The University of Hull

Risk Exposure and Performance in the Banking Sector: A Comparative Investigation of Islamic, Conventional, and Islamic Window Banks

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by

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Abstract

The core business of banks involves the operation of a payment system. They are also perceived as primary sources of credit and a safe location for individuals and businesses that want to deposit cash. As a system, the banks play the role of facilitating resources from those who have more than they require (depositors) to those who need them (borrowers). Through playing this role, banks deliver benefits to all involved and the economy in general. However, there are inherent risks in this process which could leave the banks exposed to numerous kinds of threat that could have a severe impact on the banks themselves and the economy where they operate. Risk is a critical issue for banks as they act as risk intermediaries. Failure to manage this risk may result in a global market failure such as the recent financial crisis 2007-2009, which showed empirically how damaging a banking crisis can be. Upper and Worms (2004) showed that failure in a single bank might lead to a 15 percent breakdown of the entire banking sector in terms of assets.

Focusing on the differences between Islamic, conventional, and Islamic window banks, this study investigates credit, liquidity, operating and solvency risk and its determinants for these three types of banks. It uses a sample of 950 banks from 55 countries during three periods: 2006-2015 (full sample period), 2007-2009 (global financial crisis), and 2010-2013 (sovereign debt crisis). The study proves, empirically, that risk in Islamic banks is substantially different from that in other types of banks. Islamic banks were stronger in credit position than conventional banks during the global financial and sovereign debt crises. The results also suggest that Islamic banks are less stable with respect to liquidity-based risk, particularly during sovereign debt crisis. The results also reveal Islamic banks have more operating and insolvency risk. Furthermore, the findings suggest that risk in Islamic banks is generally determined differently from conventional and Islamic window banks by the bank-specific factors and the macroeconomic factors of the countries in which the banks operate.

Another main focus of this study is to investigate the drivers of financial institutions' performance. In particular, this study examines the effect of four different types of risk (credit, liquidity, operating, and insolvency risk) on performance. We employed a large sample of 950 banks from 55 countries; we divide the periods into three periods: 2006-2015 (full sample period); 2007-2009 (global financial crisis); and 20110-2013 (severing debt crisis). Remarkably, it can be noted from the statistical regression that operating risk is the most substantial risk, and credit risk is the least significant driver of bank's performance.

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Chapter One: Introduction

1.1. Research Background and Motivation

The theory of banking suggests that banks operate the intermediation process between depositors and borrowers. If this process has been achieved efficiently, then both credit and deposit will be met at minimum cost, and this will benefit all parties involved and, consequently, the entire economy. This process is risky and can increase the fragility of the financial system, which could lead to severe global consequences, such as the global financial crisis of 2006-2009. Studies (e.g, Hoggarth et al. 2002; Dell'Ariccia et al. 2008; Acharya et al. 2010) have identified the negative effect of banking instability on the developed and developing economy. Their results lend support to the view that banks require more attention and support than other commercial sectors during the financial crisis. Thus, the recent financial crisis and subsequent turmoil has underlined the importance of financial stability in the economy. Institutions whose core business is to deal with finance, particularly the banks, are specialists when it comes to managing risk. Undeniably, banks are mediators of risk, whereby their primary aim is to make sure that exposure to risk does not negatively affect the solvency of the intermediary. Thus, an accurate understanding of risk in banks is an essential element for proper financial intermediaries and to create the broader objective of the financial stability of the financial system.

Those who support the industry of Islamic banking advance the argument that Islamic banks are stronger when compared to conventional banks. They argue that the Islamic financial industry, with its profit and risk sharing, is better able to sustain and improve the economy, particularly during financial crises. However, the views presented are theoretical, and the majority of existing theories do not provide a clear answer as they are conflicting. This research attempts to fill this gap between the theoretical and empirical perspectives. The broad aim of this research is to investigate whether Islamic banking is more stable when compared to conventional banking. With their unique characteristics, regarding both their assets and liabilities in addition to the *Shariah* compliance, leads to the following questions: Does this create different implications with regards to risk? Are Islamic banks similar to conventional banks with respect to risk? An attempt to answer these questions forms the key motivation of this research.

After the recent global financial crisis, Islamic banks received more attention as an alternative to conventional banks. Some scholars argue that, unlike conventional banks, Islamic banks were not affected during the crisis. On the other hand, others argue that since Islamic banks are part of the global financial system, they cannot be excluded from the impact of such a

crisis. For instance, Chapra (2011) argues that Islamic banks are still in their infancy and they operate in a conventional-dominant banking industry, which consequently forces Islamic banks to face the existing risk faced by conventional banks.

Theoretically, the function of Islamic banks is significantly different from that of conventional banks. Islamic banks are based on unique principles, which are in compliance with *Shariah.* Particularly, profit and loss sharing is a fundamental principle which offers a different range of financial products. In these lending products, profits and losses are shared between the investors and the bank on a predetermined basis. In contrast to conventional banks, Islamic banks focus on the return on the investment, because their own profitability is associated directly with the real rate of return. Furthermore, one of the main differences between the principles of Islamic and conventional banks is that Islamic banks prohibit the receipt of interest (*riba*) on capital provided to customers (Archer and Karim 2007). This suggests that the finances and activities of Islamic banks are profoundly different to those of conventional banks.

The success of financial institutions depends largely on how they monitor or manage the risks associated with their operations. Considering the importance of understanding the risk posed by the financial industry to any economy, it is crucial to investigate the determinants of different types of risk. In particular, Islamic banks need to be further investigated as the empirical study is limited, even though it is growing in size.

1.2. Importance of Islamic Banking

The global Islamic banking institutions have continuously and remarkably been growing over the last three decades. At present, Islamic banking is considered the fastest growing sector in the financial industry. Particularly, Islamic banking assets worldwide have grown by more than 17.6% from 2008 to 2012 (Ernst & Young 2012), with a total asset base of US 1.7 trillion in 2013. Islamic banks provide a different range of financial products and services that are in compliance with theological needs of a global population of 1.5 billion Muslims.

In reflection to the success of Islamic Banks, there is continuous interest in this industry. Many of European, American, and other Western countries are dealing with the Islamic banking products; particularly bonds (*Sukuk*). For example, the German Federal State of Saxony Anhalt issued *sukuk* in Europe with five years, amounting to US 120 million in 2004. The United Kingdom is more active in dealing with the *Sukuk* market. Several Western regulatory bodies have passed laws allowing for the regulation and licensing of *Shariah*-compliant products. In 2004, the United Kingdom reformed the law for licensing Islamic

banks and also to ensure the Islamic banking products are prone to higher levies than conventional banks. Ben Bouheni (2016) notes that these regulations have pushed Islamic banks to be globally recognized. The same author also notes that the GCC countries (Gulf Co-operation Council) have a large number of Islamic financial institutions while Asia countries are holding more than US$300 billion in funds and their markets encourage them to provide Islamic banks model (Ben Bouheni 2016).

Both banking systems, Islamic and conventional banks, have similar functions and act as a financial intermediary between surplus and defects units. However, there are similarities and variations in the operations. Accordingly, Islamic banks have a similar risk that faces conventional banks, such as credit, liquidity, operating, and solvency risk. Despite the similarities, such risks stem from different origins, impacts and implications (Akkizidis and Khandelwal 2007). Thus, Islamic bank risk may result in different severity and structure. In addition, Islamic banks have a unique risk that does not share with conventional banks, due to the distinct features of Islamic banking model, such as *Shariah Compliance Risk*.

Islamic banking has captured the attention of the global financial community, particularly during the global financial crisis and the sovereign debt crisis. There is a growing demand, to comprehensively understand the risk nature of Islamic banks, to develop risk management framework tailored to Islamic banks. There is continuous concern that the practice of risk in Islamic banks is not keeping pace with the global financial market. Unlike risk in conventional banks, risk research of Islamic banks remains an infant research area. In order to ensure a level of Islamic financial stability, there is a requirement for Islamic banks to make resources available for advancing their risk management abilities in keeping with the vibrant evolution and intricacy of Islamic financial services and products.

1.3. Research Objectives and Questions

Focusing on the difference between Islamic, conventional and Islamic window banks, the aim of this research is to analyze and explore the risk in these financial institutions to improve the practice of the banking industry towards risk. Specifically, it aims to analyze four main kinds of risks which are: (1) credit risk, (2) liquidity risk, (3) operating risk, (4) insolvency risk.

In fulfilling this aim, the objectives of this research are to: firstly, assess the risk in these financial institutions, particularly Islamic banks. Secondly, find factors determining the risk of Islamic banks. Thirdly, estimate the resilience against financial crises pressure. Finally, investigate risk effect on the performance of the industry

With the above aims and objectives as a basis, this research will attempt to answer the distinct questions that follow: Stressing the importance of credit, liquidity, operating and insolvency risk that need to be investigated (I) Are Islamic banks more stable than conventional banks? In addition, this study covers three periods, comprising the full sample period (2006-2015), global financial crisis (2007-2009), and sovereign debt crisis (2010-2013). Thus, additional questions are addressed in this research: (II) Are Islamic banks more stable than conventional banks during global financial crisis and sovereign debt crisis? Do banks change their policy appropriately after the global financial crisis? that is captured through investigating risk level during the sovereign debt crisis? (III) What are the bank-specific and country-specific determinants that affect the bank's risk in each of the three financing institutions? Specifically, Is Islamic bank's risk is affected differently from conventional and Islamic window banks. (IV) Does financial risk of banks matter in terms of performance? (IIV) Does the relationship pattern between risk and performance differ between Islamic, conventional and Islamic window banks? A comparison approach between Islamic, conventional, and Islamic window banks is utilized to address the research questions.

1.4. Significance and Contribution of the Study

Despite the utmost significance of the role of risk to banking industry and its implications for the performance of banks, these issues have not been explored in the Islamic banking empirical literature. The manner in which this study will make its primary contributions and is significant to the prevailing literature is discussed below.

Firstly, since banks are expected to act as intermediaries of risk, risk is one of the most critical elements in their operations. If risk is not properly managed, the result could be a market failure at the global level, as was experienced more recently in the 2007-2009 global financial crises, which illustrated the damage that could be caused by a banking crisis. The banks are also interconnected to the effects that Upper and Worms (2004) note, namely that the failure of one bank could have a negative effect on up to 15% of the entire banking sector with regards to assets. Hence, it is the aim of this research to investigate the risk faced by financial institutions with the aim of assisting them to avert any crisis in the future.

Moreover, there is hardly any literature dealing with how resilient Islamic banks were during the sovereign debt crisis[1]. A few scholars, such as Hoque et al. (2015), proved empirically that numerous banks performed poorly during the sovereign crisis. Fahlenbrach et al. (2012)

[1] The ‘sovereign debt crisis' term and 'debt crisis' term have been used interchangeably throughout the thesis.

[2] There are several theories that intensify the importance of banking, relating to liquidity transformation,

add that the global financial crisis resulted in the banks altering the way they behave as well as their regulations, with the aim of ensuring that they were protected from future turmoil.

Fourthly, notwithstanding the reality in that the available literature asserts the importance of operating and liquidity risk in systems of banking, there is almost no empirical literature aimed at the investigation of liquidity risk in Islamic banks. Most of the available empirical literature regarding Islamic banks tends to focus on performance (Abdul-Majid et al. 2010; Mohamad et al. 2008) and other elements, such as competition (Weill 2011; Shaban et al. 2014; Chong and Liu 2009), while others place their focus on corporate governance (Mollah and Zaman 2015a; Haniffa and Hudaib 2006). This study aims to add to the literature on both liquidity and credit risk of Islamic, Islamic window, and conventional banks.

Moreover, the most recent global financial crisis brought to the fore a central matter with regards to the role played by various kinds of risk in both the performance and survival of banks. A number of studies have been conducted to investigate the elements determining poor bank performance, such as capital structure and corporate governance. However, there is scarcity when it comes to literature dealing with the effect of risk influence on the performance of banks, especially Islamic banks.

Additionally, this study is an important resource for those who have an interest in Islamic, conventional, and Islamic window banks, such as investors, policy-makers, academics, consultants, and researchers. Based on the significant market share held by Islamic window banks, which calls for them to be explored in comparison to Islamic banks, this study looks at risk and how it impacts on such banks.

1.5. Overview of the Research Methodology

To achieve the research aim and objectives outlined above, this research utilizes a quantitative research methodology encompassing mathematics, statistics, and econometrics. In particular, this research employs different quantitative approaches according to the objective of the research questions, which can be found in each empirical chapter (3; 4; and5). For example, economic models and statistical analysis are employed in the analysis of data obtained from the banking industry. This analysis, of a quantitative nature, generates significant results linked to the research questions.

1.6. Structure of the Research

This study consists of six chapters which are as follows:

Chapter 1 (Introduction): The overall content of the study is explained in this chapter. It brings to the fore the context, significance of Islamic banking, aims and objectives, questions guiding the study, the importance and contribution of the study, and finally, the conclusions drawn from the study.

Chapter 2 (Principles of Islamic Banks): This chapter provides introductory and essential knowledge in the Islamic banking industry. In order to address the risk in Islamic banks appropriately, it is utmost important first to understand the nature of Islamic financial institutions. It explores the historical background and the development of Islamic banks. More importantly, it discusses the principles and objectives of these financial institutions and how they differ from the conventional banks. In addition, it highlights in detail the different products of Islamic banks.

Chapter 3 (Credit and Liquidity Risk in Banking Sector): This chapter is an empirical chapter that discusses mainly the liquidity and credit risk in Islamic banks, with the objective of using them to compare Islamic banks with conventional and Islamic window banks. The chapter first provides the definition and relevant literature review of these two kinds of risks. A critical literature review is presented into two parts, the theoretical and empirical part, with the aim of gaining a basic idea of the concept of credit and liquidity risk. To explore the risk in Islamic banks, three periods are considered: 2006-2015 (full sample period), 2007-2009 (global financial crisis), and 2010-2013 (sovereign debt crisis). Then credit and liquidity risk econometric model is introduced for conducting numerical analysis. The analysis starts with the preliminary analysis, followed by empirical results, and finally with conclusions.

Chapter 4 (Operating and Solvency Risk in Banking Sector): Focusing on the difference between Islamic, Islamic window, and conventional, this chapter investigates the stability of Islamic banks in terms of operating and solvency risk during the full sample period, financial crisis and sovereign debt crisis. Firstly, it provides the definition for operating and insolvency risk in financial institutions in general then in Islamic banks. Secondly, it highlights the existing theoretical views on the operation and solvency of Islamic banks. Thirdly, it presents the prior empirical studies relevant to operating and solvency risk.

Chapter 5 (Risk and Bank Performance): This chapter investigates the effect of four types of risks on bank performance for Islamic, conventional and Islamic window banks. These four types of risk are credit, liquidity, operating, and solvency risk. It also examines which types of risk matter more in terms of performance for each type of banks. The chapter presents the existing relevant literature on risk effects and performance determinants. In

addition, it highlights the design of the econometric model specification and data analysis techniques. Finally, the chapter provides conclusions derived from the results found.

Chapter 6 (Conclusions and Recommendations): Firstly, this chapter highlights the research aim, objectives for this PhD thesis, followed by the major findings. Secondly, it provides the recommendations for those interested in Islamic, conventional, and Islamic window banks such as policy makers and academia. Lastly, it provides research limitations and suggestions for future studies.

Chapter Two: Principles of Islamic Banks

2.1. Introduction

The most recent financial crisis did not only strengthen suspicions regarding conventional banks, but also attracted more attention in the direction of Islamic banks (SH & HADI 2013). Islamic banks have expanded remarkably and Islamic banking is now considered the fastest growing sector in the international banking and capital markets. There are more than 200 Islamic banks operating in more than 70 countries across the world, within Muslim countries and western countries. The previous figure excludes the Islamic insurance companies, which operate in 27 countries (Hassan and Lewis 2007b). The last report by Ernst and Young (E &Y), entitled *World Islamic Banking Competiveness 2013-14* states that the value of global Islamic banking had, by 2012, surpassed US $1.54 trillion; including banks providing only Islamic banking services and those operating windows . According to the recent report of the International Monetary Fund (IMF) the assets of Islamic banks have grown at a double - digit rate; in 2003 the assets were US$ 200 billion and then increased to an estimated 1.8 trillion by 2013. Ernst and Young (E &Y) also reports that, the market for Islamic fund across the world has increased by 8% from 2009 to 2010 and has doubled from 2004 to 2010.

Islamic products are not offered only by Islamic banks but also by non-Islamic firms such as, HSBC, Citibank, Standard Chartered, and BNP Paribas (Visser 2013). Some observers, such as (Hasan and Dridi 2011), have pointed out to the excellent performance of the Islamic banks during the global financial crisis. (Beck et al. 2013) found that the Islamic banks performed better than the conventional banks during the financial crisis in terms of assets quality and capitalization. The Islamic banking model differs significantly from the conventional banks. This leads us to highlight the nature of Islamic banks and their operations.

In order to study the risk of Islamic banking thoroughly, the objective of this chapter is to give the reader an explicit idea of the Islamic model of finance and to shed some light on the importance of Islamic banking, growth of Islamic banking, regulatory agencies in Islamic financial industry, principles of Islamic banking, products of Islamic banks, and the difference between Islamic banks and conventional banks.

2.2. History and Growth of Islamic Banks

The first Islamic bank was established was Nasser Social Bank in Egypt in1965, thus Islamic industry is considered as relatively new compared to conventional ones. That was the first time that a government in a Muslim country had shown an interest incorporating an interest-

free bank. The aim of the Nasser Social Bank was to provide micro-finance or credit to small projects and poor people on a profit sharing basis. Then Dubai Islamic Bank was established in 1970 in Dubai in the United Arab Emirates by a group of businessmen. Though the banks get a financial support from United Arab Emirates and Kuwait contributing respectively 20 percent and 10 of the capital, the bank is considered as the first bank initiated by the private sector. The establishment of Islamic Development Bank in 1975 was the most significant in the Islamic banking industry. It was established as an international financial institution issued by a conference of finance ministers of Islamic countries in 1973; 23 member countries of OIC signed for that declaration. At the second conference which was held in 1974, the Islamic Development Bank was established (Iqbal and Mirakhor 2011).

The most significant period in the history of Islamic banking industry was between 1975 and 1990. During this period, Islamic banking won the credibility and respect in terms of practical experience and theoretical development. Several Islamic products were developed and it produced high-quality results while using these products. During this period, the Islamic banking industry stated to increase and grow remarkably. Furthermore some countries, such as Iran, Pakistan, and Sudan, showed the interest to eliminate the interest rate base finance from their entire economy. Moreover, several multinational banks started offering their services in different countries; giving the products of Islamic banks recognition. The International Monetary Fund (IMF) and World Bank also recognized the Islamic financial industry and presented some papers related to Islamic Banking (Wahyudi et al. 2015). El Tiby (2011) divides the growth of Islamic banking into four periods: (1) The establishment period; (2) The spread period; (3) The international recognition period; (4) The evaluation period. Table 2.1 illustrates the division of periods of the history of Islamic banks and explains the developments in each period.

Table 2.1: The Development of Islamic Banking

The period	*Date*	*Characteristics*
The first Bank	1965	The first Islamic bank was established was Nasser Social Bank in Egypt in1965, thus Islamic industry is considered as relatively new compared to conventional ones.
The Establishment	1965-1976	The establishment of Muslim organizations to promote corporation and support among Muslim countries. The establishment of several Islamic banks across the Muslim world.

Table 2.2: Roles and Specifications of *Shariah* Supervisory Board

The Spread	1977-2002	The establishment of hundreds of Islamic banks across the globe. The transformation of financial systems to complete Islamic banking.
The International Recognition	2003-2009	The global acceptance of Islamic banks by the Western and recognition by American regulators. The growing interest of international banks in the Europe, the United States in Islamic assets.
The evaluation	2009-presrent	Large and healthy growth of Islamic assets compared to the large decline in the conventional assets during the financial crisis.

(Source: El Tiby 2011).

2.3. The Regulatory Agencies for Islamic Banks

The Islamic banking industry has been developing much faster than the regulatory bodies and regulations controlling it. Lately, there have been noteworthy efforts towards standardization of practice in Islamic banking with particular emphasis on standards of accounting, risk management, corporate governance, and capital adequacy requirements.

On a country perspective, Islamic financial industry is regulated and supervised by the regulatory and supervisory authorities in their respective countries. On a bank perspective each bank has its own *Shariah* Supervisory Board (SSB) that advices on transactions and performs a supervisory function. The roles and duties of SSB are illustrated in Table 2.2.

At a global level, there are several international bodies which support the Islamic financial industry which are: (1) Islamic Financial Service Board (IFSB); (2) Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI); (3) Islamic International Rating (IIRA); (4) International Islamic Financial Market (IIFM).

The IFSB started its operations on 2003 in Kuala Lumpur in Malaysia. Its main function is the setting up of international standards of regulatory and supervisory agencies that have a vested interest in ensuring the soundness and stability of the Islamic financial industry. The Islamic Financial Services Board (IFSB) has 49 regulatory and supervisory authorities in addition to several different international financial institutions such as the International Monetary Fund, World Bank, Bank for International Settlement, Islamic Corporation for the Development of Private Sector and 138 markets players and professional firms. The objectives of IESB can be classified down into three groups: (1) the regulatory and prudential perspective (2) the coordination among all the members and other groups (3) training and research perspective. The IFSB issued 12 standards and guiding principles to regulate the

SSB Role and specification according to AAOIFI

1. An independent body of specialized jurists in *fiqh* (Islamic commercial jurisprudence).
2. Entrusted with the duty of directing, reviewing and supervising the activities of the Islamic financial institution in order to ensure that they are in compliance with Islamic *Shariah* rules and principles.
3. Can issue *fatwas* and rulings which 'shall be binding on the Islamic financial institution.
4. Shall consist of at least three members' who are 'appointed by the shareholders . . . upon the recommendation of the board of directors (not including 'directors or significant shareholders of the Islamic financial institution).
5. Shall prepare a report on the compliance of all contracts, transactions, and dealings with the *Shariah* rules and principles.
6. Shall state whether 'the allocation of profit and charging of losses related to investment accounts conform to the basis that has been approved by the SSB.
7. Shareholders may authorize the board of directors to fix the remuneration of the *Shariah* Supervisory.

(Source: AAOIFI)

Islamic financial services which, according to El Tiby (2011), are in the following areas: (1) General governance approach of Islamic financial institutions; (2) Risk management, capital adequacy; (3) Supervisory review process; (4) Market discipline; (5) Rights of investment account holders (IAH); (6) Compliance with Islamic *Shariah* rules and principles; and (7) Transparency of financial reporting in respect of investment accounts.

The second main regulatory body is the Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI). It was first introduced in 1993 and has been increasingly adopted by extensive financial institutions (Iqbal and Molyneux 2016). AAOIFI is an international organization, with 200 members across 45 countries including central banks and several financial institutions across the world. These members are from central banks, financial institutions, accounting and auditing firms, and regulatory authorities. The AAOFI has two ethical standards, five auditing standards, seven governance standards, twenty-six accounting standards and forty-five *Shariah* Standards (AAOIFI, 2010). The aim of AAOFI is to build and disseminate standard accounting and auditing thoughts with regards to Islamic financial institutions and their applications.

2.4. Key Features of Islamic Banks

Islamic financial institutions are those base their objectives and operations on *Shariah* principles. Unlike conventional banks which are secular in their orientation, the Islamic banking industry is operated within the moral values of Islam. Thus Islamic banks cannot finance any project which is in conflict with the values of Islam. For instance, Islamic banks cannot finance a night club, casino or any other activities that is prohibited in *Shariah* (Kettell 2010)

The first main difference between principles of Islamic and conventional banks is that the Islamic banks prohibit the receipt of interest (*riba*) on capital provided to customers (Archer and Karim 2007). This free interest finance was first practiced by Arabs then it started to spread to Muslim countries and later was adapted to some Western countries. However this should not be understood to mean that the financier cannot earn profit (Kettell 2010). The Islamic financial institutions offer different procedures and products which will be elaborated upon in the coming section.

Another distinctive feature of Islamic banks is the profit and loss sharing; meaning that the risk will be shared between the provider of funds and the user of that fund. Islam encourages people to invest their money and to become partners in order to share profits and risks in the business, instead of becoming creditors. The basic belief of Islamic banks is that the provider of the capital and the user of the capital should share the risk equally whether the business is manufacturing or a simple trade sale. In the case of profit, both share it based on the predetermined proportions. In the case of loss, financial loss is born by the capital supplier with the entrepreneurs being penalized by receiving no return (wages or salary) for their endeavors. In contrast, under the commercial banking mechanism, all the pressure is on the borrower. He must pay the principle money plus the agreed interest, regardless of the success or failure of his business (Iqbal and Molyneux 2016).

Gharar (uncertainty, risk or speculation) is also prohibited, thus any transactions in Islamic banking should be free from uncertainty, risk, and speculation. The involved parties should have a perfect and clear knowledge of the counter values of their transactions. The idea behind this prohibition is to protect the weak form from exploitation. Therefore, options, futures, and gambling are consider as non-Islamic (Kettell 2010). Table 1.3 illustrates some more of the main differences in principles between the two types of banks.

2.5. Corporate Governance of Islamic Banks

Generally, financial firms have special features which make the corporate governance of financial firms distinctive from non-financial firms. Banks are heavily regulated because of the importance of banks to a country's economy. Leventis et al. (2013) points out that banks are subject to more supervisory actions due to their role as a source of fiscal revenue and to the opacity of their operations and assets. For instance, some countries specify and restrict the percentage and concentration of ownership in financial firms (Barth et al. 2012). Levine (2004) gives an extreme example: some governments own banks which make the charter of governance different .Additionally, banks are more opaque than non-financial firms. This lack of transparency intensifies the agency theory in the banking sector (Barth et al. 2012).

Unique Features of Islamic banks: The unique features of operations of Islamic banks make the corporate governance context differ from conventional banks. The main fundamentals of Islamic banks are prohibition of *riba* (interest on cash received) and prohibition on excessive uncertainty. Islamic banks embrace profit and loss sharing. They have to turn these principles of Islamic banks into practice. This makes Islamic banking exhibit different dynamics in terms of relationships among parties involved. Safieddine (2009) argues that the key variation stems from *Shariah* compliance and the contractual characteristics separating the cash flow control right for a class of investors.

Chapra and Ahmed (2002) argue that all the stakeholders of Islamic banks, including depositors, investors, and shareholders want to ensure that the banks operations are consistent with *Shariah*. This makes the nature of the agency problem differ from conventional banks. In conventional banks the agency problem occurs when managers deviate from their task to maximize shareholders' wealth. In constant, in Islamic banks, the agency problems arise when the managers are not running the banks in compliance with Islamic rules or *Shariah.*

One of the key differences, between Islamic banks and other types, is the existence, in Islamic banks, of SSB Corporate governance. First, board of directors and Shariah Supervisory Board (SSBs) and this is considered as an additional layer or double tire of governance system in the context of Islamic banks (Hassan and Lewis 2009).

Ultimately, these Islamic banks provide a model that meets the desire of the stakeholders and the Shariah principles (Kureshi & Hayat 2015). This task is accomplished through the *Shariah* Supervisory Board which consists of scholars and *Shariah* reviewers within the bank to ensure the compliance with the Islamic law. Additionally, the Islamic banks are based on the equity of participations and risk and profit–loss sharing. This makes the relationship with

the stakeholders different from the conventional banks because depositors have a direct stake of the bank's investments and equity (Sun et al. 2011). Thus, Safieddine (2009) points that the agency problem in Islamic banks does not only stem from the separation of ownership but also from the separation of cash flow and the rights of the depositors and investors. Another distinguishing feature of Islamic financial institutions, is that the shareholders of Islamic banks are not only looking to maximize the value of their investment, but are also compelled to achieve these objectives in a *Shariah* compliant fashion (Archer et al. 1998). Table 2.3 and Figure 2.2 summarize the differences in the corporate governance structure between Islamic banks and conventional banks.

Table 2.3: Difference of Corporate Governance between Islamic Banks and Conventional Banks

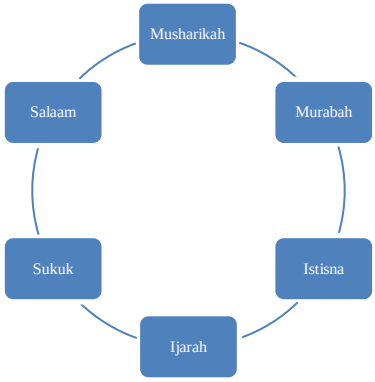
Functions	**Typical Financial Institutions**	**Additions In IIFS**
Governance	Board of Directors	*Shariah* Board
Control	Internal Auditor External Auditor	Internal *Shariah* Review Unit (ISRU) External *Shariah* Review
Compliance	Regulatory and Financial Compliance officers	Internal *Shariah* Compliance Unit (ISCU

Source: Adapted from (Safieddine2009)

2.6. Products of Islamic Banks

The main products of the Islamic banks, as it is shown figure 1.2 are; *Musharakah, Murabaha, Mudarabah, Ijara* and *Sukuk.*

Figure 2.1: The Main Products of Islamic Banks



Source: Developed by the author

2.6.1. Musharakah

Musharakah (partnership) is a product where the bank will make a partnership contract with another party by which every party will share the capital required and the skills or expertise to run a business. They will share the profit and loss at a predetermined proportion. If there was a profit they will share the profit as they agreed but that proportion does not depend on the capital. For example, if each participates with 50% of the capital, one party might share profit of 45% and the other 55% depending on the percentage they agreed on. But if they encounter a loss on their business then they share it based upon the proportion of the capital (Visser 2013). There is also a special *Musharakah* called diminishing *Musharakah*. In this type of *Musharakah*, one partner will purchase the venture over time at a pre-agreement price (Schoon 2010). This repurchasing agreement is part of the contract.

2.6.2. Mudaraba

Mudaraba is a contract by which the bank will provide the capital required for running a business and the banks will be the owner of the business. In contrast, the customer does not pay anything for the capital but will use his labour and effort to run the business. Thus the customer will act as an agent for the capital received from the bank and the customer will get an agreed proportion of profit from the bank. In case of a loss, the bank will bear all the loss and the customer will lose only his effort and time (Warde 2000).

2.6.3. Murabaha

Another Islamic financial instrument is *Murabaha* which is a contract under which the bank will buy a good for its own account then sell it to the customer at the original price plus a mark-up. That mark- up is viewed as a payment for the service that has been provided by the intermediary and as a guaranteed profit margin. The payment might take place immediately, or at a later date, or as installments (Visser 2013).

2.6.4. Ijara

Ijara is another example of an Islamic financial product which the bank purchases the needed items and then leases it to their customers. Upon expiration of the lease, then the title of the item can be sold to the lessee under *Ijara wa iqtina*. The customer has to pay in periodic installments; a portion goes towards the final purchase and the remaining goes for the transfer of the ownership of the product. Another point under *Ijara* is that the bank is the owner of the leased object during the whole specified period and the bank bears the liability if any occurs; such as manufacturing defects (Visser 2013).

2.6.5. Sukuk

Sukuk are translated as certificates, and it is an Islamic bond. As it has been seen that Islamic banks prohibit interest on capital, *Sukuk* is done through involving a tangible asset in the investment. For example the bond holder will have partial ownership of that investment, and then the bondholder will have the right to collect the profit as a rent. The first Islamic global bond issue was in 2002 through the Malaysian government (Hassan and Lewis 2007a). From these previous product examples, it can be seen that there are differences, in operations, between Islamic banks and conventional banks. The conventional banks are based on credit finance or interest based finance whereas the Islamic banks are based on asset sharing and loss-profit sharing (Visser 2013).

2.6.6. *Salam* Product

In the case of a Salam contact, the payment is made fully in advance at the time of the contact and the delivery of the asset is deferred to a specific time in the future. Salam contact is like a forward sale contract in conventional finance, with advance payment and deferred delivery. Most Salam contacts are short term, through they can be for the medium or long term, and are used for production finance.

2.6.7. *Istisna*

Istisna is a second buyer contract with the seller to manufacture, produce, contract, fabricate, assemble or process any asset in accordance with given specification, descriptions, quality, quantity identified and within a specific period and at any agreed period. The asset is produced using the seller's raw materials and or efforts, labour. All these conditions and details are discussed and agreed in advance, with the mutual consent of both parties.

Chapter Three: Credit Risk and Liquidity Risk in Banking Sector: Islamic, Conventional and Islamic Window Banks

3.1. Introduction

Banks play a significant role in any economy (Levine 2005). They operate the payment system, and they are considered as the major source of credit and a safe place for depositors. The banking system aids in allocating recourses from those with a surplus (depositors) to those in need or with deficits (borrowers). This transformation benefits all the parties involved and the overall economy[2]. However, this process can expose banks to different types of risk that can severely affect the banks and impact the entire economy.

Islamic banks have grown rapidly in the recent past. This is a reality noted by Ernst & Young (2012), who report that the Islamic financial sector had, by 2013, grown to an aggregate of US$ 1.7 trillion, showing a growth rate that was 50% faster compared to the overall banking sector. Annual growth in the Islamic banking sector is reported to have averaged 17.6% between 2008 and 2012 (Ernst & Young 2012). Hasan and Dridi (2010) add that the accelerated growth in the Islamic banking sector has resulted in Islamic banks being the fasted growing subdivision of the financial sector. Islamic bank operations comply with *Shariah*, which makes the principles of Islamic banks differ from those of conventional banks. Islamic banking also has hypothetically different operating products, such as profit and loss sharing (*Mudaraba*) (Ahmed and Khan 2007). Akkizidis and Khandelwal (2007) argue that these risks stem from the different origins, impacts, and implications in Islamic banking.

There is a growing theoretical literature discussing the effect of religious identities on the economy as a whole. In addition, the existing literature provides evidence that religiosity positively affects risk aversion (e.g, Adhikari and Agrawal 2016; Hilary and Hui 2009; McGuire et al. 2011). Diamond and Rajan (2001) argue that discipline and commitment from depositors reduce risky bank lending. This then leads to the question of are Islamic banks less risky in terms of credit and liquidity risk compared to conventional banks?

[2] There are several theories that intensify the importance of banking, relating to liquidity transformation, consumption smoothing, information production and commitment mechanisms (Diamond and Dybvig 1983; Diamond 1984; Boyd and Prescott 1986; Holmström and Tirole 1998; Kashyap et al. 2002). However, the financial intermediation theory is the key theory related to the creation of liquidity and why banks exist. This theory implies that the main function of banks is to transform the credit risk (Boyd and Prescott (1986). Freixas and Rochet (2008) summarized the financial intermediary existence theories.

The literature claims the importance of liquidity risk in banking systems; however, empirical literature investigating the liquidity risk in Islamic banking models is missing[3]. The vast majority of empirical literature regarding Islamic banks relates to performance (Mohamad et al. 2008; Abdul-Majid et al. 2010) or other dimensions such as competition (Chong and Liu 2009; Weill 2011; Shaban et al. 2014) and corporate governance (Haniffa and Hudaib 2006; Mollah and Zaman 2015a). This paper contributes to the literature on the credit and liquidity risk of Islamic, conventional, and Islamic window banks.

Moreover, empirical literature investigating the resilience of Islamic banks during the sovereign debt crisis is also missing. Hoque et al. (2015) empirically proved that many banks experienced poor performance during the sovereign debt crisis. Moreover, Fahlenbrach et al. (2012) argue that the global financial crisis led banks to change their behaviour and regulations to protect themselves from any future turmoil. We contribute to the literature by examining the stability of banks and comparing bank performance during the global financial crises and sovereign debt crises.

We also investigate determinants of banks' stability with respect to credit and liquidity risk in all of these financial institutions. For example, despite the theoretical links between credit liquidity risk and bank efficiency, empirical investigation within Islamic and Islamic window banks has been scarce. Thus, this study attempts to fill this gap in the literature. Furthermore, we investigate whether Islamic banks' risk is determined differently from conventional and Islamic window banks. Moreover, some argue that the growth and stability of Islamic banks was due to oil prices; however, the literature review does not provide an empirical answer regarding the influence of oil prices on the stability of banks. Thus, this study attempts to fill this gap in the literature.

This study is significant as it comprehensively investigates liquidity and credit risk and their determinants in Islamic, conventional, and Islamic window banks. This study is a considerable source for those interested in Islamic, conventional, and Islamic window banks such as investors, academic researchers, consultants, and policy-makers. Risk in the banking industry is very crucial and is gaining more global attention, and Islamic banks in particular have special challenges. The closest study to this research is (Abedifar et al. 2013), with the difference being that the focus of that study was not the global financial crisis and the sovereign debt crisis. Furthermore, it does not include liquidity risk in the investigation and

[3] There is growing attention to liquidity risk in the context of the banking system that explains the importance of liquidity for macroeconomic and financial crises (Dell'Ariccia et al. 2008; Acharya and Naqvi 2012; Benmelech et al. 2017).

there are differences in the risk determinants. Therefore, this study extends the literature of risk in Islamic banking.

This paper addresses three main questions motivated by the previous discussion: (i) Are Islamic banks more stable than conventional banks in terms of liquidity and credit risk? In addition, this study covers three periods, comprising the full sample period, global financial crisis, and sovereign debt crisis. Thus, additional questions are addressed in this research: (ii) Are Islamic banks more stable than conventional banks in terms of liquidity and credit risk during the global financial crisis and sovereign debt crisis? Did banks change their policy appropriately after the global financial crisis? What is captured through investigating risk during the sovereign debt crisis? Stressing the importance of credit risk and liquidity risk that need to be examined: (iii) what are the bank-specific and macroeconomic determinants that affect the credit and liquidity risk in each of the three financing models? In particular, is Islamic banks' stability affected differently than that of conventional and Islamic window banks? A comparison approach between Islamic, conventional, and Islamic window banks is utilized to address the research questions.

Overall, the findings show that all banks experienced lower risk during the sovereign debt crisis than during the global financial crisis; this is probably due to regulatory changes. Fahlenbrach et al. (2012) argue that the global financial crisis led banks to change their behaviour and use regulations to protect themselves from any future turmoil. A detailed analysis of the three types of bank provides different important findings. First, on average, during the three periods, Islamic banks have significantly lower credit risk than conventional and Islamic window banks. This result suggests that Islamic banks' ability to accommodate redemption from depositors and any other liabilities is substantially higher. This also suggests that Islamic banks have a higher ability to meet the demand for funding loans. For instance, the ratio of loan loss allowance over gross loans and impaired loans over equity are remarkably lower in Islamic banks during the entire sample period. The study uses different variables to assess risk, and the majority of these variables reveal that Islamic banks are more resilient. Further analysis during the global financial crisis and sovereign debt crisis also reveals that, on average, Islamic banks are in a better position compared to conventional and Islamic window banks.

Secondly, with respect to liquidity risk, there is a significant difference in almost all indicators. The findings show that Islamic banks were less liquid than conventional and Islamic window banks during the entire sample period. For instance, the interbank indicator for Islamic banks is substantially less than for conventional banks. In addition, other

indicators, such as liquid asset to deposit and short-term funding and liquid asset over deposit and borrowing, are consistent with this finding. Interestingly, the findings show that there were significant econometric differences during the global financial crisis and intensively during sovereign crisis. Hence, our findings suggest that Islamic banks did not change their business strategy and culture with respect to liquidity as a result of their performance during the global financial crisis. Overall, the results reveal that conventional and Islamic window banks are better than Islamic banks in terms of liquidity risk.

Thirdly, we find some evidence that Islamic banks' stability is affected differently from conventional and Islamic window banks by some bank-specific factors. For instance, we find that Islamic banks' credit risk is more sensitive to the capitalization ratio than conventional and Islamic window banks. In contrast, we find that Islamic bank's credit risk is not sensitive to the diversification ratio compared to conventional and Islamic window banks. Concerning the liquidity, we find that the cost to income ratio is also significantly related with liquidity risk in Islamic and banks, however the results are conflicting. In contrast, the evidence from conventional banks is positive and significant. We also find that oil prices have no substantial influence in the banks' risk in all the three financial institutions.

Furthermore, the findings suggest that Islamic banks are relatively less profitable and efficient than conventional banks, significantly so when compared to Islamic window banks. This is probably due to the conservative operations of Islamic banks. The growth of total assets is significantly greater in Islamic banks. This supports the fact that Islamic banks are the fastest growing financial sector. In terms of diversification, the ratio of non-interest income is significantly higher in Islamic banks. This suggests that Islamic banks have a higher diversification. The results reveal that Islamic window banks have the largest bank size, which indicates that it is large banks that tend to have Islamic windows.

The remainder of this paper proceeds as follows. Section 3.2 presents the literature review, which includes the theoretical and empirical reviews. Section 3.3 outlines the hypotheses and the reasoning for the determinants. Section 3.4 outlines the methodology of this research including all variables and the econometric methodology. Section 3.5 presents the data and preliminary analysis. Section 3.6 discusses the analysis and findings. Section 3.7 presents the conclusion of this chapter.

3.2. Literature Review

The prior literature related to the topic of this chapter can be classified into two main categories. The first focuses on theoretical aspects of the debatable comparison between

Islamic banks and conventional banks with respect to liquidity risk and credit risk. The second is the empirical literature review in banking in general and Islamic banking. Thus, this section presents both theoretical and empirical aspects.

3.2.1. Theoretical Literature Review

Islamic banks face the same risks that are encountered by conventional banks such as credit liquidity, operation, insolvency, market risk and others. However, the extent of these risks is different due to the unique Islamic model which follows the Islamic *Shariah*. This makes the nature of these risks differ from conventional banks. The contract between parties is one of the special features of Islamic banking. The following sections will illustrate these differences in detail with respect to credit risk and liquidity risk.

3.2.2. Risk in Banking Institutions

Risks fall into different categories and can be categorized in several ways. One way is to categorize risks as business or financial risks. Business risks are risks that are associated with the nature of a firm's business. This refers to factors that impact the product market. Jorion and Khoury (1996) argue that financial risks stem from losses in the financial markets attributed to the changes in financial variables. Business risks are linked to leverage and the risk that obligations and liabilities cannot be met with current assets (Hassan 2009).

Akkizidis and Khandelwal (2007) classify risk into three main categories: operating , financial, and business. Financial risk includes three risks: credit, liquidity, and markets risks. Business risk relates to management and strategic risk. On the other hand, operating risk refers to process systems, people, and an array of different factors. For example, these other risks can be commodity, country, reputation, legal, and regulatory risks.

Khan and Ahmed (2001) divide risks into systematic and unsystematic components. Systematic risk refers to the overall market or economy risk. Unsystematic risk is associated with a specific firm or asset. The asset-specific unsystematic risk can be mitigated through a diversified portfolio. In contrast, systematic risk cannot be mitigated through diversification. However, it can be controlled in different ways, such as through transferring techniques.

After classifying risks into financial and operating risks, the financial risk is broken down into credit, liquidity, and market risks. Ahmed (2010) groups risks into four categories: financial, operating, business, and event risks. In each of these categories, there are sub-categories. There are different effects and influences of each risk in these sub-categories that depend on the types of banks applied – Islamic or conventional. A noteworthy point to raise

here is that not all risks are applicable to conventional banks, but all of them are applicable to Islamic banks due to the differences in the nature of operations. Iqbal and Mirakhor (2011) provide four main categories that face Islamic banks: financial, business, treasury, and governance risks.

Van Greuning and Iqbal (2008a) divided risks into four main types which are shown in Table 3.1. Financial risks may considerably increase the overall risk profile due to complex interdependency. For instance, if a bank is involved in foreign currency business, the bank is usually exposed to currency risk, but the bank will be exposed to liquidity, credit, and reprising risks if it carries no matches in this future book. Operating risk is associated with the organization and function of a bank, such as technologies, assessments of mismanagement, and fraud. Business risk is related to a bank's business environment, such as macroeconomic and policy affairs, regulatory factors, and the financial sector's infrastructure including payment systems. Event risk refers to all exogenous factors that undermine the financial condition and capital adequacy of the bank.

Table 3.1: Risk Classifications

Financial Risks	**Operating Risks**	**Business Risks**	**Events Risks**
Balance sheet structure	Internal fraud	Macro policy	Political
Income Statement structure and profitability	External fraud	Financial infrastructure	Contagion
Capital adequacy	Employment practices and workplace safety	Legal infrastructure	Banking Crisis
Credit	Clients, products, and business services	Legal liability	Other exogenous
Liquidity	Damage to physical assets	Regulatory compliance	
Market	Business disruption and system failures (technology risk)	Reputational and fiduciary	
Interest rate	Execution, delivery, and process management	County risk	
Currency			

Source: (Van Greuning and Iqbal 2008a)

Islamic banks face two types of risk in their operations: risks similar to those of conventional banks and risks unique and specific to Islamic banks. Despite the similar risk between Islamic and conventional banks, Islamic banks are set on different foundations due to the nature of their financial instruments which must comply with *Shariah* principles and are therefore unique and complex. Akkizidis and Khandelwal (2007) argue that despite the similarities,

these risks stem from different origins, impacts, and implications in Islamic banking. The prohibition of interest, which makes all transactions based on the element of materiality, leads to a tangible economic purpose. The utilization of profit and loss sharing between different partners in transactions and their associated risks are explained in depth in Chapter Two. Risk varies from one type to another at different points of a transaction. To illustrate, the *Salam* contract can expose a bank to credit risk, and at the end of the contract it may expose the bank to commodity price risk. This research will explore and investigate the common risks between Islamic banks and conventional banks.

Credit Risk:

Nelson (1997) defined credit risk as a missed payment or a broken agreement; it is also referred to as default risk. Martens et al. (2010) described credit risk as *'the chance that a debtor or issuer of a financial instrument will not repay principal and other investment-related cash flows according to the terms specified in an agreement*'. Most banks face this type of risk, and they use different mechanisms to manage it, such as county, limiting large exposure, diversification, internal and external ratings, among others. Ahmed and Grais (2014) argue that there are factors that determine credit risk, including: (1) rating of the counterparties; (2) nature of the legal and judicial system; (3) quality of collateral; (4) maturity of the credit facility; (5) size of banking and trading books; and (6) internal control system.

3.2.2.1. Credit Risk in Islamic Banks

The unique features of Islamic banks result in the following credit risk characteristics: Firstly, One of the main features of Islamic banks is the ability to pay back any transaction with tangible real and underlying assets (Iqbal 2007). This causes Islamic banks to have the advantage of payback with collateral. This causes Islamic banks to have higher collateral levels than conventional banks. Thus, theoretically, Islamic banks may have a lower default risk. In conventional banks, borrowers are usually not asked to explain the reason for borrowing money and where it will be spent. In Islamic banks, however, customers are obliged to disclose where the money will be spent because Islamic banks have a legal partnership with the customer until the final payment. For example, under diminishing *Musharakah*, a bank acquires the asset and leases it to the customer, and the ownership transfer will take place at the end of payment. This gives banks the ownership right in case of default, allowing them to sell the asset in the market. A different credit analysis focuses on

the collateral to secure the financing contract and to assess the liquidity of the assets (Kureshi 2015). Though Islamic banks appear to have an eviction and resale right, collecting foreclosed collateral by Islamic banks is difficult in practice, particularly in the case of real estate properties, due to social responsibility.

Secondly, difference of opinion among *Shariah* scholars creates a special risk for Islamic banks. For example, while the *Murabaha* contract is an acceptable model of finance used in Islamic banks, some consider the contract binding for the sellers and not buyers, while the majority consider it binding for both parties. OIC *Figh* Academy believes that any party defaulting is responsible for compensating the wronged party. Another example, is that some scholars challenged the compliance of *Ijara* ending in ownership (Wahyudi 2015). Different views might raise counterparty risk as a result of ineffective litigation (Khan and Ahmed (2001).

On the other hand, some argue that the credit risk of Islamic banks is high because of the asymmetric information embedded in profit and loss sharing. The customer might not provide appropriate information regarding the profit that should be shared, which might increase the probability of default. This issue challenges Islamic banks to know or accurately monitor the activities of the customer.

In addition, Islamic banks are rendered more complex by further externalities. For example, if a customer fails to make a payment, Islamic banks are prohibited from charging interest, unless the customer's failure was deliberate. This makes managing credit risk in Islamic banks more challenging than in conventional banks.

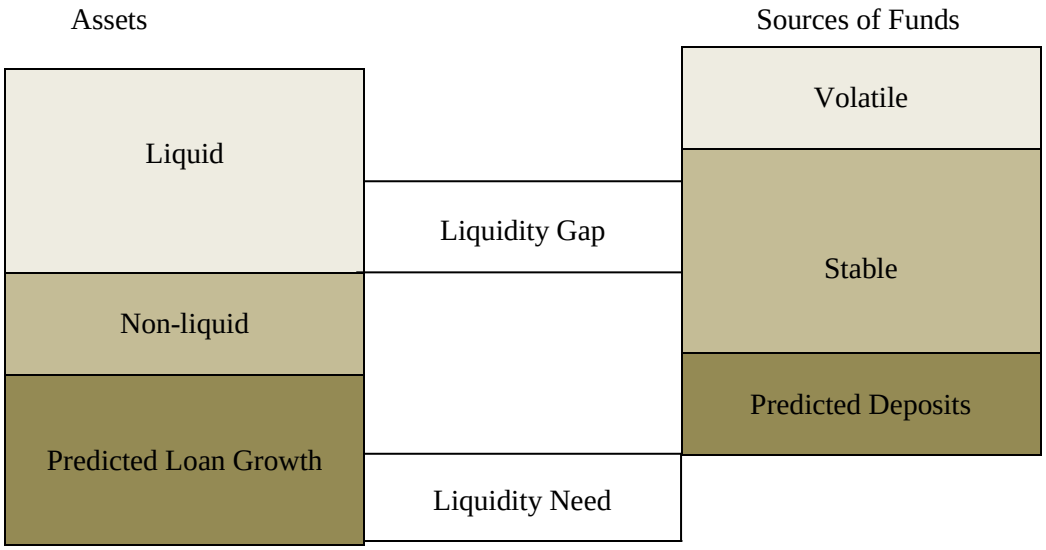
Liquidity Risk:

Liquidity risk is considered to be one of the main causes of bank failure. Its role is crucial in mitigating expected and unexpected fluctuations in the balance sheet and providing a fund for growth. Iqbal and Mirakhor (2011) argue that liquidity risk refers to the ability to cope with any redemption from borrowers or any other liabilities that impact stability. Ismail (2010) defines risk as the inability of banks to pay back their financial obligations and the easiness of getting the required funds. Liquidity risk results when either the bank faces challenges in obtaining cash at acceptable cost from borrowers, which is called funding risk, or the bank has difficulty in the sale of assets, which is called asset liquidity risk. To elaborate further, funding risk arises from the inability to access unsecured funding recourses at an economically low cost to meet obligations. Asset liquidity focuses on the availability of

assets such as marketable securities, inventories, receivables, and any assets which can be easily sold to generate cash. In other words, asset liquidity risk is the risk associated with the loss stemming from the inability to convert liquid assets into cash at carrying value to cover obligations.

In practice, there are two main causes of liquidity; the first is that banks regularly find imbalances (liquidity gap) between the asset side and the liability side that must be equalized because banks accept liquid liability but invest in illiquid assets (Bessis 2015). The second cause is when the predicted amount of funds available on the asset side is greater than the predicted amount on the liability side (liquidity need; see Figure 3.1)

Figure 3.1: Liquidity Gap and Liquidity Need



Source: (Hempel 1999)

Note: Liquid refers to liquid assets such as short term securities, federal fund certificates, and temporary investment instrument. Non-liquid stands for mortgages, commercial loan and equipment. Volatile: stands for seasonal deposits, short term borrowings, and large CDs. Stable: refers to stable demand deposit, savings, consumer CD, and equity capital.

Liquidity risk might occur if that gap has not been managed properly and thus causes undesirable consequences. The inefficiency of managing liquidity is due to the strength of liquidity pressure, the preparation of a bank's liquid instruments, the bank's condition at the time of liquidity pressure, and the inability of the bank to access internal or external liquid sources. Table 3.2 illustrates some of the internal and external factors which may potentially affect liquidity risk.

Table 3.2: Internal and External Factors for Liquidity

Internal Factors	***External Factors***
High off balance sheet exposure	Very sensitive financial markets and depositor
The banks rely heavily on short-term corporate deposit	External and Internal economic shocks
A gap in the maturity dates of the assets and liabilities	Low or slow economic performance
The bank's capital asset expansions exceeds the available funds on the liability side	Decreasing depositors' trust on the banking sector
Concentration of deposits in the short-term tenor	Non-economic factors (political, unrest, etc.)
Less allocation in the liquid government instruments	Sudden and massive liquidity withdrawals from depositors
Fewer placements of funds in long term deposit	Unplanned termination of government deposits

Source: Adapted from (Iqbal and Mirakhor 2011) (Antonio 1999), (Alsayed 2007) and (Ismal 2008)

3.2.3. Liquidity Risk in Islamic Banking

Islamic banks have traditionally held high levels of cash/liquid assets, ideally to safeguard the interests of their depositors, investors and shareholders against credit upheavals and liquidity crunch. Moreover, from leverage perceptive, the operations of Islamic banking are set on conservative foundation principles that discourage the use of inappropriate levels of debt to finance assets. Furthermore, uncertainty in investments is discouraged, which has impeded the industry in terms of its use of leverage. Thus, an Islamic bank’s funding portfolio is highly concentrated in a few liquid assets and is deficient in terms of its securities asset base (Mobin and Ahmad 2014).

