB $_{t-1}$	0.008	0.011	0.028***	0.013***	0.007	0.011	0.030***	0.013***
	[0.006]	[0.009]	[0.011]	[0.004]	[0.006]	[0.009]	[0.011]	[0.004]
Board Size $_{t-1}$	0.021	0.076***	0.104***	0.050***	0.022	0.073***	0.092***	0.050***
	[0.018]	[0.027]	[0.029]	[0.013]	[0.018]	[0.027]	[0.029]	[0.013]
Board Ind $_{t-1}$	0.040	0.046	0.017	0.041	0.043	0.050	0.024***	0.043*
	[0.033]	[0.054]	[0.062]	[0.025]	[0.033]	[0.055]	[0.062]	[0.025]
Inst Own $_{t-1}$	-0.002	-0.037	0.027	-0.008	0.003	-0.040	0.017	-0.008
	[0.023]	[0.033]	[0.036]	[0.016]	[0.023]	[0.034]	[0.036]	[0.017]
CEO Index $_{t-1}$	-0.005	-0.004	-0.001	-0.004				
	[0.004]	[0.006]	[0.007]	[0.003]				
CFO Index $_{t-1}$	-0.006*	0.006	0.004	-0.002				
	[0.003]	[0.006]	[0.006]	[0.003]				
CEO Affiliations $_{t-1}$					0.026**	0.012	-0.045**	0.012
					[0.011]	[0.020]	[0.021]	[0.009]
CEO Tenure $_{t-1}$					-0.010*	0.002	0.009	-0.002
					[0.006]	[0.008]	[0.008]	[0.004]

CEO OS $_{t-1}$					0.108	-0.062	-0.178*	-0.018
					[0.072]	[0.088]	[0.092]	[0.047]
CFO Affiliations $_{t-1}$					-0.016	0.005	-0.019	-0.012
					[0.017]	[0.029]	[0.029]	[0.013]
CFO Tenure $_{t-1}$					-0.005	0.006	0.008	0.000
					[0.005]	[0.008]	[0.008]	[0.004]
CFO OS $_{t-1}$					-0.987	0.545	-0.574	-0.295
					[0.707]	[0.877]	[1.066]	[0.486]
Const	0.023	-0.074***	-0.133**	-0.042	0.051	-0.080	-0.131*	-0.035***
	[0.043]	[0.061]	[0.065]	[0.031]	[0.046]	[0.065]	[0.071]	[0.033]
N	735	308	248	1291	735	308	248	1291
R^2	0.088	0.157	0.213	0.090	0.097	0.159	0.251	0.091

crisis period all of the included characteristics of the CFO influence leverage significantly. In particular, the CFO's ownership and affiliations (proxy for reputation) reduce the degree of under-leverage, while the coefficient of tenure has an opposite effect.

In Table 4.9 we present the results from a set of similar specifications of models using the data run for the overleveraged sub-sample. Surprisingly, not in linewith the literature, we find a positive impact of board size on leverage indicating that firms with larger boards are able to issue more debt than the estimated optimal levels suggest. Moreover, by comparison of results across periods we can say that the positive impact of size became significant during the period of the recent financial crisis and remained significant in the post-crisis period.

The results on estimated relation between managerial ability and leverage are in line with our expectations and do not reveal any significant impact on leverage. However, when we consider the impact of individual characteristics, we observe some evidence of positive impact of the CEO's external affiliations and a negative influence of the CEO's tenure on the level of overleverage.

4.5. Robustness Checks

The arguments presented in this chapter assume that CEOs and CFOs are independent. In practice however, they may be related. Using the available data, we perform additional robustness tests to identify companies in which CFO/CEO are most likely to act independently, and therefore implement their preferences easily.

As Table 4.10 reports, we test our models by distinguishing the analysed executives in terms of their tenure, affiliations, and equity ownership. In here we pay

Table 4.10 OLS Regression Coefficients for CFO Independence Test

This table presents regression results testing independence of the CFO. The six models examine determinants of industry adjusted leverage on samples of firms that identify cases where CFOs are more/less likely to be independent of their CEOs. Model 1 presents determinants of industry adjusted leverage on a sample of firms where CFO is affiliated with more firms than CEO, and Model 2 concerns the opposite cases. Model 3 is performed on a sample of firms where CFO has longer than CEO, and Model 4 concerns the opposite cases. Finally, Model 5 is performed on a sample of firms where CFO owns greater amount of equity than CEO, and Model 6 concerns the opposite cases. All models include year and industry dummies. All independent variables are lagged by one year and their definitions are presented in Table 4.1. Standard errors are presented in parentheses. ***, **, * indicate that the coefficient is significant at the 1%, 5%, and 10% level respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	CFO Affiliations > CEO Affiliations	*CFO Affiliations < CEO Affiliations*	*CFO Tenure > CEO Tenure*	*CFO Tenure < CEO Tenure*	*CFO OS > CEO OS*	*CFO OS < CEO OS*
Size $_{t-1}$	-0.005	0.016***	0.024***	0.015***	0.020***	0.018***
	[0.011]	[0.006]	[0.003]	[0.003]	[0.005]	[0.002]
Profitability $_{t-1}$	0.103	-0.157**	-0.155***	-0.063**	-0.082	-0.058**
	[0.150]	[0.077]	[0.037]	[0.027]	[0.067]	[0.025]
Tangibility $_{t-1}$	-0.021	0.211***	0.185***	0.212***	0.163***	0.242***
	[0.073]	[0.034]	[0.021]	[0.017]	[0.033]	[0.016]
MKTB $_{t-1}$	-0.058***	-0.020**	0.004	-0.025***	-0.023**	-0.009**
	[0.015]	[0.009]	[0.005]	[0.004]	[0.009]	[0.004]
Board Size $_{t-1}$	0.188***	0.049	0.047**	0.036**	0.051	0.041***
	[0.061]	[0.033]	[0.019]	[0.014]	[0.034]	[0.013]
Board Ind $_{t-1}$	0.185*	0.123*	0.123***	0.028	0.031	0.083***
	[0.107]	[0.066]	[0.035]	[0.029]	[0.065]	[0.027]
Inst Own $_{t-1}$	-0.123*	0.024	0.026	-0.036*	0.027	-0.023
	[0.074]	[0.045]	[0.024]	[0.020]	[0.041]	[0.019]
CEO Index $_{t-1}$	-0.001	-0.008	-0.011**	-0.010***	-0.002	-0.006*
	[0.014]	[0.009]	[0.005]	[0.003]	[0.008]	[0.003]