In general, banks face a crucial challenge in managing the asset-liability which causes liquidity risk. For instance, long term assets are financed by long term liabilities, which is a common issue. As far as Islamic banks are concerned, this issue is not as severe since high proportion of Islamic banks assets are short-term (Murabaha contracts) (Iqbal and Mirakhor 2011). Islamic banks use short and medium term liabilities to finance long term assets. Currently, Islamic Banks are highly dependent on short term funds to manage their longer-tenure liabilities. This issue has become even more crucial in today‟s capital market environment because the frequency of asset write-downs is on the rise.

The liabilities of Islamic banks are also different from conventional banks and give Islamic banks more flexibility in liquidity and default (two types of deposits (profit sharing like with two types, capital grantee and no capital grantee).

Islamic banks face certain challenges. Firstly, Islamic banks lack liquid *Shariah*-compliant instruments since *Shariah* law restricts asset securitisation that takes the form of debt instruments except when traded at par value. Thus, Islamic banks do not have options to sell debt-based assets. This is a limit on diversification and makes banks struggle to manage the gap between asset and liability.

Secondly, another challenge that Islamic banks face is the lack of an active interbank market due to the lack of capital markets for Islamic banks. Thirdly, the function of lender does not exist under Islamic banking operations since it is based on interest, which is prohibited; as a result, Islamic banks have a significant challenge (Makiyan 2008). Fourthly, the slow development of alternative financial instruments in Islamic banks makes raising and managing liquidity risk more difficult than in conventional banks. Fifthly, the special characteristics of Islamic banking operations make managing liquidity difficult. Examples include the inability to trade *Murabahah* or *Salam* contacts or the cancellation risk in *Murabaha* (Alvi 2009).

However, Ariffin et al. (2009) state that Islamic banks have their own techniques for managing a sufficient liquid portion of investment accounts that acts as a cushion against liquidity issues. The introduction of *Sukuk* funds creates a secondary market for *Sukuk* and also helps both liquidity and secondary market tradability (Kayed and Hassan 2011). However, Limited number of banks issued sukuk. Most of the banks count on deposits. In practice, Islamic banks offer two categories of deposits accounts: (i) a deposit account having a random remuneration (positive or negative) [i.e. mimics profit sharing] with no guarantee of the face value (ii) the other account does not provide remuneration but only guarantees the face value not the return (See Amrani et al 2017). Therefore, the bank can strengthen its liquidity by attracting remunerated deposits instead of increasing equity level.

Furthermore, the Islamic Banks Service Board (Board 2005) has issued two principles for managing liquidity risk. The first principle encourages Islamic banks to have an effective liquidity management and reporting framework. The second principle requires Islamic banks to assess liquidity risk adequately.

The earlier sections detailed the characteristics of Islamic banks that make them different from conventional banks. Although there is a theoretical debate regarding the nature of risk associated with Islamic banks and its implications, Islamic banks tend to be safer than

conventional banks. Banking theory (Diamond and Rajan 2001) states that discipline and commitment from depositors reduce risky bank lending. Renneboog and Spaenjers (2012) analysed the effect of religious affiliation on risk and investment behaviour. They found a positive correlation between religious affiliation and risk aversion. The Islamic bank's depositors are more loyal toward the Islamic banks which mitigate the risk of lending.

3.2.4. Empirical Literature Review

Most of the literature on Islamic banks focuses on performance and efficiency. Yudistira (2003) investigates the efficiency of Islamic banks in Malaysia and Bahrain over the period 2008 to 2012. Mohamad et al. (2008) examine the cost and efficiency of 43 Islamic banks across 21 countries using the Stochastic Frontier Approach (SFA) and find that Islamic banks are efficient. That is consistent with the finding of (Johnes et al. 2014) that Islamic banks have significantly higher net efficiency than conventional banks. In contrast, Rosman et al. (2014) find that Islamic banks across the Asian countries were not efficient during the recent financial crisis.

In addition, there are other areas of research such as (Shaban et al. 2014) who examined banks' willingness to lend to small businesses, comparing Islamic and conventional banks. Abdelsalam et al. (2014) examined the socially responsible investments of Islamic banks. El-Komi and Croson (2013) investigated Islamic microfinance. Abedifar et al. (2016) employed 22 Muslim countries to investigate the relationship between market share and the development of financial intermediation. Their study reveals a significant relationship, and the results show that a greater market share of Islamic banks is linked to the efficiency of conventional banks. Saeed and Izzeldin (2016b) investigated the relationship between efficiency and default risk between Islamic banks and conventional banks. They found that causality from profit efficiency to default risk is inversely related for all categories, with the single exception of Islamic banks. Abdelsalam et al. (2016) examined the relationship between organizational religiosity and the earning quality of Islamic banks in the Middle East and North Africa region during 2008-2013. The study revealed that Islamic banks are less likely to manage their earnings.

Another dimension examines the corporate governance of Islamic banks. Mollah and Zaman (2015b) investigate the impact of corporate governance in Islamic banking. They principally examine the effect of *Shariah* supervision boards, board structure, and CEO power on performance during the period 2005–2011. The study proves a positive association between *Shariah* supervision boards and Islamic banks' performance. They also find that board

structure (board size and board independence) and CEO power (CEO-chair duality and internally recruited CEO) are negatively linked with the performance of Islamic banks. Mallin et al. (2014a) investigate the impact of corporate social responsibility (CSR) on the financial performance of Islamic banks. They find that Islamic banks engage in a range of social activities, both as individual banks and as countries. Additionally, the study revealed that Islamic banks are more committed to vision and mission, the board and top management, and the financial product/services dimensions.

Gheeraert (2014b) studies the impact of Islamic banks on the development of the banking sector and provides significant empirical evidence that the development of Islamic banking in Muslim countries contributes to higher banking sector development. In addition, Gheeraert (2014b) finds that the Islamic banking sector acts as a complement to conventional banking in Muslim countries. Gheeraert (2014a) examines the impact of Islamic banking on banking sector development, examining the loan provision used by investors to value banks across the Middle East. The study proves a positive relationship between loan and value relevance to investors. The focus of the recent literature dimension is on risk in Islamic banks. Ali (2007) points out that Islamic banks are riskier due to the lack of sound corporate governance. Beck et al. (2013) look at whether the recent financial crisis justifies a closer look at Islamic banks. They prove that Islamic banks are less cost-effective and have higher asset quality. Saeed and Izzeldin (2014) examine the relationship between efficiency and default risk in Islamic banks and conventional banks over the period 2002-2010. Azmat et al. (2014) investigate Islamic joint venture bonds and whether the credit risk of the conventional structure captures Islamic bonds' underlying risk, from 52 Malaysian Islamic bond issuers. Many limited studies (Abedifar et al., 2013; Becker and Milbourn, 2011; Baele et al., 2014) have investigated the risks and stability of Islamic banks.

However, the majority of these studies were either before or during the recent global financial crisis, and behaviour, culture, and regulation are much different after the global financial crisis. Moreover, according to the author's acknowledgement, this is the first research that has studied the sovereign debt crisis within Islamic banks, particularly in terms of liquidity risk. In addition, empirical investigation is few on determinants of banks' stability with respect to credit and liquidity risk within Islamic, conventional, and Islamic window banks.

3.3. Hypotheses Development

This section provides the propositions and presents the rationales for inclusion for each of the variables included in the analysis in the context of theories and literature of related risk in

banking. This section is categorized down into three sub-sections which are: credit and liquidity risk, bank-specific determinants, and macro-level determinants.

3.3.1. Credit and Liquidity Risk

As the previous sections illustrated the characteristics and nature of credit and liquidity risk in Islamic banks compared to conventional banks and given the research aim, objectives, and questions, the following hypotheses are established. From what has been discussed earlier, it is expected that Islamic banks are less risky than conventional banks. Accordingly, hypothesis, below, is developed.

H1. Islamic banking is more resilient than conventional banking.

H1.1 Islamic banking has less credit risk than conventional banking.

H1.2 Islamic banking has less liquidity risk than conventional banking.

3.3.2. Bank-Specific Determinants

Based on the existing literature, the following hypothesises has been developed. These hypotheses are applied for all the three different types of banks: Islamic, conventional and Islamic window . They are also applied for both types of risk: credit and liquidity risk.

Size: There is a broad range of literature discussing and supporting the results that show that bank size affects the internal control and operations of banks (Caprio et al. 2007). Hannan and Hanweck (1988) argue that large banks experience lower risk owing to inferred reduction due to the notion of 'too big to fail'. Laeven et al. (2016) study the bank-specific characteristics that determined bank risk during the recent financial crisis. They find that bank systematic risk grows with size. However, many studies argue that a large scale of operations leads to enhanced diversification and scales of economies that reduce overall risk (Hughes et al. 2001; Istaitieh and Rodríguez-Fernández 2006). Moreover, a recent study conducted by De Haan and Poghosyan (2012) suggests that bank size is negatively associated with earnings volatility, and the relation was stronger during the recent financial crisis. Thus, the expected link is strong and negative.

H2: *Bank size negatively affects risk level.*

Capitalization: The equity capital to asset ratio reflects the effect of capital structure and regulation on banks' risk. A higher equity ratio leads shareholders to monitor the activities of the bank which consequently reduces risk-taking (Dinger and Von Hagen 2009). In addition,

some studies found that banks with greater capital ratios are more able to absorb losses during financial turmoil (Beltratti and Stulz 2012). Tan (2016) argues that capitalization has a negative impact on banks' performance for several reasons. First, a higher capital level reduces the funding cost for the banks. Second, banks which have higher capital ratios are more likely to engage in prudent loans; this leads to more quality assets and less risk. Third, capitalization has a significant role in absorbing the risk arising from higher risk assets, such as loans. This ratio is included to investigate the correlation between risk in the banking sector in general and to study the relationship between the three different banks: Islamic, conventional, and Islamic window.

H3: Capitalization negatively affects the risk level.

Diversification: The evidence of the impact of diversification on bank risk is inclusive. Stiroh and Rumble (2006); Tan and Floros (2012) argue that more income can be generated when banks are involved in a number of different businesses. In addition, banks with activities have the ability to reduce the costs from economies of scope, which enhances stability. In contrast, some studies find that non-interest income can reduce the solvency of banks. Ashraf et al. (2016) claim a negative relationship between diversification and risk. Moreover, a study conducted by (Maudos 2017a) shows that an increase in the share of on-interest income had a negative impact on stability in the financial crisis on which we based our examination. Following a recent reliable study, Che and Liebenberg (2017) argue that when a focused firm diversifies, it increases its asset risk relative to firms that remain focused. In the context of Islamic banks, signal empirically that Islamic banks managers' rely on the diversification portfolio thus they have hold less capital.

H4: Diversification positively affects the risk level.

Efficiency: Fiordelisi et al. (2011) suggest, in their study, that lower bank efficiency with respect to costs and revenues causes higher bank risk. Moreover, Williams (2004) assesses the impact of efficiency on the riskiness of banks; the study suggests that banks which are managed poorly tend to make poor quality loans. Consistently, (Dong et al. 2017) show a negative link between cost efficiency and risk. Kwan and Eisenbeis (1997) find a negative impact of inefficiency on risk-taking that supports the moral hazard hypothesis where poor performers are more vulnerable to risk-taking.

H5: Efficiency negatively affects the risk level.

Control Variables-Micro Level

Profitability: Rajan (1994) argues that higher profits lead to increased NPLs. This possibility exists where the policy for credit is to maximize profits and short-term reputation. Consequently, manipulations in earnings might occur by bank managers to achieve the confidence of the market. This also might lead banks with high profits to have a low quality of assets. In rebuttal, banks with greater profitability are likely to have a strong financial position. In addition, there are fewer incentives for highly profitable banks to engage in high-risk operations. Following (Berger and DeYoung 1997), the expected relation between profit and risk is negative. This ratio is included to test the impact of profit on risk and to determine whether there is any variation between the three different banks.

Loan Growth: There is little evidence regarding the impact of loan growth on bank risk (Laeven and Majnoni 2003). Keeton (1999) suggests, in his study, that a higher growth rate leads to higher loan losses. Dell'Ariccia and Marquez (2006) argue that lowering interest rates, relaxing collateral requirements, and loosening credit standards might affect the growth rate. This expansion in credit can increase the vulnerability of banks, principally during a financial crisis. In a recent influential study conducted by Foos et al. (2010), researchers employed more than 16,000 banks during 1997-2007. They find that loan growth is a significant driver of the riskiness of banks and that loan growth leads to an increase in loan assets risk provision. This ratio is included to test the effect of loan growth on credit risk and liquidity risk under the three different banks.

3.3.3. Macro-level Determinants

*Oil Pric*e: There is limited literature on the impact of oil price variation on the economy in general and in the banking sector in particular. The existing literature has no consistent conclusion regarding the precise impact of oil prices. However, a recent paper by (Khandelwal et al. 2016) shows a negative link between oil prices and the performance of banks in general. In addition, Miyajima (2016) claims that the growth of oil prices is negatively associated with the non-performing loan ratio. Consistently, Callen et al. (2015) conducted a study to investigate the consequences of oil price variation; they show that a decrease of 1% in oil price leads to around a 0.1% increase in the NPL ratios of banks. The correlation is attributed to the view that price variation impedes the ability of borrowers to

pay the interest rate and the principal. The oil average is included to test the impact of price fluctuation on risk in the banking sector, particularly on Islamic banks.

H6: Oil prices negatively affect the risk level.

Control Variables-Macro Level

Competition: Rhoades and Rutz (1982) show a negative relationship between bank concentration and proxy indicators of risk-taking such as non-performance loans. Boyd et al. (2006) present a cross-country study using different measures of risk such as Z-score. They argue that concentration (HHI) is negatively associated with stability. An influential study conducted by (Keeley 1990) presents evidence that increasing competition induced banks to increase their risk profile. Less competition leads to greater interest rates on loans which consequently might raise credit risk as a result of the moral hazard issue. Consistently, Boyd and De Nicolo (2005) conclude that less competition leads to a higher interest rate on loans which consequently might raise credit risk as a result of moral hazard issues. The empirical literature review concludes that there is a negative link between competition and risk.

Interest Rate: There is a broad range literature that proves the relationship between interest rate and stability of the banking sector (Carling et al. 2007; Chen et al. 2017). The literature exhibits a strongly positive impact of the level of interest rates on risk-taking. Delis and Kouretas (2011) employed 18,000 observations of European banks during 2001-2008. The results show that lower interest rates impact bank risk-taking positively and substantially. Higher interest rates lead to a higher value of borrowers' debt, and debt service becomes more expensive. This leads to an increase in loan default that affects the soundness of the bank. Following the previous literature (e.g, Ghosh 2015), this study uses real interest rates to adjust for inflation to measure the real interest rate for lending.

National Economic: This study also uses different national economic conditions such as GPD per capita and GDP per capita growth. Bikker and Metzemakers (2005) find that GDP growth negatively impacts bank loan loss. (Salas and Saurina 2002) predict a negative effect of GDP growth on NLPs. Louzis et al. (2012) studied the macroeconomic variables that affect loan quality. They find that GDP has a negative effect on loan quality in the Greek banking sector. These economic factors affect the impact of business cycles on loan quality. Following the broad literature, we expect a negative relationship.

3.4. Methodology

3.4.1. Dependent Variables

Table 3.3 presents all the variables used as a proxy for both credit and liquidity risk. The table explains the definition of the variables, the literature that used these proxies, and the sources of these variables. After reviewing the literature, it was noticed that credit risk measurement can be grouped into three techniques: credit rating agencies, such as Standard and Poor's, Moody's, and Fitch, market-based analysis, and accounting standards (Altman and Saunders, 1997; Allen and Powell, 2011; Wipplinger (2007). There is wide debate regarding the credibility of credit rating agencies as a measurement tool for credit risk exposure (Becker and Milbourn 2011) (Bolton et al. 2012). Concerns have been expressed regarding the timeliness and predictive accuracy of the ratings, particularly after high-profile cases such as Enron, Worldcom, the Lehman Brothers bankruptcy, and the recent financial crisis. The most used technique to evaluate credit risk is analysis of market risk, such as the value at risk method (VaR). However, adapting VaR as a measure for credit risk has challenges, complexity, and limitations. Berger et al. (2014) explain that loans are not always traded. Even when they are traded they trade infrequently, and there is no available history of daily price fluctuations. This study employs loan loss reserves ratio as an indicator of credit risk which are the primary proxy for credit risk. For further robustness checks, the research will utilize other ratios such as charge-off ratios, namely net charge-off/average gross loan and net charge-off loans/average net income before loan loss provision. Rose and Hudgins (2005) define charge-offs as loans that have been declared worthless by a bank and written off its books. These proxies represent the loan quality of the bank, which have been widely used in banking literature (Jayaratne and Strahan 1998; Cardone-Riportella et al. 2010; Imbierowicz and Rauch 2014; Shaban and James 2017).

With respect to liquidity risk, as Table 3.3 shows, this study uses six measures which examine three dimensions of liquidity risk. Interbank ratio is used to investigate the liquidity; this ratio is defined as a percentage ratio of money lent to other banks scaled by money borrowed from other banks. Interbank ratio has been used broadly in the banking literature (Bannier and Hänsel 2008; Cardone-Riportella et al. 2010; Andrea and Sette 2015). With respect to long term liquidity risk, the study considers the following three proxies: net loan divided by total assets, net loans divided by customers and short term funding, and net loans divided by customers and short term fund. These ratios represent the relationship between net loans and either with total assets, total deposits and customer deposits. These proxies have

been used in the literature (DeYoung and Jang 2016; Cardone-Riportella et al. 2010). With regards to short term liquidity, the study used two ratios which are: liquid assets divided by customers and short term fund and liquid assets divided by deposit and borrowing. These ratios are considered as a measure of liquidity by excluding inventories, prepaid expenses, and other current assets that are not liquid. Thus, Koch and MacDonald (2010) argue that the quick ratio is a conservative measure of aggregate liquidity. This ratio is calculated by subtracting the volume of all assets which the bank can quickly liquidate and turn into cash to cover possible short-term withdrawals from the volume of the liability. These proxies have been in line with established literature (Dinger 2009; Battaglia and Gallo 2013; Gombola et al. 2016a; González et al. 2016)

Table 3.3: Dependent Variables Definitions

Variable	Unit	Definitions plus reasons for inclusion	Source
		Credit Risk Variables	
Loan Loss Allowance	%	This ratio is calculated by dividing the loan loss reserves allowance by gross loan. Loan loss allowance is considered for the entire loans portfolio, and not only for impaired loans. Managers assess the quality of the loans portfolio and determine the required reserves. Then the current level of loan loss reserve is adjusted to reach the required level. The adjustment will be reflected in the loan loss provision stipulated in the income statement. When a bank decides to write off a loan, the loan amount is deducted from the loan loss reserve. The higher the ratio, the poorer the quality of the loan portfolio will be. This ratio is used as core proxy to assess banks' credit risk. (The higher this percentage is, the poorer the quality of assets will be) References: (Dinger and Von Hagen 2009; Cardone-Riportella et al. 2010; Beck et al. 2013; Kim and Sohn 2017)	BankScope database
Loan Loss Provision	%	Loan loss provision is the incurred cost to banks of adjusting the loan loss reserve or writing off a loan. Hence, loan loss reserve is a stock, while loan loss provision is a flow and is stipulated in the income statement. It is possible to have a negative loan loss provision in one period when the required loan loss reserve is lower than the current reserve. This is a robustness variable to assess banks' credit risk. (The lower the better) References: (Kwan 2003; Lepetit et al. 2008; Beck et al. 2013; Tajik et al. 2015; Khan et al.)	BankScope database
Net Charge-Off	%	The net charge-off (NCO) ratio is calculated by dividing net charge-off by average gross loans. A net charge-off is a debt owed to a bank that is unlikely to be recovered by that bank. Which is based on the difference between loans actually written off and recoveries on loans previously classified as uncollectible? Recoveries refer to the amount of loans that were previously charged-off but subsequently collected. The lower this figure, the better, as long as the write-off policy is consistent across comparable banks. This is a proxy for credit risk References: (Angbazo 1997; Moussa 2015; Gombola et al. 2016b; Shaban and James 2017)	BankScope database
Impaired Loans	%	This ratio is calculated by dividing impaired loans by gross loans. Impaired loans increase when a bank classifies a specific loan or a part of a loan portfolio as bad. It decreases when either a bank re-assesses a problem loan or part of a portfolio or when a bank writes off a loan or a part of the loan portfolio. The lower this figure is, the better the assets' quality. This is an alternative measure for credit risk of banks. (The lower the better) References: (Chen 2007; Berger et al. 2016b; Trad et al. 2017; Aydemir and Guloglu 2017)	BankScope database

Continued

Table 3.3: Dependent Variables Definitions

Variable	Unite	Definitions plus reasons for inclusion	***Source***
		Liquidity Risk Variables	
Interbank	%	The interbank ratio is calculated by dividing total deposits placed with other banks (interbank assets) divided by total deposits received from other banks (interbank liabilities). In other words, it is the money lent to other banks divided by money borrowed from other banks. If this ratio is greater than 100, then it indicates the bank is a net placer rather than a borrower of funds in the marketplace and is, therefore, more liquid. This is a core variable for assessing liquidity risk. (The higher the more liquid) References: (Bannier and Hänsel 2008; Cardone-Riportella et al. 2010; Andrea and Sette 2015)	BankScope database
Net Loans / Total Assets	%	The ratio of net loans to total assets indicates what percentage of the assets of the bank is tied up in loans. This ratio simply weights net loans against total assets to see what proportion of a bank's assets are in the form of these less-liquid earning assets. The higher the ratio, the less liquid the bank is; this ratio is the core proxy for liquidity risk. (The higher the less liquid) References: (Lee and Hsieh 2013; DeYoung and Jang 2016; Mollah and Liljeblom 2016)	BankScope database
Net Loans / Dep ST Funding	%	The ratio of net loans to deposits and short-term funding. The ratio represents the relationship between loans and deposits as a percentage. This is often called reserves-to-deposits. In this ratio, all loans are considered equally illiquid (which is clearly a strong assumption). (A higher ratio indicates a less liquid bank) References: (Cardone-Riportella et al. 2010)	BankScope database
Net Loans / Total Dep Bor	%	This ratio is the total amount of liquid assets available divided by the sum of deposits and borrowing. (A higher ratio indicates a less liquid bank) References: (Cardone-Riportella et al. 2010)	BankScope database
Liquid Assets / Dep ST Fund	%	This proxy considers the ratio of liquid assets to deposits and short-term funding. The numerator is computed from all reserve assets (and hence implicitly assumes that all are equally liquid). This ratio can be considered as a deposit run ratio since it is a proxy for the percentage of customer deposits and short-term funding that could be met if they were withdrawn suddenly. The higher this ratio, the more liquid the bank is and the less vulnerable it is to a classic run on the bank. (A higher ratio indicates a higher liquid bank) References: (Dinger 2009; Battaglia and Gallo 2013; Gombola et al. 2016a; González et al. 2016). (A higher ratio indicates a higher liquid bank)	BankScope database
Liquid Assets / Total Dep Bor	%	This ratio is the total amount of liquid assets available divided by the sum of deposits and borrowing.(A higher ratio indicates a higher liquid bank) References: (Bitar et al.; Bandyopadhyay et al. 2017; Shaban and James 2017)	BankScope database

Table 3.4: Explanatory Variables Definitions

Variable	Unit	Definitions plus reasons for inclusion	Source	Expected sign
		Bank Specific - Variables		
Islamic Banks	Dummy	It is a dummy variable which takes a value of one if the bank is Islamic otherwise it is zero.	Islamic Banks	
Islamic window banks	Dummy	It is a dummy variable for Islamic window banks, it takes a value of one if it is Islamic window and zero otherwise[4].	Conventional Banks	
Size	Log	Natural logarithm of total assets, to investigate a possible relationship between risk and size of banks.	Author's calculation based on BankScope	**(+)**
Noninterest Income	%	The share of non-interest income (excluding loan loss provision) in total operating income. This is a proxy for diversification	BankScope database	**(+)**
Cost to Income	%	Operating cost divided by operating income. A lower ratio indicates the efficiency of the bank. This is a proxy for efficiency.	BankScope database	**(−)**
Equity / Total Assets	%	Equity capital as a proportion to total asset, to assess the capitalization impact on banks' stability.	BankScope database	**(−)**
ROAA	%	This is a return on average assets ratio which is calculated by dividing net income by the average total assets. This ratio is a proxy for the profitability of a bank's assets. This is a proxy for profitability.	BankScope database	**(−)**
Loan growth	%	$(loan_t - loan_{t-1}) / loan_t$	BankScope database	**(+)**
		Country - Specific Variables		
GDP per Capita	$	Growth domestic product per capita. This is a proxy for national economy.	World Development Indicators (WDI)	**(−)**
GDP per Capita annual Growth	$	The annual growth of domestic product per capita.	World Development Indicators (WDI)	**(−)**
Inflation Rate	%	Yearly change of consumer price index. This is to investigate the effect of inflation on banks' risk.	World Development Indicators (WDI)	**(+)**
Real Interest	%	The nominal interest rate deducted from the rate of inflation. This is to assess the impact of this variable on bank's risk.	World Development Indicators (WDI)	**(−)**
Average Oil Price	%	This reflects the oil price on average basis.	Boombreg database	**(−)**
HHI Index	Index	Sum of squared market shares of banks in the system. This is a proxy for concentration.	Authors' calculation based on World Bank	**(−)**

[4] 'This study employs a dummy variable for Islamic banks and a dummy variable for hybrid bank. This way enables us to control the hybrid banks and compare fully Islamic banks with fully conventional banks'

3.4.2. Explanatory Variables

Table 3.4 explains the meaning of the explanatory variables used in this study along with the source of these data and the expected relationship. Following the previous studies (Cihák and Hesse 2008; Aubuchon and Wheelock 2010; Abedifar et al. 2013; Mollah et al. 2016), this study includes several explanatory variables which can be mainly grouped into two categories: bank-specific variables and country-level variables, as shown in the table below. Firstly, the study uses dummy variables to compare Islamic and conventional banks. Hence, this study employs a dummy variable for Islamic banks and a dummy variable for Islamic window banks. If a bank is Islamic, it takes the value of one and zero otherwise, and if a bank is Islamic window, it takes the value of one and zero otherwise. This way enables us to control the Islamic window banks and compare fully Islamic banks with fully conventional banks. This study includes a range of variables related to bank-specific characteristics: size, market share, return on assets, loan growth, equity capital ratio, cost to income, and noninterest income. The study also uses country and economic factors: inflation, GDP per capita, GDP per capita growth, real interest domestic credit, bank concentration, and inflation. The rationale of using these ratios has been explained in section 3.3 (Hypotheses).

3.4.3. Econometric Methodology

This section provides a detailed elaboration of the methodological and analytical basis for this study, such as fixed effect model, empirical model, and the estimation method. All the methods will be used to estimate and investigate the determinants of credit and liquidity risk. In general, descriptive statistics, econometrics techniques, estimations, graphs, and tables will be used to drive results for this study. We will utilize the following models to enable us investigating the credit and liquidity risk among the Islamic and conventional banks and the stability determinants. This model is estimated through applied fixed effect model which is presented below;

$$\begin{aligned}&\text{Credit Risk}_{\,i,t}\\&= \beta_{\,0} + \beta_1 \times \left(\text{Islamic Banks Dummy}_{i,t}\right) + \beta_2 \times \left(\text{Islamic window banks Dummy}_{i,t}\right)\\&+ \sum_{k=1}^{6} b_k \left(\text{Bank} - \text{Specific Variables}_{\,i,t}\right) + \sum_{m=1}^{6} \gamma_m \left(\text{Macro Level Variables}_{\,t}\right)\\&+ \varepsilon_{i,t} \qquad (1)\end{aligned}$$

$$\text{Liquidity Risk}_{i,t}$$

$$= c_0 + c_1 \times \left(\text{Islamic Banks Dummy}_{i,t}\right) + c_2 \times \left(\text{Islamic window banks Dummy}_{i,t}\right) + \sum_{k=1}^{6} \delta_k \left(\text{Bank} - \text{Specific Variables}_{i,t}\right) + \sum_{m=1}^{6} \mu_l (\text{Macro Level Variables}_{t}) + u_{i,t} \quad (2)$$

Where i stands for risk of bank i in year t. β_0, β_1, c_0, c_1 are unknown parameters to estimate; k is the independent variables for bank-specific variable; m is the independent variable for macro level variables. We use fourteen explanatory variables: such as bank size, capital ratio, ROAA, loan growth, efficiency ratio, noninterest income, HHI, Inflation, real interest rate, average oil price, GDP, and GDP Per Capita. These variables have been explained in depth in previous sections[5].

We examine the estimations by utilizing a panel data framework. The panel data approach is used because it has three main advantages over cross-sectional data. Firstly, it has the features of both cross-sectional data and time series variation in the data. More importantly, it controls for the presence of unobservable heterogeneity. Furthermore, this technique can address the problem of collinearity among explanatory variables (Verbeek 2008). However, the panel data approach might produce an unobserved bank-specific time invariant. Consequently, this might produce unbiased estimates. This is owing to the possibility that the error term might have variant bank-specific variables that might be associated with dependent variables.

The estimation method of this study uses fixed effect model. The fixed effect model and the random fixed effect model are the main methods that are used in fitting regressions with panel data. The Hausman test was applied to choose the appropriate panel estimation method. The results showed that the fixed effect should be used rather than the random effect. In using the fixed effect model, the unobserved effect (α_i) is thought to be correlated with one or more of the independent variables. In other words, it is a fixed effect when the unobserved effect is treated as fixed to be estimated across observations. Thus, the aim of this model is to eliminate the (α_i).

Furthermore, before making the estimations, the models have passed the basic tests to meet the key assumptions of regression models, such as (i) the misspecification test, (ii) serial

[5] Our data did not allow us to use year and country dummies variables owing to the fixed effect model applied in this paper. We also use additional specifications, including clustering the stand error term on bank level.

correlation test, (iii) heteroskedasticity test, (iv) multicollinearity test, and (v) normally distributed error term test. Table 3.5 presents the Pearson correlation for the variables used in this research. The results indicate that there is no presence of multicollinearity, as shown by very small correlation coefficients among the independent variables and the explanatory variables. For further possible multicollinearity (Table 3.5), a variance inflation factor (VIF) is used for all independent variables. 3.97 is the largest one, which is below the rule of thumb cut-off of 10 for multiple regression (N Gujarati 2004).

Table 3.5: Pearson Correlation Coefficients and Variance Inflation Factor (VIF)

To test for possible multicollinearity, we compute (VIF) for each independent variable and the largest one is 3.97, well below the rule of thumb of 10.0

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	VIF
Total Assets	1												3.97
Equity / Total Assets	-0.3588*	1											3.47
ROAA	0.0928*	0.0462*	1										2.02
Loan Growth	-0.1136*	0.0067	0.1236*	1									1.91
Noninterest Income	-0.1591*	0.1803*	0.0390*	0.0424*	1								1.81
Cost to Income	-0.3606*	0.1065*	-0.5932*	0.0270*	0.1136*	1							1.74
GDP per Capita	0.4657*	0.1898*	0.0569*	-0.0394*	-0.0590*	-0.2023*	1						1.48
GDP per Capita Growth	-0.1032*	-0.0739*	0.0343*	0.0661*	-0.0402*	0.0486*	-0.2885*	1					1.37
Inflation Rate	0.0279*	-0.012	0.0766*	0.0615*	0.0491*	-0.0074	-0.1662*	0.1125*	1				1.26
Real Interest	-0.1933*	0.0393*	-0.0513*	-0.0610*	0.0352*	0.0875*	-0.2457*	-0.1481*	-0.2451*	1			1.26
Average Oil Prices	0.0258*	0.0074	0.005	0.0079	0.0191	-0.0002	0.0790*	0.0168	0.1349*	-0.1971*	1		1.2
HHI Index	-0.0528*	-0.0255*	0.0743*	0.1144*	-0.0222	-0.0418*	-0.1379*	0.1138*	0.1026*	-0.1068*	-0.4165*	1	1.08

3.5. Data and Preliminary Analysis

3.5.1. Data

The focus of this study is on Islamic, conventional, and Islamic window banks that operate in the OIC (Organization of Islamic Countries)6. All the OIC countries are included in this study except for Somalia and Ivory Coas. The study covers 55 countries with a total of 950 banks, comprising 177 Islamic banks, 654 conventional banks, and 119 Islamic window banks. The period of the study is split into three periods: (i) 2006-2015 (full sample period), (ii) 2007-2009 (global crisis), (iii) and 2010-2013 (European crisis). The primary source of

[6] The study covers both listed and unlisted commercial banks

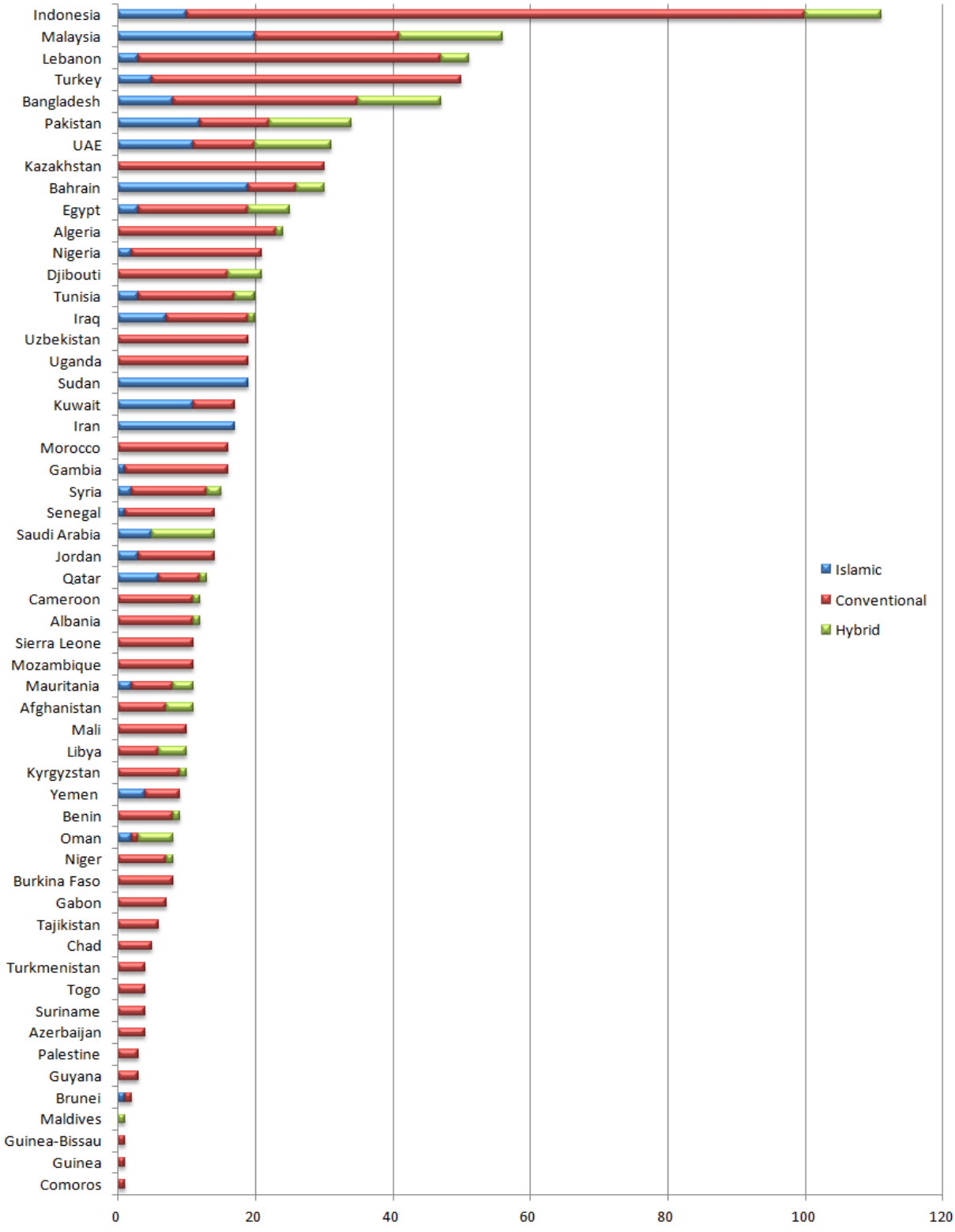
the data is Bankscope. Country-level macroeconomic data such as GPD, domestic credit, inflation rate, and real interest rate were obtained from the World Bank. The average oil prices were collected from Bloomberg. Table 3.6 and Figure 2.2 describe the sample distribution of this study. It reveals that Indonesia has the highest percentage of total banks, representing 11.67% (110 banks). The previous literature also reported Indonesia as the highest in terms of number of banks. The next highest percentage is Malaysia, Lebanon, Turkey, and Bangladesh, representing respectively 5.89% (56 banks), 5.37% (51 banks), 5.26% (50 banks), and 4.95% (47 banks). On the other hand, Guinea, Maldives, and Guinea-Bissau have the same and lowest percentage, which is 0.10% (one bank). Malaysia and Bahrain[7] have the highest number of Islamic banks, 20 banks and 19 banks, respectively. Iran and Sudan have only Islamic banks since the whole banking system in these two countries operates according to *Shariah*. To adjust for any possible outliers, all the continuous variables are winsorized at the 1% level.

[7] Malaysia and Bahrain are recognized as the hub of Islamic banking; IFSB is based in Malaysia and AAOIFI is based in Bahrain.

Table 3.6: Sample Distribution for the Sample by Countries During the Study Period 2006-2015.

	Islamic Banks		Conventional Banks		Islamic window banks		Totals		
Country	Bank	Observation	Bank	Observation	Bank	Observation	Bank	Observation	Percentage %
Afghanistan	0	0	7	70	4	40	11	110	0.1158
Albania	0	0	11	110	1	10	12	120	0.1263
Algeria	0	0	23	230	1	10	24	240	0.2526
Azerbaijan	0	0	4	40	0	0	4	40	0.0421
Bahrain	19	190	7	70	4	40	30	300	0.3158
Bangladesh	8	80	27	270	12	120	47	470	0.4947
Benin	0	0	8	80	1	10	9	90	0.0947
Brunei	1	10	1	10	0	0	2	20	0.0211
Burkina Faso	0	0	8	80	0	0	8	80	0.0842
Cameroon	0	0	11	110	1	10	12	120	0.1263
Chad	0	0	5	50	0	0	5	50	0.0526
Comoros	0	0	1	10	0	0	1	10	0.0105
Djibouti	0	0	16	160	5	50	21	210	0.2211
Egypt	3	30	16	160	6	60	25	250	0.2632
Gabon	0	0	7	70	0	0	7	70	0.0737
Gambia	1	10	15	150	0	0	16	160	0.1684
Guinea	0	0	1	10	0	0	1	10	0.0105
Guinea-Bissau	0	0	1	10	0	0	1	10	0.0105
Guyana	0	0	3	30	0	0	3	30	0.0316
Indonesia	10	100	90	900	11	110	111	1110	1.1684
Iran	17	170	0	0	0	0	17	170	0.1789
Iraq	7	70	12	120	1	10	20	200	0.2105
Jordan	3	30	11	110	0	0	14	140	0.1474
Kazakhstan	0	0	30	300	0	0	30	300	0.3158
Kuwait	11	110	6	60	0	0	17	170	0.1789
Kyrgyzstan	0	0	9	90	1	10	10	100	0.1053
Lebanon	3	30	44	440	4	40	51	510	0.5368
Libya	0	0	6	60	4	40	10	100	0.1053
Malaysia	20	200	21	210	15	150	56	560	0.5895
Maldives	0	0	0	0	1	10	1	10	0.0105
Mali	0	0	10	100	0	0	10	100	0.1053
Mauritania	2	20	6	60	3	30	11	110	0.1158
Morocco	0	0	16	160	0	0	16	160	0.1684
Mozambique	0	0	11	110	0	0	11	110	0.1158
Niger	0	0	7	70	1	10	8	80	0.0842
Nigeria	2	20	19	190	0	0	21	210	0.2211
Oman	2	20	1	0	5	50	8	80	0.0842
Pakistan	12	120	10	100	12	120	34	340	0.3579
Palestine	0	0	3	30	0	0	3	30	0.0316
Qatar	6	60	6	60	1	10	13	130	0.1368
Saudi Arabia	5	50	0	0	9	90	14	140	0.1474
Senegal	1	10	13	130	0	0	14	140	0.1474
Sierra Leone	0	0	11	110	0	0	11	110	0.1158
Sudan	19	180	0	0	0	0	19	190	0.2
Suriname	0	0	4	40	0	0	4	40	0.0421
Syria	2	20	11	110	2	20	15	150	0.1579
Tajikistan	0	0	6	60	0	0	6	60	0.0632
Togo	0	0	4	40	0	0	4	40	0.0421
Tunisia	3	30	14	140	3	30	20	200	0.2105
Turkey	5	50	45	450	0	0	50	500	0.5263
Turkmenistan	0	0	4	40	0	0	4	40	0.0421
Uganda	0	0	19	180	0	0	19	190	0.2
UAE	11	110	9	90	11	110	31	310	0.3263
Uzbekistan	0	0	19	190	0	0	19	190	0.2
Yemen	4	40	5	50	0	0	9	90	0.0947
Total	**177**	**1770**	**654**	**6520**	**119**	**1190**	**950**	**9500**	**100**

Figure 3.2: Sample Distribution Diagram



3.5.2. Descriptive Statistics

Table 3.7 reports the results of the statistical summary for the full sample period (2006-2015), which is divided into three sections: credit risk, liquidity risk, bank-specific variables and country-specific variables.

3.5.3. Full Sample Period

Credit Risk: Looking to the credit side, we use four indicators of credit risk. The results suggest that in general credit risk in Islamic banks is substantially lower than in the other types of banks. Loan loss provision over gross loan comprises the most significant difference in the credit risk section. Loan loss provision is significantly less than for conventional banks (0.9161% versus 1.2787%) and more than for Islamic window banks (0.9161% versus 0.5404%). In line with the previous indicator, loan loss allowance is also less than for conventional banks (6.0825% versus 6.5470%). While the net charge-off over the gross loan is not statistically different, however, the results are in consistent with most indicators. The impaired loan is also significantly lower in Islamic banks than in conventional banks (7.5155% versus 8.6998%). Overall, the results suggest that Islamic banks have a better ability to accommodate any redemption, which leads to a strong credit position.

Liquidity Risk: In terms of liquidity risk, interestingly, there are significant differences in most of the indicators. The interbank indicator (which is a measure for liquidity fund) in Islamic banks is 155.3634% while in conventional banks it is 177.7097%. This supports the view that Islamic banks face a lack of active interbank markets, possibly owing to the lack of capital markets for Islamic banks. With respect to long term liquidity, net loan over deposit and short-term funding appear more in Islamic banks than in conventional and Islamic window banks. In line with the previous results, Net loans over total deposit reveals that Islamic banks have less liquidity. With respect to short term liquidity, liquid assets to deposit and short-term funding is significantly lower in Islamic banks than in conventional banks (36.0260% versus 38.3977%) and significantly more than in Islamic window banks (36.0260% versus 33.6715%). In line with most indicators, liquid assets to total deposit and borrowing provide the same results (29.2416% for Islamic banks, 32.8293% for conventional banks, and 24.7716% for Islamic window banks). Generally, the results prove that Islamic banks are less liquid than conventional banks and relatively better than Islamic window banks, particularly in liquidity funding, short term liquidity and long term liquidity.

Bank-Specific Characteristics: Bank size is significantly different between the three different types of banks. The results reveal that Islamic window banks have the largest bank size which indicates that it is large banks that tend to have Islamic windows. In terms of capitalization, the results prove that Islamic banks maintain substantially better capitalization than Islamic window and conventional banks (24.5019% versus 15.5751% for conventional and 13.6567% for Islamic window). Furthermore, Islamic banks are relatively less profitable than conventional banks and significantly less profitable than Islamic window banks. That is probably due to the conservative operations of Islamic banks. The growth of gross loan is significantly greater in Islamic banks. This supports the view that Islamic banks comprise the fastest financial sector. In terms of diversification, the ratio of non-interest income is significantly higher in Islamic banks. This suggests that Islamic banks have higher diversification across all types of banks. With respect to efficiency, the cost to income ratio is higher in an Islamic bank than in conventional and Islamic window banks (64.7444% versus 60.9830% for conventional and 51.8162% for Islamic window). This might be due to the fact that the young Islamic banks have less experience than the very old conventional banks. Furthermore, this result supports the fact that Islamic banks have complexity in their products and their overall operations.

Table 3.7: Statistical Summary for all Sample Banks During the Sample Period 2006-2015

	Islamic Banks			Conventional Banks			Islamic Window banks			Max -Min		Mean Differences (T-tests)			
Variables	N	Mean	SD	N	Mean	SD	N	Mean	SD	Max	Min	T-Test 1*	T-Test 2	T-Test 3	T-Test 4
Credit Risk															
Loss Allowance	947	6.0825	9.6760	3752	6.6470	8.6734	751	6.5068	8.0944	52.0830	0.1090	1.7242*	-1.7473*	-0.9637	0.4088
Loan Loss Provision	1185	0.9161	0.3333	4524	1.2787	0.5773	848	1.1167	0.5404	11.5979	-1.5944	5.1610***	-5.3576***	-2.5780**	2.0639**
Net Charge Off	456	0.7708	2.3116	2147	0.8744	2.5217	536	0.5993	1.2809	16.3260	-3.5150	0.4131	-0.8087	1.4726	2.4487**
Impaired Loan	592	7.5155	11.3908	2967	8.6998	11.1995	604	7.6964	10.9122	63.1130	0.0270	2.0432**	-2.3425*	-0.2805	2.0156**
Liquidity Risk															
Interbank	660	155.3634	109.8560	2885	177.7097	120.7490	578	156.0710	104.2585	619.6470	0.6610	2.7770***	-3.2225***	-0.0848	2.9530***
Net Loans / Total Assets	1125	47.7591	54.8070	4431	48.5269	51.2590	837	51.3320	56.9790	80.9030	3.1360	1.8703*	-1.1586	-3.7265***	-3.8939***
Net Loans / Dep ST Funding	1114	69.3287	72.2480	4487	65.2535	64.7840	835	66.6281	71.9750	179.730	2.3970	-3.3283***	3.4512***	1.4277	-1.3795
Net Loans / Total Dep Bor	568	64.9709	71.2630	2933	63.6945	65.4340	600	68.8594	73.0010	145.7040	4.0440	-0.3458	1.0692	-2.5071**	-4.6915***
Liquid Assets / Dep ST Fund	1094	36.0260	26.8505	4493	38.3977	30.8480	838	33.6715	23.3880	134.7880	4.2080	1.8228*	-2.5487***	1.8798*	4.7106***
Liquid Assets / Total Dep Bor	577	29.2416	23.9440	2964	32.8293	27.0760	599	24.7716	19.5260	115.9120	2.0490	2.2659**	-3.1435***	3.6268***	8.3944***
Bank- Specific Variables															
Total Assets	1257	6.1050	6.1590	4597	5.8927	5.8318	841	6.4783	6.0494	7.8171	4.0124	-4.5088***	7.9099***	-9.7950***	-18.7067***
Noninterest Income	1218	43.0908	33.5978	4518	35.5977	22.6563	841	33.7777	18.0297	129.5712	-12.3400	-9.9755***	9.1460***	7.3414***	2.2032**
Cost to Income	1178	64.7444	38.7724	4461	60.9830	31.8823	836	51.8162	30.0633	236.995	11.9230	-4.6344***	3.3217***	8.0614***	7.6966***
Equity / Total Assets	1258	24.5019	23.8162	4624	15.5751	13.7321	852	13.6567	9.8535	91.2280	0.7970	-18.7338***	17.0998***	12.5817***	3.8968***
ROAA	1252	1.1845	3.7124	4583	1.2916	2.7785	850	1.4340	1.8780	11.5990	-13.0240	1.4306	-1.1182	-1.8090*	-1.4353
Loan Growth	995	26.3832	40.4000	3932	24.9327	37.5062	811	19.5086	29.9193	206.9542	-36.4121	-1.8379*	1.0725	4.0283***	3.8720***
Country - Level Variables															
GDP per Capita	1626	3.8138	0.5830	6253	3.4482	0.5082	1166	3.6444	0.6024	4.8505	2.5777	-22.6806***	25.0407***	7.4658***	-11.7370***
GDP per Capita Growth	1626	1.6040	4.1932	6253	2.6631	3.5693	1166	1.9585	4.2028	10.1687	-12.7508	9.1598***	-10.2644***	-2.2012**	6.0088***
Inflation Rate	1538	8.6123	8.5864	5716	6.0064	4.6319	1038	5.9177	4.6298	36.7023	-3.7489	-16.6145***	15.9051***	9.2442***	5.5679***
Real Interest	1118	3.3671	9.9914	4057	6.1482	8.0878	776	4.5281	7.7880	41.2530	-13.0638	8.9815***	-9.6468***	-2.7147***	5.1424***
Average Oil Prices	1770	85.8570	21.1494	6540	85.8570	21.1451	1190	85.8570	21.1523	111.5700	52.3201	0	0	0	0
HHI Index	1638	0.1250	0.1821	6188	0.0969	0.1351	1130	0.0969	0.1351	1.0000	0.0092	-7.1035***	6.9222***	4.4213***	0.0043

Note: This summary represents the summary for the whole period of the study which is 2006-2015. Max and Min is for the entire sample. * The t test for 1, 2, 3, 4 are represents respectively the econometric difference in means for; (Islamic Banks and all (Conventional plus Islamic window)), (Islamic Banks and Conventional), (Islamic Banks and Islamic window), and (Islamic window banks and Conventional). Significant level at 1%, 5%, 10% are indicated through *, **, ***, respectively.

3.5.4. Global Financial Crisis and Sovereign Debt Crisis

This section compares the risk of Islamic, conventional and Islamic window banks during three panels: full sample period (2006-2015), global financial crisis (2007-2009), and sovereign debt crisis (2010-2013). The purpose of the division of these years is for further investigation into which types of banks perform better at accommodating these financial crises. Table 3.8 presents the results with respect to credit risk while Table 3.9 presents the results with respect to liquidity risk.

Credit Risk: As shown in Table 3.8, statistically there are significant differences in the behaviour of the credit risk proxies among the three different types of banks and across the three different periods. The results reveal that loan loss provision over the gross comprise the most significant difference in panels A (2006-2015), B (2007-2009), and C (2010-2013). As it has been discussed in the previous section, Islamic banks appear to have less credit risk during the sample period (2006-2015). During the global financial crisis, Islamic banks have less loan loss provision than conventional and Islamic window banks in the three panels (for example 0.999%, 1.3242%, and 1.1999% for Islamic, conventional, and Islamic window banks respectively). Consistently, the other proxies, such as impaired loan, are substantially lower in Islamic banks during the global crisis. This suggests that Islamic banks were relatively better than conventional and Islamic window banks during the global financial crisis. During the sovereign debt crisis, the loan loss proviso appears less in Islamic banks (0.9363% versus 1.2503% for conventional banks). Furthermore, net charge-off over gross loan indicator is significantly lower for Islamic banks than conventional banks and Islamic window banks. These results prove that Islamic banks, on average, are better than conventional banks and Islamic window banks during the sovereign debt crisis. Overall, the results support the prior theoretical discussion that Islamic banks have unique features that make them more stable against default risk.

Liquidity Risk: Interestingly, there are significant econometric differences in most of the indicators in panel A, but less in panel B and C. In line with the results in panel A, the interbank indicator proves a significant difference during the global crisis; Islamic banks are 145.4622% while conventional banks are 189.9438%. This indicates that Islamic banks have less liquidity risk. Furthermore, though there is no significant difference with the interbank indicator in panel C, the results also show that Islamic banks have less interbank ratio during the European crisis. Interestingly, the interbank proxy is less for Islamic banks compared to Islamic window banks (145.4622% versus 178.9428%). Overall, with respect to the interbank

proxy, this result supports the view that Islamic banks face a lack of active interbank market (fund liquidity) owing to the lack of capital markets for Islamic banks. In terms of long term liquidity, during 2006-2015, net loan proxies are, on average, greater in Islamic banks than conventional banks and Islamic window banks. Consistently, the results show that net loans ratios on average are more during the financial and sovereign crisis This indicates that Islamic banks have more liquidity risk than conventional banks with respect to long term liquidity. In terms of short term liquidity, the results show that there is no significant difference during the global financial crisis. In contrast, Islamic banks appear to have significantly lower liquidity risk than conventional and Islamic window during the sovereign debt crisis.

Summary: The overall comparison of risk performance (credit risk and liquidity risk) suggests that there is a statistical difference between the three types of banks during the global financial crisis and sovereign debt crisis. Furthermore, the results suggest that that Islamic banks have less credit risk than conventional and Islamic window banks during the two crises. This supports the view that Islamic banks have higher asset quality. With respect to liquidity risk, particularly fund liquidity and long and short term liquidity, Islamic banks appear less liquid than conventional banks in the global financial crisis and sovereign debt crisis. However, during the sovereign debt crisis the short term liquidity appears to be better than conventional and Islamic window banks.

Table 3.8: Descriptive Statistics - Credit Risk - Mean Values

Variables	Islamic	Conventional	Islamic window	T-Test 1*	T-Test 2	T-Test 3	T-Test 4
Panel A: Full Sample Period (2006-2015)							
Loan Loss Allowance	6.0825	6.6470	6.5068	1.7242*	-1.7473*	-0.9637	0.4088
Loan Loss Provision	0.9161	1.2787	1.1167	5.1610***	-5.3576***	-2.5780**	2.0639**
Net Charge Off	0.7708	0.8744	0.5993	0.4131	-0.8087	1.4726	2.4487**
Impaired Loan	7.5155	8.6998	7.6964	2.0432**	-2.3425*	-0.2805	2.0156**
Panel B: Global Financial Crisis (2007-2009)							
Loan Loss Allowance	6.4938	6.9937	6.989	0.8363	-0.8173	-0.5861	0.0078
Loan Loss Provision	0.9993	1.3242	1.1999	2.7114***	-2.7672***	-1.454	0.9351
Net Charge Off	0.7160	0.6829	0.4315	-0.3453	0.1314	1.1291	1.3255
Impaired Loan	6.2749	8.7034	6.1806	2.2160**	-2.6022**	0.0885	2.9817***
Panel C :Sovereign Debt Crises (2010-2013)							
Loan Loss Allowance	6.0958	6.5200	6.4487	0.934	-0.9358	-0.5567	0.1469
Loan Loss Provision	0.9363	1.2503	1.0824	2.9189***	-3.0907***	-1.2373	1.4203
Net Charge Off	0.8283	0.8140	0.5891	-0.3689	0.0795	1.3863	1.4318
Impaired Loan	7.6401	8.9253	9.0287	1.8086*	-1.7774*	-1.4276	-0.1401

Note: * The t test for 1, 2, 3, 4 are represents respectively the econometric difference in means for; (Islamic Banks and All (Conventional plus Islamic window)) (Islamic Banks and Conventional) (Islamic Banks and Islamic window) and (Islamic window banks and Conventional). Significant level at 10%, 5%, 1% are indicated through *, **, ***, respectively.

Table 3.9: Descriptive Statistics - Liquidity Risk - Mean Values

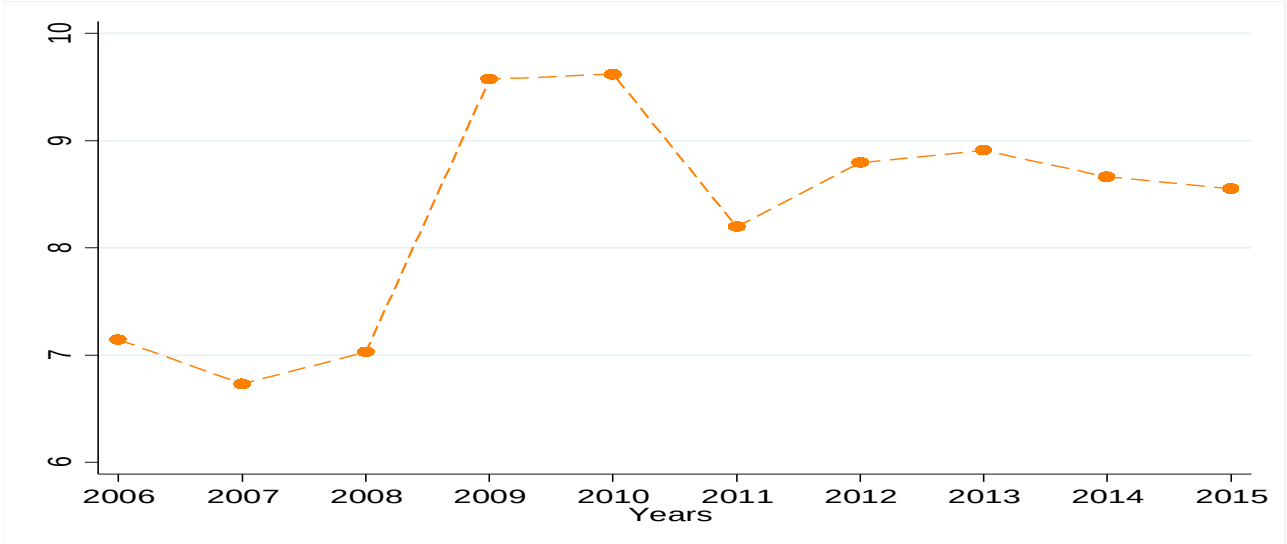
Variables	Islamic	Conventional	Islamic window	T-Test 1*	T-Test 2	T-Test 3	T-Test 4
Panel A: Full sample period (2006-2015)							
Interbank	155.3634	177.7097	156.071	2.7770***	-3.2225***	-0.0848	2.9530***
Net Loans / Total Assets	47.7591	48.5269	51.332	1.8703*	-1.1586	-3.7265***	-3.8939***
Net Loans / Dep ST Funding	69.3287	65.2535	64.7840	-3.3283***	3.4512***	1.4277	-1.3795
Net Loans / Total Dep Bor	64.9709	63.6945	68.8594	-0.3458	1.0692	-2.5071***	-4.6915***
Liquid Assets / Dep ST Fund	36.026	38.3977	33.6715	1.8228*	-2.5487***	1.8798*	4.7106***
Liquid Assets / Total Dep Bor	29.2416	32.8293	24.7716	2.2659**	-3.1435***	3.6268***	8.3944***
Panel B: Global Financial Crisis (2007-2009)							
Interbank	145.4622	189.9438	178.9235	2.7711***	-2.8401***	-1.7174*	0.655
Net Loans / Total Assets	46.7203	47.8480	51.9378	1.2241	-0.7823	-2.4699**	-2.6648***
Net Loans / Dep ST Funding	68.7339	64.5996	69.1942	-1.4231	1.6449*	-0.1274	-1.761*
Net Loans / Total Dep Bor	63.8641	62.2100	68.6897	-0.2739	0.6499	-1.4361	-2.7233***
Liquid Assets / Dep ST Fund	41.9864	40.9248	37.3331	-0.8474	0.5622	1.5973	1.7822*
Liquid Assets / Total Dep Bor	36.4740	36.4833	28.8667	-0.5424	-0.0043	2.4668***	3.7865***
Panel C : Sovereign Debt Crises (2010-2013)							
Interbank	164.6789	174.9656	148.7449	0.5895	-1.0016	1.2651	2.3632**
Net Loans / Total Assets	47.9762	48.5474	51.6499	1.1242	-0.5784	-2.6414***	-2.8662***
Net Loans / Dep ST Funding	67.7581	64.6923	66.2748	-1.8265**	1.9204**	0.6929	-0.9221
Net Loans / Total Dep Bor	64.2537	64.1667	69.2062	0.4703	0.0483	-2.1823**	-3.0679***
Liquid Assets / Dep ST Fund	33.9974	38.1584	32.5960	2.4566**	-3.0825***	0.7923	3.6818***
Liquid Assets / Total Dep Bor	26.9689	32.0669	24.1306	2.5621***	-3.412***	1.776*	5.4926***

Note: * The t test for 1, 2, 3, 4 are represents respectively the econometric difference in means for; (Islamic Banks and All (Conventional plus Islamic window)) (Islamic Banks and Conventional) (Islamic Banks and Islamic window) and (Islamic window banks and Conventional). Significant level at 10%, 5%, 1% are indicated through *, **,***, respectively.

3.5.5. Plots of Annual Average

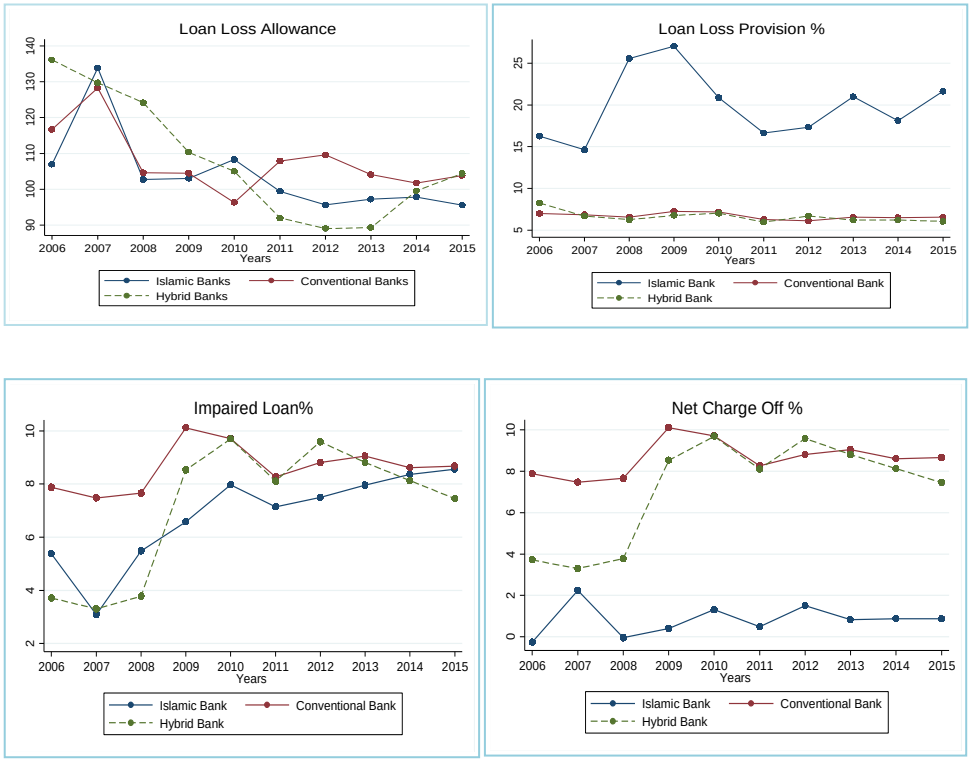
At the beginning of the global financial crisis, there was a sharp increase in impaired loans for the whole sample including all types of banks (see, Figure 3.3), which then started decreasing. Figure 3.3 also reveals that the impaired loans across all banks started increasing again during the sovereign debt crisis. Figure 3.4 illustrates the comparison of risk between all three types of banks during the study period (2006-2015). The diagrams show the mean of all the risk indicators examined in this study. In terms of credit risk, as shown graphically, there are three proxies which are substantially different, such as loan loss provision, impaired loan, and net charge-off. In line with the previous findings, the results suggest that Islamic banks are less risky than conventional banks. For example, the impaired loan and net charge-off are lower in Islamic banks. In terms of liquidity risk, the results remarkably show that most of the liquidity indicators show substantially different behaviour among the types of banks. Unlike the liquidity fund and long term liquidity, the short term liquidity appears to be better in Islamic banks in comparison with conventional and Islamic window banks which proves that Islamic banks are much less liquid than conventional banks.

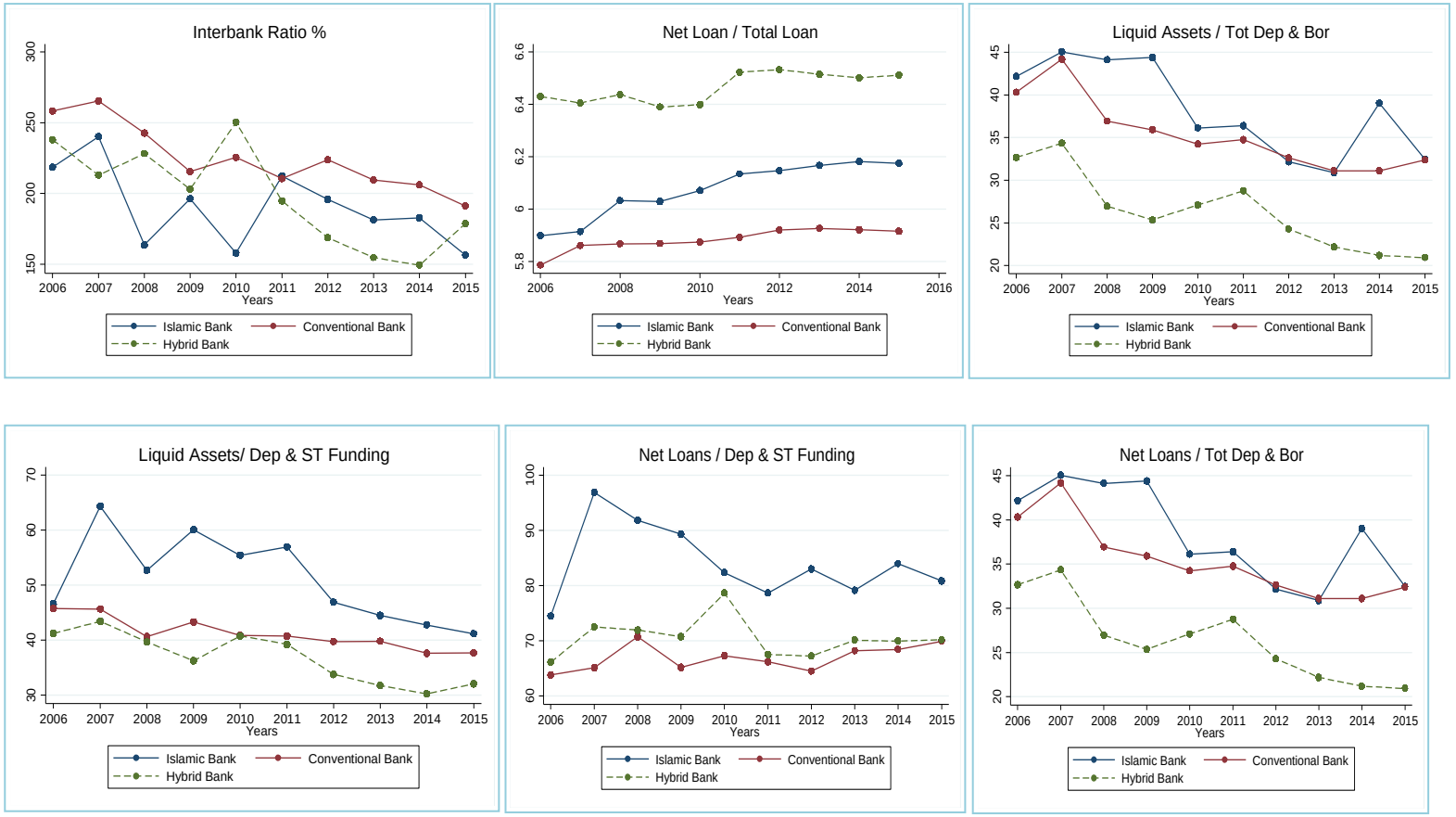
Figure 3.3: Impaired Loans for the Whole Sample



Source: Bankscope

Figure 3.4: Diagrams for Risk Indicators





Note: These represent the means for all the proxies for credit and liquidity risk used in this study during the sample period

3.6. Empirical Results

3.6.1. Comparing Islamic and conventional banks

The focus of this section is to presents the empirical test and the discussion of results on the comparison of the stability between Islamic and conventional banks. It also investigates whether there is a significant difference in the credit risk of the three types of banking. It also examines whether Islamic banking has lower credit risk and liquidity risk. This section will first present credit risk then liquidity risk during three periods: 2006-2015 (full sample period), 2007-2009 (global financial crisis), and 2010-2013 (sovereign debt crisis).

3.6.1.1. Credit Risk

Overall Sample: Table 3.10, columns (1) - (12), illustrate regression results for all the sample period 2006 -2015, with credit risk variables as the dependent variables. The aim of the regression is to investigate whether there is a difference in the credit risk between Islamic, conventional, while controlling for bank-specific and country-specific variables. The columns (1) - (12) are credit risk dependent variables which are: (1) Loss Allowance (2) Loan Loss Provision (3) Net Charge Off (4) Impaired Loan. Panel (A), suggests that there is a significant difference between Islamic banks and conventional in loss allowance ratio. This implies that Islamic banks have better assets quality compared to conventional banks. Though not significant, the results show that Islamic banks have less loan loss provision ratio and impaired ratio. These results suggest that Islamic banks tend to have lower credit risk. In general, the results reveal that there is a substantial difference between Islamic banks and conventional.

Global Financial Crisis: Panel B in Table 3.10, represents the results during the global financial crisis, the results are almost in line with the previous results which is in conclusion shows that Islamic banks have significantly lower loan loss allowance ratio (column 5) which suggests that credit risk than conventional. For instance, Islamic banks have less loan loss provision ratio and impaired ratio. These findings confirm the results found in panel A.

Sovereign Debt Crisis: Panel C investigates whether there is a significant difference between Islamic, conventional during the sovereign debt crisis. The results show that there are significant results, particularly, in the loan loss allowance ratio. Despite the insignificant results in the robustness check ratios, the results show that Islamic banks have lower ratios figures in all ratios. For instance, the results shows that Islamic banks has less loan loss

provision ratio and impaired loan ratio which indicated that Islamic banks have lower credit risk compared to conventional.

Table 3.10: Regression Results - Credit Risk - Comparison

	Panel A: Full Sample (2006-201)				*Panel B: Global Financial Crisis (2007-2009)*				*Panel C: Sovereign Debt Crisis (2010-2013)*			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Islamic Banks	-0.9513*	-0.1556	0.2073	-0.9064	-2.1526*	-0.1412	0.6280	-1.7017	-1.4397*	-0.1355	-0.1380	-2.4554
	(0.4548)	(0.2484)	(0.1459)	(1.7933)	(1.2092)	(0.7835)	(0.6034)	(2.2126)	(0.6862)	(0.2954)	(0.2201)	(2.4405)
Islamic window banks	0.2872	0.0681	-0.2843	1.4499	-0.2082	-0.2548	-0.3604	0.4429	0.19030	0.0236	-0.7269*	2.1338
	(0.4179)	(0.1281)	(0.2458)	(1.7940)	(1.0133)	(0.3278)	(0.5325)	(1.9575)	(0.6170)	(0.1141)	(0.2526)	(2.1946)
Total Assets	-1.2678***	-0.0663	-0.0847	-1.5904	-0.7375	-0.0114	-0.8751***	-1.5447	-1.0406**	-0.1336	0.3619**	-1.3234
	(0.2481)	(0.1770)	(0.0704)	(0.8252)	(0.5284)	(0.1709)	(0.2200)	(1.1160)	(0.3838)	(0.1979)	(0.1375)	(1.1303)
Equity / Total Assets	0.0151	0.0059	0.0434*	0.0457	0.0328	0.0162	0.01900	0.1507	0.03210	0.0016	0.0506	0.0756
	(0.0149)	(0.0045)	(0.0172)	(0.0751)	(0.0315)	(0.0105)	(0.0427)	(0.1295)	(0.0225)	(0.0071)	(0.0325)	(0.0863)
ROAA	-0.5113***	-0.2858***	-0.3295*	-1.0370**	0.0718	-0.3997**	-0.2104	-1.1277**	-0.4461***	-0.2566**	-0.3408**	-1.3194**
	(0.0716)	(0.0776)	(0.1280)	(0.3717)	(0.1633)	(0.1509)	(0.2300)	(0.3215)	(0.1078)	(0.0904)	(0.1450)	(0.3848)
Loan Growth	-0.0410***	-0.0045**	-0.0084*	-0.0608***	-0.0319***	-0.0056	-0.0153	-0.0141	-0.0393***	-0.0031	-0.0064**	-0.0598*
	(0.0035)	(0.0014)	(0.0040)	(0.0112)	(0.0073)	(0.0025)	(0.0086)	(0.0177)	(0.0054)	(0.0017)	(0.0026)	(0.0145)
Noninterest Income	0.0393***	-0.0036	0.0251***	0.0455	0.0458**	0.0005	0.0319*	0.0249	0.0290***	-0.0048	0.0180**	0.0013
	(0.0074)	(0.0035)	(0.0054)	(0.0327)	(0.0195)	(0.0064)	(0.0090)	(0.0588)	(0.0108)	(0.0046)	(0.0054)	(0.0369)
Cost to Income Ratio	0.0260***	-0.0200***	-0.0102***	0.0296	0.0901*	-0.0272**	-0.0188**	-0.0391	0.0276***	-0.0171**	-0.0067	0.0114
	(0.0061)	(0.0054)	(0.0048)	(0.0367)	(0.0148)	(0.0081)	(0.0071)	(0.0307)	(0.0090)	(0.0054)	(0.0056)	(0.0299)
GDP per Capita	-6.7369***	-1.3732*	-1.4711	-4.5292	-1.4558	-2.1018	-5.1243	-2.2667	-8.0280	-5.1827*	-5.0456	-1.5177
	(1.7219)	(0.5121)	(0.6184)	(2.5959)	(1.4757)	(2.1321)	(2.6225)	(6.7831)	(8.4071)	(2.5814)	(9.7708)	(1.9829)
GDP per Capita Growth	0.1092**	-0.0272	0.0303	0.2281	-0.1201	-0.0524	0.0458	-0.3101**	0.1107	-0.0353	0.0016	0.1442
	(0.0462)	(0.0136)	(0.0242)	(0.1184)	(0.1765)	(0.0408)	(0.0881)	(0.0979)	(0.0862)	(0.0270)	(0.0477)	(0.1362)
Inflation Rate	-0.0431	0.0084	-0.0272	0.0320	-0.0743	-0.0309	-0.0896	-0.1019	-0.1163	-0.0108	-0.0504	0.0697
	(0.0454)	(0.0151)	(0.0235)	(0.0547)	(0.1045)	(0.0224)	(0.0620)	(0.0570)	(0.0862)	(0.0196)	(0.0431)	(0.1388)
Real interest rate	0.0119	0.0005	-0.0074	0.0140	-0.0602	-0.0141	-0.0639*	-0.0631*	-0.0076	0.0022	0.0179	0.0054
	(0.0186)	(0.0031)	(0.0062)	(0.0183)	(0.0435)	(0.0096)	(0.0259)	(0.0262)	(0.0496)	(0.0161)	(0.0159)	(0.0488)
Average Oil Prices	0.0144*	-0.0035	-0.0001	0.0129	0.0120	-0.0007	-0.0232	-0.0271	0.0145	0.0015	0.0137	0.0148
	(0.0066)	(0.0026)	(0.0040)	(0.0126)	(0.0281)	(0.0087)	(0.0125)	(0.0237)	(0.0236)	(0.0054)	(0.0204)	(0.0393)
HHI Index	1.0854	0.2649	0.3156	1.1012	-2.9570	-3.7368	5.4380	0.4474	2.9727	-0.6901	-0.7787	-5.9441
	(1.1307)	(0.2829)	(0.2415)	(0.9781)	(2.6980)	(2.4120)	(7.1553)	(0.4234)	(11.9815)	(4.9905)	(8.1605)	(16.8269)
_cons	5.1772***	8.6688**	3.1940	3.9108**	7.1349*	5.0613	6.5191*	2.1816	9.0829	3.4293*	5.7631	7.4935
	(1.7258)	(2.6511)	(-2.2565)	(1.5643)	(3.5674)	(5.5803)	(7.6695)	(17.6792)	(26.2132)	(1.7146)	(12.7165)	(11.4527)
R^2	0.0578	0.1133	0.0911	0.1022	0.0398	0.0776	0.0289	0.1266	0.0497	0.0722	0.0281	0.0384
N	2,615	2,943	1,731	2,080	460	537	272	326	1,199	1,351	788	948

Note: This table investigates whether Islamic banks have lower credit risk than conventional, while controlling for bank and country specific variables, during sovereign debt crisis (2010-2013). The columns (1) - (12) are credit risk dependent variables which are respectively: (1, 5 and 9) Loss Allowance (2, 6 and 10) Loan Loss Provision (3, 7 and 11) Net Charge Off (4, 8 and 12) Impaired Loan. Significant level at 10%, 5%, 1% are indicated through *, **, ***, respectively.

3.6.1.2. Liquidity Risk

Overall Sample: Table 3.11, reports regression results for all the sample period 2006 - 2015, with liquidity risk variables as the dependent variables. The columns (1) - (18) are liquidity risk dependent variables which are respectively: (1) interbank (2) net loans divided by total assets (3) net loan divided by customer & short term funding (4) net loan divided by total deposits and borrowing (5) liquid assets divided by customer and short term funding (6) liquid assets divided by total deposit and borrowings. The table is divided into three panels; panel A: full sample period (2006-2015), panel B: global financial crisis (2007-2009), and panel C: sovereign debt crisis (2010-2010). The aim of the regression is to investigate whether there is a difference in the liquidity risk between Islamic and conventional. As the results appear in panel A, on average, the results show that there is a substantial difference between Islamic banks and conventional banks. The interbank ratio shows that Islamic banks are lower than conventional bank; this suggests that Islamic banks significantly have less liquidity in terms of liquidity fund. For long term liquidity, the net loan over total assets ratio, and net loan over customer & short term fund ratio reveals that Islamic banks are significantly less liquid. The significant results are at 5% level and 10% level, respectively. Examining the long term liquidity, the results show that Islamic banks hold 0.20 % lower net loan over total assets ratio at 5% significant level. Confirming the previous result, the net loan over customer & short term fund ratio is 0.36% lower in Islamic banks at 10% significant level. In terms of short term liquidity, the ratios in columns (5) and (6) show that Islamic banks have lower liquidity ratios. This implies that Islamic banks on average have more liquidity risk than conventional and Islamic window banks.

Global Financial Crisis: Panel B in Table 3.11, illustrates the regression results during the global financial crisis, the results are relatively not in line with results in panel A with respect to interbank ratio as the difference is not significant, however Islamic banks have lower interbank ratio. Islamic banks significantly, have more net loan over total assets ratio at 5% significance level, higher net loan over customer and short funding ratio net loan over deposit and borrowing. This implies that Islamic banks have less liquidity risk compared to conventional banks. With respect to short term liquidity, the results are inconsistent. In general, the results implies that Islamic are less liquid with respect liquidity funding and long term liquidity whereas the results are inclusive with respect to short term liquidity.

Sovereign Debt Crisis: Panel C Table 3.11 reports the regression results during the sovereign debt crisis. Interestingly, unlike the results during the global financial crisis, most

the liquidity risk variables suggest that there is a significant difference between Islamic and conventional banks. This is possibly because Islamic banks have not made appropriate responsive reactions after the global financial crisis. All the long term liquidity ratios are higher in Islamic banks at 1% significant level. Islamic banks shows more in the following ratios; net loans over total assets, net loan over customer and short term funding, net loan over total deposits and borrowings. In consistent, the results also reveals that Islamic banks have significantly less short term liquidity ratios (liquid assets over customer and short term and also less liquid assets over total deposits and borrowing).

Overall, we find that Islamic banks experienced more significant liquidity risk results during the sovereign debt crisis than global financial crisis. That is probably due to the fact that, after the global financial crisis, conventional banks made more appropriate regulatory changes than Islamic banks. This protected them from sovereign debt crisis. Additionally, Islamic banks have lower interbank ratio, this supports the view that Islamic banks face a lack of active interbank markets owing to the lack of capital markets for Islamic banks.

Table 3.11: Regression Results - Liquidity Risk - Comparison

	Panel A: Full Sample (2006-2015)						***Panel B: Global Financial Crisis (2007-2009)***					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Islamic Banks	-1.0965*	0.1953**	0.3570*	0.2763	-0.6932	-0.7780*	-0.8962	0.4681**	0.7456	-1.0142	2.2672	-0.9791
	(0.3655)	(0.0672)	(0.1785)	(0.2286)	(2.3959)	(0.3890)	(1.7673)	(0.2194)	(1.0511)	(5.4105)	(6.3656)	(4.2071)
Islamic window banks	3.5600*	2.6424	2.1480	6.0038*	-3.5373	-6.0004	-2.1866	4.4368	5.2963	3.9052	-1.3968	-4.1136
	(1.7801)	(1.9152)	(2.6199)	(2.4849)	(3.2235)	(3.2657)	(3.0806)	(3.3954)	(4.7101)	(2.9358)	(5.0664)	(4.7420)
Total Assets	1.3772**	2.1622	3.6849	1.7361	-8.1983***	-7.9001***	0.7133	-0.6471	0.2187	-1.9782	-8.3779***	-6.2376***
	(0.3464)	(1.3707)	(2.2830)	(1.5719)	(2.0650)	(1.9195)	(1.0632)	(1.0090)	(2.5331)	(1.8489)	(2.0542)	(1.8198)
Equity Total Assets	0.7342	-0.2256**	0.5941***	0.6446***	0.4306***	0.3173*	-0.0465	-0.2684***	0.5842*	0.8048***	0.2822	0.6024
	(0.4688)	(0.0787)	(0.1544)	(0.2140)	(0.1163)	(0.1278)	(1.2077)	(0.0632)	(0.2170)	(0.1797)	(0.1770)	(0.2488)
ROAA	3.1657	-0.1537	-0.7278	0.2646	-0.0911	-0.7239	-0.4329	-0.6900*	-1.0419	-0.1445	0.4390	-1.5206
	(2.3010)	(0.1780)	(0.3615)	(0.4997)	(0.5746)	(0.6264)	(5.6412)	(0.3256)	(1.0325)	(0.7704)	(1.0098)	(1.5173)
Loan Growth	0.0385	0.0168	0.0296	-0.0145	0.0065	-0.0152	-0.1615	0.0164	0.0124	0.0525*	-0.0359	-0.0349
	(0.1055)	(0.0111)	(0.0177)	(0.0180)	(0.0179)	(0.0224)	(0.2179)	(0.0164)	(0.0290)	(0.0212)	(0.0284)	(0.0290)
Non Interest Income	0.0327	-0.1868***	-0.2103***	-0.2648***	0.20130	0.1859**	0.1197	-0.0389	0.0896	0.0218	0.1303	-0.0835
	(0.1918)	(0.0316)	(0.0560)	(0.0566)	(0.0622)	(0.0576)	(0.4740)	(0.0250)	(0.0815)	(0.0812)	(0.0666)	(0.0987)
Cost to Income Ratio	0.0451	-0.0557***	-0.1330***	-0.0893*	-0.0585	-0.0401	-0.1632	-0.0781***	-0.1446*	-0.1651*	-0.0838	-0.0471
	(0.1905)	(0.0148)	(0.0372)	(0.0346)	(0.0441)	(0.0438)	(0.4551)	(0.0233)	(0.0634)	(0.0638)	(0.0603)	(0.0855)
GDP per Capita	1.9323	1.0513*	0.4863	1.19510	-0.3956***	-0.4547***	0.7769	0.7926**	0.2040	0.0586*	-0.2812**	-0.8800***
	(7.0239)	(0.5309)	(0.6967)	(1.1077)	(0.0972)	(0.1137)	(0.8653)	(0.2642)	(0.2246)	(0.0283)	(-0.0479)	(0.1267)
GDP per Capita Growth	-0.5972	-0.1027	0.0346	0.0558	0.2188	0.3588	3.4217	-0.4773	-0.2225	0.4759	0.3896	0.7458
	(1.4094)	(0.0919)	(0.1590)	(0.2402)	(0.1270)	(0.2065)	(5.2802)	(0.2813)	(0.5729)	(0.5204)	(0.4004)	(0.4037)
Inflation	0.4145	0.1709*	0.0476	0.3865**	-0.1298	-0.0131	0.1423	-0.0578	-0.3763	0.3212	0.3538	-0.0755
	(1.1615)	(0.0796)	(0.1739)	(0.1400)	(0.1313)	(0.2156)	(3.2844)	(0.1398)	(0.1618)	(0.1775)	(0.2467)	(0.2341)
Real interest rate	-0.4458	0.0559	0.0074	0.0578	-0.0264	-0.0008	-0.7589	0.0220	0.0135	0.2456**	-0.0613	-0.2404***
	(0.5240)	(0.0309)	(0.0534)	(0.0691)	(0.0412)	(0.0560)	(1.3677)	(0.0604)	(0.0900)	(0.0872)	(0.0810)	(0.0832)
Average Oil Prices	0.1094	-0.0086	-0.0117	-0.0007	0.0177	0.0253	0.3100	0.0079	0.0812	-0.0130	-0.0066	-0.0420
	(0.1913)	(0.0118)	(0.0177)	(0.0212)	(0.0350)	(0.0370)	(0.8532)	(0.0439)	(0.0605)	(0.0549)	(0.0574)	(0.0475)
HHI Index	-2.6967	-1.1325	-3.3840	-3.3525	8.2794***	1.1568***	1.9436	2.9766***	5.7043***	-0.5707	-0.0644	-0.9435
	(7.2570)	(1.7063)	(1.9890)	(3.1824)	(2.2750)	(0.5784)	(2.7639)	(0.9610)	(1.8408)	(6.5382)	(0.0310)	(1.3396)
_cons	-3.234	7.8897	2.7661	-5.0785	2.0130***	8.5884***	2.5882	-2.6675	5.4971	-4.9246	2.5397***	3.9839***
	(7.8963)	(13.0511)	(5.4280)	(4.7583)	(0.4919)	(1.7177)	(2.6619)	(4.3759)	(10.9242)	(5.0904)	(0.5094)	(0.6538)
R^2	0.0011	0.0494	0.0636	0.0394	0.0742	0.0502	0.0167	0.0043	0.0058	0.011	0.0128	0.0037
N	1,786	2,874	2,888	1,929	2,877	1,925	325	531	526	359	525	359

Note: This table investigates whether Islamic banks have lower liquidity risk than conventional and Islamic window banks, while controlling for bank and country specific variables, during global financial crisis (2007-2009). The columns (1) - (18) are liquidity risk independent variables which are: (1,7, and 13) interbank (2, 8 and 14) net loans divided by total assets (3, 9, and 15) net loan divided by customer &short term funding (4,10 and 16) net loan divided by total deposits and borrowing (5, 11 and 17) liquid assets divided by customer and short term funding (6,12 and 18) liquid assets divided by total deposit and borrowings. Significant level at 10%, 5%, 1% are indicated through *, **, ***, respectively.

Continued

Table 3.11: Liquidity Risk

Panel C:: Sovereign Debt Crisis (2010-2013)

	(13)	(14)	(15)	(16)	(17)	(18)
Islamic Banks	-0.8464	0.6113***	0.7168***	0.0188***	-0.0937*	-0.3677*
	(1.4007)	(0.0001)	(0.2382)	(0.0040)	(0.2150)	(0.1836)
Islamic window banks	-0.0179	0.0500**	1.8249	0.2060***	-0.9137	0.7832
	(0.0173)	(0.0197)	(2.0537)	(0.0528)	(2.2481)	(0.4249)
Total Assets	2.1727*	2.6003***	3.9829**	2.3399	-0.4863**	-0.1239**
	(1.0623)	(0.7322)	(1.2807)	(1.2350)	(0.1646)	(0.0483)
Equity Total Assets	0.4777	-0.1870***	0.6896***	0.8801***	0.4274	0.1017
	(0.6858)	(0.0408)	(0.0793)	(0.0886)	(0.1857)	(0.1659)
ROAA	3.3409	-0.5562**	-1.6383***	-1.1755**	-0.1637	-0.0150
	(3.5435)	(0.2068)	(0.3732)	(0.4046)	(0.5313)	(0.5948)
Loan Growth	0.0454	0.0275***	0.0528***	-0.0233	0.0178	-0.0044
	(0.1593)	(0.0099)	(0.0175)	(0.0189)	(0.0279)	(0.0266)
Non Interest Income	0.0730	-0.1954***	-0.2068***	-0.2976***	0.1765*	0.1815
	(0.2765)	(0.0193)	(0.0335)	(0.0346)	(0.0679)	(0.0737)
Cost to Income Ratio	-0.0150	-0.0735***	-0.1799***	-0.1234***	-0.0283	0.0143
	(0.2828)	(0.0175)	(0.0307)	(0.0346)	(0.0442)	(0.0364)
GDP per Capita	0.8930	0.0322	-0.9863	-0.1675	-0.7676	-0.9342
	(1.2788)	(1.2948)	(1.7477)	(0.2560)	(1.9462)	(1.6854)
GDP per Capita Growth	-2.4696	-0.0693	-0.0039	0.0635	0.1669	0.4176
	(2.2264)	(0.1514)	(0.2673)	(0.3056)	(0.2291)	(0.3327)
Inflation Rate	1.5584	0.3984**	0.4931	0.6450	-0.3544	-0.1172
	(1.9837)	(0.1462)	(0.2582)	(0.2909)	(0.2040)	(0.2617)
Real interest	-0.9087	0.0922	0.0251	0.0377	-0.1268	-0.0685
	(1.3466)	(0.0927)	(0.1632)	(0.1650)	(0.1614)	(0.1442)
Average Oil Prices	0.0422	-0.0190	-0.0617	0.0052	-0.0357	0.0375
	(0.7081)	(0.0426)	(0.0757)	(0.0823)	(0.0496)	(0.0594)
HHI Index	-0.2628	0.6285	0.4098	-0.0444	-0.7961	-0.1757
	(0.7914)	(0.3538)	(1.2639)	(0.94621)	(1.5748)	(0.3168)
_cons	-5.0285	3.3910	7.2407	1.4032	2.1432	4.9619
	(11.0955)	(2.7035)	(13.3565)	(3.5571)	(6.2248)	(4.7564)
R^2	0.0137	0.1233	0.0864	0.0963	0.085	0.0333
N	812	1,319	1,329	1,312	1,317	857

Note: This table investigates whether Islamic banks have lower liquidity risk than conventional and Islamic window banks, while controlling for bank and country specific variables, during global financial crisis (2007-2009). The columns (1) - (18) are liquidity risk independent variables which The columns (1) - (18) are liquidity risk independent variables which are: (1,7, and 13) interbank (2, 8 and 14) net loans divided by total assets (3, 9, and 15) net loan divided by customer &short term funding (4,10 and 16) net loan divided by total deposits and borrowing (5, 11 and 17) liquid assets divided by customer and short term funding (6,12 and 18) liquid assets divided by total deposit and borrowings.. Significant level at 10%, 5%, 1% are indicated through *, **, ***, respectively.

3.6.2. Risk Determinants

Focusing on the difference between the three types of banks (Islamic, conventional, Islamic window banks), the emphasis of this section is to present the empirical test and discussion on the impact of explanatory variables (bank-specific and country-specific variables) on credit and liquidity risk. Section 3.12 reports the determinants for credit risk whereas section 3.13 shows the determinants for liquidity risk.

3.6.2.1. Risk Determinant-Credit Risk

Table 3.12 reports the results of bank-specific characteristics and country-level determinants for credit risk, such as log total assets, equity/assets, growth of gross loan and total assets, non- interest income, and several other bank levels. The table illustrates four panels: full sample, Islamic, conventional, and Islamic window banks.

3.6.2.1.1. Bank-Specific Characteristics

Size: As shown in Table 3.12, loan loss allowance ratio is negatively and significantly correlated with credit-based risk in panel A, B and C. This implies more size is associated with lower credit risk with Islamic and conventional banks, whereas with Islamic window banks the relationship is not significant. Confirming the previous result, the remaining robustness checks ratios (loan loss provision ratios, net charge off ratio, impaired loan ratio) also reveal the same results (negative). This result is in line with the previous hypothesis of this study. The results obtained also suggest that bank size has the same behaviour with an Islamic bank whereas in contra with Islamic window banks. Overall, this supports the view that big banks tend to be better in terms of risk performance than smaller banks. This result support the view that more diversification, a lower scale of economies, higher profits, and lower informational asymmetries are all relevant factors to risk, which are associated with large banks.

Capitalization: In line with the findings of the previous literature (such as Dinger and Von Hagen 2009), the interaction between capitalization structure and loan loss provision is positively significant. Interestingly, we find that Islamic banks' credit risk is affected differently from conventional and Islamic window banks as the relationship are significant only with Islamic banks panel (Panel B). This implies that credit risk in Islamic banks is very sensitive to capitalization. Columns (1) and (4) in panel A confirm our evidence in line with

the view that capitalization is a predominant factor to explain stability of banks. The expected result was driven from the view that a higher equity ratio leads shareholders to monitor the activities of a bank. Consequently, it leads the banks to engage in less risky projects which are explained through moral hazard incentive (Keeton and Morris 1987).

Diversification: The coefficients of the non-interest income variable are as expected. Table 7 illustrates that there is a significant and positive association between diversification and loan loss provision ratio and net charge off in panel A (all banks) and C (conventional banks). This supports the view that higher diversification improves loan quality. Interestingly, coefficient is not significant in panel B (Islamic banks) and D (Islamic window banks). This indicates the diversification impact on credit risk varies when we divide the sample into Islamic, conventional, and Islamic window. The results show that all the banks and conventional banks have a negative relationship, while Islamic and Islamic window banks positive but not significant. This is possibly due to the different nature of Islamic banks' operations.

Efficiency: The regression results in Table 3.12, show that the effect of the cost to income is significant and positive in column (9) and (11) whereas as significant and negative in columns (10) in panel C (conventional banks), suggesting that the role of efficiency is inconsistent. The results also indicate that cost to income ratio is also significant and positive with respect to Islamic and Islamic window banks. This result is in line with the view that inefficiency leads to higher cost (risk) attributed to weak credit monitoring and inadequate internal control of operations (Fiordelisi et al. 2011). However, the results are significant and inconsistent with conventional banks. This implies that Islamic banks' credit risk is affected differently from conventional banks but in line with Islamic window banks by the efficiency ratio.

Loan Growth: The columns (5) and (6) in Table 3.12 in panel B and columns (13) and (14) in panel D (Islamic and Islamic window banks) reveal a significant and negative relationship between loan growth and credit risk across. These results suggest that greater loan growth leads to lower credit risk. This might be due to the possibility that fast-growing banks have proper strategies for funding, risk, and returns outcome (Demirgüç-Kunt and Huizinga 2010). In addition, this finding rejects the minimum credit standard hypothesis that loan growth can be attributed to lower interest rates, relaxing collateral requirements, and reducing the overall credit standard. However, conventional banks appear to be more sensitive to loan growth as there is a negative significant result with all the credit risk proxies. This implies that Islamic

banks' credit risk is affected differently from conventional banks but in line with Islamic window banks by the loan growth.

Profitability: In line with our expectation, the columns (1) to (3) reveal that return growth of total assets (ROAA) is significantly and negatively associated with credit risk in conventional banks, suggesting that the higher the profitability, the less the associated credit risk. In contrasts, the coefficients are not significant in Islamic and Islamic window banks. This implies that profitability is an influential determining factor for credit risk with conventional banks. This result suggests that the association between profitability and credit risk varies across the three different types of financial institutions.

3.6.2.1.2. Macroeconomic Effects

In this section, we present and discuss the regression results with respect to macroeconomic-level variables. We regress risk variables against GDP per capita, GPD per capita growth, inflation, real interest rate, average oil prices, and HHI index. Table 3.12 presents the results of estimations for all the macroeconomic effects.

Oil Prices: The results in Table 3.12 shows that all oil prices coefficients are on average positively associated to credit risk for Islamic banks, even though all of them are not significant. This indicates that higher oil price increase the probability of default risk which does not support our hypothesis (H_8). Almost similar to Islamic banks results, there is also positive correlation between oil price and credit risk. Overall, the results implies that banks' credit risk is affected positively regardless the types of banks.

GDP: The results in Table 3.12 reveal that GDP per capita are negatively associated with credit risk with conventional banks. This result is in line with the business cycles hypothesis that economic factors tend to impact the business cycles on loan quality. Furthermore, the results support the view that greater GDP leads to greater profitability and, consequently, reduced risk. However, there are no significant results in Islamic and Islamic window banks.

Inflation: The estimates obtained in Table 3.12 show that inflation does not appear to have a significant effect on the stability of banks with Islamic and Islamic window banks. However, with respect to conventional banks, the results indicate that coefficients of inflation are positive. This implies that higher inflation significantly leads to higher credit risk. The correlation is probably due to the possibility that inflation forces banks to diversify, particularly in free income activities. In conclusion, the interaction between inflation and credit risk depends on types of banks.

Competition: The results show that competition does not appear to have a significant effect on the stability of banks with all types of the financial institutions; Islamic, conventional and Islamic window banks. This implies that Islamic banks' credit risk is not affected differently from conventional banks but in line with Islamic window banks by competition factor.

Table 3.12: Regression Results - Risk Determinants for Credit Risk

variables	***Panel A: All Banks***				***Panel B: Islamic Banks***			***Panel C: Conventional Banks***				***Panel D: Islamic window banks***				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Total Assets	-0.9992***	0.0091	-0.0595	-1.2869	-1.8230*	-0.3655	-0.2847	-1.7192	-1.2894***	-0.0013	-0.0134	-0.8888	0.7485	0.2028	0.4353	1.6359
	(0.2439)	(0.1816)	(0.0948)	(0.8222)	(0.8038)	(0.1882)	(0.4993)	(2.0634)	(0.2734)	(0.2575)	(0.0817)	(1.1210)	(0.7756)	(0.1505)	(0.2875)	(2.6752)
Equity Total Assets	0.0122	-0.0030	0.0467*	0.0602	0.0916***	-0.0104	0.1060**	0.2324*	-0.0190	-0.0023	0.0172	-0.0216	-0.0192	0.0276	0.0359	0.0357
	(0.0150)	(0.0046)	(0.0200)	(0.0731)	(0.0285)	(0.0049)	(0.0258)	(0.0912)	(0.0208)	(0.0109)	(0.0149)	(0.0602)	(0.0908)	(0.0484)	(0.0260)	(0.1115)
ROAA	-0.0282	-0.1212	-0.4213*	-1.0079	0.1443	-0.0491	-0.0785	-1.5140	-0.2582*	-0.2740***	-0.4110*	-1.0049	0.6540	0.2516	-0.0355	0.1944
	(0.1041)	(0.0666)	(0.1736)	(0.4298)	(0.2192)	(0.0779)	(0.4152)	(1.1919)	(0.1324)	(0.0729)	(0.1653)	(0.5022)	(0.5732)	(0.3269)	(0.1605)	(1.4297)
Loan Growth	-0.0384***	-0.0075***	-0.0118*	-0.0628***	-0.0410***	-0.0039*	-0.0115	-0.0502	-0.0342***	-0.0085***	-0.0131**	-0.0623***	-0.0410**	-0.0137*	-0.0066	-0.0567
	(0.0046)	(0.0017)	(0.0045)	(0.0106)	(0.0107)	(0.0018)	(0.0096)	(0.0267)	(0.0052)	(0.0022)	(0.0040)	(0.0110)	(0.0162)	(0.0062)	(0.0040)	(0.0486)
Noninterest Income	0.0315***	-0.0025	0.0232***	0.0458	0.0092	-0.0076	0.0262	0.0217	0.0541***	0.0014	0.0236**	0.0270	0.0126	0.0104	0.0193	0.0919
	(0.0073)	(0.0039)	(0.0052)	(0.0328)	(0.0147)	(0.0044)	(0.0185)	(0.0665)	(0.0100)	(0.0048)	(0.0059)	(0.0300)	(0.0243)	(0.0073)	(0.0089)	(0.0523)
Cost to Income Ratio	0.0278***	-0.0234***	-0.0116**	0.0363	0.0514***	-0.0101	-0.0196	0.1263	0.0148*	-0.0321**	-0.0131**	-0.0033	0.0658***	-0.0124	-0.0054	0.0859
	(0.0061)	(0.0050)	(0.0038)	(0.0346)	(0.0155)	(0.0063)	(0.0201)	(0.0786)	(0.0074)	(0.0085)	(0.0043)	(0.0200)	(0.0145)	(0.0102)	(0.0091)	(0.0465)
GDP per Capita	-0.9394***	-1.4669*	-0.1831	-4.5831	-0.4704	-0.9259	-1.6243	0.7550	-0.8892***	-1.9221**	-0.1052	-0.2553	-0.1528	-1.2268	0.5642	-0.1173
	(0.1851)	(0.5598)	(0.6887)	(2.6972)	(0.4878)	(0.5004)	(2.0003)	(4.2879)	(0.2171)	(0.7068)	(0.4748)	(0.2917)	(0.2028)	(1.4526)	(0.9606)	(0.1486)
GDP per Capita Growth	0.1033*	-0.0197	0.0417	0.2181	0.1204	-0.0301	0.0469	0.0064	0.1406**	0.0022	0.0517	0.2845	0.0728	-0.0665*	-0.0210	0.3445*
	(0.0453)	(0.0134)	(0.0228)	(0.1223)	(0.1280)	(0.0158)	(0.0433)	(0.1011)	(0.0527)	(0.0173)	(0.0287)	(0.1487)	(0.1106)	(0.0246)	(0.0253)	(0.1607)
Inflation Rate	-0.0452	0.0132	-0.0237	0.0349	0.0003	0.0106	0.1268	0.1536	-0.0693	-0.0014	-0.0371*	0.0117	0.0722	0.0631	0.0433	-0.0207
	(0.0447)	(0.0147)	(0.0212)	(0.0556)	(0.1082)	(0.0095)	(0.1747)	(0.1559)	(0.0549)	(0.0226)	(0.0148)	(0.0492)	(0.1148)	(0.0475)	(0.0222)	(0.0954)
Real interest	0.0095	0.0031	-0.0040	0.0109	0.0376	0.0064	0.0044	-0.0016	0.0052	0.0059	-0.0030	0.0273	0.0037	-0.0043	-0.0044	-0.0367
	(0.0181)	(0.0036)	(0.0064)	(0.0181)	(0.0452)	(0.0048)	(0.0141)	(0.0581)	(0.0224)	(0.0056)	(0.0101)	(0.0231)	(0.0395)	(0.0076)	(0.0054)	(0.0445)
Average Oil Prices	0.0124	-0.0025	0.0001	0.0113	0.0245	0.0015	0.0042	0.0024	0.0111	-0.0025	0.0015	0.0082	0.0101	-0.0065	-0.0051	0.0168
	(0.0065)	(0.0025)	(0.0036)	(0.0131)	(0.0188)	(0.0023)	(0.0073)	(0.0292)	(0.0073)	(0.0033)	(0.0038)	(0.0139)	(0.0163)	(0.0041)	(0.0035)	(0.0202)
HHI Index	0.9064	0.3107	0.3681	0.9372	0.8141	0.4385	1.2561	2.4452	0.0562	0.3641	0.3078	-0.4934	0.1710	0.1537	0.1061	1.9650
	(1.1114)	(0.3066)	(0.2544)	(1.0060)	(1.0923)	(0.3202)	(0.7063)	(2.7300)	(1.3779)	(0.5274)	(0.3481)	(1.2526)	(2.1166)	(0.3732)	(0.2318)	(1.6425)
_cons	3.4718	8.8576**	2.0081	3.5408*	4.7561*	7.9129**	8.1832	2.9996	3.3390***	2.1966**	1.8901	2.1303*	9.7962	5.2132	-4.6092	2.7460
	(0.8473)	(2.8723)	(2.4504)	(1.7704)	(2.3053)	(2.1988)	(7.3869)	(15.6074)	(0.5916)	(0.7218)	(1.6968)	(1.0325)	(16.7503)	(5.2041)	(5.5909)	(2.7866)
R^2	0.0474	0.1502	0.1011	0.0864	0.0454	0.0670	0.1630	0.3881	0.0421	0.1823	0.1044	0.0484	0.2415	0.1966	0.0040	0.1827
N	2,598	2,916	1,718	2,068	425	523	241	306	1,814	1,987	1,216	1,484	359	406	261	278

Note: This table reports the results for the risk determinants (bank and country - specific variables) and credit risk for sub-samples (panel A, B, C, D) for all sample period (2006 -2015). The columns 1 - 4 are credit risk dependent variables which are: 1- Loss Allowance; 2-Loan Loss Provision; 3- Net Charge Off ; 4-Impaired Loan. Significant level at 10%, 5%, 1% are indicated through *, **, ***, respectively.

3.6.2.2. Risk Determinant-Liquidity Risk

In this section, we present the results of bank-specific characteristics and country-level determinants with respect to liquidity risk, such as log total assets, equity/assets, growth of gross loan and total assets, non- interest income, and several other bank levels. Table 3.13 illustrates the regression results for fours panels: full sample period, Islamic, conventional, and Islamic window banks.

3.6.2.2.1. Bank-Specific Characteristics

Size: As expected, column (1) in Table 3.13 illustrates that the coefficients of bank size is significant and positive for liquidity risk across all banks (panel A), probably owing to scale of economic. This finding is not in line with credit risk, as the link was negative, suggesting that the influence of bank size regardless on the type of risk (credit and liquidity risk). Similar to the above results shown in column (1), the results for Islamic is positive but not significant. Confirming the above results, the other ratios (columns 8, 10, 11) indicate that the coefficients of total assets significantly decrease the liquidity risk with Islamic banks. Concerning the conventional and Islamic window banks, the results are significant but inconsistent. This implies that Islamic banks' liquidity risk is affected differently from conventional and Islamic window.

Capitalization: With respect to H3, we find that the effect of equity to total asset ratio is significant but conflicting with Islamic banks. In line with this finding, equity capital to total assets ratio has a significant and conflicting effects of liquidity risk of conventional. Concerning the Islamic window banks (see column 20 and 21: Table 3.13), we find that higher capitalization is associated with higher liquidity risk. This is probably because the higher the capitalization the higher the leads of shareholders which make bank's managers to engage in higher risk taken to increase the net income of the banks. This implies that Islamic and conventional bank's liquidity risk is affected differently from Islamic window banks.

Efficiency: The cost to equity variable has a conflicting and significant relationship with the liquidity risk for all banks sample (see panel A, columns 2-6: Table 3.13). We also find that cost to income ratio is also significantly related with liquidity risk in Islamic and Islamic window banks, however the results are conflicting. With respect to conventional banks, the results show that efficiency has a significant and a negative relationship with liquidity risk. This implied that efficiency is associated with lower liquidity risk. These results are consistence with previous research (Fiordelisi et al. 2011; Dong et al. 2017). The possible

explanation for this result, is if the banks is managed efficiently this makes the bank management is professional enough to maintain the risk taken behaviour.

Diversification: Analysis of the results in Table 3.13 indicates that diversification is significantly and negatively related to liquidity risk in panel B (Islamic banks) which is in line with credit risk regression. This is probably due to the view that higher diversification reduce the cost from economic of scope and enhance stability. The results do not change with conventional banks, however the relationship is relatively more sensitive to diversification than Islamic and Islamic window banks as five significant results obtained with conventional banks compared to Islamic and Islamic window banks. With respect to Islamic window banks, the results show there diversification is significantly and negatively associated with liquidity risk.