CFO Index $_{t-1}$	-0.010	0.023***	0.006	-0.002	0.006	-0.006**
	[0.012]	[0.007]	[0.004]	[0.004]	[0.006]	[0.003]
Const	-0.246	-0.454***	-0.487***	-0.248***	-0.301***	-0.405***
	[0.164]	[0.081]	[0.043]	[0.038]	[0.072]	[0.034]
N	156	434	949	1560	389	1717
R^2	0.289	0.223	0.250	0.209	0.239	0.235

special attention to the independence of executives, which can affect the ability to enforce preferred policy.

To start with, in model 1 we identify firms, where the CFO is affiliated with greater number of companies than CEO, and in model 2 we consider the opposite relation. As it is indicated earlier in the paper number of external affiliations can increase CFO's independence of CEO due to reputational incentives, and decrease the ability of CEO to implement preferred policy due to reduced availability. These relationships are confirmed in the presented models. Even though in model 1 we do not observe significant impact of the CFO Index on leverage, we do not see significant impact of the CEO Index either. Importantly, in firms where CFO is affiliated with more firms than the CEO, characteristics of the board impact leverage more significantly, indicating improvement of board decision making (as discussed in Raheja (2005) and Masulis and Mobbs (2011)). In model 2, we identify firms where CEO is affiliated with more boards than the CFO, and consequently has smaller ability to implement preferred by him decisions in comparison to executives employed by only one company. In these circumstances CFO is more likely to enforce preferred decision and as the results suggest CFO Index impacts leverage positively.

The next two models identify firms, where CEOs or CFOs have longer tenure. In model 3 we observe firms where CFOs are employed by a firm for a longer period of time than CEOs and should show greater degree of independence; since they were not recruited by the current CEOs . In comparison to a model where it is CEO who has the longer tenure, impact of the CEO Index influences leverage less significantly (5% level) than in the model 4 (1% significance). Apart from this

Table 4.11 Robustness Test (OLS Regression Models)

This table presents robustness test for the regression results presented in Table 4.7. The dependent variable in all of the models is leverage, measured as a ratio of total debt to total assets. Results are presented for the full period of analysis (2000-2010) in models 4 and 8; pre-crisis (2000-2006) in models 1 and 5; crisis (2007-2008) in models 2 and 6; and post-crisis (2009-2010) in models 3 and 7. All models include time and industry dummies. All independent variables are lagged by one year, and their definitions are presented in Table 4.1. Standard errors are presented in parentheses. ***, **, * indicate that the coefficient is significant at the 1%, 5%, and 10% level respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Pre-crisis	*Crisis*	*Post-crisis*	**Full period**	*Pre-crisis*	*Crisis*	*Post-crisis*	**Full period**
Size $_{t-1}$	0.022***	0.019***	0.009**	0.019***	0.022***	0.018***	0.009**	0.019***
	[0.003]	[0.004]	[0.004]	[0.002]	[0.003]	[0.004]	[0.004]	[0.002]
Profitability $_{t-1}$	-0.126***	-0.105**	-0.081*	-0.11***	-0.123***	-0.104**	-0.091*	-0.111***
	[0.027]	[0.042]	[0.047]	[0.020]	[0.027]	[0.043]	[0.048]	[0.020]
Tangibility $_{t-1}$	0.176***	0.209***	0.199***	0.191***	0.176***	0.210***	0.201***	0.191***
	[0.016]	[0.028]	[0.032]	[0.013]	[0.017]	[0.028]	[0.032]	[0.013]
MKTB $_{t-1}$	-0.011***	-0.017***	-0.012	-0.013***	-0.011***	-0.017***	-0.012	-0.013***
	[0.004]	[0.006]	[0.008]	[0.003]	[0.004]	[0.006]	[0.008]	[0.003]
Board Size $_{t-1}$	0.036**	0.048**	0.048*	0.042***	0.037**	0.048**	0.043	0.042***
	[0.014]	[0.023]	[0.026]	[0.011]	[0.014]	[0.023]	[0.026]	[0.011]
Board Ind $_{t-1}$	0.015	0.067	0.164***	0.050**	0.020	0.070	0.163***	0.052**
	[0.029]	[0.045]	[0.051]	[0.022]	[0.029]	[0.045]	[0.051]	[0.022]
Inst Own $_{t-1}$	-0.010	-0.028	0.011	-0.007	-0.009	-0.029	0.006	-0.008
	[0.020]	[0.029]	[0.033]	[0.015]	[0.021]	[0.030]	[0.033]	[0.015]
CEO Index $_{t-1}$	-0.007**	-0.006	-0.007	-0.007***				
	[0.003]	[0.005]	[0.006]	[0.003]				
CFO Index $_{t-1}$	0.002	0.002	0.001	0.001				
	[0.003]	[0.005]	[0.005]	[0.002]				
CEO Affiliations $_{t-1}$					0.027**	0.020	0.024	0.026***
					[0.011]	[0.019]	[0.022]	[0.009]

CEO Tenure $_{t-1}$					-0.004	0.004	0.006	0.000
					[0.005]	[0.007]	[0.008]	[0.003]
CEO OS $_{t-1}$					-0.044	-0.092	-0.117	-0.077**
					[0.045]	[0.060]	[0.073]	[0.032]
CFO Affiliations $_{t-1}$					-0.017	0.013	-0.004	-0.008
					[0.016]	[0.028]	[0.028]	[0.012]
CFO Tenure $_{t-1}$					0.000	-0.004	-0.001	-0.001
					[0.005]	[0.007]	[0.008]	[0.003]
CFO OS $_{t-1}$					0.482	0.602	0.260	0.399
					[0.585]	[0.708]	[0.917]	[0.401]
Const	-0.209***	-0.217***	-0.232***	-0.215***	-0.208***	-0.214***	-0.219***	-0.210***
	[0.037]	[0.054]	[0.058]	[0.027]	[0.039]	[0.057]	[0.062]	[0.028]
N	1574	677	566	2817	1574	677	566	2817
R^2	0.275	0.286	0.243	0.263	0.277	0.289	0.247	0.264

relation, again, in firms with more independent CFO (model 3) board characteristics (size and independence) influence leverage more significantly.