Profitability: The coefficient of profitability in Islamic banks, particularly, net loans over total asset ratio and net loans and net loan over customer and short term funding ratio is significantly negative. This implies that the higher the profitability the lower the liquidity risk. This is in consistence with pecking order theory, higher profitability cause increase in the probability of retaining earnings, thus reducing the use of debt. However, there is no significant result with conventional and Islamic window banks. This suggests that profitability is as influential factor for liquidity risk for Islamic banks only. Hence, Islamic bank's liquidity risk is affected differently from conventional and Islamic window banks by profitability.

Loan Growth: The results provide evidence that loan growth affects the Islamic and conventional bank's liquidity risk significantly and positively. This implies that loan growth is a significant driver if the riskiness of banks and that loan growth leads to an increase in loan liquidity risk. That loan growth is probably due to the lower interest rates, relaxing credit standards which might affect the liquidity risk. Concerning the Islamic window banks, there is no significant relationship between loan growth and liquidity risk.

3.6.2.2.2. Macroeconomic Effects

The primary aim of this section is to empirically test the effect of macroeconomic factors on liquidity risk taking behaviour, taken into consideration the difference between three types of banks: Islamic, conventional and Islamic window banks. We regress risk variables against GDP per capita, GPD per capita growth, inflation, real interest rate, average oil prices, and HHI index. Table 3.13 presents the results of estimations for all the macroeconomic effects.

Oil Prices: In relation to the oil prices, we find on average a statistical negative relationship in conventional banks, even all are not significant. This implies that higher oil prices leads to higher liquidity risk in conventional bank (see panel A: Table 3.13). This result supports our fourth hypothesis for conventional banks. Interestingly, we find inconsistent results with respect to Islamic banks. The results indicate positive relationship between oil prices and liquidity risk. This implies that a higher oil price is linked with less liquidity risk. Hence, Islamic bank's liquidity risk is affected differently from conventional banks by oil prices.

Inflation: As shown in Table 3.13, increase in inflation seems to be associated significantly with higher liquidity risk in all bank samples. This result provides support for our hypothesis, as the debt service become expensive, which in return the probability of loan default. Relatively in consistent with previous results, all the regression results for Islamic banks indicate that inflation significantly has a negative link with liquidity risk. With respect to conventional banks, we find some evidence of significantly and positively link between the proportion of inflation and liquidity risk. Hence, inflation rates affect Islamic bank's liquidity risk differently from conventional banks

GDP: Finally, we find that GDP per capita tends to be negatively associated with liquidity in Islamic banks, as it is reported in Table 3.13 (Panel B: columns 6 and 10). This suggests that greater proportion of GDP is associated with higher liquidity risk. With respect to conventional and Islamic window banks the results are almost the same. Hence, GDP per capita is a significant driver if the riskiness of each of the three financial institutions and that GDP per capita leads to an increase in loan liquidity risk.

Competition: The results show that competition does not appear to have a significant effect on the stability of banks with Islamic and conventional financial institutions. However, the results show a significant and negative relationship between competition and Islamic window bank's liquidity. This implies that Islamic banks' credit risk is not affected differently from conventional banks but not in line with Islamic window banks by competition factor.

Table 3.13: Regression Results - Risk Determinants for Liquidity Risk

Variables	***Panel A: All Banks***					***Panel B: Islamic Banks***						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Total Assets	0.1079**	0.1457	0.6481	0.0097	0.0097	-0.1171**	0.1394	0.0691	0.0625***	0.2549	-0.1983***	-0.1561***
	(0.0530)	(0.2149)	(0.7248)	(0.0123)	(0.0102)	(0.0455)	(0.2055)	(0.0718)	(0.0303)	(0.3228)	(0.0991)	(0.0591)
Equity Total Assets	0.6730	0.2179**	0.6021**	0.6176***	0.6176***	0.3449**	0.7283	-0.3992*	0.5244***	0.4125	0.3732	0.6644***
	(0.4689)	(0.0778)	(0.1602)	(0.2343)	(0.2343)	(0.1461)	(0.5915)	(0.0725)	(0.1879)	(0.4599)	(0.2179)	(0.2130)
ROAA	0.0305	-0.1770	-0.7332	0.3128	0.3128	-0.7753	0.7278	-1.0827*	-1.4887**	-0.7214	-0.1763	-0.8435
	(0.0450)	(0.1770)	(0.3770)	(0.5209)	(0.5209)	(0.6626)	(3.5532)	(0.1845)	(0.4170)	(0.3637)	(0.6018)	(0.5358)
Loans Growth	0.0381	0.0174	0.0312	-0.0152	-0.0152	-0.0145	0.0241	0.0237	0.1639*	0.0795	0.0635	-0.0324
	(0.1056)	(0.0111)	(0.0173)	(0.0168)	(0.0168)	(0.0229)	(0.1876)	(0.0161)	(0.0304)	(0.0985)	(0.0479)	(0.0484)
Noninterest Income	0.0126	-0.1819*	-0.2063*	-0.2589*	-0.2589*	0.1794***	-0.1449	-0.1200**	-0.1410*	-0.1489***	0.0436	0.0845
	(0.1920)	(0.0362)	(0.0625)	(0.0668)	(0.0668)	(0.0740)	(0.2298)	(0.0323)	(0.0635)	(0.0668)	(0.0704)	(0.0682)
Cost to Income Ratio	0.0033	-0.0489*	-0.1228*	-0.0801*	-0.0801*	-0.0516	-0.5934***	-0.0888***	-0.1042	-0.0762	-0.0690	-0.0731
	(0.1898)	(0.0134)	(0.0392)	(0.0287)	(0.0287)	(0.0498)	(0.2958)	(0.0341)	(0.0506)	(0.0743)	(0.0464)	(0.0515)
GDP per Capita	0.5730	0.5042***	0.1699	1.5350	0.5350	-0.8895*	-0.2816***	0.7934	-0.9325	0.4983	-0.3384*	-0.2991
	(0.6796)	(0.2428)	(0.2506)	(1.9450)	(0.5484)	(0.1749)	(0.1350)	(0.9059)	(1.6527)	(0.7391)	(0.0844)	(0.4436)
GDP per Capita Growth	-0.4885	-0.1070	0.0316	0.0505	0.0505	0.3717	2.9154	-0.3138	-0.0700	0.1463	0.4232	0.6326
	(1.4111)	(0.0940)	(0.1598)	(0.2387)	(0.2387)	(0.2041)	(2.3750)	(0.1811)	(0.2652)	(0.2529)	(0.2417)	(0.3471)
Inflation Rate	0.4141	0.1674***	0.0440	0.3874*	0.3874*	-0.0129	2.2366	0.0954	-0.1886	0.1576	0.0363	0.6571**
	(1.1633)	(0.0804)	(0.1742)	(0.1397)	(0.1397)	(0.2178)	(1.7248)	(0.1432)	(0.1679)	(0.2411)	(0.1268)	(0.1923)
Real interest	-0.4522	0.0577	0.0119	0.0583	0.0583	-0.0019	-0.4627	-0.0585	-0.1687**	-0.3513	-0.0888	0.2213
	(0.5247)	(0.0323)	(0.0540)	(0.0691)	(0.0691)	(0.0558)	(0.9163)	(0.0873)	(0.0549)	(0.1847)	(0.1537)	(0.1622)
Average Oil Prices	0.1084	-0.0083	-0.0121	-0.0009	-0.0009	0.0259	0.4148	-0.0493	-0.1152	-0.1068	0.0283	0.0363
	(0.1916)	(0.0109)	(0.0168)	(0.0206)	(0.0206)	(0.0363)	(0.3946)	(0.0313)	(0.0595)	(0.0774)	(0.0647)	(0.0663)
HHI Index	-0.8249	-1.1355	-0.3497	-0.9562	-0.9562	0.4931*	-0.2809	-1.7580	-0.4990	-0.4609	0.7571	0.1478
	(1.2253)	(1.7416)	(0.6209)	(1.2713)	(1.2703)	(0.1789)	(0.3558)	(4.7337)	(0.6493)	(0.6031)	(1.6715)	(0.1532)
_cons	-3.9819	-1.4336	3.6108	-2.8954	-6.0856	7.4429*	7.6593***	2.9129	3.2174	-5.5289	6.5398*	4.3641***
	(4.7111)	(1.6962)	(4.5465)	(4.2630)	(7.0419)	(1.2709)	(2.8936)	(3.7088)	(3.2614)	(6.3755)	(1.2832)	(2.1765)
R^2	0.0098	0.0449	0.0609	0.0327	0.0327	0.0434	0.0796	0.2914	0.1812	0.0262	0.0298	0.1217
N	1,786	2,874	2,888	1,929	1,929	1,925	339	502	497	272	487	271

Note: This table reports the results for the risk determinants (bank and country - specific variables) and liquidity risk for sub-samples (panel A, B, C, D) for all sample period (2006 -2015). The columns (1) - (23) are liquidity risk independent variables which are: (1) interbank (2) net loans divided by total assets (3) net loan divided by customer &short term funding (4) net loan divided by total deposits and borrowing (5) liquid assets divided by customer and short term funding (6) liquid assets divided by total deposit and borrowings. Significant level at 10%, 5%, 1% are indicated through *, **, ***, respectively.

Continued

Table 3.13: Regression Results - Risk Determinants for Liquidity Risk

	Panel C: Conventional Banks						***Panel D: Islamic window Banks***					
	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
Total Assets	0.2062***	1.7948*	0.7720	0.9561	-0.8035**	-0.7379*	0.9969***	0.6579	0.0684***	0.4393**	-0.8925	-0.6710***
	(0.0999)	(0.5989)	(1.1450)	(1.3738)	(0.3127)	(0.2758)	(1.1121)	(0.7330)	(0.0326)	(0.1642)	(1.1360)	(0.3339)
Equity Total Assets	0.2280	-0.1023***	0.6567**	0.7999***	0.3848***	0.1458	-2.5762	0.0372	0.7954**	0.6303***	0.6045	0.3779
	(0.7117)	(0.0421)	(0.2237)	(0.3156)	(0.1470)	(0.1511)	(2.5308)	(0.1496)	(0.2273)	(0.2470)	(0.4767)	(0.4007)
ROAA	0.2794	0.1184	-0.4826	0.5383	0.1884	-0.4589	0.8495	-0.8765	-1.2910	-0.6109	-0.2251	-0.0715
	(0.4114)	(0.1871)	(0.6014)	(0.7366)	(0.6391)	(0.5819)	(0.9475)	(0.5536)	(0.6820)	(1.4650)	(1.3081)	(1.9644)
Loan Growth	0.1057	0.0200***	0.0097	-0.0123	-0.0040	-0.0136	-0.4774	0.0075	0.0214	-0.0661	-0.0635	-0.0625
	(0.1316)	(0.0083)	(0.0188)	(0.0172)	(0.0212)	(0.0254)	(0.3678)	(0.0402)	(0.0582)	(0.0964)	(0.0486)	(0.0712)
Noninterest Income	-0.2118	-0.2091*	-0.2193**	-0.2915**	0.2876*	0.2213*	0.2138	-0.2997**	-0.4576**	-0.3274***	0.2620	0.1960
	(0.3117)	(0.0204)	(0.0862)	(0.0970)	(0.0631)	(0.0777)	(0.7253)	(0.0808)	(0.1121)	(0.1323)	(0.1389)	(0.1372)
Cost to Income Ratio	0.2613	-0.0381***	-0.1363***	-0.0587	-0.0328	-0.0463	0.7555	-0.1030***	-0.2165**	-0.2950***	-0.0432	0.2428***
	(0.2478)	(0.0162)	(0.0667)	(0.0638)	(0.0564)	(0.0502)	(0.7098)	(0.0451)	(0.0738)	(0.1238)	(0.0873)	(0.0809)
GDP per Capita	0.4317	0.7449*	0.4169	0.2127	-0.2730*	-0.5628*	0.7107	0.1056	-0.2627	0.9661	-0.0750	-0.7352**
	(0.6415)	(0.1462)	(0.5310)	(0.2708)	(0.0571)	(0.1184)	(0.9050)	(0.1379)	(0.2659)	(1.2301)	(0.0564)	(0.1943)
GDP per Capita Growth	-1.9831	-0.1762	-0.1830	0.0632	0.2187	0.4298	0.3680	0.2305	0.3783	0.1499	0.2871	0.4283
	(2.0103)	(0.1139)	(0.1282)	(0.2924)	(0.1605)	(0.2354)	(3.5858)	(0.1769)	(0.1956)	(0.2963)	(0.2251)	(0.2849)
Inflation Rate	0.5732	0.2408***	0.3415	0.4304**	-0.1410	-0.1602	5.0006	0.1713	0.1278	0.5292	-0.0646	-0.2957
	(1.7170)	(0.1140)	(0.1915)	(0.1451)	(0.1631)	(0.1983)	(4.0632)	(0.1255)	(0.1795)	(0.3373)	(0.3031)	(0.3144)
Real interest	-0.4478	0.0643	0.0457	0.1313***	-0.0313	-0.0254	-0.2469	0.0282	-0.0376	0.0518	0.0066	-0.0205
	(0.7030)	(0.0487)	(0.0596)	(0.0593)	(0.0515)	(0.0685)	(1.2056)	(0.0329)	(0.0746)	(0.0597)	(0.0774)	(0.0845)
Average Oil Prices	0.0847	0.0037	0.0144	0.0138	0.0100	0.0236	-0.0186	-0.0333	-0.0596	-0.0261	0.0543	0.0585
	(0.2399)	(0.0162)	(0.0159)	(0.0161)	(0.0297)	(0.0329)	(0.4780)	(0.0342)	(0.0350)	(0.0148)	(0.0765)	(0.0544)
HHI Index	-0.6219	-0.8921	-0.7223	-0.2564	0.9533*	0.2460*	-0.0504	-3.0283	-0.8516	-0.1199***	0.6452	0.2483***
	(0.7298)	(3.0803)	(0.7578)	(2.9755)	(0.3316)	(0.0796)	(0.0576)	(4.2586)	(1.2609)	(0.1338)	(0.9565)	(0.1184)
_cons	-2.6570	-4.0836	2.7741	-7.4572	9.2548*	5.0865*	-8.1795	-0.6991	2.0194	-4.5310	7.8628	8.5949**
	(2.6958)	(4.5616)	(3.5325)	(10.9697)	(1.5489)	(0.8996)	(10.3999)	(1.0303)	(2.6383)	(6.7106)	(11.7355)	(3.1389)
R^2	0.0055	0.0221	0.0435	0.0624	0.0569	0.021	0.0244	0.1632	0.1439	0.0219	0.0758	0.0567
N	1,194	1,970	1,988	1,380	1,984	1,377	253	402	403	277	406	277

Note: This table reports the results for the risk determinants (bank and country - specific variables) and liquidity risk for sub-samples (Panel A, B, C, D) for all sample period (2006 -2015). The columns (1) - (23) are liquidity risk independent variables which are: (1) interbank (2) net loans divided by total assets (3) net loan divided by customer &short term funding (4) net loan divided by total deposits and borrowing (5) liquid assets divided by customer and short term funding (6) liquid assets divided by total deposit and borrowings. Significant level at 10%, 5%, 1% are indicated through *, **, ***, respectively.

3.7. Conclusion

This chapter has investigated the stability and determinants of credit and liquidity risk of three different types of banks: Islamic, conventional, and Islamic window banks. The focus of this study is on the global financial and sovereign debt crises. The chapter uses a sample of 950 banks from 56 countries during three different periods: 2006-2015 (full sample period), 2007-2009 (global financial crisis), and 2010-2013 (sovereign debt crisis). The chapter uses several credit and liquidity indicators (i.e. net charge-off, loan loss provision, loan reserves, impaired loans, interbank, liquid assets/customer, and short-term fund). The panel and fixed effect estimation approach are used to achieve the regression results.

Islamic banks face the same risks that are encountered in conventional banks (e.g. credit liquidity, operation, solvency, market risk, etc.). However, the extent of these risks is different, theoretically, due to the unique Islamic model which follows the Islamic *Shariah*. This makes the nature of these risks differ from conventional banks. One of the main features of Islamic banks is the ability to pay back any transaction by tangible real and underlying assets (Chapra, 2008). Furthermore, banking theory (Dimond and Rajan, 1999, 2001) states that discipline and commitment from depositors reduce risky bank lending. Considering the view that borrowers in Islamic banks tend to be more committed to the banks, credit risk might be less in Islamic banks than in conventional banks.

The empirical finding of this study proves that the risk levels vary substantially. The results prove that Islamic banks have better asset quality (credit risk) than conventional banks during the global financial and sovereign debt crises. In contrast, Islamic banks have significantly higher liquidity risk; interestingly more during the sovereign debt crisis. That is probably because Islamic banks have not appropriately changed and proved their risk management after the global financial crisis. Hence, our findings suggest that Islamic banks did not change their business strategy and culture with respect to liquidity as a result of their performance during the global financial crisis. Overall, the results reveal that conventional and Islamic window banks are in a better position compared to Islamic banks in terms of liquidity risk.

Furthermore, Islamic banks are relatively less profitable and efficient than conventional banks and significantly less so than Islamic window banks. This is probably due to the conservative operations of Islamic banks. The growth of total assets is significantly greater in Islamic banks. This supports the fact that Islamic banks comprise the fastest growing financial sector. In terms of diversification, the ratio of non-interest income is significantly higher in Islamic banks. This suggests that Islamic banks have higher diversification. The

results reveal that Islamic window banks have the largest bank size which indicates that the large banks have Islamic windows. Moreover, we find that bank-specific characteristics have a positional influence on the stability of risk.

Furthermore, we find that the stability of Islamic banks is determined differently compared to conventional and Islamic window banks by some factors. For instance, capitalizations structure has a substantial influence on the credit risk of Islamic banks only. In contrast, we find that Islamic bank's credit risk is not sensitive to diversification ratio compared to conventional and Islamic window banks. Moreover, concerning the liquidity ratio, we find that cost to income ratio is also significantly related with liquidity risk in Islamic and banks, however the results are conflicting. In contrast, the evidence from conventional banks is positive and significant. Hence, it is suggested that the policy makers and regulators make different regulations for each type of the financial institutions.

Chapter Four: Operating Risk and Insolvency Risk in Banking Sector: Islamic, Conventional and Islamic window Banks

4.1. Introduction

Banks play a fundamental role in the financial system. The efficiency of the process of transferring savings into productive activities is critical for economic growth. This process exposes banks to different risks such as operating and solvency risk; which is the focus of this paper. The global financial crisis underlines the importance of stability of banks for the entire economy. These financial crises illustrate that the intermediation activities are not without risk. However, some studies found that some firms were affected more than others. For instance, (Brunnermeier 2009), proves that the risk management has a significant effect on the degree of damage from the financial crisis.

Over the last decades, there have been many high-profile operating risk events such as Allied Irish Banks losing around US$750 million in rogue trading (Dunne and Helliar 2002), bankruptcy of the Barings Banks (Gillet et al. 2010), operating losses at Republic New York Corp (Fiordelisi et al. 2013), and the huge loss at Société Générale S.A (Sturm 2013). Hoffman (2002) argues that weak operating management led to the enormous losses which incurred in several financial institutions such as Barings and Merril Lynch. Thompson et al. (1996) argue that "Failure to adequately identify, evaluate and manage operating risks can expose the organization, and the market itself, to financial loss....." Allen and Bali (2007) find that risk causes large unexpected catastrophic losses[8]. Despite the importance of operating risks there are few studies in the banking sector in general. In particular, this chapter will address operating and insolvency risks among Islamic banks and conventional ones.

Operating risk is considered as one of the very essential and prominent risks encountered by Islamic banks. In the survey conducted by (Khan and Ahmed 2001), operating risk was the most significant after the mark-up risk, for the managers. The survey suggested that deferred sale contact of *Salaam* has the highest operating risk whereas fixed-income contract of *Murabahah* and *Ijarah* contracts has the lowest operating risk. It showed that some contacts are sophisticated and difficult to implement. Operating risks arise from internal sources such as *Shariah Compliance Risk*, people risk, systems risks and legal risk, whereas the external sources include systemic risk and political risks. The focus of this study is to investigate the stability of the three different types of banks: Islamic banks, conventional banks, and Islamic window banks. Given the importance of risk in banks, this chapter will investigate financial

[8] They utilize a comprehensive approach to measure the operational risk; they prove that the return of around 18% of the financial institutions represents compensation of the operational risk.

risk; particularly the operating risk and the insolvency risk through comparing Islamic, Islamic window and conventional banks in the OIC countries.

The global financial crisis has highlighted interest of Islamic banking as an alternative for conventional banking. Hasan and Dridi (2010) find that Islamic banks experienced better performance than conventional banks during the global financial crisis. Advocates of Islamic banking claim that Islamic banks are the best alternative for conventional banks. Theoretically, Islamic banks differ significantly from conventional banks in terms of operating and insolvency risk. Furthermore the vast majority of the literature discusses this issue from a theoretical perspective and the views are mixed and controversial. This paper will attempt to fill this gap in the literature through empirically comparing the operating and solvency risk.

Most of the empirical literature linked to Islamic banks focuses mostly on performance (Abdul-Majid et al., 2010; Mohamad et al., 2008; Hasan and Dridi, 2011) and other elements such as corporate governance (Mollah and Zaman, 2015a; Haniffa and Hudaib, 2006), and competition (Weill, 2011; Shaban et al., 2014; Chong and Liu, 2009). This paper makes a contribution to literature about operating and insolvency issues in Islamic banks, Islamic window banks, and conventional banks.

There is also, a dearth of empirical literature investigating how stable Islamic banks are during the global financial crisis. Some of the few scholars who have looked at this area include Abedifar et al. (2013), and Čihák and Hesse (2010). Available literature has demonstrated that there is a link between risk exposure and stability of banks and the global financial crisis (Gertler et al., 2012). This makes this an interesting period to conduct an investigation of the stability of Islamic banks in comparison to conventional banking institutions. Added to this, there is also a shortage of empirical literature exploring the robustness of Islamic banks during the sovereign debt crisis. Fahlenbrach et al. (2012), on the other hand, advance the argument that a global financial crisis results in banks altering the way they behave and regulate their activities so that they can protect themselves from any mayhem in future. Through the examination of the stability of banks, by doing a comparison of their performance during the global financial crisis and sovereign debt crisis, this study seeks to add to the literature available.

In addition to bank-specific characteristics, this paper will also conduct an investigation on the influence of macroeconomic factors like diversification and oil prices on insolvency and operating risk. The literature review does not deliver an empirical answer as to how oil prices

influence insolvency and operating risk of banks. It is for this reason that this study makes an attempt to close this gap found in literature with regards to economic outputs.

This paper uses numerous time separations, between 2006 and 2015, to analyse how stable banks were during these periods. According to information gathered, for purposes of this paper, no previous studies have focused on investigating the impact of sovereign debt crises on the stability of banks. This is an important contribution, given that banks went through a significant restructuring after the global financial crisis and the sovereign debt crisis in terms of the new regulatory framework, risk management orientation, and the overall market conditions. Consequently, the stability of banking system attracted the attention of both policy-makers and researchers. This paper further investigates the determinants of these risks. Some of them have no prior studies conducted on them. For example the effect of oil price on the stability of banks, particularly Islamic banks. This is important as some argue that the success of Islamic banks particularly during the recent global financial crisis was due to the oil prices.

The three main questions motivated by the previous discussion are as follows: (i) Are Islamic banks more stable than conventional banks in terms of operating and insolvency risk? In addition, this study covers three periods, comprising the full sample period, global financial crisis, and sovereign debt crisis. Thus, additional questions are addressed in this research: (ii) Are Islamic banks more stable than conventional banks in terms of operating and insolvency risk during global financial crisis and sovereign debt crisis? Do banks change their policy appropriately after the global financial crisis? that is captured through investigating risk during the sovereign debt crisis? Stressing the importance of operating and insolvency risk that need to be fully examined: (iii) what are the bank-specific determinants that affect bank's stability in terms of of operating and insolvency risk in each of the three financing models? In particular, Is Islamic bank's stability is affected differently from conventional and Islamic window banks. A comparison approach between Islamic, conventional, and Islamic window banks is utilized to address the research questions.

The results show that there is significant difference among the three different types of banks. In general, with respect to insolvency risk, we find that z-score and all its components reveals that Islamic banks have relatively more insolvency risk compared to conventional banks. We also find that Islamic banks face more risks at operating level during the period of the study. These results are almost similar to those found during the period of the global financial crisis and sovereign debt crises.

The remainder of this paper is organized as follows: Section 4.2 provides the related literature review which includes the theoretical and empirical review. Section 4.3 presents the hypotheses development and the reasoning of determinants. Section 4.4 outlines the methodology of this research including all variables and econometrics methodology. Section 4.5 presents the data and a preliminary analysis. Section 4.6 discusses the analysis and the findings. Section 4.7 presents the conclusion of this chapter.

4.2. Literature Review

The prior literature related to the present topic of this paper can be classified into two main categories. The first category focuses on the theoretical aspects of the debatable comparison between Islamic and conventional banks with respect to operating risk and the insolvency risk. The second one is the empirical literature review in banking in general and Islamic banking in particular. Thus this section presents both the theoretical and empirical aspects.

4.2.1. Theoretical Literature Review

The Islamic banks face the same risks that are encountered in the conventional banks (e.g credit liquidity, operation, solvency, market risk, etc.). However the extent of these risks is different owing to the unique Islamic model which follows the Islamic *Shariah*. The following sections will illustrate these differences in detail with respect to operating and solvency risk.

4.2.2. Operating Risk in Financial Institutions

The operating risk can be defined in several ways. The challenge in defining the operating risk is due to complexity (Milligan, 2004) and diversity (Buchelt and Untregger, 2004). There are many attempts to provide a definition of operating risk such as (Alexander 2003b) and (Moosa 2007). However, operating risk can be defined using two general approaches. The first one is the *residual approach* which defines operating risk as any risk other than credit risk and market risk. Others argue that this definition tends to be too broad and does not include the *rogue trader* which has been referred to by many such as (Marshall and Marshall 2001) [9]. The second approach is no *residual approach* which states that operating risk is the risk which stems from operations (Hughes and MacDonald 2002). The Basle Committee on

[9] Rogue trader is the trader who acts independently from others and typically recklessly-usually to the determent of both the clients and the institutions that employ him or her. The rouge traders usually involves in high investment risk which in turn might create large losses or huge gain.

Banking and Supervision defines operating risk as "the risk of losses resulting from inadequate or failed internal processes, people and systems or from external events". Figure 4.1 illustrates the risk event types that operating risk includes such as employees fraud, employees claims, telecommunication problems, and collateral management failures.

Figure 4.1: Operating Risk Projected by BASEL II

Source: (Casu 2015)

4.2.3. Operating Risk in Islamic Banks

Two principles for risk management strategies have been identified by the IFSB with the aim of mitigating Islamic banks' operating risk. The first stipulates that IIFS should ensure adequate mechanisms, including the *Shariah* Board/Advisor to make sure that such institutions operate according to *Shariah* principles and rules. Secondly, the *Shariah* Board/ Advisor will be used by the IIFS as one of the measures of ensuring that the interests of all providers are safeguarded. It will be the responsibility of the IIFS to make sure that the foundation for asset revenue, expenses and profit allocation are put in place, applied, and also reported in a way that meets the stipulations of the fiduciary responsibilities of IIFS (IFSB, 2014).

Figure 4.2: Sources of Operating Risk in Islamic Banks

Source: (Akkizidis and Khandelwal 2007)

As far as operating risk is concerned, Islamic banks encounter similar challenges as conventional financial institutions (Izhar and Asutay 2010; Archer and Karim 2007). Nevertheless, Islamic banks face more complex challenges attributed to their unique activities and features of the contract such as Islamic instruments. (Fiennes 2007; Van Greuning and Iqbal 2008b; Iqbal and Mirakhor 2011; Kumar 2008; Sundararajan 2007; Sundararajan and Errico 2002) argue that operating risk in Islamic banks are more significant. Furthermore, IFSB (2009) (Islamic Financial Services Board) explicitly states that Islamic banks are exposed to operating risk "a range of operating risks that could materially affect their operations". As illustrated in the figure 4.2, operating risk in Islamic banks is based on the following sources: *Shariah* non-compliance risk, people risk, system risk, fiduciary risk, and legal risk.

4.2.3.1. *Shariah* Compliance Risk

Shariah compliance risk is another operating risk. The Islamic Financial Supervisory Board (IFSB) (2010) defined it as "The risk that arises from IIFS failure to comply with *Shariah* rules and principles determined by the *Shariah* Board of the IIFS or the relevant body in the jurisdiction in which IIFS operates". There are two types associated with the *Shariah* compliance risk. Firstly, the risk that stems from different interpretations of *Shariah* principles and rules in a different jurisdiction. This risk is the result of the existence of different *Shariah* supervisory Boards. The consequence of this action is a nonstandard in

practice, financial reporting, auditing and accounting principles across the board. Secondly, if the Islamic banks fail to comply with *Shariah* principles, it might expose the banks to sever consequences. For example, customers lose trust and confidence which may lead customers to withdraw their funds and cancel contacts with the banks. In addition, the bank is exposed to loss in income since contracts are noncompliant that make it null and income is illegitimate.

4.2.3.2. People Risk

Another operating risk is the people risk which stems from incompetence or fraud. (Akkizidis and Khandelwal 2007) note that operating risk includes the shortage of expertise, human errors and fraud which exposes banks to potential losses. The internal control challenge cost the Dubai Islamic banks more than 50$ million in 1998, when a bank official did not conform to the banks' credit terms. This resulted in one day run on the banks' deposits to the turn of 138$ million, representing 7 percent of the banks' total deposits. Another case was around US$242 million caused by bank official of the Dubai Islamic Banks and West African Tycoon Foutange Dit Babani Sissoka (Warda, 2000). The fast growth of Islamic financial industry, unfortunately, does not match with the number of individuals who have the competence and credentials in directing and operating such businesses.

It is argued that Islamic banks has more dimensions of people risk than conventional ones, owing to the personnel of Islamic bank's personnel are required to have knowledge in both conventional and Islamic banking products (Aziz 2006; Ebrahim 2007; Nienhaus 2007). Islamic banks need to be equipped with the right and new breed of innovators, regulators, risk managers, and supervisors who have the right knowledge of finance and *Shariah* (Aziz 2006). Moreover, they need to be aware of the existing alternatives and their commercial advantages and disadvantages compared to conventional banks (Nienhaus 2007). The lack of qualified bankers with the aforementioned requirements will, theoretically, make Islamic banks have more operating risk compared to conventional ones (Jackson and Moore, 2007) In other words the unskilled people of Islamic banks will make the products either illegitimate or inefficient. Akkizidis and Khandelwal (2007) suggested the following points to control the people risk in Islamic banks. (1) A selection of employees that respect and follow the *Shariah* principles. (2) A separation of the employees' duties.(3) An internal supervision of the employees' performance. (4) A monitoring of the employees' behavior. (5) Well-established

policies that are complying with the *Shariah* principles. (6) Training processes to direct the employees in the process of the risk management.

However, there are limited but healthy professional qualifications in Islamic banks that have been created in several countries. This may reduce the pressure on Islamic industry to a medium level. It is necessary to create a pool of highly qualified professional with in-depth knowledge of not only the *Shariah* but also Islamic and conventional finance and financial engineering.

4.2.3.3. Information Technology Risk

Techniques, technology and software tools can be used to support expert judgment activities in operating risk management (Hulett et al. 2000; Van den Brink 2002; Tawalandana 2010). Operating risk is linked to the use of telecommunications and software systems that are designed particularly to the requirements of Islamic banks. Chorafas (2003) argues that information technology includes the followings; (1) Computer applications (2) Database information (3) Basic Software endowment (4) Physical networks.

It also includes the process running these information technology systems. Islamic banks have special challenges in the quality of management processes. As a new and emerging industry, Islamic banking is required to abide by specific rules; it encounters the risk of securing management skills that are completely conversant with the principles of the conventional banks and Islamic banks. Even though there is no issue with familiarity of both *Shariah* rules and finance rules, it is hard to find individuals with knowledge of both rules. Further *Shariah* rules need special management information systems which are scare. Systems that are currently available are not as strong as the ones employed in conventional banking; either being adapted systems or ones changed to manage Islamic products. Systems designed distinctly for Islamic products are limited (Brown et al. 2007).

Failure in information systems is likely to have a negative impact in the business and the consequence is likely to be severe. To maintain an efficient environment, financial institutions constantly need to improve their technological capabilities. This will also secure the institutions from information systems attack which have been on the increase during the past years (Akkizidis and Khandelwal 2007). Chorafas (2004) argues that proper information technology limit different risks such as; (1) Threats to information; (2) Vulnerability in applications; (3) Vulnerability in architecture; (4) Vulnerability in security.

Unfortunately only limited financial institutions have the ability to capitalize the best that technology can offer. Spending big sums of money in technology without the corresponding return on investment is also an indication of an information system operating risk (Chorafas 2003).

4.2.3.4. Fiduciary Risk

Islamic banks are liable for losses arising from their negligence, misconduct or breach of their investment mandate. The risk of loss which arises from such events is characterized as a fiduciary risk. In other words, fiduciary risk is an indication of failure to "perform in accordance with explicit and implicit standards applicable to their fiduciary risk" (IFSB 2005). Islamic banks must perform their fiduciary role, in doing so, they must ensure that the bases for " assets, revenue, expenses and profit allocations are established, applied and reported in a manner consistent with Islamic banks' fiduciary responsibility (IFSB 2005). Preserving the trust from all the providers is the main duty for Islamic banks to maintain the fiduciary requirements. There are two important aspects that should be taken into a consideration: (a) *Shariah* aspects: Islamic banks must ensure that the activities and the products are *Shariah* compliant; (b) Performance aspects: Islamic banks are required to have sound financial performance, without which, fund providers might indicate that there is a mismanagement or misconduct. Iqbal and Mirakhor (2011) pointed out some examples illustrating the fiduciary risk which are as follows;

Firstly, with regards to partnership-based investment in the *Musharakah* and *Mudarabah,* on the side of assets, there is an expectation that the bank will perform sufficient selection and monitoring of projects; any laxity in this area, whether by mistake or intention, can result in fiduciary risk. It becomes an important role of managers to ensure that due diligence is conducted ahead of making commitments using the funds of investors and depositors.

Secondly, when funds of current account holders, which are accepted on trust basis, (*Amanah*) are mismanaged, the bank can also be exposed to fiduciary risk. In the Islamic banking sector, it is common that such funds are used without any obligation for profit sharing. However, in incidences where heavy losses are made on investments which are financed using such funds, those who make deposits could end up with less of confidence in the bank which could prompt them to go the legal route to get the situation corrected.

Thirdly, the implicit contract to conduct activities in a manner that is transparent is breached when the mismanagement of funds results in unnecessary expenses being incurred or large expenses are allocated to the holders of investment accounts.

4.2.3.5. Legal Risk

There is a debate among academics and practitioner regarding the inclusion of legal risk as part of a broad notion of operating risk (Alexander 2003a; Scott 2001). Scott (2001) attributes this to the complexity and difficulty in defining the nature of legal risk. The same author goes on to argue that this is because legal risk has an unpredictable effect even though it can be determined by losses that banks incur.

Confusion on the subject matter also revolves around the various meaning of the term legal risk, which also depends on specific context and the practical concerns of the persons employing it (Hadjiemmanuil, 2003). Hadjiemmanuil (2003) argues that there are different ways in which loss may incur; all of which are often classified under the domain of legal risk. Thus the loss may be attributed to; (1) legally flawed actions of the banks or its employees and agents; (2) legal uncertainty; (3) legal uncertainty and financial innovation; (4) country specific legal perils and costs.

The impact of legal risk in Islamic banks is substantial and cannot be neglected (Djojosugito 2008; Brown et al. 2007; Hassan and Dicle 2005). The legal risk in Islamic banks can arise from uncertainty in laws (Kumar 2008), shortage of sound legal system to enforce financial contracts (Djojosugito 2008; Iqbal and Mirakhor 2011), legal uncertainty in the interpretations of contacts (Hesse, 2008), the legality of financial instruments (Djojosugito 2008), a shortage of legal expertise (Kumar, 2008). Furthermore, some activities of Islamic banks do not have a sufficient aspect of legal aspect thus this expose Islamic bank to more operating risk. (Hassan and Dicle 2005) attribute this to the fact that the majority of Islamic banks operate within similar legal and business environment. Djojosugito (2008) argues that, the legal risk in Islamic banks stems from the fact the many laws related to Islamic banking and finance are vague. This will affect even transactions which are properly documented. Such uncertainty, will result in the law interpreting some transactions in ways that are contrary to the stipulations of *Shariah* law. For Islamic banks, the consequence is devastating as the integrity of the whole operations can be questionable if part of it is not interpreted according to *Shariah*. Furthermore, some institutions are just not capable of delivering judgments related to *Shariah*. Judges in non-*Shariah* court for instance rarely receive proper

training in *Shariah*. Therefore, it is too much to expect that their decisions will reflect the *Shariah* principles. It is true that in some jurisdictions, like in the case of Malaysia, there is a requirement that the court refer the question of *Shariah* to *Shariah* people. However, the legal risk is still personal since the final decision will be decided by the court (Djojosugito 2008).

4.2.4. Insolvency Risk in Islamic Banks

The insolvency risk can be defined as the risk that is associated with maturing obligations because it has a negative net worth. Girardone et al. (2009) propose that insolvency risk should not be treated separately because all risks can sensationally affect the bank solvency. In other words, excessive credit risk, operating risk, market risk, liquidity risk, and capital risk could all affect the ability of banks to sustain themselves successfully. Bessis (2015) argues that banks are exposed to insolvency risk when there is not enough capital to absorb losses. Rose and Hudgins (2002) identify some of the indicators that may affect the insolvency risk. The first relates to the a situation where interest rate spread between market yields on bank debt issues and market yields on government securities are on the same maturity. If the spread increases then investors believe that the bank in question is becoming more risky relative to government debt. The second relates to the ratio of stock price per share to annual earnings per share. The third is linked the ratio of equity capital to total asset. Finally it is the Basel Tier 1.

Hence, the insolvency risk in Islamic banks includes all the challenges that have been discussed in the other types of risk (credit, liquidity and operating risk). For instance, as it has been explained previously, complexity of Islamic model of banking, the profit and loss sharing products are not straightforward as conventional loan contacts. This might affect the insolvency risk of Islamic banks.

4.2.5. Empirical Literature Review

There is growing attention from the academic researchers and policy-makers concerning different aspects of operating and insolvency risk. McNulty and Akhigbe (2017) find that operating risk leads to excessive litigation. Cummins et al. (2006) and Wei (2003) found that operating loss events impact on the market values of American banks. Allen and Bali (2007) used a comprehensive approach to measure operating risk and found that operating risk is likely to be the main cause for catastrophic losses; showing that compensation for operating risk represents 15 percent of financial institutions' return. Chernobai et al. (2011) show that operating losses are associated with internal control, and those institutions that suffered from

these losses are young and complex institutions. McNulty and Akhigbe (2017) find that operating risk leads to excessive litigation.

There are many studies which examine solvency risk because of its importance. However, the majority of studies in insolvency risk are conducted on conventional banks. Cook et al. (2014) study the effect of financial stress, particularly solvency risk, on the use of restrictive bond covenants through employing a comprehensive database of corporate bonds. Gryglewicz (2011) study the relationship between solvency and liquidity risk. Iyer et al. (2016) examine the depositor responses to insolvency risk and found that depositors and bank staff are less likely to run compared to other depositors. Yeyati and Micco (2007) investigate the implications of concentrations and foreign penetration on bank insolvency of Latin American countries.

Despite the growing literature of operating and insolvency risk, there is few literature discussing these risks in the context of Islamic banks. There are various different studies that have examined a specific aspects of Islamic banks such as corporate governance of Islamic banks (Ghayad 2008; Mollah and Zaman 2015b; Safieddine 2009). The majority compare the performance of Islamic banks (Johnes et al. 2014; Mohamad et al. 2008; Johnes et al. 2009; Abdul-Majid et al. 2010), corporate governance and performance (Mollah and Zaman 2015b), corporate social responsibility and performance (Mallin et al. 2014b). The trend of recent literature focuses on risk of Islamic banks such as. However, these studies such as Abedifar et al. (2013) and Beck et al. (2013) focus mainly on credit risk. Moreover, there is limited research conducted during the global financial crisis and no studies during the sovereign debt crisis; therefore, this study attempts to fill up this gap and contribute to literature of risk in banking.

4.3. Hypothesis Development

4.3.1. Operating and Insolvency Risk

Based in the previous sections which have illustrated the characteristics and nature of operating and insolvency risk in Islamic banks compared to conventional banks and given the research aim, objectives and questions, it is expected that Islamic banks are less risky than the conventional banks. Accordingly the hypothesises below are developed.

H1. Islamic banking is more resilient than conventional banking.

> *H1.1 Islamic banking has less operating risk compared with the conventional and Islamic window banking.*

H1.2 Islamic banking has less insolvency risk compared with the conventional and Islamic window banking.

4.3.2. Bank-Specific Determinants

The following hypotheses are applied for all types of banks: Islamic, conventional and Islamic window banks and for both operating and insolvency risk.

Size: Caprio et al. (2007) believe that there is adequate literature both discussing and supporting the reality that the size of the bank has an effect on the operations and internal control of the banks. Hannan and Hanweck (1988) add that the larger the bank the less risk it is exposed to because of the inferred reduction emanating from the idea of *too big to fall*. In their study, Laeven et al. (2016) focus on distinct bank characteristics that the risk of a bank depends on, using the recent financial crisis as a basis. They arrived at the conclusion that bank systematic risk grows with size. However, numerous studies, including (Hughes et al. 2001; Istaitieh and Rodríguez-Fernández 2006) conclude that running a large scale operation results in greater diversification and scale of economies which brings down the aggregate risk. In a more recent study, De Haan and Poghosyan (2012) attempts to deliver proof that there is a negative association between bank size and earning volatility; with this association being stronger in times of financial crises. For this reason, the expected link is not only strong, it is negative too.

H2: *Bank size negatively affects the risk level.*

Capitalization: According to Dinger and Van Hagen (2009) the capital structure and regulation on banks can be reflected by equity capital to asset ratio. When the equity ratio is higher, the result is shareholders paying more attention to the activities of the bank, which in turn leads to a reduction in risk. Added to this, some studies have come to the conclusion that banks which have bigger capital ratios have better capacity to absorb loses emanating from financial calamity (Beltratti and Stulz 2012). This is a view also supported by Tan (2006) who notes the positive impact of capitalisation on the performance of banks for a number of reasons. The first of these reasons is that access to higher capital levels brings down the costs of funding the bank. Secondly, when banks have a higher capital ratio, they have a higher probability of being involved in loans that are more prudent, which results in assets of a better quality and lower levels of risk. The third is that capitalisation plays an important role in absorbing the risk coming from assets with higher levels of risk; such as loans. This ratio is included in order to make it possible to conduct an investigation of the correlation between

risks in the banking sector broadly and at a more specific level between the three types of banks: Islamic window , conventional, and Islamic.

H3: Capitalization negatively affects the risk level.

*Profitabilit*y: (Rajan 1994) advances the argument that the higher the profits, the higher the NPLs. This is a possibility in contexts where the policy governing credit is to get as much profit as possible and also where the reputation required is short term. As a result, bank managers may manipulate the earnings with the aim of achieving market conviction. This may also lead to a situation where banks with high profits have a low quality of assets. In contradiction, banks that are more profitable have a greater possibility of having financial positions that are more robust. Also, banks that are highly profitable have little reason to engage in operations that are high risk. Based on Berger and DeYoung (1997) the expected connection is between risk negative and profit. The reason why this ratio is included is to make it possible to test the impact of profit on risk and determine if there are any notable differences between the three types of banking institutions.

H4: Profitability negatively affects the risk level.

Diversification: The evidence of the impact of diversification on bank risk is inclusive. Stiroh and Rumble (2006); Tan and Floros (2012) argue that more income can be generated when banks are involved in a number of different businesses. In addition, banks with activities have the ability to reduce the costs from economies of scope, which enhances stability. In contrast, some studies find that non-interest income can reduce the solvency of banks. Ashraf et al. (2016) claim a negative relation between diversification and risk. Moreover, a study conducted by (Maudos 2017a) show that an increase in the share of on-interest income had a negative impact on stability in the financial crisis on which we based our examination. Following a recent reliable study conducted by Che and Liebenberg (2017) argue that when a focused firm diversifies, it increases its asset risk relative to firms that remain focused.

H5: Diversification *positively affects the risk level.*

Control Variables-Micro Level

Loan Growth: There is little evidence on the impact of loan growth on bank risk (Laeven and Majnoni 2003). Keeton (1999) find in his study that higher growth rate leads to higher loan losses. Dell'Ariccia and Marquez (2006) argue that lowering interest rates, relaxing collateral requirement and loosing credit standard might affect the growth rate. This expansion in credit can increase the vulnerability of banks; principally during the financial crisis. Following a

recent influential study conducted by Foos et al. (2010), they employed more than 16,000 banks during 1997-2007. They find loan growth is a significant driver of the riskiness of banks, and that loan growth leads to an increase in loan assets risk provision. This ratio is included to control for risk and at the same time to test the effect of the loan growth on the credit risk and liquidity risk under the three different banks.

Efficiency: In their study Fiordelisi et al. (2011) advance the proposal that situations where the bank efficiency is lower when it comes to costs and revenues results in higher risk. In the same vein, Williams (2004) conducts an assessment of how efficiency impacts the risk of banks and comes to the conclusion that poorly managed banks have a tendency to also make loans of a poor quality. Dong et al. (2017) produces consistent conclusions and notes a negative association between cost efficiency and risk. The study by Kwan and Eisenbeis (1997) concludes a negative impact of inefficiency on risk taking which gives credence to the moral hazard hypothesis which suggests that those who perform poorly have greater valnerability to risk-taking.

4.3.3. Macro-level Determinants

The following hypotheses are applied for all types of banks: Islamic, conventional and Islamic window banks and for both operating and insolvency risk.

*Oil Pri*ces: When it comes to the impact of oil prices variation, there is limited literature on both the broader economy and the banking sector specifically. Where literature is available, conclusions are inconsistent. However, in a recent study by Khandelwal et al. (2016) the conclusion was that there is a negative relationship between performance of banks and oil prices in general. In their study, Miyajima (2016) came to the conclusion that there is a negative association between the growth of oil prices and the ratio of non-performing loans. In another study that produces consistent results with the above, Callen et al. (2015) explore the results of variation in oil prices and came to the conclusion that a decrease of 1 percent in the price of oil results in around 0.1 percent acceleration in bank NPL ratios. This is a correlation credited to the perception that variation in price results in the capacity of borrowers to service loans being negatively affected. The oil average is included in this test because of its impact on fluctuation of prices on banking sector risk; especially in Islamic banks.

H6: Oil prices negatively affect the risk level.

Control Variables-Micro Level

Competition: Rhoades and Rutz (1982) demonstrate that there is a negative link between the concentration of banks and substitute risk indicators such as loan performance. In a cross country study which employed a number of measures of risk like z-score, Boyd et al. (2006), concluded that concentration (HHI) had a negative link with z-score. Another influential study conducted by Keeley (1990) delivers proof that when competition increases, banks also increase their risk profile. The same scholar notes that when competition is low, interest rates on loans also tend to be higher which could result in the escalation of credit risk because of the moral hazard issue. In keeping with this observation, Boyd and De Nicolo (2005) came to the conclusion that when competition is low, interest rates on loans tend to be higher, which could also result in increased risk because of issues linked to moral hazard. The empirical review of literature comes to the conclusion that there is a negative correlation between competition and risk.

Interest Rate: There is an adequate body of literature which lends proof to the assertion that there is a link between stability in the banking sector and interest rates (Chen et al., 2017; Carling et al., 2007). In this literature, can be noted a robustly positive impact of level of interest on taking of risk. In 18000 observations, conducted by Delis and Houretas (2011) on banking institutions, they arrived at the conclusion that interest rates that are low, have a substantial positive impact on risk taking by banks. When interest rates are higher, the value of borrowers' debt also becomes higher which makes servicing that debt more expensive. The inevitable result of this is an increase in borrowers being unable to pay back loans which also compromises the soundness of the banking institution. Using previous literature such as Ghosh (2015) as a basis, this study employs real interest rate for adjusting inflation to measure the lending's real interest rate.

National Economy: In this study, numerous national economic elements like GPD per capita and GDP per capita growth are used. Bikker and Metzemakers (2005) conclude that GDP growth has a negative effect on bank loan loss, while Salas and Saurina (2002) forecast GDP growth's negative effect on NLPs. Microeconomic variables that have an impact on the equality of loans was studied by Louziz et al., (2012). They arrived at the conclusion that loan quality is negatively impacted on by GDP; within the banking sector in Greece. They also conclude that these economic elements have an effect on loan quality business cycles. Based on the broad literature, we anticipate a negative relationship.

4.4. Methodology

4.4.1. Dependent Variables

Operating Risk

The high quality of operations and management translates into a portfolio composition of assets and lower composition of liabilities (Maudos and Fernández de Guevara 2004). This research utilizes several operating efficiency proxies for the bank operating risk.

Definition of inputs and outputs: Humphrey (1985) and Berger and Humphrey (1997) identified two main approaches to define inputs and outputs: production approach, and intermediation approach. The intermediation approach views banks as fund collectors or fund purchasers. These funds are then intermediated into loans and other assets. Under the production approach, the banks are treated as a primarily producing service for customers. The bank makes transactions and process documents for account holders, for example loan applications or payment instruments. However, Berger and Humphrey (1997) argue that this approach is appropriate for evaluating the operations in branches of financial institutions. This is because in branches, the primarily process is related to document process as a whole and the branch managers have no involvement in banking funding or investment decisions. In contrast, the intermediation approach is appropriate in evaluating the entire financial institution because this approach is inclusive to overall cost of banks such as interest expense and non-interest expense. Furthermore, Ferrier and Lovell (1990) argue that the intermediation approach also address the validity of the bank. Following the intermediation approach, this study is adopting a cost and revenue based model.

Advantages: The revenue based model has several virtues. Firstly, it considers the non-traditional activities since it is sensitive to the inclusion and exclusion of these activities. This is important because omitting these activities leads to inaccurate measure of the status of bank efficiency (Rogers 1998; Clark and Siems 2002). Secondly (Read the main article plus other then add another two). It use a core efficiency indicator plus several efficiency indicators for further robustness checks as a measure for the operating risk which are: (1) net interest margin; (2) cost to income; (3) non-interest expenses; (4) ROAA (5) ROAE. Table 4.1 presents all the dependent variables used in this research. The table illustrates the definitions, references, and the data source of the variables.

(1) Net Interest margin is one of the dependent variables which can be defined as the interest income minus interest expense as a percentage of total assets. (2) Following the broad literature (Bitar et al. 2017; Chortareas et al. 2012), this paper also uses cost to income as a

proxy that measures the overheads of the efficiency of the operating costs, it includes the major operating costs such as salaries in relation to gross income. It excludes bad and doubtful debt expense. This ratio provides a useful measure of the best practice of bank cost to produce an identical output. (3) Non-interest expenses encompasses overheads which normally refers to service charges and commission, employee salaries, general management affairs, external legal and other expenses. (4) We also investigate ROAA and ROAE as a proxy for operation efficiency.