Lastly, models 5 and 6 distinguish firms with greater CFO's (model 5) or CEO's equity holding (model 6). Again, we use ownership in order to identify firms with more independent CFOs. In doing so we perceive larger CFO's ownership as an indicator of his greater compensation for the value he adds to the board, and therefore greater impact on the decision making. On the basis of 389 firm-year observations where CFO holds greater ownership than CEO, we do not find a significant relationship between any of the observed ability indices and leverage. On the other hand in firms where as it is the CEO who holds more shares than the CFO (model 6) we observe negative influences of both indices on the level of leverage.

In conclusion, the presented models suggest that if CFOs are given an opportunity to enforce preferred policies, they influence the level of leverage positively, or at least do not allow CEO to decrease its level.

In the last part of the robustness checks we test, if the identified relationships between industry adjusted leverage hold for the standard measure of leverage (ratio of total debt to total assets). We report the models with modified measure of leverage in Table 4.11. The results confirm the identified relationships in the main body of the chapter.

4.6. Conclusions

In this chapter we investigate the characteristics of the CEOs and CFOs of UK firms on their leverage decisions. We use a sample of firms during the period 2000 to 2010, consisting of 728 CFOs and 736 CEOs. Our evidence extends the empirical literature on the managerial determinants of leverage by focusing on the

two most influential executive directors. Specifically, we find that in the context of the UK the Chief Executive Officer's ability and his personal characteristics are more significant in influencing the capital structure decision of firms. However, our analysis partially shows that CEOs preferences towards debt policy are different than the CFO's, but CFO's impact is not significant enough to determine it.

We provide further evidence by dividing firms into two categories on teh basis of the level of industry adjusted leverage. In doing so we find that determinants of the suboptimal leverages are not symmetrical. Specifically, we find that managerial attributes exert a greater influence on the extent of suboptimality in the underleveraged sample of firms. We show that the CEO's ability further increases the degree of under-leverage. The results further reveal that in firms that seem to be constrained and hence cannot issue sufficient debt, caused by external (i.e. financial crisis) as well as internal (i.e. credit constraint) factors, the CFO significantly influences the firm's leverage policy and his impact is in line with the shareholder-value maximising objective i.e. optimal leverage policy.

Results from the analysis of highly leveraged companies do not reveal any significant influence of managerial ability on debt financing. However, we find that in the pre-crisis period CEO's tenure has a negative, and external affiliations have a positive impact on leverage. Interestingly, the impact of the latter attribute changes the direction of influence in the post-crisis period.

This analysis implies several avenues for further research. First, examining the relation between leverage and executive director characteristics with a larger set of data after the period of financial crisis could uncover the changes in the spread of power between the executives due to increased market scrutiny. Second, the heterogeneity of preferences of directors towards its leverage policy can be explored

by including in the dataset the complete executive part of the board. Finally, our results imply that the number of managerial external affiliations and director ownership capture the differences between the executives. In particular, the insights from the estimated relation between ownership and leverage suggest that the well-known non-linear impact of managerial ownership on corporate polices and performance needs to be revisited at the individual executive level.

3. CONCLUSION

The main objective of this thesis has been to provide additional insights into the understanding of the interactions between asymmetric information, the manager-shareholder agency conflict, and corporate governance mechanisms. In meeting this objective the central focus of the study has been on the heterogeneity with respect to the personal characteristics and trading behaviour of executive directors. Using detailed and recent information on the UK non-financial firms, we present robust evidence for the crucial role which the asymmetric information between insiders and outsiders plays in determining corporate policies and managerial trading decisions. While we conduct our empirical analysis during the period 2000 to 2010, we investigate how the observed relations change during and after the global financial crisis of 2007-2008.

We carry out our analysis in three distinct analytical frameworks. Specifically, in Chapter 2 we examine the role of information asymmetry in the context of the insider trades made by CEOs and CFOs. The analysis of the subsequent market-adjusted returns from their purchase transactions shows that these executive directors have indeed information advantage over outside investors. Moreover, we find that the short-term market reaction to the trading is much stronger than the long-term one, possibly suggesting that the market perception of the informativeness of insider trades exceeds the real informative content of these trades. In addition, our findings reveal that the observed returns significantly depend on two managerial characteristics, decreasing with the number of external affiliations of the trading executive and the extent of the insider trading activity proxied by the number of past transactions carried out by the same director. The returns from the

transactions also depend on the market conditions, as well as the corporate governance environment. The strongest impact of the latter is observed for the board independence measure. Furthermore, we show that the relation between board independence and returns is positive during the crisis and negative in the post-crisis period. Last but not least, when we distinguish between opportunistic and routine transactions made by directors, the results indicate that the opportunistic trades are more informative than the routine ones. However, this finding prevails only in the long run whereas the market reacts more positively to routine trades in the short term.

In Chapter 3, we further investigate the incentives of executive directors and the role of asymmetric information by considering the link between insider trades and the probability of insolvency. We carry out our empirical analysis using a unique sample of solvent and insolvent firms. Our main objective in this analysis is to shed further light on the question of whether executive directors hold superior information over outside investors and, more importantly, attempt to use it to benefit from their informational advantage. For example, we argue in the study that managers of insolvent firms can attempt to avoid or delay the event of insolvency by purchasing their own stocks with a view to affecting the market's perception of the company about its financial health. To investigate these issues an extended database is used covering the insider trading activities of all the members on the board. The findings from this empirical investigation reveal that incorporating the insider trading information in the analysis increases the predictive power of the existing bankruptcy prediction models. Our results show that in the period closest to the event of insolvency the board of directors of insolvent firms become more active in terms of their trading and increase their purchase transactions significantly. However,

compared to the solvent firms in the sample, the trading volume and the percentage of trading directors in insolvent firms are significantly lower in the more distant past. More importantly, as mentioned above, the findings imply that while insider trading in more distant periods from insolvency seems to be driven by the informational advantage of insiders, the trading on the verge of insolvency may be motivated by directors' rational signalling incentives, or their overconfidence.