Insolvency Risk

In line with the broad banking literature (Hesse and Čihák 2007; Laeven and Levine 2009; Goetz 2017; Fratzscher et al. 2016; Tabak et al. 2013; Mirzaei et al. 2013; Lepetit et al. 2008; Schaeck et al. 2011), the research uses the z-score as a proxy to measure insolvency risk. Z-score measures how much the bank has to decrease the standard deviation of return of average assets in order to maintain the insolvency. In another words, it measures the distance from the insolvency (Roy 1952). Thus Z-score is the inverse probability of insolvency; for example, probability that the value of the bank's assets are lower than bank's debt. This is illustrated in the equation below:

$$P\ (\mu \leq -E) = \int_{-\infty}^{-K} f(\ ROA)dr \qquad (1)$$

where *P* stand for the probability, μ is the consolidated return and *E* is the consolidated equity. *K=E /A*, where E refers to consolidated assets, *A* refers to the consolidated equity. f is the label for the probability density function and *dr* stands for standard deviation, (for more details see Boyd and Graham (1986). This means that higher figures imply that the bank has less insolvency risk and is more stable. Z-score allows to compare the solvency risk of different types of financial institutions, despite their differences in objectives, ownership, governance, and other aspects (Čihák 2007). The calculation of Z-score (probability of failure) can be approximated as follows:

$$\frac{\text{Return on Average Assets + Equity Capital to Asset Ratio}}{\text{Standard Deviation of Return on Average Assets}} \qquad (2)$$

Zscore _P has two different components which are: (i) $\left(\frac{Average\ ROA}{SDROA}\right)$ which measures the portfolio risk of banks. (ii) $\left(\frac{Average(\ Total\ Equity/Total\ Assets)}{SDROA}\right)$ which measure the leverage risk

Table 4.1: Dependent Variables Definitions

Variable	Unit	Definitions plus reasons for inclusion	Source
		Operating risk Variables	
Net Interest Margin	%	It represents what banks get out of their assets. In other word it is the difference between income and financial cost with relation to total assets. It is calculated through the following formula: (Interest Income - Interest Expense) / Average Earning Assets. The higher the figure the more efficient the bank. References: (Maudos and Fernández de Guevara 2004; Angbazo 1997; Bonin et al. 2005; Mamatzakis et al. 2016).	BankScope
Non-Interest Expenses	%	It refers to overheads expense scaled by average assets. It represents the cost for bank operation. Thus it measures the operation performance of banks relative to assets invested. References: (Hsiao et al. 2010; Kao and Liu 2004; Park and Weber 2006; Davutyan and Yildirim 2017).	BankScope
Cost to Income	%	This is operating cost divided by operating income. The lower the figure the higher efficiency of the bank. References: (Bitar et al. 2017; Chortareas et al. 2012; Altunbas et al. 2010).	BankScope
ROAA	%	This is return on average assets ratio which is calculated through dividing net income by the average total assets. The higher this figure the better. References: (Mamatzakis et al. 2016; Pi and Timme 1993; Beitel et al. 2004).	BankScope
ROAE	%	This is return on average equity ratio. The higher the figure the better. References: (Mamatzakis et al. 2016; Pi and Timme 1993; Beitel et al. 2004).	BankScope
		Insolvency Risk Variables	
Zscore_1	Log	This is the core proxy for solvency risk which is calculated as follows: (*ROAA* + *CAR*) / *SD ROAA3*, where, CAR refers to capital asset ratio, *ROAA3* is the return for average assets and *SD* is the standard deviation for three years period. The greater the value the better. Reference (Hesse and Čihák 2007; Laeven and Levine 2009; Goetz 2017; Fratzscher et al. 2016; Tabak et al. 2013)	BankScope
Zscore_2	Log	ROAA / SD ROAA3	BankScope
Zscore_3	Log	CAR / SD ROAA3	BankScope
Zscore_4	Log	(*M_ ROAA* + *M*_Capital Asset Ratio) / *SD ROAA*; where M stands for mean over the sample period; SD ROAA is the standard deviation over the sample period.	BankScope
Zscore_5	Log	M_RAAA / SD ROAA	BankScope
Zscore_6	Log	M_CAR / SD ROAA	BankScope

4.4.2. Explanatory Variables

The study considers a wide set of positional explanatory variables. Table 4.2 explains the meaning of the explanatory variables used in this study plus the source of these data and the expected relationship. The study includes several control variables which can be mainly grouped into two categories: bank-specific characteristics and country-specific variables (as it is shown in the table below). Firstly, the study uses dummy variables to compare the Islamic banks, Islamic window banks, and conventional banks. If the bank is Islamic it takes the value of one; if not, it takes zero. The same approach applies to Islamic window banks; if the bank is Islamic window then it takes the value of one and zero if not. This study includes a range of control variables related to bank specific-characteristics: size, marker share, return on assets, and return on equity, loan/total assets, loan growth, assets growth, leverage ratio, noninterest income, and efficiency. The study also uses country and economic factors: inflation, GDP per capita GDP per capita growth, real interest domestic credit, bank concentration and inflation.

Table 4.2: Explanatory Variables Definitions

Variable	Unit	Definitions plus reasons for inclusion	Source	Expected sign
		Bank Specific - Variables		
Islamic Banks	Dummy	It is a dummy variable which takes a value of one if the bank is Islamic otherwise it is zero.	Islamic Banks	
Islamic window banks	Dummy	It is a dummy variable for Islamic window banks, it takes a value of one if it is Islamic window and zero otherwise.	Conventional Banks	
Size	Log	Natural logarithm of total assets, to control a possible relationship between risk and size of banks.	Author's calculation based on BankScope	**(+)**
Noninterest Income	%	The share of non-interest income (excluding loan loss provision) in total operating income. It represents diversification.	BankScope database	**(+)**
Cost to Income	%	Operating cost divided by operating income. A lower ratio indicates the efficiency of the bank. This ratio is used as an explanatory variable for insolvency risk equation.	BankScope database	**(−)**
Equity / Total Assets	%	Equity capital as a proportion to total asset, to assess the capitalization impact on banks' stability.	BankScope database	**(−)**
ROAA	%	This is a return on average assets ratio which is calculated by dividing net income by the average total assets. This ratio is used as an explanatory variable for insolvency risk equation.	BankScope database	**(−)**
Asset Growth	%	This is the asset growth rate which is calculated by the following formula: (Total Asset$_t$ - Total Asset $_{t-1}$) / Total Asset. This ratio is used for insolvency risk equation.	BankScope database	**(+)**
Loan Growth	%	(loan$_t$ - loan$_{t-1}$) / loan$_t$. This ratio is used in operating risk equations.	BankScope database	**(+)**
		Country - Specific Variables		
GDP per Capita	$	Growth domestic product per capita	World Development Indicators (WDI)	**(−)**
GDP per Capita Annual Growth	$	The annual growth of domestic product per capita.	World Development Indicators (WDI)	**(−)**
Inflation Rate	%	Yearly change of consumer price index. This is to investigate the effect of inflation on banks' risk.	World Development Indicators (WDI)	**(+)**
Real Interest	%	The nominal interest rate deducted from the rate of inflation. This is to assess the impact of this variable on bank's risk.	World Development Indicators (WDI)	**(−)**
Average Oil Prices	%	This reflects the oil price on average basis.	Boombreg database	**(−)**
HHI Index	Index	Sum of squared market shares of banks in the system. This represents concentration impact.	Authors' calculation based on World Bank	**(−)**

4.4.3. Econometric Methodology

We will utilize the following models to enable us investigating the credit and liquidity risk among the Islamic and conventional banks, and the stability determinants. This model is estimated through applied fixed effect model which is presented below;

$$\begin{aligned}&\text{Operating risk}_{\,i,t}\\&= \beta_{\,0} + \beta_1 \times \left(\text{Islamic Banks Dummy}_{i,t}\right) + \beta_2 \times \left(\text{Islamic window banks Dummy}_{i,t}\right)\\&+ \sum_{k=1}^{6} b_k \left(\text{Bank} - \text{Specific Variables}_{\,i,t}\right) + \sum_{m=1}^{6} \gamma_m \left(\text{Macro Level Variables}_{\,t}\right)\\&+ \varepsilon_{i,t} \qquad (3)\end{aligned}$$

$$\begin{aligned}&\text{Inslovency Risk}_{\,i,t} =\\&c_{\,0} + c_1 \times \left(\text{Islamic Banks Dummy}_{i,t}\right) + c_2 \times \left(\text{Islamic window banks Dummy}_{i,t}\right)\\&+ \sum_{k=1}^{6} \delta_k \left(\text{Bank} - \text{Specific Variables}_{\,i,t}\right) + \sum_{m=1}^{6} \mu_l \left(\text{Macro Level Variables}_{\,t}\right)\\&+ u_{i,t} \qquad (4)\end{aligned}$$

Where i stands for risk of bank i in year t. $\beta_{\,0}$, β_1 , $c_{\,0}$, c_1 are unknown parameters to estimate, k is the independent variables for bank-specific variable, m is the independent variable for macro level variables. We use eighteen explanatory variables: (1) Islamic Bank; (2) Islamic Windows Bank; (3) Size; (4) Capital Asset Ratio; (5) Loan Growth; (6) Efficiency Ratio; (8) Noninterest Income; (9) Rate; (11) HHI; (12) Inflation; (13) Domestic Interest; (14) Rate Real Interest; (15) Bank Concentration; (16) GPD Per Capita; (17) GDP Per Capita Growth. These variables have been explained in depth in previous sections. We cluster the error term for banks instead of countries because some countries have more Islamic banks than others. It is important to mention that we use assets growth with insolvency risk equation whereas loan growth with operating risk equation. ROAA and cost to income ratios will be dependent variables for operating risk model whereas they are explanatory variables for insolvency risk model.

We utilize panel data estimation to estimate the relationships between dependent variables and independent variables. The panel data approach has advantages over have over cross

section or time series data. The panel data combine both time series and cross sectional approach. This feature leads to many merits to the data: it makes the data more informative, more variability and leads to less *collinearity* among the variables. Secondly, the panel data approach tackles the issue of *heterogeneity* in the variables. Moreover, it is also suited in the dynamics of changes. Furthermore, the effects can be observed or detected through panel data which cannot be detected.

The model used in this paper is the fixed effect model, which assumes that an unobservable bank effect (the fixed effect) is in correlation with the explanatory variables. This makes the regression to be biased and inconsistent; then this leads to eliminate the fixed effect in this case the year dummies to control the legged variables. The fixed effects and the random effects model are the main two methods which fit with the estimation of panel data approach. To select the appropriate model, the fixed effects or the random effect model, the Hausman test was utilized. The result of the test showed that the fixed effect model is preferred to random effect model because with random effects there is likely to be a correlation with one or more of the explanatory variables (Baltagi 2008). The assumption of the fixed effect model is that there is a correlation between the unobserved effect (α_i) and the explanatory variables. This leads to biased and inconsistent coefficient. Therefore, this method aims to eliminate the (αi).

This is a model that has satisfied elementary assumption tests like; (1) misspecification test (omitted or redundant variables; (2) serial correlation test; (3) heteroskedasticity test; (4) multicollinearity test; and (5) normally distributed error test. Table 4.3 presents the Pearson correlation for the variables used in this research. The results indicate there is no presence of multicollineaity as shown by very small correlation coefficients among the independent variables and the explanatory variables. For further possible multicollinearity (Table 4.3), a variance inflation factor (VIF) for all independent variables. 3.97 is the largest one which is below the rule of thumb cut-off of 10 for multiple regression (N Gujarati 2004).

Table 4.3: Pearson Correlation Coefficients and Variance Inflation Factors (VIF)

To test for possible multicollinearity, we compute (VIF) for each independent variable and the largest one is 3.97, well below the rule of thumb of 10.0

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	VIF
Total Assets	1												3.97
Equity / Total Assets	-0.3588*	1											3.47
ROAA	0.0928*	0.0462*	1										2.02
Growth of Total Assets	0.0343*	0.0154	0.0102*	1									1.80
Non-Interest Income	-0.1591*	0.1803*	0.0390*	0.0424*	1								1.81
Cost to Income	-0.3606*	0.1065*	-0.5932*	0.0270*	0.1136*	1							1.74
GDP per Capita	0.4657*	0.1898*	0.0569*	-0.0394*	-0.0590*	-0.2023*	1						1.48
GDP per Capita Growth	-0.1032*	-0.0739*	0.0343*	0.0661*	-0.0402*	0.0486*	-0.2885*	1					1.37
Inflation Rate	0.0279*	-0.012	0.0766*	0.0615*	0.0491*	-0.0074	-0.1662*	0.1125*	1				1.26
Interest Rate	-0.1933*	0.0393*	-0.0513*	-0.0610*	0.0352*	0.0875*	-0.2457*	-0.1481*	-0.2451*	1			1.26
Average Oil Prices	0.0258*	0.0074	0.005	0.0079	0.0191	-0.0002	0.0790*	0.0168	0.1349*	-0.1971*	1		1.2
HHI Index	-0.0528*	-0.0255*	0.0743*	0.1144*	-0.0222	-0.0418*	-0.1379*	0.1138*	0.1026*	-0.1068*	-0.4165*	1	1.08

4.5. Data and Preliminary Analysis

4.5.1. Data

The primary source of the data of this study was collected from Bankscope database. The aggregate country level is retrieved from the World Bank database and the average oil prices were collected from Bloomberg. As illustrated in Table 4.4, the sample comprises 950 commercial banks covering 55 countries of OIC (Organization of Islamic Countries) over the period 2006-2015. To obtain the research aim, the sample period is divided into three intervals: 2006-2015 (full sample period), 2007-2009 (global financial crisis) and 2010-2013 (sovereign debt crisis). The total number of Islamic banks is 177, whereas 654 for conventional banks and 119 for Islamic window banks. The sample distribution in Table 4.3 shows that Indonesia has the highest percentage of the total banks which represents 11.67% (110 banks). The second highest percentage is Malaysia, Lebanon, Turkey, and Bangladesh which represents respectively 5.89% (56 banks), 5.37% (51 banks), 5.26% (50 banks), and 4.95% (47 banks). On the other hand Guinea, Maldives, and Guinea-Bissau have the same and lowest percentage which is 0.10% (1 bank). Malaysia and Bahrain has the highest

number of Islamic banks which are respectively 20 banks and 19 banks. Iran and Sudan have only Islamic banks since the whole banking system in these two countries is according to *Shariah* law. To adjust for any possible outliers, we utilized winsorized at the 1% level to the continuous variables.

Table 4.4: Sample Distribution for the Sample by Countries During the Study Period 2006-2015

	Islamic Banks		Conventional Banks		Islamic window banks		Totals		
Country	Bank	Observation	Bank	Observation	Bank	Observation	Bank	Observation	Percentage %
Afghanistan	0	0	7	70	4	40	11	110	0.1158
Albania	0	0	11	110	1	10	12	120	0.1263
Algeria	0	0	23	230	1	10	24	240	0.2526
Azerbaijan	0	0	4	40	0	0	4	40	0.0421
Bahrain	19	190	7	70	4	40	30	300	0.3158
Bangladesh	8	80	27	270	12	120	47	470	0.4947
Benin	0	0	8	80	1	10	9	90	0.0947
Brunei	1	10	1	10	0	0	2	20	0.0211
Burkina Faso	0	0	8	80	0	0	8	80	0.0842
Cameroon	0	0	11	110	1	10	12	120	0.1263
Chad	0	0	5	50	0	0	5	50	0.0526
Comoros	0	0	1	10	0	0	1	10	0.0105
Djibouti	0	0	16	160	5	50	21	210	0.2211
Egypt	3	30	16	160	6	60	25	250	0.2632
Gabon	0	0	7	70	0	0	7	70	0.0737
Gambia	1	10	15	150	0	0	16	160	0.1684
Guinea	0	0	1	10	0	0	1	10	0.0105
Guinea-Bissau	0	0	1	10	0	0	1	10	0.0105
Guyana	0	0	3	30	0	0	3	30	0.0316
Indonesia	10	100	90	900	11	110	111	1110	1.1684
Iran	17	170	0	0	0	0	17	170	0.1789
Iraq	7	70	12	120	1	10	20	200	0.2105
Jordan	3	30	11	110	0	0	14	140	0.1474
Kazakhstan	0	0	30	300	0	0	30	300	0.3158
Kuwait	11	110	6	60	0	0	17	170	0.1789
Kyrgyzstan	0	0	9	90	1	10	10	100	0.1053
Lebanon	3	30	44	440	4	40	51	510	0.5368
Libya	0	0	6	60	4	40	10	100	0.1053
Malaysia	20	200	21	210	15	150	56	560	0.5895
Maldives	0	0	0	0	1	10	1	10	0.0105
Mali	0	0	10	100	0	0	10	100	0.1053
Mauritania	2	20	6	60	3	30	11	110	0.1158
Morocco	0	0	16	160	0	0	16	160	0.1684
Mozambique	0	0	11	110	0	0	11	110	0.1158
Niger	0	0	7	70	1	10	8	80	0.0842
Nigeria	2	20	19	190	0	0	21	210	0.2211
Oman	2	20	1	0	5	50	8	80	0.0842
Pakistan	12	120	10	100	12	120	34	340	0.3579
Palestine	0	0	3	30	0	0	3	30	0.0316
Qatar	6	60	6	60	1	10	13	130	0.1368
Saudi Arabia	5	50	0	0	9	90	14	140	0.1474
Senegal	1	10	13	130	0	0	14	140	0.1474
Sierra Leone	0	0	11	110	0	0	11	110	0.1158
Sudan	19	180	0	0	0	0	19	190	0.2
Suriname	0	0	4	40	0	0	4	40	0.0421
Syria	2	20	11	110	2	20	15	150	0.1579
Tajikistan	0	0	6	60	0	0	6	60	0.0632
Togo	0	0	4	40	0	0	4	40	0.0421
Tunisia	3	30	14	140	3	30	20	200	0.2105
Turkey	5	50	45	450	0	0	50	500	0.5263
Turkmenistan	0	0	4	40	0	0	4	40	0.0421
Uganda	0	0	19	180	0	0	19	190	0.2
UAE	11	110	9	90	11	110	31	310	0.3263
Uzbekistan	0	0	19	190	0	0	19	190	0.2
Yemen	4	40	5	50	0	0	9	90	0.0947
Total	**177**	**1770**	**654**	**6520**	**119**	**1190**	**950**	**9500**	**100**

Table 4.5: Statistical Summary for all Sample Banks During the Period 2006-2015

	Islamic Banks			Conventional Banks			Islamic window banks			Max-Min		Difference in means (*t-test*)			
Variables	N	Mean	SD	N	Mean	SD	N	Mean	SD	Max	Min	*t-test* 1*	*t-test* 2	*t-test* 3	*t-test* 4
Panel A: Operating risk															
Net Interest Margin	1204	3.9199	3.7217	4131	5.3282	3.4618	774	4.0772	2.7355	19.4000	-2.2410	10.8917***	-12.2079***	-1.0130***	9.5119***
Non-Interest Expense	1245	4.4870	3.7325	4146	4.9798	3.7946	775	3.2038	2.5581	21.6220	0.3250	1.8182	-4.0338***	8.4186***	12.5088***
Cost to Income Ratio	1178	64.7444	38.7724	4461	60.9830	31.8823	836	51.8162	30.0633	236.9950	11.9230	-4.6344***	3.3217***	8.0614***	7.6966***
ROAA	1252	1.1845	3.7124	4583	1.2916	2.7785	850	1.4340	1.8780	11.5990	-13.0240	1.4306	-1.1182	-1.8090*	-1.4353
ROAE	1252	8.7208	14.6469	4530	11.4623	16.3778	849	11.5430	11.7070	56.5690	-58.3330	5.6508***	-5.3601***	-4.6896***	-0.1371
Panel B: Solvency Risk															
Zscore_1	643	1.6355	0.5878	2461	1.6819	0.5565	601	1.7569	0.5529	3.0527	0.1621	2.5061**	-1.8599*	-3.7450***	-2.9651***
Zscore _2	971	0.4359	0.6105	3731	0.5361	0.6030	720	0.6231	0.6239	1.8970	-1.4215	5.3080***	-4.5999***	-6.1781***	-3.5271***
Zscore _3	646	1.6062	0.5840	2475	1.6457	0.5568	603	1.7196	0.5534	3.0295	0.1530	2.2184**	-1.5872	-3.5146***	-2.9248***
Zscore_4	687	1.6537	0.5819	2590	1.6974	0.5566	619	1.7636	0.5498	3.0755	0.1738	2.3959**	-1.8111*	-3.4980***	-2.6656***
Zscore_5	947	0.5130	0.5031	3665	0.5891	0.5201	709	0.6865	0.5289	1.9060	-0.9049	4.9324***	-4.0360***	-6.7893***	-4.5517***
Zscore_6	1132	1.4526	0.5243	2601	1.6625	0.5537	620	1.7245	0.5520	3.0346	0.2211	11.7512***	-10.8155***	-10.1876***	-2.5099**
Panel C: Bank- Specific Variables															
Total Assets	1257	6.1050	0.8719	4597	5.8927	0.8356	841	6.4783	0.8300	7.8171	4.0124	-4.5088***	7.9099***	-9.7950***	18.7067***
Equity / Total Assets	1258	24.5019	23.8162	4624	15.5751	13.7321	852	13.6567	9.8535	91.2280	0.7970	-18.7338***	17.0998***	12.6817***	3.8968***
Loan Growth	995	26.3832	40.4000	3932	24.9327	37.5062	811	19.5086	29.9193	206.9000	-36.4100	-1.8379*	1.0725	4.0283***	3.8620***
Asset Growth	1106	21.8198	30.0916	4024	21.3738	29.1158	816	18.3651	22.9246	161.9600	-25.9200	-1.0018	0.4479	2.7441**	2.7820***
Noninterest Income	1218	43.0908	33.5978	4518	35.5977	22.6563	841	33.7777	18.0297	129.5700	-12.3400	-9.9755***	9.1460***	7.3414***	2.2032**
Panel D: Country - Level Variables															
GDP per Capita	1626	3.8138	0.5830	6253	3.4482	0.5082	1166	3.6444	0.6024	4.8505	2.5777	-22.6806***	25.0407***	7.4658***	-11.7370***
GDP per Capita Annual Growth	1626	1.6040	4.1932	6253	2.6631	3.5693	1166	1.9585	4.2028	10.1687	-12.7508	9.1598***	-10.2644***	-2.2012**	6.0084***
Inflation Rate	1538	8.6123	8.5864	5716	6.0064	4.6319	1038	5.9177	4.6298	36.7023	-3.7489	-16.6145***	15.9051***	9.2442***	5.5679
Real Interest	1118	3.3671	9.9914	4057	6.1482	8.0878	776	4.5281	7.7880	41.2530	-13.0638	8.9815***	-9.6468***	-2.7147***	5.1424***
Average Oil Prices	1770	85.8570	21.1494	6540	85.8570	21.1451	1190	85.8570	21.1523	111.5700	52.3200	0.0000	0.0000	0.0000	0.0000
HHI Index	1638	0.1250	0.1821	6188	0.0969	0.1351	1130	0.0969	0.1351	1.0000	0.0092	-7.1035***	6.9222***	4.4213***	0.0043

Note: This summary represents the summary for the whole period of the study which is 2006-2015. Max and Min is for the entire sample. * The t test for 1, 2, 3, 4 stands for the econometrics difference in means for: (Islamic Banks and all (Conventional plus Islamic window banks)) (Islamic and Conventional Banks) (Islamic and Islamic window banks) (Islamic window and Conventional Banks). Significant level at 10%, 5%, 1% are indicated through *, **,***, respectively.

4.5.2. Descriptive Analysis

Operating risk: Table 4.5 reports a statistical summary for the full sample and compares the results among the different types of banks. The table is divided into four panels: (1) panel A: operating risk; (2) panel B: insolvency risk; (3) panel B: bank specific variables. We begin the analysis by looking first at the operating risk (panel A), which includes five indicators. Interestingly, we find that most of the indicators reveal that there is a substantial difference between Islamic, conventional and Islamic window banks. The results show that the most significant difference is the net interest margin and the second significant is the cost to income. Overall, the results suggest that Islamic banks are less operating ly efficient compared to other banks. This is probably due the young age of the Islamic financial industry and the complexity of its products. In addition, the results shows that Islamic window banks perform better than Islamic banks, the possible interpretation for that could be the maturity of Islamic window banks in comparison to Islamic banks; as most of them started as conventional and then later began offering Islamic banking service. In particular, the net interest margin is significantly lower in Islamic banks compared to other types, as indicated by the mean value of 3.9199% versus 5.3282% for conventional banks and 4.0772% for Islamic window banks. Looking to the profit maximization indicators, we find that Islamic banks tend to be less efficient. Though there is no significant results with respect to return on average assets but the results reveal that Islamic banks tend to have less operating efficiency. However, return on average equity shows that there is a significant difference and Islamic banks have less efficiency; 8.7208 % for Islamic banks compared to 14.6469% for conventional banks and 11.5430% for Islamic window banks. In addition, cost to income ratio is substantially higher in Islamic banks which mean that Islamic banks are less efficient (64.7444%, 60.9830% and 51.8162% for Islamic, conventional and Islamic window respectively). Overall, the results suggest that Islamic banks have more operating risk compared to conventional and Islamic window banks.

Insolvency Risk: In terms of insolvency, the statistical summary reveals that there are significant differences among the three different types of banks. In general, we find that z-score and all its components reveals that Islamic banks relatively have higher default (insolvency) risk compared to conventional and Islamic window banks. In particular, Zscore_1 and Zscore_2 appear lower for Islamic banks. Furthermore, Zscore_ 5 also appears less in Islamic banks (0.5130 versus 0.5891 for conventional banks and 0.6875 for Islamic window banks). Consistent with the previous findings, the Zscore_ 6 is also lower with

Islamic banks (1.4526 versus 1.6625 for conventional banks and 1.7245 for Islamic window banks). All the indicators suggest that there is a significant difference between Islamic banks and conventional and shows that Islamic banks have higher insolvency risk.

Bank-Specific Characteristics: The data in Table 4.5 reveals capitalization has the highest significance difference among all the bank level variables, which suggests that Islamic banks substantially maintain better capitalization compared to Islamic window and conventional banks (24.5019 % versus 15.5751% for conventional and 13.6567% for Islamic window). The results also reveal that bank size has a significant difference between the three kinds of financial institutions. The results show that Islamic window banks have the largest banks size which indicates that it is the large banks that tend to have Islamic windows. In terms of diversification, the ratio of non-interest income is significantly higher in Islamic banks. This suggests that Islamic banks have higher diversification across all types of banks.

4.5.3. Global Financial Crisis and Sovereign Debt Crisis

This section compares the risk of Islamic banks, conventional banks and Islamic window banks during three panels: (1) panel A: full sample period (2006-2015); (2) panel B: global financial crisis (2007-2009); and (3) panel C: Sovereign debt crisis (2010-2013). The purpose of the division of these years is to investigate which types of banks is better in accommodating these financial shocks. Table 4.6 reports the results with respect of operating risk, whereas table 4.7 presents the results with respect of solvency risk.

Operating risk: As has been discussed in the previous section, Islamic banks appear to have higher operating risk compared to conventional and Islamic window bank during the full sample period. Looking at the global financial crisis in Panel B (Table 4.6), we find that there are three significant differences in mean values between Islamic and conventional banks with respect to operating risk. These differences are more pronounced in the following ratios: net interest margin, return on average assets, and return on average equity. For instance, Islamic banks tend to have lower net interest margin ratio and lower return on average equity when compared to conventional banks (4.8958% versus 5.4818% for conventional, and 10.6114% versus 13.5879% for conventional banks). Though the remaining mean values are not significant, however they indicate in general that Islamic banks are more risky in terms of operating aspects compared to conventional and Islamic window banks, which is in agreement with the results found in Panel A. Then, we compared the risk during the sovereign debt crisis which is shown in Panel C. Interestingly, we find that all the means values of operating risk measures differ significantly between Islamic, conventional and

Islamic window banks which is unlike the results found in Panels A and B. All the indicators reveal that Islamic banks are more risky compared to conventional banks. For example, Islamic banks appear to have higher net interest margin ratio and non-interest margin ratio (3.6206% versus 5.3164% for conventional banks, 4.3935% versus 5.2013% for conventional banks). The results also show that Islamic banks are more risky compared with Islamic window banks. For instance, the mean total risk-based cost to income for Islamic banks is 65.2356% (compared to 52.6518% for Islamic window banks). Hence, the results suggest that Islamic banks are substantially more risky-based on operating aspects in comparison with conventional and Islamic window banks. More importantly, the results also reveal that Islamic financial institutions are more risky during sovereign debt crisis.

Insolvency Risk: As illustrated in Table 4.7, the indicators in panel A show that Islamic banks are more risky compared to conventional and Islamic window banks. Five out of six indicators are substantially different from conventional banks. For example, Zscors 1; 2; 3; 4; 6 are significantly lower in Islamic banks which suggests that Islamic banks are less stable than conventional banks in terms of insolvency risk. Almost the same results are obtained when comparing Islamic banks with Islamic window banks. We next compare the results during the global financial crisis (2007-2009) which is shown in Panel B in Table 4.7. We find that all the mean values in Panel A are substantially different Islamic and conventional banks. In addition, the results show that Islamic banks have lower Zscors which implies that Islamic banks have higher insolvency risk. Comparing Islamic with Islamic window banks, we find consistent results found when comparing with conventional banks. In conclusion, Islamic banks appear to have higher insolvency risk compared to conventional and Islamic window banks during the global financial crisis. Looking to sovereign debt crisis in Table 4.7 (Panel C), the number of significant differences in this panel in less compared to the Panels A and B; however, Islamic banks are relatively less solvent in comparison with other banks and Islamic window banks. For instance, the mean total Zscor_2 of Islamic banks is 0.4359 (compared to 0.5209 for conventional, and 0.6590 for Islamic window banks). In summary, the results suggest that Islamic banks are less solvent during normal times and during financial crises.

Table 4.6: Descriptive Statistics - Operating risk - Mean Values

	Islamic Banks			Conventional Banks			Islamic window banks			Difference in Means			
Variables	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD	*t*-test 1	*t*-test 2	*t*-test 3	*t*-test 4
Panel A: Full Sample Period (2006-2015)													
Net Interest Margin	3.9199	3.3385	3.7217	5.3282	4.5410	3.4618	4.0772	3.3825	2.7355	10.8917***	-12.2079***	-1.0130***	9.5119***
Non- Interest Expense	4.4870	3.4050	3.7325	4.9798	3.9430	3.7946	3.2038	2.5210	2.5581	1.8182	-4.0338***	8.4186***	12.5088***
Cost to Income Ratio	64.7444	55.9020	38.7724	60.9830	55.4720	31.8823	51.8162	46.0105	30.0633	-4.8760***	3.4339***	8.0614***	7.6966***
ROAA	1.1845	1.1400	3.7124	1.2916	1.3330	2.7785	1.4340	1.2930	1.8780	1.4306	-1.1182	-1.8090*	-1.4353
ROAE	8.7208	8.8445	14.6469	11.4623	11.7650	16.3778	11.5430	12.6760	11.7070	5.6508***	-5.3601***	-4.6896***	-0.1371
Panel B: Global Financial Crisis (2007-2009)													
Net Interest Margin	4.8958	4.0585	4.2478	5.4818	4.6480	3.3794	4.2767	3.4540	3.1355	1.6231	-2.2932**	1.5982	4.2404***
Non-Interest Expense	4.6101	3.6555	3.6357	4.6462	3.9045	3.2472	3.0617	2.2845	2.2611	-0.8947	-0.1544	4.8685***	5.9604***
Cost to Income Ratio	58.7516	51.1330	34.0720	59.3811	53.6095	32.9968	52.1785	42.8855	36.6368	-0.1854	-0.2654	1.8840*	2.6124***
ROAA	1.8322	1.6580	4.0965	1.4545	1.4715	2.6488	1.3331	1.3630	2.1259	-2.0010**	1.8243*	1.4916	0.5784
ROAE	10.6114	9.4370	15.1328	13.5879	13.7620	15.6077	11.7981	12.2025	13.5605	2.6136***	-2.7852***	-0.8407	1.4302
Panel C: Sovereign Debt Crisis (2010-2013)													
Net Interest Margin	3.6206	3.2860	3.5181	5.3164	4.5850	3.4204	4.0490	3.3825	2.5143	9.272***	-10.0937***	-1.9451*	6.4471***
Non- Interest Expense	4.3935	3.3510	3.6521	5.2013	4.0200	4.0535	3.2354	2.6630	2.2466	2.7286***	-4.2394***	5.2442***	8.6148***
Cost to Income Ratio	65.2356	55.6500	40.1586	61.9433	56.0300	31.3622	52.6518	45.3730	32.2258	-3.0083***	2.0201**	5.061***	5.2512***
ROAA	0.9224	1.0565	3.8123	1.2360	1.3260	2.7717	1.3656	1.2860	1.9031	2.4727***	-2.1824***	-2.1121**	-0.8785
ROAE	8.1781	8.6920	14.8714	10.7586	11.1730	16.9075	10.8365	12.9480	12.6248	3.4757***	-3.3004***	-2.8789***	-0.0859

Note: This summary represents the summary for the whole period of the study which is 2006-2015. Max and Min is for the entire sample. * The t test for 1; 2; 3; 4 stands for the econometrics difference in means for: (Islamic Banks and all (Conventional plus Islamic window banks)) (Islamic and Conventional Banks) (Islamic and Islamic window banks) (Islamic window and Conventional Banks). Significant level at 10%, 5%, 1% are indicated through *, **,***, respectively

Table 4.7: Descriptive Statistics - Insolvency Risk - Mean Values

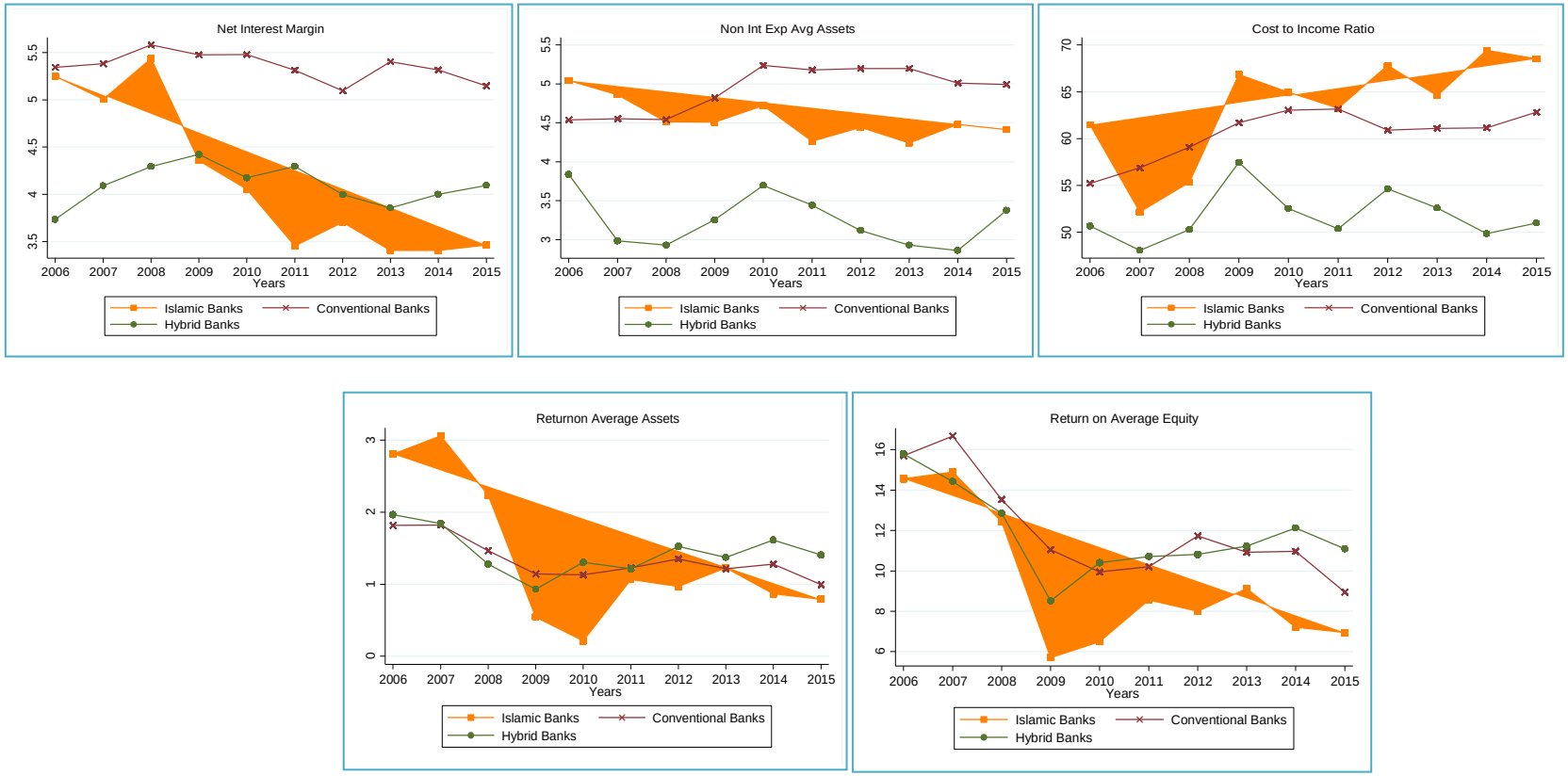
	Islamic Banks			***Conventional Banks***			***Islamic window banks***			***Difference in Means***			
Variables	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD	*t*-test 1	*t*-test 2	*t*-test 3	*t*-test 4
Panel A:Full Sample Period (2006-2015)													
Zscore_1	1.6355	1.6764	0.5878	1.6819	1.6893	0.5565	1.7569	1.7124	0.5529	2.5061**	-1.8599*	-3.7450***	-2.9651***
Zscore _2	0.4359	0.4994	0.6105	0.5361	0.5844	0.6030	0.6231	0.6681	0.6239	5.3080***	-4.5999***	-6.1781***	-3.5271***
Zscore _3	1.6062	1.6427	0.5840	1.6457	1.6522	0.5568	1.7196	1.6710	0.5534	2.2184**	-1.5872	-3.5146***	-2.9248***
Zscore_4	1.6537	1.6944	0.5819	1.6974	1.7065	0.5566	1.7636	1.7320	0.5498	2.3959**	-1.8111*	-3.4980***	-2.6656***
Zscore_5	0.5130	0.5257	0.5031	0.5891	0.5966	0.5201	0.6865	0.6696	0.5289	4.9324***	-4.0360***	-6.7893***	-4.5517***
Zscore_6	1.4526	1.4171	0.5243	1.6625	1.6677	0.5537	1.7245	1.6823	0.5520	11.7512***	-10.8155***	-10.1876***	-2.5099**
Panel B: Global Financial Crisis (2007-2009)													
Zscore_1	1.4469	1.5041	0.5021	1.6801	1.6714	0.4895	1.5185	1.5263	0.4552	3.9209***	-4.4446***	-1.1274	3.2618***
Zscore _2	0.3506	0.4631	0.6040	0.5692	0.6158	0.5651	0.5242	0.5927	0.5179	4.8459***	-4.8700***	-2.7995***	0.8960
Zscore _3	1.3991	1.4608	0.4980	1.6304	1.6358	0.5039	1.4824	1.5106	0.4484	3.8987***	-4.3357***	-1.3322	2.9397***
Zscore_4	1.5001	1.5535	0.4654	1.6943	1.6902	0.4850	1.5430	1.5504	0.4547	3.3899***	-3.9141***	-0.7194	3.1257***
Zscore_5	0.4149	0.4494	0.4845	0.6039	0.6305	0.4954	0.5806	0.6082	0.4549	5.0008***	-4.9707***	-3.2679***	0.5345
Zscore_6	1.3343	1.2685	0.4928	1.6466	1.6443	0.4979	1.4981	1.5066	0.4519	7.4522***	-7.8987***	-3.0509***	3.0083***
Panel C: Sovereign Debt Crisis (2010-2013)													
Zscore_1	1.63071	1.69057	0.59547	1.65597	1.67137	0.56321	1.81475	1.76290	0.57268	1.5211	-0.6784	-3.7151***	-4.0884***
Zscore _2	0.43592	0.46393	0.60230	0.52088	0.58436	0.61934	0.65903	0.67234	0.63246	3.2632***	-2.5446**	-4.8738***	-3.5719***
Zscore _3	1.60371	1.65434	0.58981	1.62238	1.63353	0.55731	1.77598	1.71238	0.57640	1.3284	-0.5084	-3.4947***	-3.9913***
Zscore_4	1.64830	1.70597	0.59595	1.67397	1.68250	0.56265	1.82057	1.76324	0.57287	1.5245	-0.7142	-3.5716***	-3.8412***
Zscore_5	0.52962	0.51469	0.49744	0.58343	0.59322	0.52386	0.69793	0.65741	0.57798	2.5132**	-1.8623*	-4.1552***	-3.4054***
Zscore_6	1.47159	1.44254	0.52437	1.63995	1.64795	0.55695	1.77968	1.72751	0.58012	6.8054***	-5.7633***	-7.5261***	-3.6892***

Note: This summary represents the summary for the whole period of the study which is 2006-2015. Max and Min is for the entire sample. * The t test for 1; 2;3; 4 stands for the econometrics difference in means for: (Islamic Banks and all (Conventional plus Islamic window banks)) (Islamic and Conventional Banks) (Islamic and Islamic window banks) (Islamic window and Conventional Banks). Significant level at 10%, 5%, 1% are indicated through *, **,***, respectively

4.5.4. Plots of Annual Averages

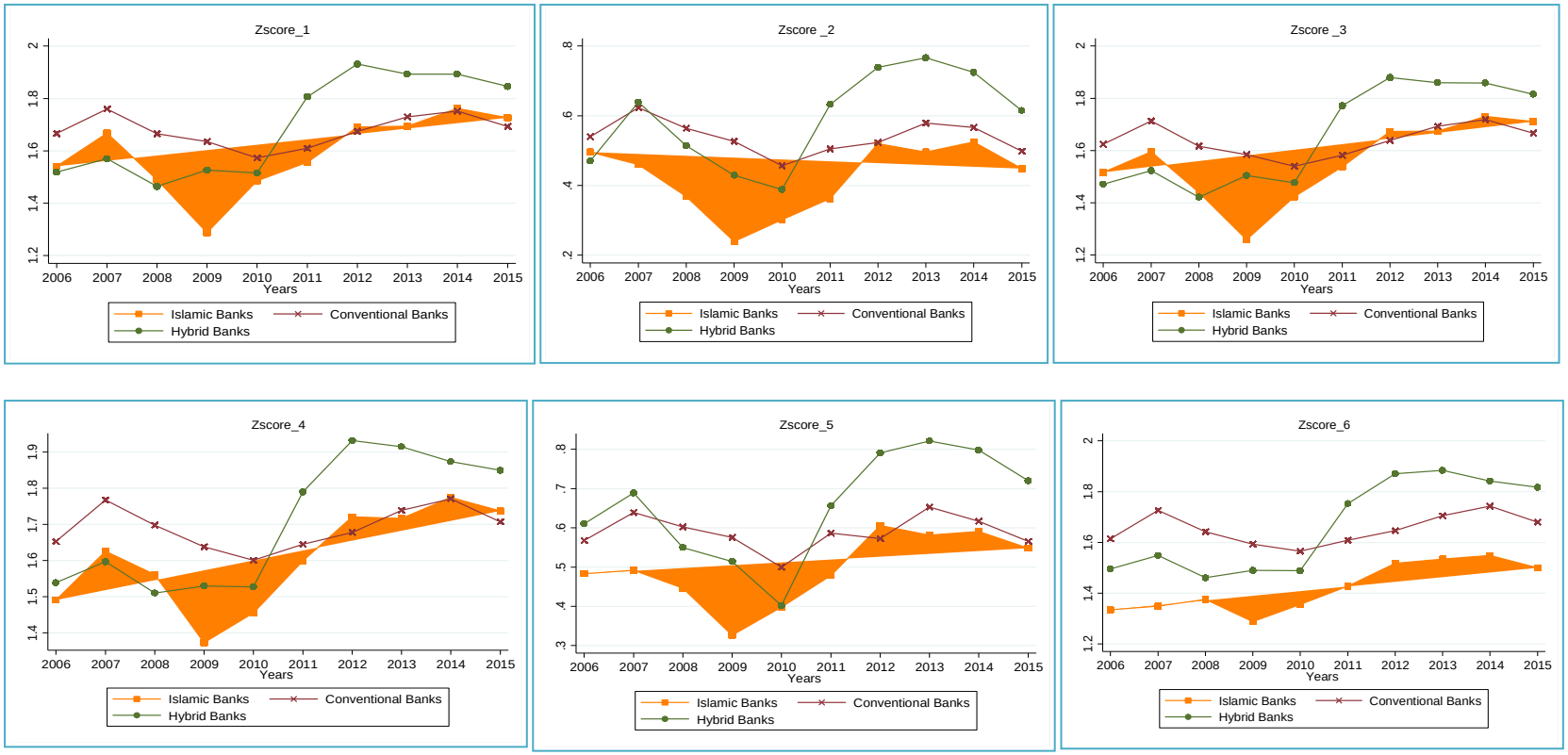
Figure 4.3 shows a comparison of the indicators for operating and insolvency risk of the three kinds of financial institutions for the entire sample period (2006-2015). In terms of operating risk, all the banks have experienced two drawdown which are the global financial crisis and the sovereign debt crisis. However, the diagrams reveal that each type of financial institutions had varying patterns. In particular, the results indicate that Islamic banks performed significantly worse than conventional and Islamic window banks with respect to operating aspects. In addition, Figure 4.3 shows that Islamic banks have lower Z-score during the sample periods which suggest that they have higher insolvency risk.

Figure 4.3: Diagrams for Risk Indicators



Continued

Figure 4.3: Diagrams for Risk Indicators



4.6. Empirical Results

4.6.1. Comparing Islamic and Conventional Banks

The primary purpose of this section is to report the empirical investigation and discuss the results of the stability of the three types of financial institutions using the comparing approach. In particular, this section examines whether there is a significant difference in the operating and insolvency risk among Islamic, conventional, and Islamic window banks. Furthermore, it attempts to investigate whether Islamic banks are less risky compared to conventional and Islamic window banks with respects to these two risks. Initially, we show the results for operating risk (Table 4.8) then insolvency risk (Table 4.9), which are both divided into three panels: (A) full sample period 2006-2015; (B) 2007-2009 (global financial crisis); and (C) 2010-2013 (sovereign debt crisis).

4.6.1.1. Operating risk

Full Sample: Firstly, we consider the full sample period which is from 2006 until 2015, we find that are three significant results in cost to income ratio, return on average asset ratio and return on average equity ratio. Specifically, Islamic banks appear to have higher cost to income and lower ROAA which implies that Islamic banks are less efficient in terms of operating aspects. On the other hand, Islamic banks appear to have higher ROAE. Although the remaining operating risk indicators are not significant, net interest margins are lower in Islamic banks. Hence we can conclude that Islamic banks tend to have higher operating risk during the full sample period because they have more operating process in comparison to conventional banks.

Global Financial Crisis: If we consider the global financial crisis (2007-2009), we find that there are less significant results. Cost to income ratio is significantly higher in Islamic banks which implies that Islamic financial institutions have higher operating risk. Net interest margin and non-interest margin ratios are higher in Islamic banks, though not significantly different. Thus, Islamic banks appear more risky during the global financial crisis with less significant level compared to the entire sample period.

Sovereign Debt Crisis: Finally, we investigate the stability during the sovereign debt crisis; the results show that non-interest expense is statistically and significantly lower in Islamic banks. Though not significant, the results reveal higher cost to income ratio and lower ROAA and ROAE. This result is consistent with the finding of column 11 which indicates that the

Islamic banks have an issue with the operating aspects. The results also suggest that Islamic banks did not learn from the global financial crisis.

4.6.1.2. Insolvency Risk

Full sample: Concerning the full sample, constantly the results indicates that Islamic banks have higher insolvency risk compared others, through not significant. Furthermore, Column 6 shows that the insolvency risk is substantially higher with Islamic banks. This supports the regression results in the other columns, suggesting the Islamic financial institution are less solvent.

Global Financial crisis: Table 4.8 shows that, during the global financial crisis, the Islamic banks were significantly less solvent as it is shown in Columns 9 and 10. Though not significant, the remaining results in columns 7; 8; and 11, confirm the previous findings. The results also show that, with Islamic window banks, there are no significant regression results. However, the results suggest that Islamic window banks have more insolvency risk during the global financial crisis.

Sovereign Debt Crisis: Interestingly, the results show that during the sovereign debt crisis, there are no significant results. However, the results suggest that Islamic banks are less solvent compared to conventional banks. This implies that Islamic banks are experiencing more insolvency risk; however the Islamic banks seem better in comparison with the period of the global financial crisis. The results also reveal that there is substantial difference in Islamic window banks and that they are more solvent in comparison with other banks.

Table 4.8: Regression Results - Operating risk - Comparison

	Panel A: Full Sample Period (2006-2015)					***Panel B: Global Financial Crisis (2007-2009)***					***Panel C :Sovereign Debt Crisis (2010-2013)***				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Islamic Banks	-0.3258	0.4308	0.4392**	-0.7491*	0.5672*	0.5487	0.7039	0.7805*	0.0350	1.4809	-0.6161**	0.0625	0.9376	-0.5613	-0.6374
	(0.2878)	(0.2991)	(0.1418)	(0.3602)	(0.2997)	(0.3810)	(0.6604)	0.3953	(0.4266)	(2.5507)	(0.2910)	(0.3527)	(5.0267)	(0.4733)	(2.0419)
Islamic window banks	0.2260	0.2486	2.3398	-0.1334*	-1.4243	0.6881	0.3608	5.5194	-0.0429	-0.5795	0.0916	-0.0074	-3.8416	0.1749	1.9079
	(0.2985)	(0.3161)	(2.6343)	(0.1774)	(1.3540)	(0.6195)	(0.4167)	(5.3003)	(0.3109)	(2.2402)	(0.2201)	(0.3346)	(3.8294)	(0.2437)	(1.9696)
Total Assets	-0.1322	-1.0195***	-1.2010***	0.6650**	0.1502***	0.0025	-0.2789	-1.7527	0.4790	0.7269	-0.0227	-1.2167**	1.9022***	0.6902**	0.2377*
	(0.3018)	(0.2618)	(0.2452)	(0.1972)	(0.0377)	(0.3998)	(0.2160)	(3.4532)	(0.2827)	(1.5548)	(0.1283)	(0.3596)	(0.3901)	(0.2559)	(0.1208)
Equity / Total Assets	0.0484***	0.0025	-0.4180**	0.0419**	0.0078	0.0367	0.0136	-0.2897	0.0281	0.0021	0.0552***	-0.0059	-0.4660***	0.0418*	0.0360
	(0.0091)	(0.0091)	(0.1485)	(0.0131)	(0.0547)	(0.0193)	(0.0208)	(0.3552)	(0.0248)	(0.0538)	(0.0071)	(0.0152)	(0.1387)	(0.0170)	(0.0950)
Loan Growth	-0.0001	-0.0007	-0.0176	0.0030	0.0147	0.0020	0.0038	0.0486	0.0005	0.0025	-0.0037**	0.0020	0.0223	-0.0001	-0.0052
	(0.0024)	(0.0024)	(0.0227)	(0.0022)	(0.0117)	(0.0033)	(0.0033)	(0.0444)	(0.0045)	(0.0264)	(0.0018)	(0.0030)	(0.0301)	(0.0026)	(0.0143)
Noninterest Income	-0.0591***	0.0095	0.1630**	0.9806	0.0002	-0.0579***	0.0050	0.1008	0.0036	-0.0293	-0.0568***	0.0099	0.1381	0.0065	0.0075
	(0.0051)	(0.0058)	(0.0505)	(0.0054)	(0.0282)	(0.0101)	(0.0076)	(0.1011)	(0.0107)	(0.0611)	(0.0036)	(0.0093)	(0.0820)	(0.0089)	(0.0451)
GDP per Capita	-0.5790	0.8773	16.5907*	-1.2405	-9.1262	0.4914	-1.8006	3.9382	0.6334	-7.0687	0.6561	1.4344	1.0864	-4.1538	-2.0564
	(0.9695)	(0.7181)	(8.0346)	(1.0780)	(5.0982)	(3.0166)	(2.2365)	(3.1427)	(1.9851)	(10.7261)	(2.6852)	(2.1275)	(0.7419)	(2.9343)	(1.1520)
GDP per Capita Growth	0.0159	-0.0115	-0.256	0.0477*	0.2511*	0.2090**	-0.0065	-1.6315**	0.2720*	1.1773*	-0.0115	-0.0309	0.0427	0.0448	0.2731
	(0.0198)	(0.0233)	(0.1499)	(0.0194)	(0.1203)	(0.0718)	(0.0520)	(0.5717)	(0.1109)	(0.4839)	(0.0286)	(0.0301)	(0.2514)	(0.0290)	(0.1640)
Inflation Rate	0.0212	0.0129	-0.3886*	0.0327	0.1298	-0.0072	0.0080	0.2557	0.0109	-0.1109	-0.0013	-0.0024	-0.2699	0.0335	0.2255
	(0.0192)	(0.0119)	(0.1125)	(0.0164)	(0.1045)	(0.0367)	(0.0220)	(0.2875)	(0.0526)	(0.2182)	(0.0285)	(0.0211)	(0.3136)	(0.0332)	(0.2726)
Real interest	-0.0054	0.0106	0.0739	-0.0188	-0.0932*	0.0141	-0.0010	0.1235	-0.007	-0.0783	-0.0289	-0.0093	0.1535	0.0049	0.0704
	(0.0062)	(0.0086)	(0.069)	(0.0096)	(0.0421)	(0.0194)	(0.0096)	(0.1255)	(0.0174)	(0.0852)	(0.0170)	(0.0110)	(0.1334)	(0.0172)	(0.0839)
Average Oil Prices	-0.0018	-0.0014	0.0013	0.0034	0.0211	0.0055	-0.0135*	-0.1539***	0.0020	0.0451	-0.0065	-0.0081	0.0196	0.0117	0.0499
	(0.0036)	(0.0026)	(0.0322)	(0.0029)	(0.0208)	(0.0133)	(0.0050)	(0.0760)	(0.0144)	(0.0676)	(0.0078)	(0.0052)	(0.0762)	(0.0095)	(0.0533)
HHI Index	-0.8005	1.1094	8.3959	-0.5246	-2.5987	-0.8986	0.2144	8.4534	-0.3924	0.7008	-3.0142***	2.8374	1.6375*	-1.3861	-2.0955*
	(0.9606)	(0.6807)	(5.3652)	(0.4090)	(2.2670)	(0.9750)	(0.6749)	(8.0737)	(0.6503)	(3.6917)	(0.7975)	(1.6944)	(0.8481)	(0.7848)	(1.0894)
_cons	9.3480	6.9935*	4.0542	0.7518	10.3134	4.0244	12.7176	5.4527**	-4.7163	5.1672	5.0513	7.1936	5.9251	9.8235	2.6920
	(3.1838)	(3.2399)	(3.2006)	(3.3363)	(15.9771)	(10.0668)	(8.6006)	(2.1239)	(5.9240)	(6.2466)	(9.2451)	(7.6016)	(4.7568)	(9.9258)	(1.5069)
R-Square	0.1707	0.0858	0.0808	0.0256	0.0477	0.0254	0.2935	0.4284	0.0129	0.6052	0.0273	0.0320	0.1540	0.0017	0.0147
N	2831	2829	2878	2,905	2884	497	494	505	511	506	1,299	1,302	1,337	1,347	1,338

Note: This table investigates whether Islamic banks have lower operating risk than conventional and Islamic window banks, while controlling for bank and country specific variables, for all three periods which are: Panel A sample period (2006-2015), Panel B global financial crisis (2007-2009), Panel C sovereign debt crisis (2010-2013). The Columns 1 - 15 are operating risk dependent variables which are respectively: (1, 6, 11) Net Interest Margin; (2, 7, 12) Non-Interest Margin; (3, 8, 13) Cost to Income; (4, 9, 14) ROAA; (5, 10, 15) ROAE. Significant level at 10%, 5%, 1% are indicated through *, **,***, respectively

Table 4.9: Regression Results - Insolvency Risk - Comparison

	Panel A: Full Sample Period (2006-2015)					***Panel B: Global Financial Crisis (2007-2009)***						***Panel C :Sovereign Debt Crisis (2010-2013)***						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
Islamic Banks	-0.0590	-0.0681	-0.0576	-0.0551	-0.0689	-0.2504***	-0.1515	-0.1515	-0.2667***	-0.2185***	-0.1515	-0.3236*	-0.0093	-0.1117	-0.0035	-0.0093	-0.1036	-0.1758
	(0.0570)	(0.0574)	(0.0588)	(0.0542)	(0.0699)	(0.0463)	(0.1419)	(0.1419)	(0.0602)	(0.0580)	(0.1419)	(0.1327)	(0.0655)	(0.0865)	(0.0834)	(0.0815)	(0.0661)	(0.1016)
Islamic window banks	-0.0699	-0.0196	-0.0708	-0.0762	-0.0113	-0.0966	-0.0159	-0.0159	-0.1280	-0.1437	-0.0159	-0.1541	0.0101	-0.0264	0.0152	0.0101	-0.0198	0.0390
	(0.0527)	(0.0558)	(0.0548)	(0.0531)	(0.0587)	(0.0557)	(0.0612)	(0.0612)	(0.0612)	(0.0704)	(0.0612)	(0.0831)	(0.0523)	(0.0656)	(0.0641)	(0.0623)	(0.0701)	(0.0583)
Total Assets	0.0985	0.1776**	0.1013	0.1010	0.1773**	0.1226	0.0655	0.0655	0.0683	0.0971	0.0655	0.1321	0.1297***	0.1643***	0.1251*	0.1297*	0.1740***	0.1507*
	(0.0547)	(0.0525)	(0.0545)	(0.0564)	(0.0468)	(0.0649)	(0.0573)	(0.0573)	(0.0659)	(0.0765)	(0.0573)	(0.0853)	(0.0315)	(0.0527)	(0.0515)	(0.0505)	(0.0447)	(0.0562)
Equity / Total Assets	0.0002	-0.0013	0.0002	0.0006	-0.0019	0.0030	-0.0030	-0.0032	-0.0009	-0.0011	-0.0038	0.0032	0.0015	-0.0037*	0.0010	0.0015	-0.0035	0.0041
	(0.0029)	(0.0008)	(0.0031)	(0.0031)	(0.0013)	(0.0016)	(0.0016)	(0.0016)	(0.0013)	(0.0011)	(0.0016)	(0.0018)	(0.0016)	(0.0016)	(0.0038)	(0.0041)	(0.0027)	(0.0021)
Asset Growth	-0.0001	-0.0001	-0.0001	0.0006	-0.0004	0.0005	-0.0003	-0.0003	-0.0013*	-0.0002	-0.0003	-0.0003	0.0006	-0.0011*	-0.0001	0.0006	-0.0009	0.0004
	(0.0005)	(0.0003)	(0.0006)	(0.0006)	(0.0004)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0005)	(0.0008)	(0.0008)	(0.0005)	(0.0008)
Noninterest Income	-0.0041**	-0.0021	-0.0044***	-0.0041***	-0.0017	-0.0037***	-0.0009	-0.0009	-0.0018	-0.0019	-0.0009	-0.0018	-0.0037***	-0.0003	-0.0039**	-0.0037**	-0.0011	-0.0037***
	(0.0013)	(0.0013)	(0.0012)	(0.0010)	(0.0012)	(0.0009)	(0.0015)	(0.0015)	(0.0017)	(0.0019)	(0.0015)	(0.0019)	(0.0009)	(0.0013)	(0.0014)	(0.0011)	(0.0012)	(0.0009)
Cost to Income	-0.0038***	-0.0108***	-0.0029**	-0.0035***	-0.0079***	-0.0023**	-0.0088***	-0.0088***	-0.0045**	-0.0043**	-0.0088***	-0.0031*	-0.0027***	-0.0117***	-0.0022*	-0.0027	-0.0084***	-0.0016
	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0007)	(0.0009)	(0.0014)	(0.0014)	(0.0014)	(0.0012)	(0.0014)	(0.0012)	(0.0006)	(0.0015)	(0.0009)	(0.0008)	(0.0008)	(0.0008)
GDP per Capita	-0.1069	-0.1262	-0.0998	0.0012	-0.0451	-0.0839	-0.2090	-0.5390	0.1105	0.0937	-0.2090	-0.5748	-0.7692	0.4946	-0.6065	-0.7692	0.6276	-0.3885
	(0.2330)	(0.2027)	(0.2295)	(0.2549)	(0.1378)	(0.2371)	(0.4467)	(0.4467)	(0.8506)	(0.7360)	(0.4467)	(0.5260)	(0.7864)	(0.3546)	(0.7200)	(0.6436)	(0.3688)	(0.5795)
GDP Capita Growth	-0.0030	0.0059	-0.0040	-0.0007	0.0019	0.0002	0.0333**	0.0333**	0.0412*	0.0379**	0.0333**	0.0280*	0.0004	-0.0006	-0.0057	0.0004	-0.0019	-0.0029
	(0.0088)	(0.0057)	(0.0086)	(0.0077)	(0.0045)	(0.0083)	(0.0108)	(0.0108)	(0.0543)	(0.0167)	(0.0108)	(0.0118)	(0.0080)	(0.0055)	(0.0087)	(0.0073)	(0.0044)	(0.0069)
Inflation Rate	-0.0111**	-0.0081**	-0.0114	-0.0097*	-0.0054	-0.0077	0.0010	0.3001	-0.0016	0.0001	0.0543	-0.0012	-0.0047	0.0007	-0.0006	-0.0047	0.0031	0.0026
	(0.0044)	(0.0038)	(0.0044)	(0.0044)	(0.0032)	(0.0046)	(0.0040)	(0.8004)	(0.0062)	(0.0051)	(0.0049)	(0.0050)	(0.0078)	(0.0050)	(0.0066)	(0.0072)	(0.0040)	(0.0059)
Real interest	0.0001	-0.0001	0.0001	0.0004	0.0002	0.0003	-0.0026	-0.0026	-0.0032	-0.0047	-0.0026	-0.0049	0.0045	0.0043	0.0041	0.0045	0.0015	0.0037
	(0.0014)	(0.0015)	(0.0014)	(0.0013)	(0.0014)	(0.0012)	(0.0033)	(0.0033)	(0.0039)	(0.0032)	(0.0033)	(0.0028)	(0.0042)	(0.0039)	(0.0031)	(0.0028)	(0.0037)	(0.0029)
Average Oil Prices	0.0015*	0.0016	0.0014*	0.0013	0.0011	0.0013	-0.0024	-0.0024	-0.0022*	-0.0022*	-0.0024	-0.0010	0.0049*	0.0027	0.0046*	0.0049	0.0026*	0.0041*
	(0.0007)	(0.0320)	(0.0007)	(0.0008)	(0.0006)	(0.0008)	(0.0017)	(0.0017)	(0.0011)	(0.0441)	(0.0017)	(0.0015)	(0.0021)	(0.0015)	(0.0020)	(0.0019)	(0.0012)	(0.0019)
HHI Index	0.1425	-0.0117	0.1397	0.1527	0.0467	0.0709	0.0800	0.0843	0.2531	0.2624	0.0809	0.18071	0.2346	0.2307	0.2252*	0.2346	0.2113	0.0746
	(0.1021)	(0.0886)	(0.1048)	(0.1040)	(0.0883)	(0.1133)	(0.0871)	(0.0871)	(0.1824)	(0.1855)	(0.0871)	(0.1591)	(0.2102)	(0.1314)	(0.1048)	(0.0897)	(0.1283)	(0.2008)
_cons	1.7809*	0.4851	1.6763*	1.3547	0.1288	1.3901*	1.6119	1.2311	1.2835	1.2052	1.6119	3.1721	3.4196	-1.8534	2.8245	3.4196	-2.4927	1.8179
	(0.7262)	(0.4997)	(0.7007)	(0.7969)	(0.4542)	(0.6973)	(1.5421)	(1.6221)	(3.1774)	(2.7387)	(1.5421)	(1.8533)	(2.7204)	(1.2342)	(2.4125)	(2.1219)	(1.3213)	(1.9151)
R-Square	0.1575	0.1929	0.1465	0.1523	0.1758	0.1177	0.0962	0.0962	0.0962	0.0962	0.0072	0.0962	0.0053	0.135	0.0126	0.0053	0.098	0.0378
N	2143	2617	2148	2230	2559	2381	473	473	349	360	511	395	1,036	1,201	1,002	1,036	1,160	1,114

Note: This table investigates whether Islamic banks have lower solvency risk than conventional and Islamic window banks, while controlling for bank and country specific variables, for all three periods which are: panel (A) sample period (2006-2015), Panel B global financial crisis (2007-2009), Panel C sovereign debt crisis (2010-2013). The Columns 1 - 18 are operating risk dependent variables which are respectively: (1, 7, 13) Zscore_1; (2, 8, 14) Zscore_2; (3, 9, 15) Zscore_3; (4, 10, 16) Zscore_4; (5, 10, 17) Zscore_5; (6, 11, 18) Zscore_6. Significant level at 10%, 5%, 1% are indicated through *, **,***, respectively

4.6.2. Bank Risk Determinants

We next turn our attention to the bank-specifics and country-specifics variables and examine their effects in each type of risk through focusing on the difference between Islamic, conventional, and Islamic window banks. In particular, we investigate if Islamic banks are affected differently from conventional and Islamic window banks. Table 4.10 reports the determinants of insolvency risk whereas Table 4.11 presents the determinants of operating risk.

4.6.2.1. Risk Determinants - Insolvency Risk

Table 4.9 shows the regression results of bank-specific and county-specific for the insolvency risk such as banks size and oil prices. The table is divided into four panels; (A) all types of banks; (B) Islamic banks (C); conventional banks; (D) Islamic window banks. We first study the influence of bank-specific characteristics on insolvency risk.

4.6.2.1.1. Bank-Specific Characteristics

Size: The results shown in Table 4.10 reveal that there is a statistically negative relationship between size and insolvency in Panels A; B; and C. The robustness check ratios support the results found in Column 1. This implies that an increase in size leads to decrease of insolvency probability of the banks, which is in line with the hypothesis of this study. This supports the *'too big to fail'* view; as the big banks are stronger than small banks. Big banks have more diversification, lower scale of economies, and lower information asymmetries. The results also show that Islamic window banks behave differently as there is no significant correlation between size and risk, however negative relationship exists. Overall, the results indicate that Islamic banks have not been affected differently from conventional banks.

Capitalization: The results indicate that there is substantially significant relationship between equity ratio and insolvency risk in Panels A and C. The results suggest that the higher the capitalization the less the insolvency risk; particularly with conventional banks. This is in line with the hypothesis of this study. That is due to the foundation notion says that if the capitalization is higher, shareholders tend to monitor the activities of the banks which leads the banks to engage in less risky projects. However, the result suggests that there is no significant result with Islamic and Islamic window banks. This implies that unlike conventional banks the insolvency risk in Islamic banks is not sensitive to capitalization factor.

Diversification: The results show that there is a positive significant relationship with diversification and insolvency risk in all the panels. The results suggest that the higher the diversification the higher the insolvency risk. These results assert and are in line with the hypothesis of this study. These result support the finding of (Maudos 2017b) which concludes that diversification affect the stability of banks negatively. The results also imply that behaviour does not vary across the Islamic banks and the other types of financial institutions.

Efficiency: as shown in Table 4.9, efficiency is significantly and positively correlated with the insolvency risk in all panels. This implies that more the efficient the bank, the less risky it is in terms of insolvency. The results are in line with the hypothesis of this study and in agreement with the previous studies (e.g, Williams 2004; Dong et al. 2017). However, the results reveal that the association between efficiency and risk is substantially more with conventional banks as the regression results are all significant from with all the proxies of insolvency risk, Columns 13 to 18. This implies that efficiency has a substantial influence in the insolvency risk in all types of banking and is more sensitive in the conventional banks.

Growth of Total Assets: The regression result in Column 1 in Panel A shows that growth of loan is significantly correlated with less insolvency risk. The same results are found with conventional banks in Columns 16 and 18. This is probably because that the fast-growing banks have better strategies and risk culture. However, the result does not reveal any significant results with Islamic and Islamic window banks. This implies that the behaviour of this relation varies across the banks types: all, Islamic, conventional, and Islamic window.

Profitability: In line with the hypothesis of this study, profitability appears to have a significant and negative correlation with insolvency risk in all the panels: A; B; C; and D. For instance, the regression results show a significant correlation in Panel C in Columns 13; 14; 16; and 17. The results show that the higher the profit the less the insolvency risk. This is probably due to the strong financial position of these banks. The result asserts the finding of (Berger and DeYoung 1997). The results suggest that there is no variation in the relationship between the three different types of banks. Overall, the results imply that the profitability ratio substantially decrease the insolvency risk in all the three types of banks.

4.6.2.1.2. Macroeconomic Effects

This section reports and discusses the regression results with respects to macroeconomic-level variables. We regress insolvency risk variables against macroeconomic variables such

as GDP per capita, inflation, real interest rate, average oil prices, and HHI index. Table 4.10 illustrates the results estimations for all the macroeconomics effects.

Average Oil Prices: The results in Table 4.10, shows that oil price is significantly associated with insolvency risk in Panel A in Columns 1, and 3. This suggests that the increase in the oil prices leads to an increase in the Z-score which consequently decrease in the insolvency risk. Though not significant, the regression results are consistently from Column (1) to 24 indicates the negative relationship between oil prices and insolvency risk

National Economy: The results in Table 4.9 reveal that GDP per capita is significantly associated with insolvency risk in Islamic banks as illustrated in Columns 7 and 12. The results suggest that an increase in the greater oil prices leads to an increase in the insolvency risk of Islamic banks. Though not significant, with conventional and Islamic window banks, the relationship in reserve compared to Islamic banks. Concerning the GDP per capita growth, the results reveal that the relationship is significant with Islamic banks only; suggesting, the higher growth of GDP per capita, the less insolvency risk with Islamic banks. This supports the view that the higher the growth of GDP, the higher the profitability of the banks as the prosperity of individuals increase.

Inflation: As expected, the obtained results reveal that an increase in inflation leads to an increase the insolvency risk; significantly in Panel A. Though not significant in the other panels, the result suggest the higher the inflation, the higher the probability of the insolvency of the banks. This is because higher interest rates lead to higher value of borrowed debt and debt servicing becomes more expensive; consequently increasing the probability of loan default. The result also implies that there is no variation in the results across the bank types.

Competition: The association between competition and insolvency risk is statistically significant with Panel A. The same association is found in Panel C in Columns 13; 15; 16; and 18. The result implies that greater competition decreases the insolvency risk and that is probably because the banks engage in less risky activities. The result also implies that there is no variation in the results across the banks types.

Table 4.10: Regression Results - Risk Determinants for Insolvency Risk

	Panel A: All Types of Banks					***Panel B: Islamic Banks***						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Total Assets	0.1146***	0.1997***	0.0980	0.1146	0.2014***	0.1249	0.2646***	0.4248***	0.2527***	0.2220	0.2639	0.2738
	(0.0218)	(0.0528)	(0.0553)	(0.0586)	(0.0490)	(0.0664)	(0.0691)	(0.0754)	(0.0541)	(0.0658)	(0.0767)	(0.0632)
ROAA	0.0212***	0.1078***	0.0004	0.0212*	0.0715***	-0.0009	0.0371*	0.1058***	0.0244*	-0.0024	0.0625***	-0.0019
	(0.0064)	(0.0117)	(0.0091)	(0.0087)	(0.0095)	(0.0093)	(0.0136)	(0.0137)	(0.0109)	(0.0121)	(0.0075)	(0.0066)
Equity / Total Assets	0.0019	0.0063***	0.0000	0.0019	0.0042**	0.0008	0.0010	-0.0012	0.0010	-0.0019	-0.0049*	0.0037**
	(0.0012)	(0.0016)	(0.0006)	(0.0027)	(0.0014)	(0.0006)	(0.0025)	(0.0025)	(0.0014)	(0.0010)	(0.0021)	(0.0009)
Asset Growth	0.0009**	-0.0003	0.0003	0.0009	-0.0005	0.0029	-0.0004	-0.0002	-0.0004	0.0007	-0.0011	0.0012
	(0.0003)	(0.0005)	(0.0028)	(0.0005)	(0.0005)	(0.0017)	(0.0007)	(0.0009)	(0.0007)	(0.0006)	(0.0009)	(0.0006)
Noninterest Income	-0.0045***	-0.0029*	-0.0046***	-0.0045***	-0.0024*	-0.0040***	-0.0027*	-0.0015	-0.0028*	-0.0022*	-0.0009	-0.0021**
	(0.0007)	(0.0014)	(0.0013)	(0.0012)	(0.0012)	(0.0009)	(0.0012)	(0.0009)	(0.0010)	(0.0006)	(0.0011)	(0.0005)
Cost to Income	-0.0023***	-0.0069***	-0.0031*	-0.0023*	-0.0047***	-0.0028	-0.0010	-0.0065**	-0.0007	-0.0028*	-0.0035*	-0.0009
	(0.0006)	(0.0007)	(0.0010)	(0.0008)	(0.0010)	(0.0011)	(0.0013)	(0.0022)	(0.0012)	(0.0012)	(0.0015)	(0.0010)
GDP per Capita	0.0380	-0.0270	-0.0938	0.0380	-0.0197	-0.0718	-0.6831*	-0.7592	-0.6668	-0.5811	0.0157	-0.8307**
	(0.1323)	(0.1841)	(0.2305)	(0.2594)	(0.1193)	(0.2575)	(0.2787)	(0.4016)	(0.4631)	(0.4671)	(0.3287)	(0.2532)
GDP per Capita Growth	-0.0020	0.0047	-0.0040	-0.0020	0.0006	0.0005	0.0149	0.0278*	0.0136	0.0175	0.0153	0.0193
	(0.0042)	(0.0059)	(0.0091)	(0.0076)	(0.0044)	(0.0086)	(0.0116)	(0.0109)	(0.0110)	(0.0099)	(0.0095)	(0.0096)
Inflation Rate	-0.0095*	-0.0098	-0.0112*	-0.0095*	-0.0055	-0.0074	-0.0140	0.0057	-0.0155	-0.0106	0.0026	0.0036
	(0.0038)	(0.0037)	(0.0045)	(0.0044)	(0.0031)	(0.0047)	(0.0109)	(0.0031)	(0.0094)	(0.0107)	(0.0062)	(0.0051)
Real interest	0.0010	0.0006	0.0002	0.0010	0.0010	0.0003	-0.0002	0.0055*	-0.0004	0.0025	0.0009	0.0017
	(0.0016)	(0.0015)	(0.0015)	(0.0013)	(0.0014)	(0.0012)	(0.0037)	(0.0021)	(0.0037)	(0.0044)	(0.0023)	(0.0020)
Average Oil Prices	0.0013*	0.0013	0.0014*	0.0013	0.0009	0.0013	0.0005	0.0013	0.0005	0.0014	0.0006	0.0015
	(0.0005)	(0.0008)	(0.0007)	(0.0008)	(0.0006)	(0.0009)	(0.0013)	(0.0015)	(0.0012)	(0.0014)	(0.0014)	(0.0012)
HHI Index	0.1703*	0.0005	0.1499	0.1703	0.0107	0.0771	-0.0803	-0.0983	-0.0830	-0.0473	0.0559	-0.1806
	(0.0865)	(0.1073)	(0.1036)	(0.1071)	(0.0902)	(0.1183)	(0.2032)	(0.2239)	(0.1848)	(0.1513)	(0.1756)	(0.1541)
_cons	1.0081*	-0.2882	1.6686*	1.0081	-0.3386	1.3025	2.9109**	0.7951	2.9113	2.8096	-1.0896	2.9699**
	(0.4781)	(0.4859)	(0.6951)	(0.7867)	(0.4769)	(0.7343)	(1.0651)	(1.3713)	(1.7975)	(1.8269)	(1.0923)	(1.0130)
R^2	0.1354	0.2306	0.1274	0.1354	0.2015	0.1098	0.1036	0.2049	0.0994	0.1892	0.2600	0.0444
N	2,177	2,558	2,100	2,177	2,513	2,381	332	422	332	385	445	531

Note: This table reports the results for the risk determinants (bank and country - specific variables) and solvency risk for sub-samples (panel A, B, C, D) for all sample period (2006 -2015). The Columns (1) - (24) are credit risk dependent variables which are respectively: (1, 7, 13, 19) Zscore_1; (2, 8, 14, 20) Zscore_2; (3, 9, 15, 21) Zscore_3; (4, 10, 16, 22) Zscore_4; (5, 11, 17, 23) Zscore_5; (6, 12, 18, 24) Zscore_6. Significant level at 10%, 5%, 1% are indicated through *, **, ***, respectively.

Continued

Table 4.10: Regression Results-Risk Determinants for Insolvency Risk

	Panel C: Conventional Banks					***Panel A: Islamic window banks***						
	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
Total Assets	0.1141***	0.2036***	0.1186***	0.1316***	0.1979***	0.1124	0.0822	0.2305	0.0779	0.0902	0.2781*	0.0835
	(0.0261)	(0.0247)	(0.0260)	(0.0259)	(0.0468)	(0.0663)	(0.0745)	(0.1707)	(0.1195)	(0.1310)	(0.1196)	(0.1255)
ROAA	0.0255**	0.1084***	0.0099	0.0277***	0.0725***	0.0039	0.0041	0.1106*	-0.0144	-0.0108	0.0690	0.0324
	(0.0084)	(0.0099)	(0.0080)	(0.0079)	(0.0152)	(0.0110)	(0.0321)	(0.0491)	(0.0296)	(0.0347)	(0.0489)	(0.0553)
Equity / Total Assets	0.0039*	0.0041*	0.0044*	0.0052*	-0.0023	0.0040	-0.0020	-0.0011	-0.0022	-0.0013	-0.0018	-0.0020
	(0.0017)	(0.0017)	(0.0017)	(0.0017)	(0.0026)	(0.0034)	(0.0015)	(0.0010)	(0.0010)	(0.0013)	(0.0015)	(0.0014)
Asset Growth	0.0008	-0.0002	0.0009	0.0017***	-0.0001	0.0017**	-0.0117	-0.0133	-0.0118	-0.0105	-0.0088	-0.0163
	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0006)	(0.0073)	(0.0097)	(0.0077)	(0.0086)	(0.0078)	(0.0076)
Noninterest Income	-0.0043***	-0.0029**	-0.0046***	-0.0050***	-0.0026	-0.0045*	-0.0103***	-0.0068*	-0.0103*	-0.0106**	-0.0049	-0.0110**
	(0.0009)	(0.0008)	(0.0009)	(0.0009)	(0.0020)	(0.0020)	(0.0022)	(0.0030)	(0.0027)	(0.0031)	(0.0030)	(0.0035)
Cost to Income	-0.0042***	-0.0077***	-0.0039***	-0.0034***	-0.0065***	-0.0042**	-0.0010	-0.0056*	-0.0010	-0.0017	-0.0006	0.0003
	(0.0007)	(0.0008)	(0.0007)	(0.0007)	(0.0008)	(0.0014)	(0.0019)	(0.0021)	(0.0023)	(0.0024)	(0.0019)	(0.0023)
GDP per Capita	0.1218	0.2451	0.0817	0.2429	-0.0201	0.2654	0.5911	0.1054	0.5873	0.5962	0.1196	0.6795
	(0.1766)	(0.1616)	(0.1760)	(0.1736)	(0.1260)	(0.1924)	(0.3847)	(0.3261)	(0.5026)	(0.5469)	(0.2769)	(0.5119)
GDP per Capita Growth	-0.0096	-0.0001	-0.0101	-0.0057	-0.0012	-0.0069	-0.0089	0.0057	-0.0086	-0.0075	0.0001	-0.0105
	(0.0054)	(0.0047)	(0.0053)	(0.0051)	(0.0044)	(0.0091)	(0.0116)	(0.0084)	(0.0088)	(0.0107)	(0.0063)	(0.0109)
Inflation Rate	-0.0059	-0.0087	-0.0064	-0.0060	-0.0065	-0.0058	-0.0040	-0.0097	-0.0038	-0.0021	-0.0094	-0.0012
	(0.0049)	(0.0045)	(0.0049)	(0.0047)	(0.0042)	(0.0050)	(0.0105)	(0.0085)	(0.0114)	(0.0116)	(0.0085)	(0.0119)
Real interest	0.0012	-0.0011	0.0010	0.0004	0.0010	0.0001	-0.0003	-0.0002	-0.0002	-0.0011	0.0018	-0.0010
	(0.0021)	(0.0020)	(0.0021)	(0.0021)	(0.0019)	(0.0019)	(0.0039)	(0.0026)	(0.0030)	(0.0029)	(0.0027)	(0.0030)
Average Oil Prices	0.0010	0.0008	0.0010	0.0007	0.0007	0.0008	0.0019	0.0033	0.0019	0.0017	0.0022	0.0011
	(0.0007)	(0.0006)	(0.0007)	(0.0006)	(0.0005)	(0.0008)	(0.0013)	(0.0020)	(0.0019)	(0.0019)	(0.0017)	(0.0020)
HHI Index	0.2421*	0.0161	0.2280*	0.2221*	0.0111	0.2323*	0.2645	0.1830	0.2693	0.2672	0.0946	0.2663
	(0.1068)	(0.1000)	(0.1065)	(0.1050)	(0.0618)	(0.1071)	(0.2633)	(0.3167)	(0.3443)	(0.3481)	(0.3183)	(0.3399)
_cons	0.7943	-1.1800*	0.8878	0.2484	-0.2076	0.3236	-0.5613	-1.0322	-0.5270	-0.5767	-1.5084	-0.8934
	(0.6225)	(0.5696)	(0.6192)	(0.6080)	(0.4317)	(0.8310)	(1.4600)	(0.9997)	(1.8431)	(2.0751)	(1.0484)	(1.8687)
R^2	0.1401	0.1982	0.1296	0.2982	0.2011	0.3461	0.1600	0.2174	0.1674	0.1591	0.1953	0.1442
N	1,469	1,783	1,721	1,532	1,754	1,536	307	371	307	313	360	314

Note: This table reports the results for the risk determinants (bank and country - specific variables) and solvency risk for sub-samples (panel A, B, C, D) for all sample period (2006 -2015). The columns (1) - (24) are credit risk dependent variables which are respectively: (1, 7, 13, 19) Zscore_1; (2, 8, 14, 20) Zscore_2; (3, 9, 15, 21) Zscore_3; (4, 10, 16, 22) Zscore_4; (5, 11, 17, 23) Zscore_5; (6, 12, 18, 24) Zscore_6. Significant level at 10%, 5%, 1% are indicated through *, **, ***, respectively

4.6.2.2. Risk Determinants - Operating risk

The main focus of this section is to report and discuss the regression results. In particular, this section investigates the effect of bank and country-specifics on operating risk for three groups of banks: (A) Islamic banks (B); conventional banks (C); Islamic window banks. Table 4.10 illustrates the regression results from Columns 1 to 20; which represent the operating risk.

4.6.2.2.1. Bank - Specific Characteristics

Size: We first start with the bank-specific variables. The results indicate that there is a statistical significant association between size and operating risk in Panels A and C. In panel A, the results suggest that an increase in size leads to a decrease in the operating risk. This supports the view that the big banks experience lower risk owing to inferred reductions due to the notion *too big to fail*. However, the results are mixed in panel C (conventional banks). Furthermore, we also find that such association does not exist with Islamic and Islamic window banks. This implies that unlike Islamic banks, stability (operating risk) of conventional banks are sensitive to size factor.

Capitalization: Concerning the capitalization influence, the results show that equity capital ratio is a negative and significant vector in determining the operating risk for Panels A; C; and D. For instance, the regression results in Column 1 in the three panels, shows that an increase in the equity ratio leads to an increase in the net interest margin. This implies that the higher the capitalization, the less the operating risk. This is because higher equity ratio leads shareholders to monitor the activities of the bank which consequently reduces the risk taking. The results also suggest that there is no significant relationship between equity ratio and operating risk in the case of Islamic banks.

Diversification: The coefficients indicate that there is a constantly significant link between diversification and operating risk as in appears panel A, B, C, and D. The results imply that the diversification leads to more operating risk in conventional and Islamic window banks. This is probably due to the notion that more diversification might lead to loss of focus the business. This result is not consistent with the view that non-interest income can reduce the risk of the banks. However, the result is in line with the previous studies (e.g, Maudos 2017b). Furthermore, we found there are conflicting results in Islamic banks.

Loan Growth: The results reveal that there is little evidence on the positive influence of growth of loans on operating risk with Islamic window banks. Column 2, in Panel D, shows that loan growth significantly effects operating risk level in Islamic window banks. This

implies that the fast growing banks are experiencing better operating aspects. This is probably due to the view that the fast growing banks have better strategies for their business including management of risk. The regression estimations in the remaining panel are not significant. However, it relatively concludes the same results.

4.6.2.2.2. Macroeconomic Effects

The focus of this section is to present the regression results and discussion. In particular, it studies the effect of macroeconomic factors on operating risk, taking into consideration the difference between four categories of banks: all types of banks, Islamic, conventional, and Islamic window banks. As shown in Table 4.10, the macroeconomic factors are: GDP per capita; GDP per capita growth; inflation; real interest rate; average oil prices; and HHI index.

Oil Prices: Column 6 in Islamic bank panel in Table 4.10 reveals a significant and positive relationship between oil prices and operating risk. The result implies that an increase in the oil price leads to a decrease in the operating risk. In consistence, Column (15), in the conventional bank panel, shows negative. This implies that the oil prices affect the stability of Islamic banks differently from conventional banks.

National Economy: As shown in Columns 12; 13; 14; and 15, in conventional banks groups, there is a significant correlation between GDP per capita and operating risk. However, the results show that there are conflicting results. Though not significant, the result with Islamic banks reveals the same conclusion. Concerning the GDP per capita growth, the results indicate it has a negative substantial influence on the operating risk with Islamic bank and conventional banks as it is shown in Columns 7 and 13. This implies that GDP per capita and GDP per capita growth are influential factors for the risk in both Islamic and conventional banks.

Competition: Consistent with the findings of some studies and referenced in the hypothesis (e.g, Rhoades and Rutz 1982; Boyd and De Nicolo 2005). The results in Column 6 in Panels C (Islamic banks) indicate that there is a positive significant relationship between competition and operating risk of Islamic banks. The results suggest that an increase in competition leads to increase operating risk through improving their operating perspectives. Though not significant, the results obtained with conventional banks reveal the conflicting results. This implies that banks' stability of Islamic banks is affected differently from conventional and Islamic window banks by competition factor.

Inflation: The results reveal that an increase in inflation leads to an increase the operating risk; significantly in Islamic banks, however not significant with other banks.

Table 4.11: Regression Results- Risk Determinants for Operating risk

	Panel A: All Types of Banks					***Panel C: Islamic Banks***				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Total Assets	-0.1006	1.0233***	-1.4978***	0.6884**	1.1636***	-0.5005	-0.7281	-1.1148	-0.054	2.1326
	(0.0901)	(0.2679)	(0.2590)	(0.1913)	(0.1927)	(0.2848)	(0.2635)	(6.8581)	(0.4961)	(2.1125)
Equity / Total Assets	0.0482***	0.0027	-0.4097*	0.0414**	0.0064	0.0161	0.0076	-0.1608	0.0057	-0.0247
	(0.0050)	(0.0095)	(0.1532)	(0.0135)	(0.0524)	(0.0095)	(0.0127)	(0.2334)	(0.0176)	(0.048)
Loan Growth	-0.0010	-0.0007	-0.0171	0.0030	0.0146	0.0020	0.0036	-0.0234	0.0062	0.0119
	(0.0013)	(0.0024)	(0.0230)	(0.0022)	(0.0119)	(0.0031)	(0.0046)	(0.0493)	(0.0042)	-0.0176)
Noninterest Income	-0.059***	0.0099	0.1698**	-0.0004	-0.0023	-0.0541***	0.0221**	0.1868*	0.0131*	0.0460*
	(0.0025)	(0.0058)	(0.0492)	(0.0053)	(0.0281)	(0.0044)	(0.0060)	(0.0760)	(0.0054)	(0.0158)
GDP per Capita	-0.6688	0.9314	1.1141*	-1.4260	-0.5760	1.2910	0.4760	1.5075	0.4998	-0.747
	(0.5770)	(0.7274)	(0.5605)	(1.0466)	(5.1008)	(1.2256)	(1.5158)	(16.9277)	(1.3219)	(6.8984)
GDP per Capita Growth	0.0168	-0.0119	-0.2740	0.0491*	0.2538*	-0.0287	-0.0908**	0.4242	0.0103	-0.0209
	(0.0169)	(0.0235)	(0.1452)	(0.0187)	(0.1181)	(0.0431)	(0.0284)	(0.5214)	(0.0532)	(0.2595)
Inflation Rate	0.0212	0.0128	-0.3835**	0.0323	0.1286	0.0484	0.0092	-0.1895	0.0043	-0.1396
	(0.0159)	(0.0120)	(0.1164)	(0.0162)	(0.1040)	(0.0346)	(0.0149)	(0.4151)	(0.0388)	(0.1640)
Real interest	-0.0058	0.0107	0.0801	-0.0193	-0.0944*	-0.0171	0.0285	0.4122	-0.069**	-0.2875**
	(0.0070)	(0.0086)	(0.0696)	(0.0097)	(0.0426)	(0.0153)	(0.0185)	(0.2049)	(0.0228)	(0.0889)
Average Oil Prices	-0.0018	-0.0014	-0.0013	0.0036	0.0214	-0.0171**	0.001	0.1221	-0.0105	-0.0323
	(0.0024)	(0.0026)	(0.0314)	(0.0029)	(0.0208)	(0.0060)	(0.0050)	(0.0830)	(0.0056)	(0.0338)
HHI Index	-0.8228*	1.0949	8.404	-0.5287	-2.5294	-2.5363***	3.2296	1.4591	-0.8665	-1.8468
	(0.3720)	(0.6983)	(5.6336)	(0.3965)	(2.2006)	(0.7034)	(1.6604)	(15.0995)	(1.2058)	(5.0287)
_cons	9.4493***	6.9202	9.7589**	10.1352	11.2944	4.6752	4.8250	10.3852*	-6.0260	2.2927
	(2.0533)	(3.3385)	(3.3283)	(3.3100)	(16.2077)	(4.5727)	(4.7989)	(0.0005)	(4.8927)	(21.8411)
R^2	0.1666	0.1266	0.0723	0.0205	0.0455	0.3252	0.1839	0.1038	0.0727	0.119
N	2,831	2,829	2,878	2,905	2,884	489	488	485	496	494

Note: This table reports the results for the risk determinants (bank and country - specific variables) and solvency risk for sub-samples (panel A, B, C, D) for all sample period (2006 -2015). The columns (1) - (5) are operating risk dependent variables which are: (1) Net Interest Margin (2) Non-Interest Margin (3) Cost to Income (4) ROAA (5) ROAE. Significant level at 10%, 5%, 1% are indicated through *, **, ***, respectively.

Continued

Table 4.11: Regression Results- Risk Determinants for Operating risk

Variables	***Panel C: Conventional Banks***					***Panel D: Islamic window banks***				
	(12)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Total Assets	-0.0623	1.139**	-17.8236***	0.7335**	5.3839**	-0.4155	-1.0851	-15.1921**	0.6164	4.1799
	(0.1066)	(0.3335)	(2.2561)	(0.2388)	(1.6992)	(0.2689)	(0.6162)	(6.4368)	(0.3764)	(2.3210)
Equity Total Assets	0.0681***	-0.0048	-0.682***	0.0633**	-0.0098	0.0864***	-0.0038	-0.6376**	0.0909*	0.1299
	(0.0069)	(0.0136)	(0.1710)	(0.0185)	(0.0732)	(0.0187)	(0.0382)	(0.2558)	(0.0410)	(0.1918)
Loan Growth	-0.0022	-0.0003	0.0008	0.0005	0.0073	-0.0064	-0.0064*	0.0144	0.0011	0.0240
	(0.0016)	(0.0030)	(0.0251)	(0.0023)	(0.0143)	(0.0040)	(0.0022)	(0.0602)	(0.0060)	(0.0364)
Noninterest Income	-0.0623***	0.0031	0.1563	-0.0052	-0.0289	-0.0472***	0.0025	-0.1757	0.0038	0.0049
	(0.0037)	(0.0104)	(0.0981)	(0.0079)	(0.0500)	(0.0074)	(0.0108)	(0.2300)	(0.0082)	(0.0627)
GDP per Capita	-1.7723*	0.5924	30.5562***	-3.1631*	-18.5402*	-0.9961	-1.5837	-7.4259	0.6570	3.7803
	(0.7624)	(0.9394)	(9.7350)	(1.4905)	(7.4724)	(1.3470)	(1.3791)	(15.5097)	(0.6802)	(8.3781)
GDP per Capita Growth	0.0389	0.0114	-0.4010**	0.0477	0.2703	0.0315	0.0350	-0.2493	0.0561	0.3105
	(0.0214)	(0.0248)	(0.1339)	(0.0253)	(0.1367)	(0.0355)	(0.0473)	(0.2118)	(0.0282)	(0.2058)
Inflation Rate	-0.0009	-0.0068	-0.2194	0.0176	0.0647	-0.0089	0.0352	-0.4291	0.0452	0.2493
	(0.0214)	(0.0155)	(0.1250)	(0.0237)	(0.1268)	(0.0347)	(0.0212)	(0.2513)	(0.0324)	(0.1813)
Real Interest	-0.0041	0.0032	0.0043	-0.0080	-0.0467	-0.0137	-0.0033	0.1229	0.0032	-0.0043
	(0.0091)	(0.0067)	(0.0915)	(0.0122)	(0.0520)	(0.0146)	(0.0064)	(0.1593)	(0.0113)	(0.0610)
Average Oil Prices	0.0022	-0.0005	-0.0457	0.0087	0.0454*	0.0021	-0.0026	0.0652	0.0014	0.0117
	(0.0029)	(0.0027)	(0.0252)	(0.0035)	(0.0221)	(0.0053)	(0.0065)	(0.0735)	(0.0029)	(0.0291)
HHI Index	-0.2245	-0.2246	2.0348	0.0405	-1.7545	-0.5110	0.5093	13.3723	-0.3294	-2.3037
	(0.4727)	(0.3663)	(4.4410)	(0.3716)	(2.3187)	(1.1148)	(0.9019)	(10.0304)	(0.6594)	(3.8599)
_cons	13.0013**	9.6391*	6.4430	6.3568	4.4282	11.2971*	16.0762*	14.4327*	-6.7457	-13.9051
	(2.6515)	(4.0537)	(32.7918)	(4.7689)	(24.8364)	(5.0231)	(7.4230)	(7.2661)	(3.3834)	(32.9891)
R^2	0.2104	0.2748	0.5767	0.0157	0.0303	0.3563	0.0567	0.0779	0.1863	0.1483
N	1,945	1,944	1,986	1,999	1,980	397	397	407	410	410

Note: This table reports the results for the risk determinants (bank and country - specific variables) and operating risk for sub-sample (panel A, B, C, D) for For the full sample period (2006-2015). The Columns (1)-(5) are operating dependent variables which are: (1, 6, 12, 16) Net Interest Margin (2, 7, 13, 17) Non-Interest Margin (3, 8, 14, 18) Cost to Income (4, 9, 15, 19) ROAA (5, 10, 16, 20) ROAE. Significant level at 10%, 5%, 1% are indicated through *, **, ***, respectively

4.7. Conclusion

The focus of this chapter is to examine the stability and determinants of operating and insolvency risk of three different types of banks: Islamic, conventional, and Islamic window banks. The focus of this study is on the global financial and sovereign debt crises. The chapter uses a sample of 950 banks from 55 countries during three different periods: 2006-2015 (full period), 2007-2009 (global financial crisis), and 2010-2013 (sovereign debt crisis). The chapter uses several operating and insolvency risk indicators (i.e. net interest margin, cost to income, non-interest expenses, ROAA, ROAE, Z-score). The panel fixed effect estimation approach is used to achieve the regression results.

The risks faced by Islamic banks are similar to those faced by conventional banks. However, at a theoretical level these risks differ owing to the distinct Islamic model which is established on the conventions of the Islamic *Sharia*. Allen and Bali (2007) find that risk causes large unexpected catastrophic losses. More importantly, operating risk is considered as one of the very essential and prominent risks encountered by Islamic banks. In the survey conducted by (Khan and Ahmed 2001) operating risk was the more significant after the mark-up risk, for the managers.

Based on this study's statistical results, it can be proposed that the insolvency and operating risk levels differ significantly among the three different financial institutions. They illustrate that Islamic banks face more risks at operating level during the period of the study. These results are similar to those found during the period of the global financial crisis and sovereign debt crises. The empirical findings also suggest that, when compared to conventional and Islamic window banks, Islamic banks face increased insolvency risk. However, the results suggest that Islamic banks are less solvent compared to conventional banks. This implies that Islamic banks are experiencing more insolvency risk, however the Islamic banks seem better in comparison with the period of the global financial crisis.

However, the performance of Islamic banks was better during the sovereign debt crisis as there are no notable results during this time when compared to the global financial crisis. This could be explained by the reality that Islamic banks substantially altered and changed their methods of managing risk after the global financial crisis. Consequently, the findings we came up with show that Islamic banks altered their culture and business strategy with regards to insolvency risk as a consequence of how they performed during the global financial crisis. Added to this, this is a result which shows that conventional banks cannot be viewed as being

in a significantly better position in comparison to Islamic banks with regards to insolvency and operating risk.

Chapter Five: Risk and Bank's Performance

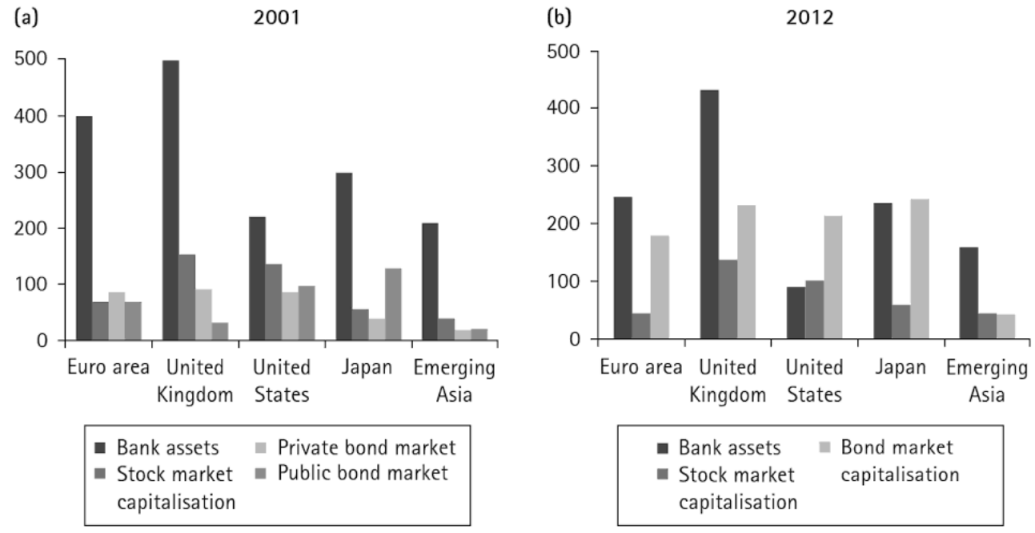
5.1. Introduction

The latest global financial crisis has brought to the fore an important issue regarding the role played by different types of risk in the performance or survival of banks. During a financial crisis[10], not all banks perform well as there has been a significant variation in performance (Beltratti and Stulz 2012). It is important to understand the performance of financial institutions during normal times and financial crises and how that performance can be improved through regulations. Fahlenbrach et al. (2012) found that the financial institutions that had the worst performance during the 1998 crisis were also among the worst during the global financial crisis 2007-2008. Bank supervisors and regulators argue that risks were the main determinants for the poor performance during the financial crises. For instance, the Basel Committee on Banking Supervision (BCBS 2011) has highlighted the critical role of a risk management regulatory framework to strength the resilience of the banking financial system. This chapter investigates, empirically, the association between risk and performance through comparing the behaviour of three different banks: Islamic, conventional, and Islamic window banks. The research is divided into three periods: 2006-2015 (full period), 2007-2009 (global financial crisis), and 2010-2013 (sovereign debt crisis).

Bank lending is considered as a major source of funding to householders and non-financial corporations, in comparison to other financial intermediaries such as money markets, bond markets, and equity markets. Figure 5.1 illustrates the dominant and large size of bank loans (bank-based economy) in comparison to other financial markets, such as the money market, bond market, and equity market. Moreover, the failure of banks can lead to severe consequences and spread to the real economy.

[10] There is no common definition of financial crisis. Kindleberger and Aliber (2000) argue that it is complicated to define financial crisis precisely as historically the roots of the financial crises were from different events. Reinhart and Rogoff (2009) categorised financial crises into different types of financial events, such as banking, currency, and sovereign debt crisis. However, in this chapter we refer to the global financial crisis and sovereign debt crisis.

Figure 5.1: Size of the Financial Markets by Country Region, Percentage of GDP



Source: (Cassis et al. 2016). *Original sources*: IMF and Global Financial Stability Report and UK office for National Statistics.

The rapid proliferation of Islamic banks has brought about an alternative to conventional banks. This is a perception supported by Hasan and Dridi (2011), who note that Islamic banks are seen as the most rapidly growing sub-sector of the financial sector. According to the Ernst and Young World Islamic Banking Competiveness 2013-2014 report, the combined assets of global Islamic banks was estimated to be over US$1.54 trillion by 2012. This rapid growth started in the 1980s, with the total assets of Islamic banks growing to $100 billion in 2010 from a base or around $5 billion in the 1980s (Mohieldin, 2012). According to Karim et al. (2012), this makes these kinds of bank a big part of the international banking system. The same author estimates that Islamic banks are expected to grow at between 15% and 20% annually.

Those who support the Islamic banking model argue that the performance of such banks was not affected by the latest global financial crisis. For instance, Hasan and Dridi (2010), in their study, came to the conclusion that Islamic banks were better with regards to assets and credit during 2007 and 2008. Beck et al. (2013) note that the distinct features of Islamic banks, such as risk and profit sharing, were attributed to this success. Notwithstanding a lot of the literature regarding the performance of banks, there is still a dearth of literature dealing with the connection between risk and performance, with a special focus on the variance between Islamic, conventional, and Islamic window banks.

Daher et al. (2015) note that the way Islamic banks operate is different from that of conventional banks, since the Islamic banks work with the objective of applying *Shariah* law, with the *Shariah* Advisory Board (SSB) monitoring the operations of such banks. The aim of this research, as is suggested by the title, is to conduct an investigation into the influence of various kinds of risk (including credit risk, solvency risk, operating risk, and liquidity risk) on the performance of banks. It is believed that this paper will be among some of the first to investigate how risk impacts the performance of Islamic banks.

This chapter addresses two main questions that are motivated by the previous discussions: (I) Do financial risks have an effect on bank performance? In addition, the period of the study covers three periods, comprising the full sample period, global financial crisis, and sovereign debt crisis. Thus, additional questions are addressed in this research. What is the impact of these two financial risks on the performance during these two financial crises of the three different banks? (II) What are the key determinants of risk that are necessary to understand performance issues, especially the effect of oil prices on banks performance?

A comparative approach between Islamic, conventional, and Islamic window banks is utilized to address the research questions. To test the effect of risk on bank performance, we collected data of 950 banks across 55 countries from the Organization of Islamic Countries (OIC). We divide these into three periods: 2006-2015 (full sample period), 2007-2009 (global financial crisis), and 2010-2013 (sovereign debt crisis).

The main findings are presented in the following discussion. For almost all bank types, risk is an influential predictor of bank performance. Furthermore, the most significant predictor of performance is the operating risk. This implies that higher operating risk is associated with less performance for the financial institutions that maintain, in general and in times of negative shocks in the financial sector, and vice versa. This emphasizes that operating risk is a more significant performance predictor than other types of risk, such as credit and liquidity risk.

The statistical results also show that credit risk is the least significant risk driver and not significant in most of the regression results in all types of banks panel, Islamic banks panel, and conventional banks panel during the three intervals. The results also show that the influence of liquidity risk is substantially more for Islamic banks than for conventional and Islamic window banks. Unlike Islamic window banks, the results indicate that Islamic and conventional banks behave relatively the same. Furthermore, the results indicate some evidence that oil prices were negatively and significantly associated with performance in Islamic financial institutions during the global financial crisis. The result implies that an

increase in oil prices leads to lower bank performance. This is probably because most of the sample banks of this study are located in countries where oil is imported.

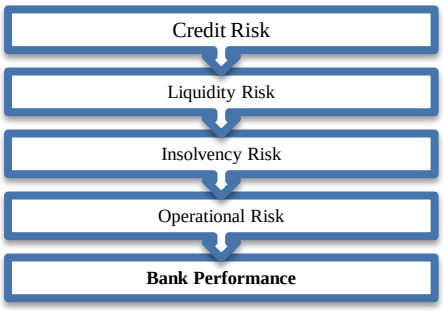
The remainder of this chapter is organized as follows: Section 5.1 presents an overview of the literature and the hypotheses' background for the analysis; Section 5.3 describes the methodology, Section 4.4 discusses the data and proxy variables; Section 5.5 reports the results; and Section 5.6 provides the conclusion.

5.2. Prior Studies and Hypotheses Development

5.2.1. Overview of Risk Types and Financial Crises

Liquidity and credit risk are some of the types of risks that banks are exposed to. The Basel Committee (2000) defined credit risk as "the potential that a bank borrower or counterparty will fail to meet its obligations in accordance with agreed terms." In simple terms, this means that a loan is not being paid back, in part or in full. Liquidity risk appears when the bank has insufficient assets to pay the due obligations (Casu 2015). Another important risk is operating risk. According to the Basel Committee on Banking Supervision (2000), operating risk can be defined as "the risk of loss resulting from inadequate or failure in internal processes, people and systems or from external events." Finally, insolvency risk is generated when the bank can no longer meet its financial obligations with its lenders as debt payment becomes due. However, there were subsequent phrases of process for these types of risks. Berger et al. (2014) specify three phrases during the global financial crisis: (1) the credit crisis, (2) the liquidity crisis, and the (3) operating risk crisis.

Figure 5.2: Risk Framework and Performance in Banks



This is proposed by the authors

5.2.2. Determinants of Banks Performance

Several studies have been conducted to investigate the determinants of poor bank performance, particularly during the current financial crises. The existing literature can be classified into two main streams of determinants: bank-specific and macroeconomic characteristics. Using buy-and-hold returns and ROE, Aebi et al. (2012) investigated the effect of management-related corporate governance on the performance of banks during the financial crisis. There are also other empirical studies focusing on the link between governance aspects and poor performance during a financial crisis (e.g, Diamond and Rajan 2009; Erkens et al. 2012; Fahlenbrach and Stulz 2011; Cheng et al. 2015). A small body of literature analyses the effect of the deposit insurance design feature on banking system fragility (Demirgüç-Kunt et al. 2008; Dermirgc-Kunt and Kane 2002; Demirgüç-Kunt and Huizinga 2004). Among country-specific studies (Cetorelli et al. 2007; Fu et al. 2014), the effect of competition on the stability of financial system has been analysed. Di Patti and Hardy (2005) investigated the impact of deregulation and liberalization on the profit efficiency and performance of Pakistani banks over 15 years. They found that bank productivity has increased with respect to profitability. (Berger et al. 2016a; Demirguc-Kunt et al. 2013). Other studies focus on the influence of bank capital on better performance during the global financial crisis 2006-2008[11]. Mergaerts and Vander Vennet (2016) studied the effect of business models on bank performance and found that retail-oriented banks are associated with better bank performance.

A number of other studies focus on the relationship between macroeconomic elements and performance (Shim 2013). Mirzaei et al. (2013) investigated the effects of market structure on bank performance for 1929 banks in 40 countries in emerging and advanced economies by utilizing structure-conduct-performance and relative market power. They found that banks with a higher market share have better performance. Bikker and Hu (2002) suggest that better bank performance is associated with a more developed financial systems. The interpretation for that result is that a greater financial system would enhance the efficiency of the bank and hence improve the overall performance. Likewise, (Athanasoglou et al. 2008), among others, empirically found that macroeconomic factors such as cyclical output clearly impact the performance of banks.

[11] Beltratti and Stulz (2012) provided a comprehensive investigation into both bank-specific and country-specific determinants of banks performance during the global financial crisis.