Finally, in Chapter 4 we explore the interplay between asymmetric information, the manager-shareholder agency problem, and the capital structure decision by underlining the differentiation between the CEO and the CFO of firms in terms of their preference towards a specific leverage policy and their ability to achieve it. To conduct our analysis we construct a proxy of managerial ability using several observable characteristics of the executives. This setting allows us to show that overall the influence of CEOs over the leverage decision is stronger than CFOs and this result is more pronounced in (underleveraged) firms which cannot reach their optimal level of leverage. Also, we present evidence that even though CEO characteristics generally exert a greater influence on the capital structure decision, the impact of CFO's tenure, ownership and directorships is more pronounced during and after the recent financial crisis, and in firms which are likely to be financially constrained. Similar to our analysis in previous chapters, we also conduct a comprehensive investigation by incorporating the corporate governance characteristics of firms in the empirical specification. The results indicate that the influence of internal governance mechanisms on leverage varies depending on the extent of sub-optimality. That is, while independent boards influence leverage positively in the underleveraged firms, they do not exert a significant impact on capital structure in the overleveraged firms. Similarly, the impact of board size is

also not symmetrical, having a positive influence on capital structure only in the overleveraged sample.

Overall, the current study contributes to the corporate finance literature by providing substantial evidence in favour of the importance of two main capital market imperfections, namely the asymmetric information between corporate insiders and outside investors, and the costly manager-shareholder agency conflicts, in determining corporate decisions and managerial behaviour. More specifically, the analytical approach of this study provides us with new insights into the role of executive directors by focusing on the heterogeneity of top executive directors. By providing an empirical investigation over a long period of time and using detailed time-variant information on the personal characteristics of directors, it is shown that the incentives of managers evolve depending upon both internal and external factors. Thus, the study implies that treating internal corporate governance and the personal characteristics of directors as constant over time and attempting to control for them by estimating fixed-effects models may deliver misleading results. We argue that this aspect of our empirical specification becomes even more essential in carrying out research using firm-level data in an environment which is characterised by dispersed ownership and hence weak shareholders and strong managers.

Finally, there are several lines of further research, which the analysis of this study implies. Firstly, while we find that the heterogeneity of managers in terms of their attitudes, incentives, and personal characteristics adds to our understanding of the corporate behaviour, we present evidence based on only two top executives, namely the CEO the CFO. We do not, for example, explore the characteristics of the remaining members of the board in investigating the research questions set out in the study. Although the rest of the board is not as influential and powerful as the top

executive directors, incorporating them in the analysis can potentially provide further insights and hence enhance our understanding of the role of managers in shaping corporate affairs and affecting firm value.

Secondly, as discussed earlier, the evidence we provide in this study suggests that inside directors have significant informational advantage over outside investors. Furthermore, the current study shows that directors act upon their superior information in an attempt to make profit (as presented in Chapter 2) and/or to influence market perception (as shown in Chapter 3). However, our empirical framework does not involve an investigation as to whether insiders are successful at their attempts to affect the market's perception of the firm regarding, for example, its future growth prospects or current financial health. Accordingly, a natural extension of our analysis would be to test if the signalling attempts of directors are successful so that firms can delay or avoid the event of insolvency to some extent by increasing the value of financially distressed firms. This setting would require generating a sample of financially distressed firms, rather than only of insolvent firms, to observe whether some of these firms avoid insolvency partly through the inside trading activities of directors. This research would add strongly to the recent arguments of Benmelech et al. (2010) and Keida and Philippon (2009) , who, among others, state that managers are able to hide bad news by mimicking the behaviour of firms with high growth potential.

Thirdly, the findings of this study enforce the view that the asymmetric information between corporate insiders and outside investors remains as one of the most important challenges facing investors. Also, the study points to the importance of corporate governance mechanisms in lessening the costs of asymmetric information and the related agency issues. However, we argue that there is still a gap

in the literature providing a systematic and convincing evidence regarding the exact role of external and internal corporate governance mechanisms. One of the areas we identify in this respect concerns with the role of institutional investors. For instance, the analysis of Chapter 2 implies that institutional ownership concentration can play a substitution role in conveying information to the capital markets. This, however, contradicts the findings from Chapter 3 that are in line with the existing literature, which suggest that the institutional investors in the UK are passive with regard to their monitoring and disciplining functions. These contradictory results therefore imply that there is a need to develop a comprehensive proxy for investor activism to quantify the exact nature of the relationship between corporations and their institutional investors. This can be achieved to some extent, for example, by considering closely the portfolio turnover of institutional investors in a similar manner developed by earlier studies in different contexts (in a similar manner to Barber and Odean, 2000; Carhart, 1997; Gaspar et al., 2005). This awaits future research.

References

Acharya, V. V., & Johnson, T. C. (2010). More insiders, more insider trading: Evidence from private-equity buyouts. *Journal of Financial Economics, 98 (3)*, 500-523.

Acharya, V. V., Myers, S. C., & Rajan, R. (2011). The internal governance of firms. *Journal of Finance, 66 (3)*, 689-720.

Achraya, V. V., Sundaram, R. K., & Kose, J. (2011). Cross-country variations in capital structures: The role of bankruptcy codes. *Journal of Financial Intermediation, 20 (1)*, 25-54.

Adams, R., Almeida, H., & Ferreira, D. (2005). Powerful CEOs and their impact on corporate performance. *Review of Financial Studies, 18 (4)*, 1403–1432.

Agrawal, A., & Knoeber, C. R. (1996). Firm performance and mechanisms to control agency problems between managers and shareholders. *Journal of Financial and Quantitative Analysis, 31 (3)*, 377-397.

Almeida, H., Campello, M., & Weisbach, M. S. (2004). The cash flow sensitivity of cash. *Journal of Finance, 59 (4)*, 1777-1804.

Altman, E. (1986). Financial ratios, discriminant analysis and the prediction of corporate bankruptcy. *Journal of Finance, 23*, 589-609.

Altman, E. I. (1984). A further empirical investigation of the bankruptcy cost question. *Journal of Finance, 39 (4)*, 1067-1089.

Altman, E. I., & Hotchkiss, E. (2006). *Corporate financial distress and bankruptcy: Predict and avoid bankruptcy, analyze and invest in distressed debt.* (3 ed.). Hoboken, New Jersey: John Wiley & Sons.

Altman, E. I., & Narayanan, M. P. (1997). An international survey of business failure classification models. *Financial Markets, Institutions and Instruments, 6 (2),* 1-57.

Ang, J. S., Chua, J. H., & McConnell, J. J. (1982). The administrative costs of corporate bankrupcy: a note. *Journal of Finance, 37 (1),* 47-82.

Arcot, S., Bruno, S., & Faure-Grimaudc, A. (2010). Corporate governance in the UK: Is the comply or explain approach working? *International Review of Law and Economics, 30 (2),* 193–201.

Baker, M., Stein, J. C., & Wurgler, J. (2003). When does the market matter? Stock prices and the investment of equity dependent firms. *Quarterly Journal of Economic, 118 (3),* 969-1005.

Barber, B., & Odean, T. (2000). Trading is hazardous to your wealth: the common stock investment performance of individual investors. *Journal of Finance, 55 (2),* 773-806.

Bebchuk, L. A., Grinstein, Y., & Peyer, U. (2010). Lucky CEOs and lucky directors. *Journal of Finance, 65 (6),* 2363-2401.

Bebchuk, L. A., & Weisbach, M. S. (2010). The state of corporate governance research. *Review of Financial Studies, 23 (3),* 939-961.

Ben-David, I., Graham, J. R., & Harvey, C. R. (2007). Managerial overconfidence and corporate policies. In: NBER.

Benmelech, E., Kandel, E., & Veronesi, P. (2010). Stock-based compensation and CEO (dis) incentives. *Quarterly Journal of Economics, 125 (4)*, 1769-1820.

Bennedsen, M., Pérez-González, F., & Wolfenzon, D. (2008). Do CEOs matter? In *Working Paper*: Colombia University.

Berger, P. G., Ofek, E., & Yermack, D. L. (1997). Managerial entrenchement and capital structure decisions. *Journal of Finance, 52 (4)*, 1411-1438.

Bertrand, M., & Schoar, A. (2003). Managing with style: the effects of managers on firm policies *Quarterly Journal of Economics, 118 (4)*, 1169-1207.

Bhagat, S., Bolton, B., & Subramanian, A. (2011). Manager characteristics and capital structure: theory and evidence. *Journal of Financial and Quantitative Analysis, 46 (6)*, 1581-1627.

Borokhovich, K. A., Parrino, R., & Trapani, T. (1996). Outside directors and CEO selection. *Journal of Financial and Quantitative Analysis, 31 (3)*, 337-355.

Brennan, M. J., & Cao, H. H. (1996). Information, trade, and derivative securities. *Review of Financial Studies, 9 (1)*, 163-208.

Bris, A., Welch, I., & Zhu, N. (2006). The costs of bankruptcy: Chapter 7 liquidation versus Chapter 11 reorganization. *Journal of Finance, 61 (3)*, 1253-1303.

Brochet, F. (2010). Information content of insider trades before and after the Sarbanes-Oxley Act. *Accounting Review, 85 (2)*, 419-446.

Brockman, P., Martin, X., & Unlu, E. (2010). Executive Compensation and the Maturity Structure of Corporate Debt. *Journal of Finance, 65 (3)*, 1123-1161.

Brookman, J., & Thistle, P. D. (2009). CEO tenure, the risk of termination and firm value. *Journal of Corporate Finance, 15 (1)*, 331-344.

Brounen, D., De Jong, A., & Koedijk, K. (2006). Capital structure policies in Europe: Survey evidence. *Journal of Banking and Finance, 30 (5)*, 1409-1422.

Brown, S. J., & Warner, J. B. (1985a). Using daily stock returns: The case of event studies. *Journal of Financial Economics, 14 (1)*, 3-31.

Brown, S. J., & Warner, J. B. (1985b). Using daily stock returns: The case of event studies. *Journal of Financial Economics, 14 (3)*, 3-31.

Campbell, J. Y., Hilscher, J., & Szilagyi, J. (2008). In search of distress risk. *Journal of Finance, 63 (6)*, 2899-2939.

Carhart, M. (1997). On persistance in mutual fund performance. *Journal of Finance, 52 (1)*, 57-82.

Charitou, A., Neophytou, E., & Chatalambous, C. (2004). Predicting the corporate failure: empirical evidence for the UK. *European Accounting Review, 13 (3)*, 465-497.

Chava, S., & Purnanandam, A. (2010). CEOs versus CFOs: Incentives and corporate policies. *Journal of Financial Economics, 97 (2)*, 263-278.

Chen, C., Martin, X., & Wang, X. (2012). Insider trading, litigation concerns, and auditor going-concern opinions. *Accounting Review, 88 (2)*, 365-393.

Cohen, L., Malloy, C., & Pomorski, L. (2012). Decoding insider information. *Journal of Finance, 67 (3),* 1009-1043.

Collins, D., Masli, A., Reitenga, A. L., & Sanchez, J. M. (2009). Earnings restatements, the Sarbanes-Oxley Act adn the disciplining of chief financial officers. *Journal of Accounting Auditing and Finance, 24 (1),* 1-34.

Conrad, J., & Kaul, G. (1993). Long-term market overreaction or biases in computed returns? *Journal of Finance, 48 (1),* 39-63.

Daily, C. M., & Dalton, D. R. (1994a). Bankruptcy and corporate governance: The impact of board composition and structure. *Academy of Management Journal, 37 (6),* 1603-1617.

Daily, C. M., & Dalton, D. R. (1994b). Corporate governance and the bankrupt firm: An empirical assessment. *Strategic Management Journal, 15 (8),* 643-654.