5.2.3. The Effects of Risk

Financial incentives encourage executives in financial institutions to exploit the internal control to undertake excessive risk, which improves the performance in the short term but causes damage to the institutions when it materializes (Kashyap et al. 2008). The core function of the risk management is to identify and prevent excessive risk-taking. Ellul and Yerramilli (2013) recognize that the function of risk management is endogenous; it cannot be controlled through the discipline of external market.

There are limited empirical studies that have examined the association between risk and performance. Wheelock and Wilson (1995) investigated the possible link between managerial efficiency and failure. They found that efficiency is a significant determinant of bank failure that enhances survival, particularly during economic distress. In agreement, Berger and DeYoung (1997) and Mester (1996) suggest that failing banks tend to be less efficient. Possibly in the most comprehensive study, Koutsomanoli-Filippaki and Mamatzakis (2009) assessed the connection between the efficiency of banks and risk in European banks using a panel vector auto-regression (VAR) analysis. They found a dynamic correlation between default risk and efficiency. Despite the continuing interest in investigating the relationship between default risk and efficiency, these studies predominantly focus only on conventional banks and make no attempts to examine the behaviour of Islamic banks. To the best of our knowledge, there has been only one attempt to study the association in the context of Islamic banks (Saeed and Izzeldin 2016a). Moreover, predominantly, studies in the existing literature have been limited to credit risk indicators, including loan loss allowance and loan loss provisions. They did not investigate other important kinds of risk, such as liquidity risk. Banks are exposed to different sources of risk, namely credit, liquidity, solvency, and operating risk.

5.2.4. Review of studies in Islamic Banking

The vast majority of the earlier literature on Islamic banks compares the performance of Islamic banks with that of conventional banks[12]. El-Gamal and Inanoglu (2002) studied Islamic banks versus conventional banks in Turkey. Using a sample across countries, Bader et al. (2008) and Johnes et al. (2009) compared the profit performance of Islamic banks with that of conventional banks during the period 1990-2005. Beck et al. (2013) examined the

[12] Abedifar et al. (2015) and Hassan and Aliyu (2018) provide a comprehensive survey of the literature on Islamic banking.

performance of Islamic banks during the financial crisis through employing a sample of Islamic and conventional banks from 22 countries. Rahman and Rosman (2013) compared the efficiency performance in MENA countries, focusing on the period of the global financial crisis. There is other extensive literature examining the performance of Islamic banks (Siraj and Pillai 2012; Siddiqui 2008; Johnes et al. 2014; Ika and Abdullah 2011; Abdulle and Kassim 2012; Sarker 1999; Mokhtar et al. 2006; Belanès et al. 2015; Alkassim 2005; Iqbal and Molyneux 2016; Abdul-Majid et al. 2010; Mobarek and Kalonov 2014; Ismail et al. 2013; Rosman et al. 2014).

In another dimension of study, Ariss (2010) and Weill (2011) investigated whether Islamic banks have more competition than conventional banks using a sample of banks across countries where Islamic banks and conventional ones coexist. Other recent studies examined the market power of Islamic banks and its implications for capital adequacy (Hamza and Kachtouli 2014; Louati et al. 2015). Meslier et al. (2017) found a significant association between deposit rate and competition in conventional banks, but this was not significant for Islamic banks. Some have studied the capital structure of Islamic banks, such as Sorwar et al. (2016).

In recent times, the focus of study has been on risk in Islamic banks, (Abedifar et al. 2013; Waemustafa and Sukri 2016; Hayat and Kraeussl 2011). However, not all of these studies examined the determinants of performance of Islamic banking in comparison to conventional and Islamic window banks, specifically the relationship between risk type and banks performance.

5.2.5. Hypotheses Development

Berger and DeYoung (1997) presented four hypotheses which demonstrate the link between performance efficiency and bank default risk: (i) bad luck, (ii) bad management, (iii) skimping (iv) and moral hazard. This research mostly will follow the moral hazard and bad management hypotheses, which are applied for Islamic, conventional and Islamic window banks as well as for all types of banks.

Amel et al. (2004) argue that bank managers usually tend to take excessive risk due to the constant pressure to improve the performance of the banks. In other literature (Hughes et al. 1996, 2000; Hughes et al. 2001), bank managers are modelled as profit maximizing managers. Thus, managers make production and profit decisions that effect bank risk. This also impacts the discount rate which is applied in evaluating the present value of cost and profit. Managers that operate in banks which have a high degree of agency problem are more

inclined to peruse profit-maximizing plan. Thus, it would be expected that an increase in bank performance causes a higher default risk. The *moral hazard* hypothesis says that shareholders push managers to be excessive risk takers. The performance result will increase in the short term, but in the future the bank will face financial stress, such as non-performing loans. Thus, it is expected that an increase in bank performance leads to increase in bank risk.

H_1. *An increase in bank risk leads to increase bank performance*

Financial intermediation theory suggest that managers have to assess the risk and manage it, write contracts, and monitor the problems of non-performance (Bhattacharya and Thakor 1993). This follows the *bad management* hypothesis, suggested by Berger and DeYoung (1997). The hypothesis says that if a manager is poor at maintaining the bank's risk portfolio, then they will also be poor in improving the performance of the bank. Bowman (1980) found a negative relationship between risk and return performance, and he argued that good managers could increase performance and simultaneously decrease risk. He further explains this relationship in that good managers choose the right environment, right strategy, and right implementation, which leads to a decrease in risk and an increase in performance. Thus, we expect a decrease in risk to lead to an increase in bank performance, and a high bank risk to lead to a decrease in the bank performance.

H_2. *An increase in bank risk leads to a decrease in bank performance*

Oil Prices: Some argue that the growth of Islamic banks is attributed to the growth of oil prices as Islamic banks are located mainly in oil producing countries. However, there is limited literature on the impact of oil price variation on the economy in general and on the banking sector in particular. A recent paper by Khandelwal et al. (2016) shows a negative link between oil prices and the performance of banks in general. Callen et al. (2015) conducted a study to investigate the consequences of oil price variation; they showed that a decrease of 1% in the oil price leads to around a 0.1% increase in the NPL ratios of banks. The correlation is attributed to the view that price variation impedes the ability of borrowers to pay the interest and the principal. Narayan et al. (2019) tested the effect of oil prices on Islamic stocks. They found that these stocks reacted statistically significantly to oil prices. However, to the best of our knowledge, no studies have been conducted in the context of Islamic bank performance. The oil price average is included to investigate how sensitive banks performance to oil prices and whether the effect differs among Islamic, conventional and Islamic window banks.

H_4. *Oil prices negatively affect bank performance*

5.3. Methodology:

5.3.1. Dependent Variables

Performance Measures - Dependent Variables: As discussed above, the broad aim of this chapter is to test the determinants of bank performance, particularly the relationship between bank risk and performance. We applied the non-structural approach, which is translated through accounting and market-based ratios as a measurement for banks' performance. We used three accounting measures of bank performance: Return on Average Asset, (ROA), Return on Average Equity (ROE)[13], and Interest on Average Assets (IAA). Several studies have used either ROA or ROE as a proxy for performance (Schaeck and Cihák 2014; García-Herrero et al. 2009; Demirgüç-Kunt and Maksimovic 2002; Fahlenbrach et al. 2017; Köster and Pelster 2017; Shaban and James 2018; Mirzaei et al. 2013; Bennett et al. 2015). The return on assets ratio is calculated through dividing net income by total assets. It presents how efficiently the bank is generating revenue from its assets. In addition, we use interest income as the percentage of average assets, which is also used in the literature (e.g., Bennett et al. 2015). Table 5.1 illustrates all the variables used as dependent variables.

5.3.2. Explanatory Variables

Risk Measures - (Main Independent Variables): This research employs four different types of risk as determinants of bank performance: (1) credit risk, (2) liquidity risk, (3) operating risk, and (4) insolvency risk. These ratios follow the line established in earlier studies such as Lepetit et al. (2008), Cardone-Riportella et al. (2010), Moussa (2015), Kwan (2003), Lee and Hsieh (2013), and Dinger and Von Hagen (2009). The aim of including these four different types of risk is to investigate the relationship between each type of default risk and bank performance. This research uses a loan loss provision proxy, which represents the loan quality of the bank and has been widely used in banking literature (Jayaratne and Strahan 1998; Cardone-Riportella et al. 2010; Imbierowicz and Rauch 2014; Shaban and James 2017). The second group of variables is intended to measure the liquidity risk of the banks, as Table 3.3 shows that in this study net loan is divided by total assets. With respect to operating risk, the higher quality of operations and management translates into a portfolio composition of assets and the lower composition of liabilities (Maudos and Fernández de Guevara 2004). Following the previous banking literature (Hassan et al. 2009; Beck et al. 2013; Mamatzakis et al. 2016; Park and Weber 2006), this research utilizes several efficiency indications for

[13] Non-structural and structural are the two main broad approaches used in measuring performance.

bank operating risk. The variables utilized in this study are (1) net interest margin, (2) cost to income, and (3) non-interest expenses. In line with the broad banking literature (Hesse and Čihák 2007; Laeven and Levine 2009; Goetz 2017; Fratzscher et al. 2016; Tabak et al. 2013; Mirzaei et al. 2013; Lepetit et al. 2008; Schaeck et al. 2011), the research uses the z-score as a proxy to measure insolvency risk. Z-score measures how much the bank has to decrease the standard deviation of return of average assets in order to maintain the insolvency. In other words, it measure the distance from the insolvency (Roy 1952). Particularly, z-score = (M_ROAA + M_CAR) / SD ROAA3, where, CAR refers to capital asset ratio, ROAA3 is the return for average assets and SD is the standard deviation for three years period. For asymmetry reasons, this research employs the log of the Z-score as in Houston et al. (2010) and Laeven and Levine (2009). Table 5.1 illustrates all the risk types used in this research.

5.3.3. Control Variables

The control variables used in the models are described in Table 5.2. This study considers six bank-specific control variables, which have been explained above in the rationale for employing them. Specifically, these are size, noninterest income, cost to income, equity capital, and loan growth. Moreover, in order to control the macroeconomic aspects in which the bank operates, this research employs six variables: (1) GDP per capita; (2) GDP capita annual growth; (3) inflation; (4) real interest rate; (5) average oil price; (6) HHI index.

Size: Based on the existing literature (Berger et al. 2010; Liang et al. 2013; Pelletier 2018), this research employs several control factors that affect bank performance. Bank size can positively affect bank performance through different channels: size due to benefiting from the economy of scale and market power from operating from several different markets. This in turn affects the performance of banks (Berger and Humphrey 1997). Wheelock and Wilson (2012) add to the growing evidence that banks face more earnings for larger bank sizes due to the scale economies. Among recent studies, Gandhi and Lustig (2015) empirically find that larger banks performed better than smaller banks during the global financial crisis based on the banks being too big to fail. Therefore, we expected size to have a positive impact on bank performance. We use log of total asset as a proxy for bank size.

Non-Interest Income (Diversification): Following Stiroh (2004), we use non-interest income as the control factor. The literature finds non-interest income to be one of determinants of performance. Acharya et al. (2002) argue that non-interest income does not necessarily affect the risk or profit of banks. Using a sample of 472 large commercial banks between 1988 to 1995, DeYoung and Roland (2001) tested the association between profitability of banks and

volatility; they found that diversification increases bank revenue and earnings. Among recent studies, (Mergaerts and Vander Vennet 2016) suggest that diversification is linked to higher profitability. We use non-interest income as a proxy for diversification, which is ratio of non-interest income of the sum of total income (non-interest and interest income).

Equity to Total Assets: Following several studies, (Mergaerts and Vander Vennet 2016; Luo et al. 2016), we use equity to total assets as a proxy for capital strength. Pasiouras and Kosmidou (2007) argue that banks are considered safer and perform better particularly during financial turmoil if they have higher assets ratios. Empirical tests (García-Herrero et al. 2009; Ben Naceur and Goaied 2008; Dietrich and Wanzenried 2011; Athanasoglou et al. 2008; Demirguc-Kunt et al. 2013) have found that banks that maintain a high ratio of equity to total assets are the best performing banks. The possible explanation is that if banks have higher capital costs, they have lower funding costs and bankruptcy cost. In addition, it is thought that higher capital risk prompts bank management to undertake less risky investments that would decrease losses (Lepetit et al. 2008). Therefore, we expect that higher equity to total assets ratio in positively linked with bank performance.

Growth Loan: Foos et al. (2010) found a negative relationship, underlining the view that the new loans are not issued at a compensating rate for default. However, based on the argument which says that higher loan growth generally is associated with higher profitability (Mirzaei et al. 2013), we expect that an increase in the loan growth leads to an increase in a bank's performance.

Inflation: Perry (1992) was the first to introduce the issue of the link between inflation and bank performance. If inflation has been accurately anticipated by the bank's managers, this makes management able to adjust the interest rates appropriately in order to ensure that earnings are more than costs (Martín-Oliver et al. 2013). On the other hand, Demirgüç-Kunt and Detragiache (1998) argue that inflation increases the likelihood of bank default and decreases the earning of banks. Empirically, Caglayan and Xu (2016) demonstrate that inflation negatively affects bank performance due to conservative behaviour from managers in issuing loans. We use the inflation rate as a proxy for inflation, which is the change rate of GDP deflator.

Business cycle: The majority of studies indicate that GPG has a positive relationship with bank performance (Dietrich and Wanzenried 2011; Albertazzi and Gambacorta 2009; Athanasoglou et al. 2008). This is possibly due to the increase in the lending rate and decrease in default probability. Von Hagen and Ho (2007) test the impact of several factors of money market pressure on the recent global financial crisis, and the results indicate that a

slowdown of GDP tends to intensify the banking crisis. There are different notions beyond such a relationship: (1) bank managers tend to lend more as householders are able to pay back the money and (2) banks have easy access to the advanced technology in prosperous countries (Lensink et al. 2008).

5.3.4. Econometric Methodology

Focusing on three different types of banks (Islamic, conventional, and Islamic window banks), our model examines the effect of different types of risk on performance of banks. We utilize panel data framework in the model. The key motivation for using panel data is to control for any unobserved bank heterogeneity. As panel data can be classified into balanced panel and unbalanced data, we use unbalanced data in this research since the data of the banks are not available for some observations[14].The model used in the study is presented below.

$$\mathrm{ROAA}_{i,t} = \alpha_0 + \alpha_1 \times \mathrm{CR}_{i,t} + \alpha_2 \times \mathrm{LR}_{i,t} + \alpha_3 \times \mathrm{OR}_{i,t} + \alpha_4 \times \mathrm{IR}_{i,t} + \sum_{k=1}^{6} \beta_{5,k}\, \mathrm{Bank}_{i,t} + \sum_{m=1}^{6} \alpha_{5,m}\, \mathrm{Macro}_t + \varepsilon_{i,t} \quad (1)$$

$$\mathrm{ROAE}_{i,t} = \beta_0 + \beta_1 \times \mathrm{CR}_{i,t} + \beta_2 \times \mathrm{LR}_{i,t} + \beta_3 \times \mathrm{OR}_{i,t} + \beta_4 \times \mathrm{IR}_{i,t} + \sum_{k=1}^{6} \beta_{5,k}\, \mathrm{Bank}_{i,t} + \sum_{m=1}^{6} \beta_{6,m}\, \mathrm{Macro}_t + \varepsilon_{i,t} \quad (2)$$

$$\mathrm{Interest\ Income}_{i,t} = \gamma_0 + \gamma_1 \times \mathrm{CR}_{i,t} + \gamma_2 \times \mathrm{LR}_{i,t} + \gamma_3 \times \mathrm{OR}_{i,t} + \gamma_4 \times \mathrm{IR}_{i,t} + \sum_{k=1}^{6} \beta_{5,k}\, \mathrm{Bank}_{i,t} + \sum_{m=1}^{6} \gamma_{6,m}\, \mathrm{Macro}_t + \varepsilon_{i,t} \quad (3)$$

Where $\mathrm{Bank\ performance}_{i,t}$ is a proxy measure for the bank performance variables for bank *i* at time *t*. Bank performance variables are: (1) return on average assets; (2) return on average equity; (3) interest income percentage of average assets. $\mathrm{CR}_{i,t}, \mathrm{LR}_{i,t}, \mathrm{OR}_{i,t}$ and $\mathrm{IR}_{i,t}$ stand for credit risk, liquidity risk, operating risk, and insolvency risk respectively for bank *i* at time $t. \alpha_0, \alpha_1, \beta_0, \beta_1, \gamma_0, \gamma_1, \mu_0, and\ \mu_1$ are the unknown parameters to estimate. K is the independent variable for bank-specific variables, whereas m is the independent variable for

[14] Under balanced panel data, all banks have all the observations for all entities over the period of the entire sample period; whereas under unbalanced panel data, there are some missing observations for some entities during the sample period (Wooldridge 2013).

macro-level variables. y is the dummy variable for bank i at year y, and c is the dummy variable for bank i at country c[15].

In this study, we apply a fixed effect model. We applied a fixed effect model technique for two main reasons. Firstly, the ordinary least squares model (OLS) does not treat data as panel data; it ignores the panel structure of the data and all observations are pooled together. Secondly, after performing the Hausman specification test[16], we find that a random effect model is consistent; therefore, we applied fixed effects estimators. Before running the regression, we made several tests for the validity of the data of the research, such as multicollinearity. This refers to the possible correlation between two or more independent variables[17]. In this research, we use the Pearson correlation matrix and Variance Inflation Factor (VIF) to examine the multicollinearity between the explanatory variables. Table 5.3 presents the results for these statistical examinations, which indicates that there is no multicollinearity issue in this research.

15 We also use additional specifications, including clustering on bank level.

[16] For more details for Hausman specification test (see Hausman 1978)

[17] As a further robustness check, we double check the endogeneity in the last empirical chapter, using GMM approach, and find similar results.

Table 5.1: Bank Performance and Risk Variable Definitions

Variable	Unit	Definitions	Source
		Bank Performance - Dependent Variables	
ROAA	%	This is return on average assets ratio which is calculated by dividing net income over average total assets.	BankScope database
ROAE	%	This is return on average equity ratio which is net income over total equity	BankScope database
Interest Income	%	This is interest income over total assets	BankScope database
		Risk Measures - Main Independent Variables	
Loan Loss Provision	%	This ratio represents the credit risk, which is loan loss provision scaled by gross loan. The lower this ratio, the better the quality of assets. References: (Kwan 2003; Lepetit et al. 2008; Beck et al. 2013; Tajik et al.	BankScope database

		2015; Khan et al.).	
Net Loans	%	This ratio represents liquidity risk, which is the ratio of net loans to total assets. It shows what percentage of the total assets of the bank is tied up in loans. The higher the ratio, the less liquid the bank is. References: (Lee and Hsieh 2013; DeYoung and Jang 2016; Mollah and Liljeblom 2016).	BankScope database
Cost to Income	%	This ratio represents the operating risk, which is operating cost scaled by operating income. The lower this ratio, the higher the efficiency of the bank. References: (Bitar et al. 2017; Chortareas et al. 2012; Altunbas et al. 2010).	BankScope
Zscore _4	Log	This ratio represents the insolvency risk which is calculated as follows; (*M*_ *ROAA* + *M*_Capital Asset Ratio) / *SD ROAA*, where M stands for mean over the sample period; SD ROAA is the standard deviation over the sample period. The greater the value the better.	BankScope

Table 5.2: Other Variables Definitions

Variable	Unit	Definitions	Source	Expected Sign
		Bank Specific - Variables		
Islamic Banks	Dummy	This is a dummy variable which takes a value of one if the bank is an Islamic bank and otherwise zero.	Islamic Banks	
Islamic window banks	Dummy	This is a dummy variable for Islamic window banks, it takes a value of one if the banks is an Islamic window bank and zero otherwise.	Conventional Banks	
Size	Log	Natural logarithm of total assets	Author's calculation based on BankScope	**(+)**
Noninterest Income	%	The share of non-interest income (excluding loan loss provision) in total operating income. This is a proxy for diversification impact.	BankScope database	**(+)**
Equity / Total Assets	%	Equity capital as a proportion to total asset, to control the capitalization impact on banks' stability.	BankScope database	**(+)**
Loan growth	%	$(loan_t - loan_{t-1}) / loan$	BankScope database	**(+)**
		Country - Specific Variables		
GDP per Capita	$	Gross domestic product per capita	World Development Indicators (WDI)	**(+)**
GDP per Capita annual Growth	$	The annual growth of domestic product per capita.	World Development Indicators (WDI)	**(+)**
Inflation Rate	%	Yearly change of consumer price index.	World Development Indicators (WDI)	**(-)**
Real Interest	%	The nominal interest rate deducted from the inflation rate.	World Development Indicators (WDI)	**(−)**
Average Oil Price	%	This reflects the oil price on an average basis.	Boombreg database	**(+)**

Table 5.3: Correlation Coefficients and Variance Inflation Factor (VIF)

To test for possible multicollinearity, we utilize the Pearson correlation matrix, which is used for parametric data. The correlation between independent variables is considered high if it is equivalent to or exceeding 0.8 (Brooks 2014). We further compute (VIF) for each independent variable and the largest one is 1.98, well below the rule of thumb of 10.0

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	VIF
Loan Loss Allowance	1															
Interbank	-0.0257	1														
Net Interest Margin	-0.0422*	-0.0063*	1													
Z-score	-0.2665*	0.0771*	-0.1417*	1												
Islamic Banks	-0.0119	-0.0430*	-0.1292*	-0.0415*	1											1.98
Islamic window banks	-0.0085	-0.0383*	-0.0818*	0.0563*	-0.1811*	1										1.42
Total Assets	-0.1652*	-0.0360*	-0.3182*	0.2723*	0.0542*	0.2063*	1									1.36
Equity Assets	-0.0263*	0.0070*	0.0586*	-0.1843*	0.1591*	-0.05478	-0.2613*	1								1.30
Growth Loans	-0.1553*	-0.0347*	0.0917*	-0.0561*	0.0231*	-0.0514*	-0.1213*	0.0793*	1							1.30
Noninterest Income	0.1862*	-0.0361*	-0.2776*	-0.2093*	0.1150*	-0.0429*	-0.1524*	0.1513*	0.0370*	1						1.25
GDP Capital	-0.0188	-0.0745*	-0.2994*	0.0473*	0.2323*	0.0723*	0.4641*	0.1598*	-0.0265*	-0.0570*	1					1.17
GDP Per Capita	-0.0139	0.0166	0.0737*	0.0271	-0.0694*	-0.0221*	-0.0653*	-0.0397*	0.0581*	-0.0262*	-0.1835*	1				1.15
Inflation Rate	0.0088	0.0178	0.0536*	-0.0792*	0.1718*	-0.0334*	0.0364*	-0.0124*	0.0571*	0.0444*	-0.1387*	0.0449*	1			1.12
Real Interest Rate	0.0293	-0.0198	0.1458*	-0.0536*	-0.10668	-0.0339*	-0.1903*	0.0227*	-0.0592*	0.0253	-0.2292*	-0.1071*	-0.2461*	1		1.11
Oil Price	-0.0238	-0.0036	-0.0152	0.0315*	0.0000	0.0000	0.0255*	0.0098*	0.0434*	0.0211	0.0809*	0.0240*	0.1178*	-0.1849*	1	1.10

5.4. Data and Preliminary Analysis

5.4.1. Data

Our sample includes 950 commercial banks from 55 countries which are members of Organization of Islamic Countries (OIC), comprising 177 Islamic banks, 654 conventional banks, and 119 Islamic window banks. The primary source of the bank-specific data is from Bankscope, the country-level macroeconomic data such as GPD is from the World Bank, and oil prices are gathered from the World Bank. The span of the entire sample runs from 2005 and ends in 2016. For the purpose of this study, the sample is divided into three intervals: (i) 2006-2015 (full sample), (ii) 2007-2009 (global financial crisis), (iii) 2010-2013 (sovereign debt crisis). Table 5.4 describes the sample distribution of this study. It reveals that Indonesia has the highest percentage of total banks, representing 11.67% (110 banks). The next highest percentage is Malaysia, followed by Lebanon, Turkey, and Bangladesh, representing respectively 5.89% (56 banks), 5.37% (51 banks), 5.26% (50 banks), and 4.95% (47). On the other hand, Guinea, Maldives, and Guinea-Bissau have the same and lowest percentage, which is 0.10% (one bank each). Malaysia and Bahrain have the highest number of Islamic banks, with 20 banks and 19 banks, respectively. Iran and Sudan have only Islamic banks. since the whole banking system in these two countries operates according to *Shariah*. To adjust for any possible outliers, all the continuous variables are winsorized at the 1% level.

Table 5.4: Sample Distribution for the Sample by Countries During the Study Period 2006-2015.

	Islamic Banks		Conventional Banks		Islamic window banks		Totals		
Country	Bank	Observation	Bank	Observation	Bank	Observation	Bank	Observation	Percentage %
Afghanistan	0	0	7	70	4	40	11	110	0.1158
Albania	0	0	11	110	1	10	12	120	0.1263
Algeria	0	0	23	230	1	10	24	240	0.2526
Azerbaijan	0	0	4	40	0	0	4	40	0.0421
Bahrain	19	190	7	70	4	40	30	300	0.3158
Bangladesh	8	80	27	270	12	120	47	470	0.4947
Benin	0	0	8	80	1	10	9	90	0.0947
Brunei	1	10	1	10	0	0	2	20	0.0211
Burkina Faso	0	0	8	80	0	0	8	80	0.0842
Cameroon	0	0	11	110	1	10	12	120	0.1263
Chad	0	0	5	50	0	0	5	50	0.0526
Comoros	0	0	1	10	0	0	1	10	0.0105
Djibouti	0	0	16	160	5	50	21	210	0.2211
Egypt	3	30	16	160	6	60	25	250	0.2632
Gabon	0	0	7	70	0	0	7	70	0.0737
Gambia	1	10	15	150	0	0	16	160	0.1684
Guinea	0	0	1	10	0	0	1	10	0.0105
Guinea-Bissau	0	0	1	10	0	0	1	10	0.0105
Guyana	0	0	3	30	0	0	3	30	0.0316
Indonesia	10	100	90	900	11	110	111	1110	1.1684
Iran	17	170	0	0	0	0	17	170	0.1789
Iraq	7	70	12	120	1	10	20	200	0.2105
Jordan	3	30	11	110	0	0	14	140	0.1474
Kazakhstan	0	0	30	300	0	0	30	300	0.3158
Kuwait	11	110	6	60	0	0	17	170	0.1789
Kyrgyzstan	0	0	9	90	1	10	10	100	0.1053
Lebanon	3	30	44	440	4	40	51	510	0.5368
Libya	0	0	6	60	4	40	10	100	0.1053
Malaysia	20	200	21	210	15	150	56	560	0.5895
Maldives	0	0	0	0	1	10	1	10	0.0105
Mali	0	0	10	100	0	0	10	100	0.1053
Mauritania	2	20	6	60	3	30	11	110	0.1158
Morocco	0	0	16	160	0	0	16	160	0.1684
Mozambique	0	0	11	110	0	0	11	110	0.1158
Niger	0	0	7	70	1	10	8	80	0.0842
Nigeria	2	20	19	190	0	0	21	210	0.2211
Oman	2	20	1	0	5	50	8	80	0.0842
Pakistan	12	120	10	100	12	120	34	340	0.3579
Palestine	0	0	3	30	0	0	3	30	0.0316
Qatar	6	60	6	60	1	10	13	130	0.1368
Saudi Arabia	5	50	0	0	9	90	14	140	0.1474
Senegal	1	10	13	130	0	0	14	140	0.1474
Sierra Leone	0	0	11	110	0	0	11	110	0.1158
Sudan	19	180	0	0	0	0	19	190	0.2
Suriname	0	0	4	40	0	0	4	40	0.0421
Syria	2	20	11	110	2	20	15	150	0.1579
Tajikistan	0	0	6	60	0	0	6	60	0.0632
Togo	0	0	4	40	0	0	4	40	0.0421
Tunisia	3	30	14	140	3	30	20	200	0.2105
Turkey	5	50	45	450	0	0	50	500	0.5263
Turkmenistan	0	0	4	40	0	0	4	40	0.0421
Uganda	0	0	19	180	0	0	19	190	0.2
UAE	11	110	9	90	11	110	31	310	0.3263
Uzbekistan	0	0	19	190	0	0	19	190	0.2
Yemen	4	40	5	50	0	0	9	90	0.0947
Total	**177**	**1770**	**654**	**6520**	**119**	**1190**	**950**	**9500**	**100**

5.4.2. Descriptive Statistics

As a preliminary step, we begin with the cross-sectional analysis of the full sample and compare the results between the three different banks: Islamic, conventional, and Islamic window banks. Table 5.5 reports sample summary statistics for the entire sample (2006-2015), which is divided into seven panels: (A) bank performance; (B) credit risk; (C) liquidity risk; (D) operating risk; (E) insolvency risk; (F) bank-specific variables; and (G) country-level variables.

5.4.3. Full Sample Period

Bank Performance: Looking to the accounting performance measures, the return on average assets ratio appears lower for Islamic banks compared to conventional banks and significantly lower than Islamic window banks. In particular, Islamic banks have ROAA of 1.1845% versus 1.2916% and 1.4340% for conventional and Islamic window banks, respectively. The results also reveal that there is a significant difference in the return on average equity ratio among these kinds of financial institutions, with a mean value for Islamic banks of 8.7208%, which is lower than for conventional and Islamic window banks (11.4623%, 11.5430% respectively). This finding is inconsistent with previous studies that find that Islamic banks have a lower ROAE (Pappas et al. 2017, among others). Looking to the market ratio, we find that the interest income ratio is significantly higher in Islamic banks than in conventional and Islamic window banks (0.1745% for Islamic banks versus, 0.1436% for conventional and 0.1022% for Islamic window banks).

Credit Risk: Considering panel (B), which represents the risk measures side in Table 5.5, we use four types of risk, which are credit risk, liquidity risk, operating risk, and insolvency risk. The results suggest that, in general, credit risk in Islamic banks is substantially lower than in the other types of banks. For instance, loan loss provision is significantly less than for a conventional bank (0.9161% versus 1.2787%) and less than for Islamic window banks (0.9161% versus 1.1167%). Thus, the results suggest that Islamic banks have a better ability to accommodate any redemption, which leads to a strong credit position.

Liquidity Risk: Looking at liquidity risk in Panel (B), there are significant differences between Islamic banks and the other types of banks, including Islamic window and conventional banks. Net loan over deposit and short-term funding appear greater in Islamic banks than in conventional and Islamic window banks. In line with the previous results, net loans over total assets reveals that Islamic banks have less liquidity. Though not significant,

net loan over assets is lower in Islamic banks than in conventional banks. Net loan over assets is significantly lower in Islamic banks than in Islamic window banks (47.7591% versus 48.5269%) and significantly more than in Islamic window banks (47.7591% versus 51.3320%).

Operating Risk: As presented in Panel (B) in Table 5.5, which considers the operating risk, the results show that there is a significant difference in the cost to income. Overall, the results suggest that Islamic banks are operating less efficiently compared to other banks. For instance, the cost to income is significantly higher in Islamic banks compared to other types, as indicated by the mean value of 64.7444% versus 60.9830% for conventional banks and 51.8162% for Islamic window banks. This is probably due the young age of Islamic financial institutions and the complexity of their products. In addition, the results show that Islamic window banks perform better that Islamic banks; the possible interpretation for that is the fact that Islamic window banks are more mature compared to Islamic banks as most of them started as conventional banks and then later started offering Islamic banking services.

Insolvency Risk: In terms of solvency, the statistical summary reveals that there is a significant difference among the three different types of banks. In general, we find that z-score reveals that Islamic banks have significantly higher default (insolvency) risk compared to conventional and Islamic window banks (1.6537 versus 1.6974 for conventional banks, and 1.7636 for Islamic window banks). This suggests that there is a significant difference between Islamic banks and conventional banks and shows that Islamic banks have a higher insolvency risk.

5.4.4. Financial Crises

This section compares bank performance and risk to Islamic, conventional and Islamic window banks during three periods, which are the full sample period (2005-2016), global financial crises (2007-2009), and sovereign debt crisis (2010-2013). Table 5.6 reports the results for these three periods.

Bank Performance: As shown in Table 5.6, unlike the full sample period, there are statistically significant differences in the bank performance measures during the global financial crisis and sovereign debt crisis, particularly ROAA. During the global financial crisis, Islamic banks appear to have significantly better ROAA compared to conventional and Islamic window banks. However, during the sovereign debt crisis, Islamic banks have less return on average assets compared to conventional and Islamic window banks. This is

indicated by the mean value of 8.1781% versus 10.8365% for conventional banks and 10.8365% for Islamic window banks.

Risk Measures: With respect to credit risk, the results reveal that there is a significant difference among the bank types during the full sample period. Islamic banks have 6.0825% versus 6.6470% for conventional banks and 6.5068% for Islamic window banks. This suggests that Islamic banks have a better asset quality. Though the results are not significant, Islamic banks during both crises appear to have a better asset quality. In terms of liquidity, as shown in Table 5.6, the results prove that there is a statistical difference among the banks during the three periods: the full sample period, the global financial crisis and the sovereign debt crisis. During the three periods, Islamic banks have lower net loans over gross assets, which indicates that Islamic banks have a higher liquidity risk. In terms of operating risk, on average Islamic banks have a higher operating risk compared to conventional and Islamic window banks. Finally, Islamic banks appear to have a statistically significant insolvency risk during the full sample period and global financial crisis However, there is no significant difference during the sovereign debt crisis, and this might suggest that Islamic banks have learned from their bad performance during the global financial crisis.

Table 5.5: Statistics Summary for all Sample Banks During the Period 2006-2015

	Islamic Banks			Conventional Banks			Islamic window banks			Max -Min		Mean Differences (*t*-tests)			
Variables	N	Mean	SD	N	Mean	SD	N	Mean	SD	Max	Min	*t-test* 1*	*t-test* 2	*t-test* 3	*t-test* 4
Panel A: Bank Performance															
ROAA	1252	1.1845	3.7124	4583	1.2916	2.7785	850	1.4340	1.8780	11.599	-13.024	1.4306	-1.1182	-1.8090*	-1.4353
ROAE	1272	8.7208	14.6469	4530	11.4623	16.3778	849	11.5430	11.7070	56.5690	-58.3330	5.6508***	-5.3601***	-4.6896***	-0.1371
Interest Income	345	0.1745	0.1353	847	0.1436	0.1022	370	0.1339	0.0986	0.5800	0.0100	-5.0633***	4.2907***	4.6078***	1.5382
Panel B: Risk - Main Independent Variables															
Loan Loss Provision	1185	0.9161	0.3333	4524	1.2787	0.5773	848	1.1167	0.5404	11.5979	-1.5944	5.1610***	-5.3576***	-2.5780**	2.0639**
Net Loans / Total Assets	1125	47.7591	54.8070	4431	48.5269	51.2590	837	51.3320	56.9790	80.9030	3.1360	1.8703*	-1.1586	-3.7265***	-3.8939***
Cost to Income Ratio	1178	64.7444	38.7724	4461	60.9830	31.8823	836	51.8162	30.0633	236.9950	11.9230	-4.8760***	3.4339***	8.0614***	7.6966***
Z-score_	687	1.6537	0.5819	2590	1.6974	0.5566	619	1.7636	0.5498	3.0755	0.1738	2.3959**	-1.8111*	-3.4980***	-2.6656***
Panel C: Bank - Specific Variables															
Total Assets	1257	6.1050	0.8719	4597	5.8927	0.8356	841	6.4783	0.8300	7.8171	4.0124	-4.5088***	7.9099***	-9.7950***	18.7067***
Equity / Total Assets	1258	24.5019	23.8162	4624	15.5751	13.7321	852	13.6567	9.8535	91.2280	0.7970	-18.7338***	17.0998***	12.6817***	3.8968***
Growth of Gross Loan	995	26.3832	40.4000	3932	24.9327	37.5062	811	19.5086	29.9193	206.9000	-36.4100	-1.8379*	1.0725	4.0283***	3.8620***
Non-Interest Income Gross Re	1218	43.0908	33.5978	4518	35.5977	22.6563	841	33.7777	18.0297	129.5700	-12.3400	-9.9755***	9.1460***	7.3414***	2.2032**
Total Assets (Log)	1257	6.1050	0.8719	4597	5.8927	0.8356	841	6.4783	0.8300	7.8171	4.0124	-4.5088***	7.9099***	-9.7950***	18.7067***
Panel D: Country - Level Variables															
GDP per capita (Log)	1626	3.8138	0.5830	6253	3.4482	0.5082	1166	3.6444	0.6024	4.8505	2.5777	-22.6806***	25.0407***	7.4658***	11.7370***
GDP per capita growth (annual %)	1626	1.6040	4.1932	6253	2.6631	3.5693	1166	1.9585	4.2028	10.1687	-12.7508	9.1598***	-10.2644***	-2.2012**	6.0084***
Inflation	1538	8.6123	8.5864	5716	6.0064	4.6319	1038	5.9177	4.6298	36.7023	-3.7489	-16.6145***	15.9051***	9.2442***	5.5679
Real Interest Rate	1118	3.3671	9.9914	4057	6.1482	8.0878	776	4.5281	7.7880	41.2530	-13.0638	8.9815***	-9.6468***	-2.7147***	5.1424***
Average Oil Price	1770	85.8570	21.1494	6540	85.8570	21.1451	1190	85.8570	21.1523	111.5700	52.3200	0.0000	0.0000	0.0000	0.0000

Note: This summary represents the summary for the whole period of the study which is 2006-2015. Max and Min is for the entire sample. * The t test for 1, 2, 3, 4 are represents respectively the econometric difference in means for; (Islamic Banks and all (Conventional plus Islamic window)), (Islamic Banks and Conventional), (Islamic Banks and Islamic window), and (Islamic window banks and Conventional). Significant level at 1%, 5%, 10% are indicated through *, **, ***, respectively.

Table 5.6: Additional Summary Statistics-Mean Values

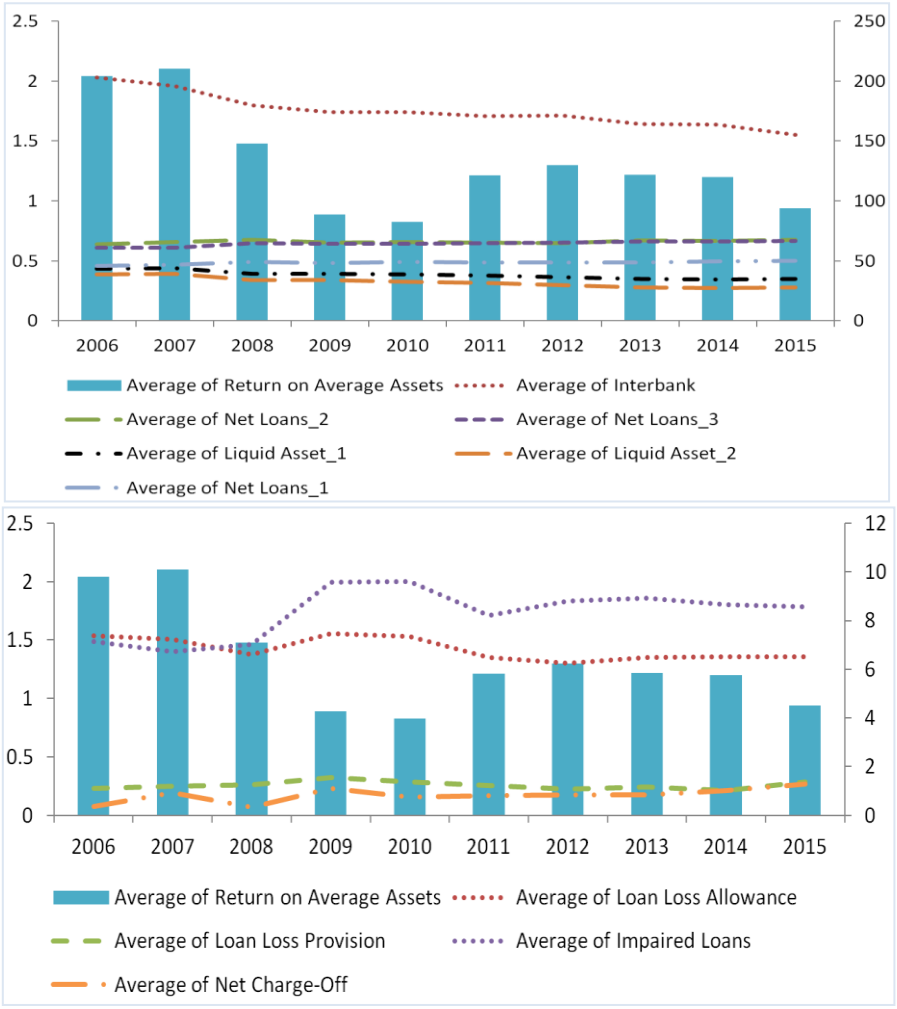
	Full Sample Period (2006-2015)						***Global Financial Crisis (2007-2009)***						***Sovereign Debt Crises (2010-2013)***					
Variables	IB	CB	HB	*t-test* 1*	*t-test* 2	*t-test* 3	IB	CB	HB	*t-test* 1*	*t-test* 2	*t-test* 3	IB	CB	HB	*t-test* 1*	*t-test* 2	*t-test* 3
Panel A: Bank Performance																		
ROAA	1.1845	1.2916	1.434	1.4306	-1.1182	-1.8090*	1.8322	1.4545	1.3331	-2.0010**	1.8243*	1.4916	0.9224	1.236	1.3656	2.4727***	-2.1824***	-2.1121**
ROAE	8.7208	11.4623	11.543	5.6508***	-5.3601***	-4.6896***	10.6114	13.5879	11.7981	2.6136***	-2.7852***	-0.8407	8.1781	10.7586	10.8365	3.4757***	-3.3004***	-2.8789***
Panel B: Risk - Main Independent Variables																		
Loan Loss Allowance	6.0825	6.6470	6.5068	1.7242*	-1.7473*	-0.9637	6.4938	6.9937	6.9890	0.8363	-0.8173	-0.5861	6.0958	6.5200	6.4487	0.9340	-0.9358	-0.5567
Loan Loss Provision	0.9161	1.2787	1.1167	5.1610***	-5.3576***	-2.5780**	0.9993	1.3242	1.1999	2.7114***	-2.7672***	-1.454	0.9363	1.2503	1.0824	2.9189***	-3.0907***	-1.2373
Net Loans_1	47.7591	48.5269	51.332	1.8703*	-1.1586	-3.7265***	46.7203	47.848	51.9378	1.2241	-0.7823	-2.4699**	47.9762	48.5474	51.6499	1.1242	-0.5784	-2.6414***
Cost to Income Ratio	64.7444	60.983	51.8162	-4.8760***	3.4339***	8.0614***	58.7516	59.3811	52.1785	-0.1854	-0.2654	1.8840*	65.2356	61.9433	52.6518	-3.0083***	2.0201**	5.061***
Z-score_	1.6537	1.6974	1.7636	2.3959**	-1.8111*	-3.4980***	1.5001	1.6943	1.543	3.3899***	-3.9141***	-0.7194	1.6483	1.67397	1.82057	1.5245	-0.7142	-3.5716***

The t test for 1, 2, 3, 4 are represents respectively the econometric difference in means for; (Islamic Banks and all (Conventional plus Islamic window)), (Islamic Banks and Conventional), (Islamic Banks and Islamic window), and (Islamic window banks and Conventional). Significant level at 1%, 5%, 10% are indicated through *, **, ***, respectively.

5.4.5. Plots of Annual Average

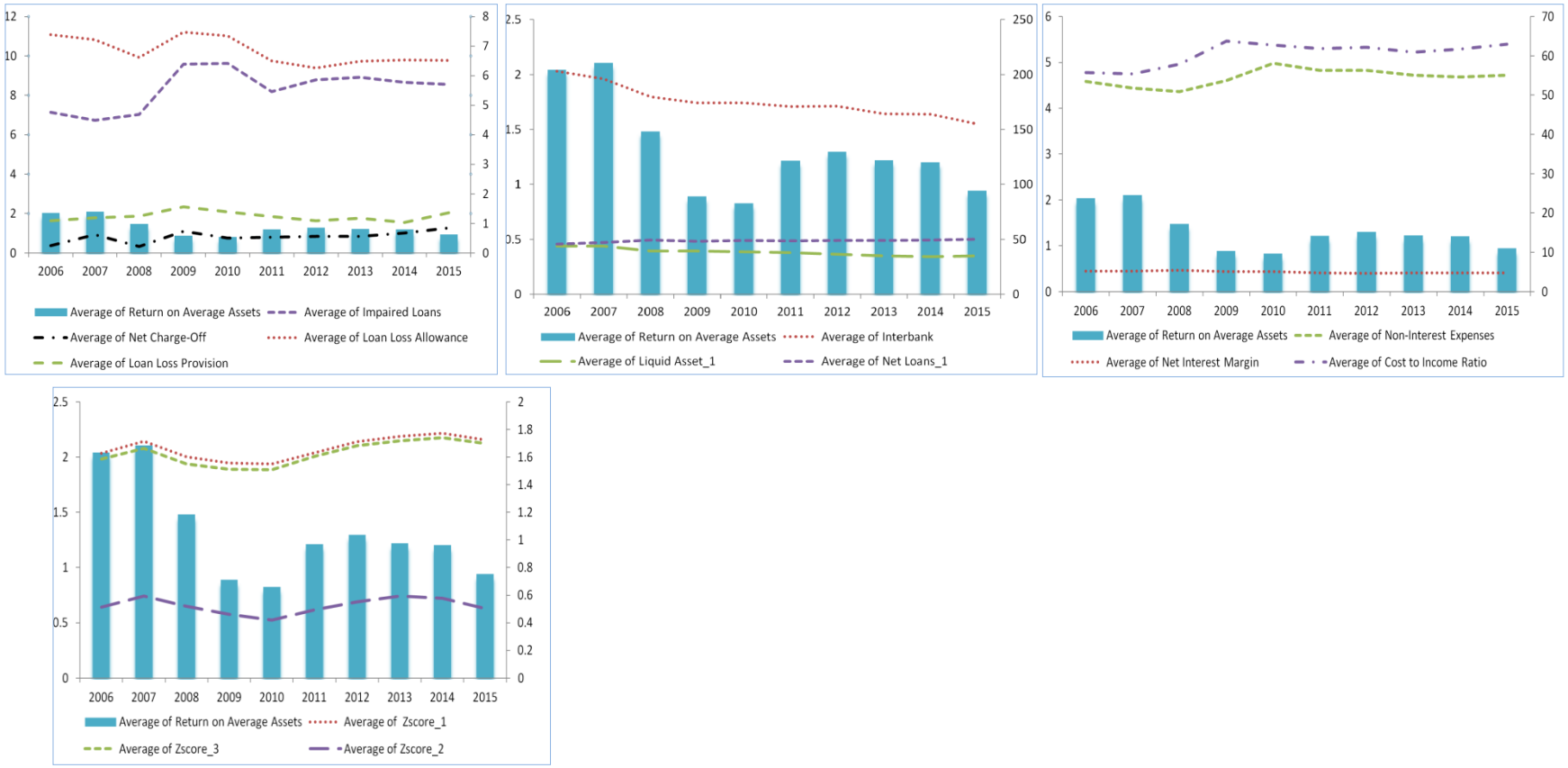
The graphs in Figure 6.1 illustrate the effect of risk on performance during the full sample period. The graphs indicate that liquidity is not enough to explain the fluctuation of bank performance, particularly during the financial crises. The liquidity ratios do not change sharply. However, the performance declined, especially during the global financial crisis. This suggests that unlike what was argued in the literature, the relation with liquidity and performance is much more complicated and perhaps the relationship is not a linear one. However, the credit risk is relatively sufficient to explain the trend of bank performance, as shown in Figure 5.3. Figures 5.4-6, indicate that Islamic, conventional and Islamic window banks have the same results.

Figure 5.3: Trend of Risk and Performance for All Banks



Note: These are the mean values for the entire sample period for all banks. Average net loans_1 is the ratio of net loans scaled by total assets, whereas net loan_2 is the ratio of net loans to deposits and short-term funding. Net loans _3 is the ratio of the total amount of liquid assets available scaled by the sum of deposits and borrowings. Interbank is the percentage ratio of money lent to other banks divided by money borrowed from other banks. Average liquid Assets_1 is the liquid assets scaled by short-term funding. The credit risk variables are scaled by the gross loan.

Figure 5.4: Trend of Risk and Performance for Islamic Banks



Note: These are the mean values for the entire sample period for Islamic banks. The credit risk variables are scaled by the gross loan. Average net loans_1 is the ratio of net loans scaled by total assets, whereas net loan_2 is the ratio of net loans to deposits and short-term funding. Net loans _3 is the ratio of the total amount of liquid assets available scaled by the sum of deposits and borrowings. Interbank is the percentage ratio of money lent to other banks divided by money borrowed from other banks. Average liquid Assets_1 is the liquid assets scaled by short-term funding. With respect to operating risk, (1) net interest margin, which represents what banks get out of their assets, which is calculated through the following formula (interest income-interest expense) / average earning assets. (2) Cost to income, which is the operating costs scaled by operating income. Non-interest expense is the overheads expenses scaled average assets. Z-score is calculated as follows (ROAA+CAR) /SD ROAA_3, (see chapters three and four for explanation and definition for these variables).

Figure 5.5: Trend of Risk and Performance for Conventional Banks

Note: These are the mean values for the entire sample period for Islamic banks. The credit risk variables are scaled by the gross loan. Average net loans_1 is the ratio of net loans scaled by total assets, whereas net loan_2 is the ratio of net loans to deposits and short-term funding. Net loans _3 is the ratio of the total amount of liquid assets available scaled by the sum of deposits and borrowings. Interbank is the percentage ratio of money lent to other banks divided by money borrowed from other banks. Average liquid Assets_1 is the liquid assets scaled by short-term funding. With respect to operating risk: (1) net interest margin, which represents what banks get out of their assets, which is calculated through the following formula (interest income-interest expense) / average earning assets. (2) Cost to income, which is the operating costs scaled by operating income. Non-interest expense is the overheads expenses scaled average assets. Z-score is calculated as follows (ROAA+CAR) /SD ROAA_3, (see chapters three and four for explanation and definition for these variables).

Figure 5.6: Trend of Risk and Performance for Islamic window banks

Note: These are the mean values for the entire sample period for Islamic banks. The credit risk variables are scaled by the gross loan. Average net loans_1 is the ratio of net loans scaled by total assets, whereas net loan_2 is the ratio of net loans to deposits and short term funding. Net loans _3 is the ratio of the total amount of liquid assets available scaled by the sum of deposits and borrowings. Interbank is the percentage ratio of money lent to other banks divided by money borrowed from other banks. Average liquid Assets_1 is the liquid assets scaled by short-term funding. With respect to operating risk; (1) net interest margin, which represents what banks get out of their assets, which is calculated through the following formula (interest income-interest expense) / average earning assets. (2) Cost to income, which is the operating costs scaled by operating income. Non-interest expense is the overheads expenses scaled average assets. Z-score is calculated as follows (ROAA+CAR) /SD ROAA_3, (see chapters three and four for explanation and definition for these variables).

5.5. Empirical Results

This section presents the results for banks' risk and banks' performance during the three intervals of the full sample period (2005-2016), global financial crisis (2007-2009), and sovereign debt crisis (2010-2013). In particular, we examine the effect of four types of risk on performance: (1) credit risk; (2) liquidity risk; (3) operating risk; and (4) insolvency risk. These results are shown while controlling the bank-specific and country-specific characteristics.

5.5.1. The Full Sample Period

We first examine the impact of risk on performance during the entire sample period 2005-2016. Table 5.7 reports the regression results, with loan loss provisions ratio as credit risk, net loan over total assets ratio as liquidity risk, cost to income ratio as operating risk and z-score as insolvency risk. The primary proxy for the banks' performance is the return on average assets (ROAA). In addition, the study uses return on average equity (ROAE) and interest income over total assets. We present the *t*-stat results in order to identify the main risk determinant for each type of bank. Interestingly, the results show that the most significant risk that affects performance is the operating risk for Panel A (all bank types), Panel B (Islamic banks), and Panel C (conventional banks), whereas the most significant risk for Panel D (Islamic window banks) is the insolvency risk[18]. The results which imply that an increase in operating risk results in a decrease in the bank performance are statistically significant for all types of bank. This is because an increase in the cost of income negatively affects bank performance. In terms of credit risk, the results show that a poorer quality of assets is related to a higher performance of banks. However, the results are not significant for Islamic banks and conventional banks. Concerning the coefficients of liquidity risk, the results show that there is a negative and significant relationship between liquidity risk and performance for almost all the panels. This result implies that if the bank is less liquid, performance is negatively affected. Finally, in terms of insolvency, the results indicate that there a significant relationship of all the dependent variables with all the panels. This implies that the less the insolvency risk, the better the performance. The results also indicate that oil prices have an insignificant effect on bank performance with all panels. In conclusion, the results indicate that the operating risk is the most important risk for Islamic and conventional

[18] In Tables in Appendix A 1-3, the risk types are regressed on only the two dummy variables of Islamic and hybrid banks. However, in tables 5.6, we include all the control variables; this enhances the power of the research model as the R-squared increased.

banks, whereas insolvency risk is the most important risk for Islamic window banks. The least determining risk is credit risk for Islamic and conventional banks, whereas liquidity risk is the least determining risk for Islamic window banks.