Daily, C. M., & Johnson, J. L. (1997). Sources of CEO power and firm financial performance: A longitudinal assesment. *Journal of Management, 23 (2),* 97-117.

Darrat, A. F., Gray, S., & Wu, Y. (2010). Does board composition affect the risk of bankruptcy? In *SSRN*.

Datta, S., Iskandar-Datta, M., & Raman, K. (2005). Managerial stock ownership and the maturity structure of corporate debt. *Journal of Finance, 60 (5),* 2333-2350.

De Jong, A., & Veld, C. (2001). An empirical analysis of incremental capital structure decisions under managerial entrenchment. *Journal of Banking and Finance, 25 (10),* 1857-1895.

De Miguel, A., Pindado, J., & De La Torre, C. (2005). How do entrenchment and expropriation phenomena affect control mechanisms? *Corporate Governance: An International Review, 13 (4)*, 505-516.

Denis, D. J., Denis, D. K., & Sarin, A. (1997). Ownership structure and top executive turnover. *Journal of Financial Economics, 45 (2)*, 193-221.

Eckbo, B. E., & Thorburn, K. S. (2003). Control benefits and CEO discipline in automatic bankrupcy actions. *Journal of Financial Economics, 69 (1)*, 227-258.

Eckbo, B. E., Thorburn, K. S., & Wang, W. (2012). How costly is corporate bankruptcy for top executives? In *Tuck School of Business Working Paper*

Fama, E. F. (1980). Agency problems and the theory of the firm. *Journal of Political Economy, 88 (2)*, 288-307.

Fama, E. F., & Jensen, M. C. (1983). Separation of ownership and control. *Journal of Law and Economics 26 (2)*, 301–325.

Ferreira, M. A., & Vilela, A. S. (2004). Why do firms hold cash? Evidence from EMU Countries. *European Financial Management, 10 (2)*, 295-319.

Fidrmuc, J. P., Georgen, M., & Renneboog, L. (2006). Insider trading, news releases, and ownership concentration. *Journal of Finance, 61 (6)*, 2931-2973.

Finnerty, J. (1976). Insiders and market efficiency. *Journal of Finance, 31 (1)*, 1141-1148.

Fitch, E. M., & Slezak, S. L. (2008). Can corporate governance save distressed firms from bankruptcy? An empirical analysis. *Review of Quantitative Finance and Accounting, 30 (2),* 225-251.

Flannery, M., & Rangan, K. (2006). Partial adjustment toward target capital structures. *Journal of Financial Economics, 79 (3),* 469-506.

Florackis, C. (2008). Agency costs and corporate governance mechanisms: evidence for UK firms. *International Journal of Managerial Finance, 4 (1),* 37-59.

Florackis, C., Kostakis, A., & Ozkan, A. (2009). Managerial Ownership and Performance. *Journal of Business Research, 62 (12),* 1350–1357.

Florackis, C., & Ozkan, A. (2009a). The impact of managerial entrenchment and agency costs: and empirical investigation using UK panel data. *European Financial Management, 15 (3),* 497-528.

Florackis, C., & Ozkan, A. (2009b). Managerial incentives and corporate leverage: evidence from the United Kingdom. *Accounting and Finance, 49 (3),* 531-553.

Fracassi, C., & Tate, G. A. (2012). External networking and internal firm governance *Journal of Finance, 67 (1),* 153-194.

Frank, M. Z., & Goyal, V., K. (2009). Capital structure decisions: Which factors are reliably important? *Financial Management, 38 (1),* 1-37.

Frank, M. Z., & Goyal, V. K. (2007). Corporate leverage: How much do managers really matter? In *SSRN*.

Franks, J., Mayer, C., & Renneboog, L. (2001). Who disciplines management in poorly performing companies? *Journal of Financial Intermediation, 10 (3-4),* 209-248.

Friedrich, S., Gregory, A., Matatko, J., & Tonks, I. (2002). Short-run returns around the trades of corporate insiders on the London Stock Exchange. *European Financial Management, 8 (1),* 7-30.

Gabaix, X., & Landier, A. (2008). Why has CEO pay increased so much? *Quarterly Journal of Economics, 123 (1),* 49–100.

Gaspar, J.-M., Massa, M., & Matos, P. (2005). Shareholders investment horizons and the market for corporate control. *Journal of Financial Economics, 76 (1),* 135-165.

Gilson, S. C. (1990). Bankruptcy, boards, banks, and block holders. *Journal of Financial Economics, 27 (2),* 355-387.

Goergen, M., & Renneboog, L. (2001). Strong managers and passive institutional investors in the UK. In *The Control of Corporate Europe* (pp. 259-284). Tilurg: Oxford University Press.

Gosnell, T., Keown, A., & Pikerton, J. (1992). Bankruptcy and insider trading: Differences between exchange-listed and OTC firms. *Journal of Finance, 47 (1),* 349-362.

Graham, J. R. (2000). How big are the tax benefits of debt? *Journal of Finance, 5 (1),* 1901-1942.

Graham, J. R., & Harvey, C. R. (2001). The theory and practice of corporate finance: evidence from the field. *Journal of Financial Economics, 60 (2-3),* 187-243.

Graham, J. R., Harvey, C. R., & Puri, M. (2013). Managerial attitudes and corporate actions. *Journal of Financial Economics, 109 (1)*, 103-121.

Gregory, A., Rajesh, T., & Tonks, I. (2013). More than Just Contrarians: Insider Trading in Glamour and Value Firms. *European Financial Management, 19 (4)*, 747-774.

Guttman, L. (1954). Some Necessary Conditions for Common-Factor Analysis *Psychometrika, 19 (2)*, 149-161.

Hahn, P. D., & Lasfer, M. (2013). Has governance doomed board meetings? In. Twenty Years after Cadbury, Ten Years after Sarbanes-Oxley: Challenges of Corporate Governance: University of Bath.

Harford, J., Mansi, S. A., & Maxwell, W. F. (2008). Corporate governance and firm cash holdings in the US. *Journal of Financial Economics, 87 (3)*, 535–555.

Harris, M., & Raviv, A. (2005). Allocation of decision-making authority. *Review of Finance, 9 (3)*, 353-383.

Hernandez Tinoco, M., & Wilson, N. (2013). Financial distress and bankruptcy prediction among listed companies using accounting, market and macroeconomic variables. *International Revie of Financial Analysis, 30 (December 2013)*, 394-419.

Hillegeist, S., Keating, E., Cram, D., & Lundstedt, K. (2004). Assessing the probability of bankruptcy. *Review of Accounting Studies, 9 (1)*, 5-34.

Hoitash, R., Hoitash, U., & Johnstone, K. M. (2012). Internal control material weaknesses and CFO compensation. *Contemporary Accounting Research, 29 (3)*, 768-803.

Hoque, H., & Lasfer, M. A. (2013). Director's dealing and post-IPO performance. *European Financial Management, Forthcoming*.

Hu, A., & Kumara, P. (2004). Managerial entrenchment and payout policy. *Journal of Financial and Quantitative Analysis, 39 (4),* 759-790.

Huang, R., & Ritter, J. (2009). Testing theories of capital structure and estimating the speed of adjustment. *Journal of Financial and Quantitative Analysis, 44 (2),* 237-271.

Iqbal, Z., & Shetty, S. (2002). Insider trading and stock market perception of bankruptcy. *Journal of Economic and Business, 54 (5),* 525-535.

Jaffe, J. (1974). Special information and insider trading. *Journal of Business, 47 (1),* 410-428.

Jeng, L. A., Metrick, A., & Zeckhauser, R. (2003). Estimating the returns to insider trading: A performance evaluation perspective. *Review of Economics and Statistics, 85 (2),* 453-471.

Jensen, M. C. (1986). Agency cost of free cash flow, corporate finance, and takeovers. *American Economic Review, 76 (2),* 321-329.

Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behaviour agency costs and ownership structure. *Journal of Financial Economics, 3 (1),* 305-360.

Jian, M., & Lee, K. W. (2011). Does CEO reputation matter for capital investments? *Journal of Corporate Finance, 17 (4),* 929-946.

Jiang, J. X., Petroni, K. R., & Wang, I. Y. (2010). CFOs and CEOs: Who have the most influence on earnings management? *Journal of Financial Economics, 96 (3),* 513-526.

Jiang, X., & Zaman, M. A. (2010). Aggregate insider trading: Contrarian beliefs or superior information? *Journal of Banking and Finance, 34 (6),* 1225–1236.

Kaiser, H. F. (1960). VARIMAX Solution for Primary Mental Abilities *Psychometrika, 25 (2),* 153-158.

Kaplan, S. N., Klebanov, M. M., & Sorensen, M. (2012). Which CEO characteristics and abilities matter? *Journal of Finance, 67 (3),* 937-1007.

Ke, B., & Petroni, K. (2004). How informed are actively trading institutional investors? Evidence from their trading behavior before a break in a string of consecutive earnings increases. *Journal of Accounting Research, 42 (5),* 895-927.

Keida, S., & Philippon, T. (2009). The economics of fraudulent accounting. *The Review of Financial Studies, 22,* 2169-2199.

Khan, T. S. (2006). Company dividends and ownership structure: Evidence from UK panel data. *Economic Journal, 116 (510),* c172-c189.

Kim, J.-B., Li, Y., & Zhang, L. (2011). CFOs versus CEOs: Equity incentives and crashes. *Journal of Financial Economics, 101 (3),* 713-730.

Klock, M. S., Mansi, S. A., & Maxwell, W. F. (2005). Does corporate governance matter to bondholders. *Journal of Financial and Quantitative Analysis, 40 (4),* 693-719.

Korczak, A., Korczak, P., & Lasfer, M. (2010). To trade or not to trade: The stratgic trading of insiders around news annoucements. *Journal of Business Finance and Accounting, 37 (3),* 369-407.

Kose, J., & Lang, L. H. P. (1991). Insider trading around dividend announcements: Theory and evidence. *Journal of Finance, 46 (4),* 1361-1389.

Kothari, S. P., & Warner, J. B. (1997a). Measuring long-horizon security price-performance. *Journal of Financial Economics, 43 (3),* 301-339.

Kothari, S. P., & Warner, J. B. (1997b). Measuring long-horizon security price performance. *Journal of Financial Economics, 43 (3),* 301-339.

Lajili, K., & Zéghal, D. (2010). Corporate governance and bankruptcy filing decisions. *Journal of General Management, 35 (4),* 3-26.

Lakonishok, J., & Lee, I. (2001). Are insiders' trades informative? *Review of Financial Studies, 14 (1),* 79-111.

Landier, A., Sraer, D., & Thesmar, D. (2013). Bottom-up corporate governance. *Review of Finance, 17 (1),* 161-201.

Lasfer, M. A. (1995). Agency costs, taxes and debt: The UK evidence. *European Financial Management, 1 (3),* 265-285.

Lasfer, M. A. (2006). The interrelationship between managerial ownership and board structure. *Journal of Business Finance and Accounting, 33 (7-8),* 1006–1033.

Leary, M. T., & Roberts, M. R. (2005). Do firms rebalance their capital structures? *Journal of Finance, 60 (6),* 2575-2619.

Lemmon, M., Roberts, M., & Zender, J. (2008). Back to the beginning: Persistance and the cross-sectional distribution of capital structure. *Journal of Finance, 63 (1),* 1575-1608.

Lin, J.-C., & Howe, J. S. (1990). Insider trading in the OTC market. *Journal of Finance, 45 (4),* 1273-1284.

Loderer, C. F., & Sheenhan, D. P. (1989). Corporate bankruptcy and manager's self-serving behavior. *Journal of Finance, 44 (4),* 1059-1075.

Ma, Y. (2001). Insider trading behavior prior to Chapter 11 bankruptcy annoucements. *Journal of Business Research, 54 (1),* 63-70.

Malmendier, U., Tate, G., & Yan, J. (2011). Overconfidence and early-life experiences: The effect of managerial traits on corporate financial policies. *Journal of Finance, 66 (5),* 1687-1733.

Malmendier, U., & Zheng, H. (2012). Managerial duties and managerial biases. In: UC Berkley.

Masulis, R. W., & Mobbs, S. (2011). Are all inside direstors the same? Evidence from the external directorship market. *Journal of Finance, 66 (3),* 823-862.

McKnight, P. J., & Weir, C. (2009). Agency costs, corporate governance mechanisms and ownership structure in large UK publicly quoted companies: A panel data analysis. *Quarterly Review of Economics and Finance, 49 (2),* 139-158.

Modigliani, F., & Miller, M. H. (1958). The cost of capital, corporation finance and the theory of investment. *American Economic Review, 48 (3),* 261-297.

Morck, R., Shleifer, A., & Vishny, R. W. (1988). Management ownership and market valuation: an empirical analysis *Journal of Financial Economics, 20 (January-March)*, 293-315.

Morellec, E. (2004). Can managerial discretion explain observed leverage ratios? *Review of Financial Studies, 17 (1)*, 257-294.

Myers, S. C. (1977). Determinants of corporate borrowing. *Journal of Financial Economics, 5 (2)*, 147-175.

Ohlson, J. A. (1980). Financial ratios and the probabilistic prediction of bankruptcy. *Journal of Accounting Research, 18 (1)*, 109-131.

Ozkan, A. (1996). Corporate bankruptcies, liquidation costs and the role of banks. *Manchester School, 64 (S1)*, 104-118.

Ozkan, A. (2001). Determinants of capital structure and adjustment to long run target: Evidence from UK company panel data. *Journal of Business Finance and Accounting, 28 (1-2)*, 175-198.

Ozkan, A., & Ozkan, N. (2004). Corporate cash holdings: An empirical investigation of UK companies. *Journal of Banking and Finance, 28 (9)*, 2103-2134.

Ozkan, A., & Trzeciakiewicz, A. (2014). Informative content of insider purchases: Evidence from the Financial Crisis. *Review of Behavioral Finance, Forthcoming*.

Pawlina, G., & Renneboog, L. (2005). Is investment-cash flow sensitivity caused by agency costs or asymmetric information? Evidence from the UK. *European Financial Management, 11 (4)*, 483-513.

Pindado, J., & Rodrigues, L. (2005). Determinants of financial distress costs. *Financial Markets and Portfolio Management, 19 (4)*, 343-359.

Piotroski, J. D., & Roulstone, D. T. (2005). Do insider trades reflect both contrarian beliefs and superior knowledge about future cash flow realizations? *Journal of Accounting and Economics, 39 (1)*, 55-81.

Platt, H., & Platt, M. (2012). Corporate board attibutes and bankruptcy. *Journal of Business Research, 65 (8)*, 1139-1143.

Poletti-Hughes, J., & Ozkan, A. (2014). Ultimate controllers, ownership and the probability of insolvency in financially distressed firms. *Managerial and Decision Economics, 35 (1)*, 36-50.

Raheja, C. (2005). Determinants of board size and composition: A theory of corporate boards. *Journal of Financial and Quantitative Analysis, 40 (1)*, 283-306.

Rajan, G., Raghuram, & Zingales, L. (1995). .What do we know about capital structure? Some evidence form international data. *Journal of Finance, 50 (5)*, 1421-1460.

Ravina, E., & Sapienza, P. (2010). What do independent directors know? Evidence from their insider trading. *Review of Financial Studies, 23 (3)*, 962-1003.

Rozeff, M., & Zaman, M. A. (1998). Overreaction and insider trading: Evidence from growth and value portfolios. *Journal of Finance, 53 (2)*, 701-716.

Ryan, P. (2005). The market impact of directors' trades relationship to various measures of a firm's information environment. *The British Accounting Review, 37 (3)*, 319-337.

Schoar, A., & Washington, E. L. (2011). Are the seeds of bad governance sown in good times? In *NBER Working Paper Series*.

Seyhun, H. N. (1986). Insiders' profits, costs of trading and market efficiency. *Journal of Financial Economics, 16 (1),* 189-212.

Seyhun, H. N. (1988). The information content of aggregate insider trading. *Journal of Business, 61 (1),* 1-24.

Seyhun, H. N., & Bradley, M. (1997). Corporate bankruptcy and insider trading. *Journal of Business, 70 (2),* 189-216.

Shleifer, A., & Vishny, R. W. (1997). A survey of corporate governance. *Journal of Finance, 52 (2),* 737-783.

Short, H., & Keasey, K. (1999). Managerial ownership and the performance of firms: Evidence from the UK. *Journal of Corporate Finance, 5 (1),* 79-101.

Shumway, T. (2001). Forecasting bankruptcy more accurately: a simple hazard model. *Journal of Business, 74 (1),* 101-124.

Stultz, R. M. (1990). Managerial discretion and optimal financing policies. *Journal of Financial Economics, 26 (1),* 3-27.

Sudarsanam, S., Wright, M., & Huang, J. (2011). Target bankruptcy risk and its impact on going private buyout performance and exit. *Corporate Governance: An International Review, 19 (3),* 240-258.

Sylvain, F., Gregory, A., Matatko, J., & Tonks, I. (2002a). Short-run Returns around the Trades of Corporate Insiders on the London Stock Exchange. *European Financial Management, 8 (1),* 7-24.

Sylvain, F., Gregory, A., Matatko, J., & Tonks, I. (2002b). Short-run returns around the trades of corporate insiders on the London Stock Exchange. *European Financial Management, 8 (1),* 7-30.

Titman, S., & Wessels, R. (1988). The determinants of capital structure choice. *Journal of Finance, 43 (1),* 1-21.

Wang, W., Shin, Y.-C., & Francis, B. B. (2012). Are CFO's trades more informative than CEO's trades? *Journal of Financial and Quantitative Analysis, 47 (4),* 743-762.

Warner, J. B. (1977). Bankruptcy costs: Some evidence. *Journal of Finance, 32 (2),* 337-347.

Yan, X. S., & Zhang, Z. (2009). Institutional investors and equity returns: Are short-term institutions better informed? *Review of Financial Studies, 22 (2),* 893-924.

Yermack, D. L. (1996). Higher market valuation of companies with samll boards of directors. *Journal of Financial Economics, 40 (1),* 185-211.