Table 5.7: Effects of Risk on Bank Performance - Full Sample Period (2005-2016)

	Panel A: All Banks Types						***Panel B: Islamic Banks***					
	ROAA Coef.	*t-Stat*	ROAE Coef.	*t-Stat*	Int-Income Coe.	*t-Stat*	ROAA Coef.	*t-Stat*	ROAE Coef.	*t-Stat*	Int-Income Coef.	*t-Stat*
Credit Risk	0.0041	0.9600	0.0632	2.1000**	0.0098	1.7000	0.0140	0.8200	0.1121	1.3100	0.0209	1.3800
	(0.0043)		(0.0301)		(0.0058)		(0.0171)		(0.0854)		(0.0151)	
Liquidity Risk	-0.0067	-3.7500***	-0.0569	-4.5400***	0.0150	6.2300***	-0.0234	-4.1200***	-0.0614	-2.1700**	0.0003	0.0600
	(0.0018)		(0.0125)		(0.0024)		(0.0057)		(0.0283)		(0.0050)	
Operating risk	-0.0272	-19.1700***	-0.1969	-19.6800***	-0.0124	-6.5200***	-0.0266	-6.3900***	-0.1876	-9.0200***	-0.0079	-2.1400***
	(0.0014)		(0.0100)		(0.0019)		(0.0042)		(0.0208)		(0.0037)	
Insolvency Risk	0.6392	14.3900***	4.4881	14.3500***	0.1978	3.3200***	0.8275	6.5600***	4.4834	7.1200***	0.2709	2.4400***
	(0.0444)		(0.3128)		(0.0595)		(0.1262)		(0.6301)		(0.1110)	
Total Assets	-0.2471	-5.3800***	-0.8007	-2.4700**	-0.1539	-2.4900**	-0.4174	-2.2700**	-1.0671	-1.1600	-0.5391	-3.3300***
	(0.0459)		(0.3248)		(0.0617)		(0.1839)		(0.9180)		(0.1621)	
Non-Interest Income	0.0087	5.9700***	0.0380	3.6800***	-0.0402	-20.2000***	0.0151	4.7200***	0.0972	6.0900***	-0.0440	-15.1500***
	(0.0015)		(0.0103)		(0.0020)		(0.0032)		(0.0160)		(0.0029)	
Equity Total Assets	0.0558	16.9200***	-0.3002	-12.8900***	0.0342	7.5000***	0.0407	5.0100***	-0.1739	-4.2900***	0.0165	2.1900**
	(0.0033)		(0.0233)		(0.0046)		(0.0081)		(0.0405)		(0.0075)	
Growth of Gross Loans	-0.0001	-0.1800	0.0015	0.3200	-0.0006	-0.6700	0.0011	0.5500	0.0039	0.3700	0.0050	2.6800**
	(0.0007)		(0.0048)		(0.0009)		(0.0021)		(0.0104)		(0.0018)	
Oil Price	0.0005	0.4900	0.0080	1.0600	-0.0010	-0.7200	-0.0034	-1.0000	0.0077	0.4600	-0.0026	-0.8900
	(0.0011)		(0.0075)		(0.0014)		(0.0034)		(0.0169)		(0.0030)	
GDP per Capita	0.0000	-2.0900**	-0.0001	-1.2000	0.0000	-0.6300	0.0000	-1.2500	-0.0001	-0.7000	0.0000	0.7100
	(0.0000)		(0.0001)		(0.0000)		(0.0000)		(0.0001)		(0.0000)	
GDP per Capita Growth	0.0222	2.7900**	0.2312	4.1200***	0.0170	1.6000	-0.0330	-1.3600	-0.0587	-0.4800	-0.0423	-1.9800
	(0.0080)		(0.0561)		(0.0106)		(0.0243)		(0.1215)		(0.0213)	
Real Interest Rate	-0.0130	-3.7500***	-0.0608	-2.5000**	-0.0104	-2.2400**	-0.0274	-2.8700**	-0.0866	-1.8200	-0.0100	-1.1900
	(0.0035)		(0.0243)		(0.0046)		(0.0096)		(0.0477)		(0.0084)	
_cons	3.9041	10.8900***	32.5058	12.8100***	5.7833	12.0200***	6.5121	4.8200	30.2142	4.4800***	7.8091	6.5900***
	(0.3586)		(2.5367)		(0.4813)		(1.3507)		(6.7438)		(1.1844)	
R-Squared	0.3070		0.2556		0.1545		0.3123		0.3727		0.3508	
Observations	2,448		2,444		2,428		369		369		366	

Note: Credit risk is measured through loan loss provision ratio. Liquidity risk is measured through net loan over total assets. Operating risk is measured through cost to income ratios, and finally insolvency risk is measured through Z-score. The definition of these variables is available in Table 5.1-2.

Continued

Table 5.7: Effects of Risk on Bank Performance - Full Sample Period (2005-2016)

	Panel C: Conventional Banks						***Panel D: Islamic window banks***					
	ROAA		ROAE		Int-Income		ROAA		ROAE		Int-Income	
	Coef.	*t-Stat*	Coef.	*t-Stat*	Coef.	*t-Stat*	Coef.	*t-Stat*	Coef.	*t-Stat*	Coef.	*t-Stat*
Credit Risk	-0.0058	-1.2000	0.0007	0.0200	0.0067	0.9300	0.0594	4.5900***	0.3644	3.7300***	-0.0045	-0.3100
	(0.0048)		(0.0363)		(0.0072)		(0.0130)		(0.0978)		(0.0148)	
Liquidity Risk	-0.0028	-1.2900	-0.0353	-2.2200**	0.0205	6.5300***	-0.0083	-1.8700	-0.1212	-3.6300***	-0.0055	-1.0900
	(0.0021)		(0.0159)		(0.0031)		(0.0044)		(0.0333)		(0.0051)	
Operating risk	-0.0307	-18.3300***	-0.2205	-17.5300***	-0.0130	-5.2800***	-0.0121	-3.9000***	-0.1271	-5.4100***	-0.0205	-5.7500***
	(0.0017)		(0.0126)		(0.0025)		(0.0031)		(0.0235)		(0.0036)	
Insolvency Risk	0.5716	10.7300***	4.2830	10.7500***	0.1887	2.4100***	0.5632	6.4100***	4.9000	7.3900***	0.3307	3.2900***
	(0.0533)		(0.3985)		(0.0782)		(0.0879)		(0.6633)		(0.1005)	
Total Assets	-0.2855	-5.3800***	-1.2480	-3.1200***	-0.1202	-1.5400	-0.0584	-0.5000	0.1367	0.1600	-0.2661	-1.9900*
	(0.0531)		(0.3996)		(0.0780)		(0.1168)		(0.8814)		(0.1340)	
Non-Interest Income	0.0073	3.6500***	0.0145	0.9600	-0.0381	-12.8300***	-0.0017	-0.3900	-0.0286	-0.8800	-0.0368	-7.5000***
	(0.0020)		(0.0151)		(0.0030)		(0.0043)		(0.0324)		(0.0049)	
Equity Total Assets	0.0527	12.8300***	-0.3975	-12.9000***	0.0313	5.1100***	0.0780	6.8900***	-0.1380	-1.6200	0.0835	6.4300***
	(0.0041)		(0.0308)		(0.0061)		(0.0113)		(0.0854)		(0.0130)	
Growth of Gross Loans	-0.0006	-0.7900	-0.0017	-0.3000	-0.0025	-2.2300***	0.0012	0.6200	0.0033	0.2200	-0.0058	-2.6300**
	(0.0008)		(0.0058)		(0.0011)		(0.0019)		(0.0147)		(0.0022)	
Oil Price	0.0006	0.5200	0.0080	0.8600	-0.0012	-0.6400	0.0033	1.5000	0.0286	1.7300	0.0015	0.6000
	(0.0012)		(0.0093)		(0.0018)		(0.0022)		(0.0166)		(0.0025)	
GDP per Capita	0.0000	-1.7200	-0.0002	-1.3800	0.0000	-0.8400	0.0000	-0.8200	-0.0002	-0.8200	-0.0001	-1.5500
	(0.0000)		(0.0002)		(0.0000)		(0.0000)		(0.0003)		(0.0000)	
GDP per Capita Growth	0.0282	3.0500***	0.2594	3.7500***	0.0272	2.0100*	0.0321	1.9100	0.3142	2.4800**	0.0339	1.7600
	(0.0092)		(0.0691)		(0.0135)		(0.0168)		(0.1266)		(0.0192)	
Real Interest Rate	-0.0122	-2.8400**	-0.0666	-2.0700***	-0.0096	-1.5100	-0.0050	-0.8600	-0.0244	-0.5600	-0.0138	-2.1100
	(0.0043)		(0.0322)		(0.0063)		(0.0057)		(0.0433)		(0.0066)	
_cons	4.3283	10.5100***	38.8761	12.5400***	5.7724	9.5300***	1.3232	1.5100	21.8100	3.2900***	7.0421	7.0000***
	(0.4118)		(3.1014)		(0.6055)		(0.8779)		(6.6259)		(1.0060)	
R-Squared	0.3252		0.2719		0.1210		0.1706		0.0827		0.3498	
Observations	1,735		1,731		1,720		344		344		342	

Note: Credit risk is measured through loan loss provision ratio. Liquidity risk is measured through net loan over total assets. Operating risk is measured through cost to income ratios, and finally insolvency risk is measured through Z-score. The definition of these variables is available in Table 5.1-2.

5.5.2. Global Financial Crisis

This section reports the results of the risk effect on banks' performance during the global financial crisis (2007-2013). Table 5.8 reports the regression results, with loan loss provisions ratio as credit risk, net loan over total assets ratio as liquidity risk, cost to income ratio as operating risk and z-score as insolvency risk. The core dependent variable is the return on average assets (ROAA), in addition, the study used return on average equity (ROAE) and interest income over total assets. Concerning the most significant coefficient during the global financial crisis, the results shows that operating risk is empirically the most significant for Panel A and conventional banks. With respect to Islamic banks, insolvency risk is the most significant result. In terms of credit risk, it does not appear to be as significant for almost all the panels. This is probably because the relationship is not a linear one, and it looks more complicated with respect to credit risk. With respect to liquidity risk, it appears to be more significant for Islamic banks than conventional banks as the coefficient is significant with ROAA and ROAE, whereas it is not significant with conventional banks. The results show that the less the liquidity, the lower the performance. The liquidity risk is more significant in Islamic banks than in conventional and Islamic window ones because Islamic banks have liquidity challenges, as has been discussed in the third chapter. With respect to insolvency risk, the results suggest that it has a significant relationship with performance. The results indicate that the less the solvency risk, the better the performance. Unlike the results in Panels A, C, and D, the oil prices coefficient appears to be significant and negative with Islamic banks. Thus, an increase in the oil prices leads to a decrease in the performance of Islamic banks. This implies that the oil price was not the reason for the growth of Islamic banks, and that is probably because the majority of Islamic banks exists in countries such as Indonesia and Malaysia where oil is imported.

Table 5.8: Effects of Risk on Bank Performance - Global Financial Crisis (2007-2009)

	Panel A: All Banks Types						***Panel B: Islamic Banks***					
	ROAA		ROAE		Int-Income		ROAA		ROAE		Int-Income	
	Coef.	*t-Stat*	Coef.	*t-Stat*	Coef.	*t-Stat*	Coef.	*t-Stat*	Coef.	*t-Stat*	Coef.	*t-Stat*
Credit Risk	0.0004	0.0400	0.0165	0.2600	0.0029	0.2400	0.0356	0.4300	0.9202	2.4600**	0.0535	0.4900
	(0.0087)		(0.0645)		(0.0118)		(0.0829)		(0.3743)		(0.1094)	
Liquidity Risk	-0.0070	-1.7300	-0.0231	-0.7800	0.0238	4.4400***	-0.0340	-3.2300***	-0.0990	-2.0800*	-0.0065	-0.5200
	(0.0040)		(0.0295)		(0.0053)		(0.0105)		(0.0475)		(0.0125)	
Operating risk	-0.0230	-7.3000***	-0.2446	-10.4700***	-0.0057	-1.3800	-0.0041	-0.4500	-0.1989	-4.8300***	0.0027	0.2500
	(0.0032)		(0.0234)		(0.0042)		(0.0091)		(0.0412)		(0.0110)	
Insolvency Risk	0.6633	6.3500***	4.6515	6.0600***	0.3776	2.7300**	1.7219	6.4400***	10.4353	8.6500***	0.5191	1.6200
	(0.1045)		(0.7681)		(0.1383)		(0.2672)		(1.2070)		(0.3208)	
Total Assets	-0.3441	-3.4500***	-1.5624	-2.0900**	0.0380	0.2900	-1.1404	-2.0300*	-6.9690	-2.7400**	-1.0257	-1.4100
	(0.0998)		(0.7472)		(0.1330)		(0.5630)		(2.5431)		(0.7255)	
Non-Interest Income	0.0025	0.6600	-0.0430	-1.5400	-0.0432	-8.5900***	-0.0188	-2.4300*	-0.0126	-0.3600	-0.0708	-7.5800***
	(0.0037)		(0.0280)		(0.0050)		(0.0077)		(0.0349)		(0.0093)	
Equity Total Assets	0.0561	8.1000***	-0.2745	-5.3300***	0.0511	5.0800***	0.0384	2.4700*	-0.3305	-4.7100***	-0.0094	-0.4500
	(0.0069)		(0.0515)		(0.0100)		(0.0155)		(0.0702)		(0.0209)	
Growth of Gross Loans	0.0024	1.6400	0.0228	2.1100*	-0.0012	-0.5900	0.0067	1.7200	0.0272	1.5400	0.0104	2.1500*
	(0.0015)		(0.0108)		(0.0020)		(0.0039)		(0.0176)		(0.0048)	
Oil Price	0.0003	0.0700	0.0488	1.6200	0.0037	0.6900	-0.0369	-2.5300*	-0.1236	-1.8800	0.0206	1.1700
	(0.0041)		(0.0301)		(0.0054)		(0.0146)		(0.0658)		(0.0176)	
GDP per Capita	0.0000	-0.4200	-0.0001	-0.5100	0.0000	0.1400	0.0000	0.4300	0.0001	0.3700	0.0001	0.8600
	(0.0000)		(0.0003)		(0.0000)		(0.0001)		(0.0003)		(0.0001)	
GDP per Capita Growth	0.0228	0.6200	0.2474	0.9300	0.0311	0.6400	-0.0751	-1.1500	-0.3437	-1.1700	-0.0733	-0.9400
	(0.0365)		(0.2672)		(0.0482)		(0.0651)		(0.2942)		(0.0778)	
Real Interest Rate	-0.0110	-1.4400	-0.0312	-0.5600	0.0071	0.7000	-0.0584	-2.7400*	-0.1811	-1.8800	0.0092	0.3600
	(0.0077)		(0.0561)		(0.0101)		(0.0213)		(0.0963)		(0.0254)	
_cons	4.4503	5.0800***	37.4836	5.7300***	3.3394	2.8800**	13.1594	3.2500***	79.4806	4.3400***	9.9310	1.9300
	(0.8761)		(6.5415)		(1.1582)		(4.0518)		(18.3035)		(5.1495)	
R-Squared	0.3686		0.3244		0.1384		0.6785		0.3611		0.5133	
Observations	496		493		494		59		59		58	

Note: Credit risk is measured through loan loss provision ratio. Liquidity risk is measured through net loan over total assets. Operating risk is measured through cost to income ratios, and finally insolvency risk is measured through Z-score. The definition of these variables is available in Table 5.1-2.

Continued

Table 5.8: Effects of Risk on Bank Performance - During Global Financial Crisis (2007-2009)

	Panel C: Conventional Banks						***Panel D: Islamic window banks***					
	ROAA		ROAE		Int-Income		ROAA		ROAE		Int-Income	
	Coef.	*t-Stat*	Coef.	*t-Stat*	Coef.	*t-Stat*	Coef.	*t-Stat*	Coef.	*t-Stat*	Coef.	*t-Stat*
Credit Risk	-0.0062	-0.6600	-0.0012	-0.0200	-0.0064	-0.4800	-0.0321	-0.9600	-0.2864	-1.2600	0.0814	2.1700**
	(0.0094)		(0.0748)		(0.0134)		(0.0336)		(0.2273)		(0.0375)	
Liquidity Risk	0.0044	0.9400	0.0582	1.5700	0.0350	5.3400***	0.0031	0.3200	-0.0577	-0.8700	0.0013	0.1200
	(0.0047)		(0.0371)		(0.0066)		(0.0098)		(0.0661)		(0.0109)	
Operating risk	-0.0247	-7.1700***	-0.2455	-8.8900***	-0.0049	-1.0200	-0.0443	-4.5900***	-0.4156	-6.3800***	0.0006	0.0600
	(0.0034)		(0.0276)		(0.0048)		(0.0096)		(0.0651)		(0.0107)	
Insolvency Risk	0.5109	4.3700***	3.9476	4.2800***	0.3387	2.0900*	0.8298	3.7100***	6.3980	4.2300***	0.7865	3.1500**
	(0.1169)		(0.9233)		(0.1624)		(0.2238)		(1.5123)		(0.2493)	
Total Assets	-0.3504	-3.2400***	-1.6533	-1.8900	0.1518	1.0100	-0.7441	-1.6400	-5.3102	-1.7300*	0.1108	0.2200
	(0.1080)		(0.8749)		(0.1502)		(0.4540)		(3.0677)		(0.5058)	
Non-Interest Income	0.0123	2.6200***	-0.0486	-1.2700	-0.0356	-5.4000***	0.0299	2.4800**	0.0982	1.2100	-0.0042	-0.3200
	(0.0047)		(0.0384)		(0.0066)		(0.0120)		(0.0814)		(0.0134)	
Equity Total Assets	0.0305	2.7800***	-0.4963	-5.6400***	0.0699	4.5000***	-0.0270	-0.4500	-0.7807	-1.9500	0.0576	0.8700
	(0.0110)		(0.0880)		(0.0155)		(0.0594)		(0.4013)		(0.0662)	
Growth of Gross Loans	0.0010	0.6100	0.0207	1.5700	-0.0034	-1.4600	-0.0070	-1.6700**	-0.0693	-2.4500**	-0.0156	-3.3500***
	(0.0017)		(0.0132)		(0.0023)		(0.0042)		(0.0283)		(0.0047)	
Oil Price	0.0012	0.2500	0.0490	1.3400	0.0030	0.4600	0.0136	1.8300**	0.0715	1.4200	-0.0058	-0.7000
	(0.0046)		(0.0366)		(0.0064)		(0.0074)		(0.0503)		(0.0083)	
GDP per Capita	0.0000	0.0300	-0.0002	-0.4300	0.0000	0.7200	-0.0001	-1.2000	-0.0005	-0.8900	0.0000	-0.1200
	(0.0000)		(0.0004)		(0.0001)		(0.0001)		(0.0005)		(0.0001)	
GDP per Capita Growth	0.0569	1.1200	0.5784	1.4500	0.0943	1.3400	-0.0830	-1.6700**	-0.0213	-0.0600	0.0965	1.7400
	(0.0509)		(0.3999)		(0.0705)		(0.0498)		(0.3363)		(0.0554)	
Real Interest Rate	-0.0002	-0.0200	0.0166	0.2100	0.0285	2.0500*	-0.0112	-1.2200	-0.0519	-0.8400	-0.0097	-0.9500
	(0.0100)		(0.0789)		(0.0139)		(0.0091)		(0.0617)		(0.0102)	
_cons	3.8704	4.0300***	36.5313	4.7200***	1.4644	1.1000	8.1769	2.3900**	78.8348	3.4100***	2.2598	0.5900
	(0.9602)		(7.7427)		(1.3298)		(3.4193)		(23.1040)		(3.8092)	
R-Squared	0.3538		0.2750		0.0461		-0.6305		0.3054		0.3498	
Observations	374		371		373		63		63		63	

Note: Credit risk is measured through loan loss provision ratio. Liquidity risk is measured through net loan over total assets. Operating risk is measured through cost to income ratios, and finally insolvency risk is measured through Z-score. The definition of these variables is available in Table 5.1-2.

5.5.3. Sovereign Debt Crisis

Finally, this section reports the results of the risk effect on banks' performance during the global financial crisis (2010-2013). Table 5.9 reports the regression results, with loan loss provisions ratio as credit risk, net loan over total assets ratio as liquidity risk, cost to income ratio as operating risk, and z-score as insolvency risk. The core dependent variable is the return on average assets (ROAA); in addition, the study uses return on average equity (ROAE) and interest income over total assets. The results indicate that the greatest statistically significant coefficient is the operating risk for all types of banks panel, Islamic banks panel, and conventional banks panel. This indicates how important operating risk is, compared to other types of financial risk, to both Islamic and conventional banks. However, the insolvency risk is the most important risk for Islamic window banks. Concerning the impact of credit risk, the results suggest that it is not significant. The results show that a better quality of assets is related to a higher performance of banks. With respect to liquidity, the results show that it is significant for all panels, and as the liquidity decreases so does the performance of the banks. The insolvency risk appears to be associated significantly and negatively. This implies that the more insolvency risk, the less the performance of banks. Finally, we look at the oil price; though not significant, it is negatively associated with performance for all panels. This implies that the higher the oil prices, the less the performance. This is because the oil prices affect the economy of the countries negatively; in addition, the majority of the countries examined in this study are oil importing countries.

Table 5.9: Effects of Risk on Bank Performance - During Sovereign Debt Crisis (2010-2013)

	Panel A: All Banks Types						***Panel B: Islamic Banks***					
	ROAA		ROAE		Int-Income		ROAA		ROAE		Int-Income	
	Coef.	*t-Stat*	Coef.	*t-Stat*	Coef.	*t-Stat*	Coef.	*t-Stat*	Coef.	*t-Stat*	Coef.	*t-Stat*
Credit Risk	0.0118	1.6600	0.1478	3.0400**	0.0111	1.1800	0.0104	0.4000	0.1849	1.3900	0.0333	1.6400
	(0.0071)		(0.0486)		(0.0094)		(0.0260)		(0.1332)		(0.0203)	
Liquidity Risk	-0.0072	-2.5000**	-0.0731	-3.7200***	0.0170	4.4800***	-0.0276	-2.7000**	-0.0616	-1.1800	0.0191	2.3400**
	(0.0029)		(0.0197)		(0.0038)		(0.0102)		(0.0523)		(0.0081)	
Operating risk	-0.0275	-12.2800***	-0.1662	-10.9300***	-0.0158	-5.3900***	-0.0356	-5.4300***	-0.2124	-6.3400***	-0.0089	-1.7300
	(0.0022)		(0.0152)		(0.0029)		(0.0065)		(0.0335)		(0.0052)	
Insolvency Risk	0.6398	8.7100***	4.3280	8.6600***	0.0490	0.5100	0.6782	3.0000**	3.0033	2.6000**	0.1632	0.9300
	(0.0734)		(0.4997)		(0.0957)		(0.2258)		(1.1562)		(0.1755)	
Total Assets	-0.1995	-2.7100**	0.1055	0.2100	-0.1739	-1.8200	-0.6189	-2.1800**	-0.6852	-0.4700	-0.5787	-2.6300**
	(0.0736)		(0.5007)		(0.0958)		(0.2845)		(1.4569)		(0.2202)	
Non-Interest Income	0.0084	3.7200***	0.0280	1.8300	-0.0410	-13.7300***	0.0281	5.4300***	0.1208	4.5600***	-0.0386	-9.4000***
	(0.0022)		(0.0153)		(0.0030)		(0.0052)		(0.0265)		(0.0041)	
Equity Total Assets	0.0537	10.2900***	-0.2924	-8.2400***	0.0316	4.5700***	0.0033	0.2100	-0.2934	-3.6900***	0.0092	0.7700
	(0.0052)		(0.0355)		(0.0069)		(0.0155)		(0.0795)		(0.0120)	
Growth of Gross Loans	-0.0008	-0.7700	-0.0072	-0.9700	-0.0020	-1.4200	0.0006	0.1700	0.0079	0.4400	0.0052	1.9300
	(0.0011)		(0.0074)		(0.0014)		(0.0035)		(0.0178)		(0.0027)	
Oil Price	-0.0014	-0.4000	-0.0227	-0.9800	-0.0060	-1.3400	-0.0133	-1.0800	-0.0380	-0.6000	-0.0145	-1.5200
	(0.0034)		(0.0232)		(0.0045)		(0.0123)		(0.0631)		(0.0095)	
GDP per Capita	0.0000	-0.2900	0.0000	0.0300	0.0001	1.0200	0.0001	1.0700	0.0004	0.8100	0.0001	1.1200
	(0.0000)		(0.0003)		(0.0001)		(0.0001)		(0.0005)		(0.0001)	
GDP per Capita Growth	-0.0004	-0.0200	0.0829	0.7200	-0.0263	-1.1900	-0.0649	-1.5800	-0.0007	0.0000	-0.0129	-0.4000
	(0.0169)		(0.1151)		(0.0220)		(0.0411)		(0.2107)		(0.0319)	
Real Interest Rate	-0.0052	-0.5800	0.0226	0.3700	-0.0159	-1.3500	-0.0195	-0.6800	0.0004	0.0000	-0.0027	-0.1200
	(0.0090)		(0.0614)		(0.0118)		(0.0289)		(0.1479)		(0.0226)	
_cons	3.7094	5.6700***	28.0401	6.2900***	6.0894	7.1400***	7.2330	3.0100***	25.7717	2.0900*	6.9721	3.7400***
	(0.6546)		(4.4572)		(0.8527)		(2.4044)		(12.3123)		(1.8639)	
R-Squared	0.3309		0.1864		0.0008		0.2954		0.0850		0.1121	
Observations	1,072		1,071		1,060		173		173		171	

Note: Credit risk is measured through loan loss provision ratio. Liquidity risk is measured through net loan over total assets. Operating risk is measured through cost to income ratios, and finally insolvency risk is measured through Z-score. The definition of these variables is available in Table 5.1-2.

Continued

Table 5.9: Effects of Risk on Bank Performance - During Sovereign Debt Crisis (2010-2013)

	Panel C: Conventional Banks						***Panel D: Islamic window banks***					
	ROAA			ROAE			ROAA			ROAE		
	Coef.	*t-Stat*		Coef.	*t-Stat*		Coef.	*t-Stat*		Coef.	*t-Stat*	
Credit Risk	-0.0056	-0.7200	0.0223	0.3700	0.0033	0.2600	0.0991	4.6000***	0.7786	4.4200***	-0.0323	-1.1200
	(0.0078)		(0.0603)		(0.0125)		(0.0215)		(0.1763)		(0.0289)	
Liquidity Risk	-0.0012	-0.3900	-0.0558	-2.3400*	0.0181	3.6800***	-0.0165	-2.1100*	-0.1880	-2.9300**	-0.0232	-2.2000**
	(0.0031)		(0.0238)		(0.0049)		(0.0078)		(0.0641)		(0.0105)	
Operating risk	-0.0365	-14.2000***	-0.2107	-10.6400***	-0.0200	-4.9200***	-0.0056	-1.2300	-0.0912	-2.4400**	-0.0177	-2.8900**
	(0.0026)		(0.0198)		(0.0041)		(0.0046)		(0.0373)		(0.0061)	
Insolvency Risk	0.4905	6.0600***	3.9755	6.3700***	-0.0108	-0.0800	0.4903	3.4400***	3.7086	3.1700***	0.2361	1.2300
	(0.0809)		(0.6237)		(0.1280)		(0.1427)		(1.1682)		(0.1912)	
Total Assets	-0.1921	-2.4500*	-0.2698	-0.4500	-0.1826	-1.4800	0.0668	0.4100	1.7231	1.3000	0.1577	0.7300
	(0.0783)		(0.6040)		(0.1236)		(0.1613)		(1.3204)		(0.2161)	
Non Interest Income	-0.0041	-1.3800	-0.0237	-1.0300	-0.0388	-8.2200***	-0.0117	-1.8100	-0.0435	-0.8200	-0.0461	-5.2800***
	(0.0030)		(0.0229)		(0.0047)		(0.0065)		(0.0529)		(0.0087)	
Equity Total Assets	0.0537	9.6400***	-0.3557	-8.2800***	0.0280	3.1000**	0.1154	7.0600***	-0.0286	-0.2100	0.1224	5.5900***
	(0.0056)		(0.0430)		(0.0090)		(0.0163)		(0.1338)		(0.0219)	
Growth of Gross Loans	-0.0005	-0.4400	-0.0085	-0.9500	-0.0047	-2.5800**	0.0017	0.5500	0.0067	0.2600	-0.0095	-2.2900**
	(0.0012)		(0.0090)		(0.0018)		(0.0031)		(0.0255)		(0.0042)	
Oil Price	0.0004	0.1100	-0.0151	-0.5500	-0.0069	-1.2200	-0.0057	-0.8000	-0.0271	-0.4700	-0.0029	-0.3000
	(0.0036)		(0.0275)		(0.0057)		(0.0071)		(0.0578)		(0.0096)	
GDP per Capita	0.0000	-0.9400	-0.0003	-0.8100	0.0000	0.5300	0.0001	0.5300	0.0004	0.4000	0.0000	0.2500
	(0.0001)		(0.0004)		(0.0001)		(0.0001)		(0.0010)		(0.0002)	
GDP per Capita Growth	0.0175	0.9200	0.1541	1.0500	-0.0307	-1.0300	0.0055	0.1400	0.2409	0.7700	-0.0280	-0.5400
	(0.0189)		(0.1462)		(0.0299)		(0.0382)		(0.3130)		(0.0514)	
Real Interest Rate	-0.0122	-1.2600	-0.0051	-0.0700	-0.0151	-1.0000	-0.0040	-0.2300	-0.0294	-0.2100	-0.0237	-1.0100
	(0.0097)		(0.0743)		(0.0152)		(0.0174)		(0.1428)		(0.0234)	
_cons	4.5004	6.5400***	37.2885	7.0200***	7.1528	6.5600***	0.5711	0.4000	12.1652	1.0300	4.8408	2.4900**
	(0.6880)		(5.3120)		(1.0907)		(1.4430)		(11.8144)		(1.9444)	
R-Squared	0.3253		0.2423		0.0000		0.3229		0.0626		0.0186	
Observations	742		741		733		157		157		156	

Note: Credit risk is measured through loan loss provision ratio. Liquidity risk is measured through net loan over total assets. Operating risk is measured through cost to income ratios, and finally insolvency risk is measured through Z-score. The definition of these variables is available in Table 5.1-2.

5.6. Conclusions

The financial crises has highlighted the importance of risk, leading policy makers to focus more on preventing any further financial crises in the future. For instance, the regulatory bodies such as Basel Committee on Banking Supervision (BCBS) are striving to explore and set up new regulations that enhance the performance and stability of the financial institutions. During the financial crises, not all banks performed well, as there was a significant variation in performance (Beltratti and Stulz 2012). The main focus of this paper is to investigate the drivers of financial institutions' performance. In particular, this chapter examines the effect of four different types of risk (credit, liquidity, operating, and insolvency risk) on performance. In addition, our research sheds light on the effect of oil prices in the contraction of performance. We employed a large sample of 950 banks from 55 countries, taking into consideration the different types of financial institutions: Islamic, conventional, and Islamic window banks. We divide the periods into three periods: 2006-2015 (full sample period); 2007-2009 (global financial crisis); and 2010-2013 (sovereign debt crisis).

Remarkably, it can be noted from the statistical regression that operating risk is constantly positive and the most substantial risk in nearly every panel. This can be inferred to mean that the higher the operating risk, the greater performance in those financial institutions, in general and in times of negative shocks in the financial sector, and vice versa. This also highlights the reality that operating risk can be used as a more important predictor of performance when compared to other kinds of risks like liquidity and credit risk.

Moreover, it has been illustrated by our analysis that credit risk is the least significant driver of risk and is not so important in the majority of the regression results in all kinds of banks panels during the three intervals. What this implies is that the performance differences in financial institutions cannot be adequately explained by credit risk. This could be seen as lending support to the perception that the global financial crises began with the credit risk and concluded with operating risk. With regards to the liquidity risk, the results indicate that liquidity risk has substantially more impact on Islamic banks than it has on the conventional and Islamic window banking sectors. What this implies is that maintaining liquidity in Islamic banks is a challenge as it seems substantially and positively interconnected to performance. We also arrive at the conclusion that, in the majority of the regression results, Islamic window banks behave in a different manner from conventional and Islamic financial institutions. During the three intervals of this study, we have arrived at the conclusion that Islamic and conventional banks behave in the same manner. We finally find some evidence

that oil prices are negatively and significantly associated with performance for Islamic financial institutions during the global financial crisis. The result implies that an increase in the oil price leads to lower bank performance. This is probably because most of the sample banks of this study are located in countries where oil is imported.

The results and implications of this chapter can be valuable sources for the policy-makers and regulators, especially in financial institutions. They can use them for developing tools and regulations that can help mitigate future financial crises. In addition, this chapter contributes to the literature regarding the investigation into the determinants of the contraction of performance, particularly during the global and sovereign debt crisis.

Chapter Six: Conclusion

6.1. Summary and Research Findings

Summary: The broad aim of the study was to investigate the determinants of stability in Islamic banks through comparing three different types of banks: Islamic, conventional, and Islamic window banks. Additionally the study investigates the effect of risk on bank performance. To meet this objective, a quantitative approach is followed through collecting data from a large sample of 950 banks from 55 countries of OIC (Organization of Islamic Countries). The focus of the study is on the global financial crisis and sovereign debt crisis: 2006-2015 (full sample period); 2007-2009 (global financial crisis); and 2010-2013 (sovereign debt crisis). The thesis concentrates on the main risks which are credit, liquidity, operating , and insolvency risk. Islamic banks encounter similar types of risks that are faced by conventional banks such as credit and liquidity risk. Despite this theoretical similarity, the extent of these risks is different due to the uniqueness of Islamic banks which follows *Shariah*.

This chapter brings the conclusion of this thesis as it summarizes the findings of all the previous chapters. Firstly, the chapter will present a research summary that highlights the aims and objectives of the thesis. This will be followed by a brief presentation of findings of the three empirical chapters which includes the empirical and theoretical perspectives. The chapter also presents the limitations and motivations for future research.

Findings: Focusing on the difference between Islamic, conventional and Islamic window banks, the aim of this research is to analyze and explore the risk in these financial institutions to improve the practice of the banking industry with regards to risk. Specifically, it aims to analyze four main kinds of risks: (1) credit risk; (2) liquidity risk; (3) operating risk; and (4) insolvency risk. In fulfilling this aim, the objectives of this research are to assess the risk in these financial institutions, particularly Islamic banks in order to find factors determining the risks faced by Islamic banks; to estimate the resilience against pressure from financial crises; and to investigate risk effect on performance of the industry.

The thesis includes three major empirical chapters which are 3, 4, and 5. Chapter 3 investigates the credit and liquidity risk in the three financial institutions, whereas chapter 4 studies the operating and insolvency risk. Chapter 5 examines the effect of risk on banks performance. In addition to these major chapters, there are three other chapters (1, 2, 6), namely introduction, principles of Islamic banks and conclusions respectively.

It is illustrated, by the findings, that in comparison to conventional banks, Islamic banks are not as profitable and efficient. This could probably be explained by the reality that Islamic

banks are more conservative. Islamic banks also show a significantly greater potential for the growth of assets. This lends support to the assertion that Islamic banks are among some of the fastest growing subsectors of the broader financial sector. With regards to diversification, the non-interest income ratio is considerably greater in Islamic banks; implying that there is greater diversification in Islamic banks. The results also show that Islamic window banks are bigger in size; suggesting that it is large banks that usually have Islamic windows. We also conclude that bank-specific characteristics have a positional impact on risk stability.

Findings made by this study provide evidence that there is a substantial variance in risk between the three types of banks. They make the suggestion that the quality of assets in Islamic banks is better than that of Islamic window and conventional banks. In comparison, liquidity risk is much higher in Islamic banks, when compared to conventional banks; especially during sovereign debt crisis. The reason behind this reality could probably be that Islamic banks have not taken measures to appropriately alter and prove their risk management, following the global financial crisis. Therefore, our conclusions propose that Islamic banks did not adjust their business culture and strategies with regards to liquidity as a result of their performance during the global financial crisis. Generally, it is shown by the results that conventional banks are in a better position when they are compared to Islamic banks with regards to liquidity.

Furthermore, we find that the stability of Islamic banks is determined differently compared to conventional and Islamic window banks by some factors. For instance, bank prudence has a substantial influence on the credit risk of Islamic banks only. In contrast, we find that Islamic bank's credit risk is not sensitive to diversification ratio compared to conventional and Islamic window banks. Moreover, concerning the liquidity ratio, we find that cost to income ratio is also significantly related with liquidity risk in Islamic and banks, however the results are conflicting. In contrast, the evidence from conventional banks is positive and significant. Hence, it is suggested that the policy makers and regulators make different regulations for each type of the financial institutions.

This study's statistical results make the suggestion that the insolvency and operating risk levels differ considerably. It is illustrated by the results that, during the study period, Islamic banks have higher levels of operating risk. The empirical findings also make the suggestion that, when compared to Islamic window and conventional banks, Islamic banks tend to have more insolvency risk during the sovereign debt crisis and global financial crisis. However, it can be concluded that Islamic banks show better performance during the sovereign debt crisis: since there are no significant results during this period when compared to the global

financial crisis. The reason behind this could be related to the fact that, following the global financial crisis, Islamic banks may have altered the manner in which they manage risk. Therefore, we arrive at the finding that Islamic banks indeed altered their business culture and strategy with regards to insolvency risk as a consequence of the way they performed during the global financial crisis. Also, the results show that Islamic window and conventional banks are not necessarily in a better position, with regards to sustainability, in comparison to Islamic banks, with regards to insolvency and operating risk.

Fascinatingly, it is shown by the statistical regressions that operating risk is constantly positive and the most substantial risk in nearly all panels. What this implies is that there is better performance for those banking sectors with more operating elements that are more efficient. It also suggests that the performance of banks is more robust and better in general and also in times when the financial sector is experiencing negative shocks and vice versa. This also brings to the fore the reality that operating risk can be used as a more substantial forecaster of performance than other forms of risks like liquidity and credit risks.

Our analysis goes further to indicate that credit risk is the least important driver of risk and has no significance in the majority of regression results in all forms of bank panels, during all the three intervals. This can be understood to imply that performance variance in financial institutions cannot be sufficiently explained using credit risk alone. This could lend credence to the suggestion that credit risk prompts global financial crisis and operating risk ends it. Regarding liquidity risk, conclusions from the study illustrate that Islamic banks are impacted on more by liquidity risk than is the case with Islamic window and conventional banks. This also indicates that for Islamic banks, the biggest challenge is liquidity as it looks like it is not only significant, but also positively correlated to performance. We also arrived at the conclusion that, in most of the regression results, Islamic window banks behave in a different manner when compared to conventional and Islamic financial institutions. We conclude that during the three intervals, conventional and Islamic banks behave in the same manner.

Finally, we unearth some proof showing that there is significant and negative association between oil prices and performance of Islamic banking institutions during the global financial crisis. The implication of such a result is that as prices of oil increase, the performance of banks lowers. This could be because the majority of banks sampled are located in countries where oil is imported in.

6.2. Policy Implications

This research makes a contribution to the currently available literature with regards to performance and risk. Furthermore, based on the found empirical results, this study has some implications and recommendations for the banking regulators of Islamic, conventional, and Islamic window banks, policy-makers, practitioners, academics, and business partners. Additionally, these results are beneficial in assessing the levels of risk in the banking sector, particularly in Islamic banks, for regulative bodies such as AAOIFI, IFSB, central banks, and institutional stakeholders. It is recommended, by this research, that all parties improve the way they manage risk and also that they create novel strategies for performance and risk management. The findings provide evidence that enables policy-makers to pursue regulations that promote the risk level so that banks can withstand financial crises.

In particular, this study pointed to the strengths and the weakness of Islamic banks with respect to risk management practice. This study helps them to enhance and promote their current situation, processes and procedures relating to risk management.

For instance, it can be concluded that Islamic banks are less liquid compared to the conventional and Islamic window banks, especially during the sovereign debt crisis. Accordingly, Islamic banks have to change their strategy to perform better during financial crises. Additionally, one of the key factors affecting the liquidity in Islamic banks is the lack of globally accepted standards, which should be taken into account in order to promote the liquidity level of Islamic banks.

This study also emphasizes the need for improving the risk status of conventional banks. For instance, the study shows that conventional banks need to work to improve the credit risk of their operations.

Moreover, the findings suggest that Islamic banks' risk is generally determined differently from conventional and Islamic window banks by bank-specific factors. Hence, it is suggested that the policy-makers and regulators make different regulations for each type of financial institution. Furthermore, the policy-makers should pay more attention to the operating risk, as it has been the most significant risk influencing the banks' performance for all the three financial institutions.

There are also practical implications for academicians through the opening up of new areas of studies, such as examining the most influenced risk for each banks' model. Moreover, the addition to the risk management model will be helpful to conduct further research studies.

6.3. Limitations and Suggestions for Further Studies

As no study can ever reach a stage of perfection, this one also has its limitations. Despite the fact that this research place great emphasis the common important types of risks, which are credit, liquidity, operating , and insolvency risk; there are others types that have not been explored, such as market risk that, should have been examined. Furthermore, there are other risks which have not been investigated in this study, which exist only in Islamic banks such as *Shariah Compliance Risk.*

It should also be noted, that these measures of risk only partly reflect the risk value: since variation across banks may be due to regional cultural and regulatory differences because each region has its unique philosophy in dealing with risk such as internal policies in terms of impaired loan classification, reserve requirements, and write-off policies. Therefore, for further studies, it is suggested to divide the banks into regions.

The fact that this study utilized only the quantitative methodology can be considered a limitation. This research has not included other stakeholders such as the customers and regulators. It would be useful to obtain the regulators' and customer's views on the issues discussed in this research using qualitative research methodology or it could be achieved through using mixed methodologies that encompasses both qualitative and quantitative approaches in answering the thesis questions.

Given the importance of different types of risks, it would be useful to assess the relationship between these risks rather than just examining the effect of risk on bank performance, taking into consideration the different types of financial institutions, to test the theoretical argument.

The results of the research are limited only within Islamic banks. The research does not examine the broader Islamic Banking industry such as Islamic microfinance, insurance companies, *takaful*, brokers, Islamic social funds, and Islamic development funds. Thus, the scope for improvement and further study is still wide. Based on the limitations of this research as detailed above, future researchers can either work on improving the limitations or using the suggestions for further studies.

Appendix:

Table A1: Effects of Risk on Performance- Full Sample Period (2006-2015)

	Panel A: All Banks Types						***Panel B: Islamic Banks***					
	ROAA		ROAE		Int-Income		ROAA		ROAE		Int-Income	
	Coef.	*t-Stat*	Coef.	*t-Stat*	Coef.	*t-Stat*	Coef.	*t-Stat*	Coef.	*t-Stat*	Coef.	*t-Stat*
Loan Loss Provision	-0.0842***	-7.3200	-0.5900***	-8.1400	0.0032	1.3900	-0.1143***	-2.9300	-0.0414	-0.7000	-0.0053	-0.7800
	(0.0115)		(0.0724)		(0.0023)		(0.0390)		(0.0595)		(0.0068)	
Net Loans / Total Asset	-0.0188***	-14.6000	-0.0679***	-8.3700	0.0002	0.6300	-0.0391***	-10.7900	-0.0812***	-3.7400	-0.0004	-0.9300
	(0.0013)		(0.0081)		(0.0003)		(0.0036)		(0.0217)		(0.0004)	
Cost to Income Ratio	-0.0332***	-28.2500	-0.2057***	-27.7400	-0.0006***	-3.2400	-0.0431***	-13.3900	-0.2163***	-11.6300	-0.0015***	-3.5500
	(0.0012)		(0.0074)		(0.0002)		(0.0032)		(0.0186)		(0.0004)	
Z score	0.3972***	10.9200	4.1210***	18.0100	-0.0050	-1.0000	0.5440***	5.0200	4.5420***	8.1000	-0.0310***	-3.1900
	(0.0364)		(0.2288)		(0.0050)		(0.1084)		(0.5609)		(0.0097)	
_cons	4.4700***	43.1800	27.4648***	42.0400	0.1697***	8.7600	6.2528***	21.0200	26.6516***	15.3700	0.2724***	7.4800
	(0.1035)		(0.6533)		(0.0194)		(0.2975)		(1.7335)		(0.0364)	
R-Squared	0.1723		0.1857		0.0204		0.3358		0.2725		0.0615	
Observations	5,212.00		5,106.00		1,209.00		860.00		720.00		236.00	

	Panel C: Conventional Banks						***Panel D: Islamic window banks***					
	ROAA		ROAE		Int-Income		ROAA		ROAE		Int-Income	
	Coef.	*t-Stat*	Coef.	*t-Stat*	Coef.	*t-Stat*	Coef.	*t-Stat*	Coef.	*t-Stat*	Coef.	*t-Stat*
Loan Loss Provision	-0.0898***	-7.0300	-0.6684***	-7.5000	0.0046	1.7500	-0.0326	-1.1300	-0.6697***	-3.9400	0.0035	0.5400
	(0.0128)		(0.0891)		(0.0026)		(0.0288)		(0.1699)		(0.0064)	
Net Loans / Total Asset	-0.0133***	-8.9500	-0.0633***	-6.1400	0.0004	0.9900	-0.0190***	-5.0700	-0.1299***	-5.8900	-0.0002	-0.2700
	(0.0015)		(0.0103)		(0.0004)		(0.0037)		(0.0221)		(0.0008)	
Cost to Income Ratio	-0.0332***	-24.0700	-0.2234***	-23.1300	-0.0004	-1.6500	-0.0236***	-7.9500	-0.1620***	-9.2600	-0.0018***	-2.8200
	(0.0014)		(0.0097)		(0.0003)		(0.0030)		(0.0175)		(0.0006)	
Z-score	0.4083***	9.5900	3.9224***	13.2200	-0.0017	-0.2500	0.3244***	4.2100	3.6185***	7.9700	0.0068	0.6700
	(0.0426)		(0.2966)		(0.0070)		(0.0771)		(0.4540)		(0.0101)	
_cons	4.2074***	35.2400	29.1680***	34.8900	0.1438	5.6000	3.6509***	13.3400	26.7133***	16.5700	0.2231***	4.1100
	(0.1194)		(0.8360)		(0.0257)		(0.2737)		(1.6122)		(0.0543)	
R-Squared	0.1473		0.1702		0.0182		0.1686		0.2530		0.0418	
Observations	3,552.00		3,536.00		679.00		709.00		709.00		294.00	

Table A2: Effects of Risk on Performance- Global Financial Crisis (2007-2009)

	Panel A: All Banks Types						***Panel B: Islamic Banks***					
	ROAA		ROAE		Int-Income		ROAA		ROAE		Int-Income	
	Coef.	*t-Stat*	Coef.	*t-Stat*	Coef.	*t-Stat*	Coef.	*t-Stat*	Coef.	*t-Stat*	Coef.	*t-Stat*
Loan Loss Provision	-0.0992***	-4.1100	-0.9364***	-6.0800	-0.0100	-0.9300	-0.0903	-1.1000	0.0404	0.9100	0.0134	0.4500
	(0.0241)		(0.1541)		(0.0108)		(0.0819)		(0.3554)		(0.0297)	
Net Loans / Total Asset	-0.0181***	-6.3300	-0.0275	-1.5200	0.0004	0.4400	-0.0418***	-5.2400	-0.0476	0.1700	-0.0010	-0.5900
	(0.0029)		(0.0181)		(0.0009)		(0.0080)		(0.0346)		(0.0017)	
Cost to Income Ratio	-0.0334***	-12.3800	-0.2421***	-14.1200	0.0004	0.4600	-0.0410***	-4.7000	-0.2150***	0.0000	-0.0043*	-2.0800
	(0.0027)		(0.0172)		(0.0009)		(0.0087)		(0.0378)		(0.0021)	
Z-score	0.5025***	5.9600	4.4380***	8.2600	0.0151	0.6000	1.1603***	4.2400	8.1032***	0.0000	0.0882	1.8300
	(0.0844)		(0.5370)		(0.0252)		(0.2737)		(1.1874)		(0.0481)	
_cons	4.5560***	19.5300	29.0974***	19.6200	0.1631**	2.5700	6.4396***	9.2000	25.0982***	0.0000	0.4395***	3.4800
	(0.2333)		(1.4834)		(0.0634)		(0.6998)		(3.0363)		(0.1263)	
R-Squared	0.1933		0.2152		0.0060		0.4068		0.3611		0.3025	
Observations	1,134.00		1,127.00		80.00		173.00		173.00		20.00	

	Panel C: Conventional Banks						***Panel D: Islamic window banks***					
	ROAA		ROAE		Int-Income		ROAA		ROAE		Int-Income	
	Coef.	*t-Stat*	Coef.	*t-Stat*	Coef.	*t-Stat*	Coef.	*t-Stat*	Coef.	*t-Stat*	Coef.	*t-Stat*
Loan Loss Provision	-0.1197***	-7.0300	-1.2554***	-6.5300	-0.0270**	-2.2300	-0.1024**	-2.3000	-0.6697***	-3.9400	0.0119	0.5400
	(0.0264)		(0.1923)		(0.0121)		(0.0446)		0.1699		(0.0219)	
Net Loans / Total Asset	-0.0094***	-8.9500	-0.0053	-0.2200	0.0023	1.6100	-0.0152**	-2.7400	-0.1299***	-5.8900	0.0002	0.0600
	(0.0033)		(0.0236)		(0.0015)		(0.0055)		0.0221		(0.0031)	
Cost to Income Ratio	-0.0335***	-24.0700	-0.2445***	-11.4700	0.0032**	2.9500	-0.0464***	-8.1600	-0.1620***	-9.2600	-0.0055	-1.7100
	(0.0029)		(0.0213)		(0.0011)		(0.0057)		0.0175		(0.0032)	
Z-score	0.3743***	9.5900	3.5070***	5.1500	-0.0487	-1.4200	0.6344***	4.7600	3.6185***	7.9700	-0.1120	-1.3200
	(0.0937)		(0.6812)		(0.0342)		(0.1333)		0.4540		(0.0850)	
_cons	4.1861***	35.2400	29.8896***	15.7900	0.0144	0.1500	4.4708***	10.5900	26.7133***	16.5700	0.3879*	1.8500
	(0.2608)		1.8930		(0.0965)		(0.4223)		1.6122		(0.2098)	
R-Squared	0.1569		0.1879		0.2480		0.3534		0.3326		0.2480	
Observations	816.00		809.00		39.00		145.00		145.00		294.00	

Table A3: Effects of Risk on Performance- Sovereign Debt Crisis (2009-2013)

Panel A: All Banks Types

	ROAA		ROAE		Int-Income	
	Coef.	*t-Stat*	Coef.	*t-Stat*	Coef.	*t-Stat*
Loan Loss Provision	-0.0522***	-2.9500	-0.3041***	-2.7400	0.0063	1.9300
	(0.0177)		(0.1108)		(0.0033)	
Net Loans / Total Asset	-0.016***	-8.0900	-0.0601***	-4.8200	0.0008*	2.0400
	(0.0020)		(0.0125)		(0.0004)	
Cost to Income Ratio	-0.0363***	-19.5900	-0.1903***	-16.3700	-0.0013***	-4.5100
	(0.0019)		(0.0116)		(0.0003)	
Zscore	0.3416***	6.2400	4.1435***	12.0500	-0.0047	-0.7200
	(0.0548)		(0.3438)		(0.0066)	
_cons	4.4649***	27.7900	25.6319***	25.4400	0.1652***	6.1400
	(0.1606)		(1.0075)		(0.0269)	
R-Squared	0.1707		0.1644		0.0755	
Observations	2,185.00		2,183.00		667.00	

Panel B: Islamic Banks

	ROAA		ROAE		Int-Income	
	Coef.	*t-Stat*	Coef.	*t-Stat*	Coef.	*t-Stat*
Loan Loss Provision	-0.0801	-1.4400	-0.1867	-0.6900	-0.0131	-1.2400
	(0.0554)		(0.2704)		(0.0105)	
Net Loans / Total Asset	-0.0355***	-6.3000	-0.0609**	-2.2200	-0.0006	-0.8700
	(0.0056)		(0.0275)		(0.0007)	
Cost to Income Ratio	-0.0470***	-9.8900	-0.2165***	-9.3400	-0.0018***	-3.7900
	(0.0048)		(0.0232)		(0.0005)	
Zscore	0.4467**	2.7400	4.5433***	5.7000	-0.0420***	-3.7300
	(0.1633)		(0.7967)		(0.0113)	
_cons	6.1421***	13.5400	25.7395***	11.6300	0.3150***	6.1000
	(0.4536)		(2.2126)		(0.0517)	
R-Squared	0.1568		0.2594		0.0929	
Observations	384.00		384.00		122.00	

Panel C: Conventional Banks

	ROAA		ROAE		Int-Income	
	Coef.	*t-Stat*	Coef.	*t-Stat*	Coef.	*t-Stat*
Loan Loss Provision	-0.0750***	-3.7100	-0.3774**	-2.6800	0.0076*	2.2200
	(0.0202)		(0.1406)		(0.0034)	
Net Loans / Total Asset	-0.0096***	-4.2500	-0.0497***	-3.1700	0.0007	1.5900
	(0.0023)		(0.0157)		(0.0004)	
Cost to Income Ratio	-0.0395***	-17.3700	-0.2119***	-13.3800	-0.0016***	-4.5900
	(0.0023)		(0.0158)		(0.0004)	
Zscore	0.2986***	4.6300	3.9134***	8.7200	-0.0067	-0.8000
	(0.0644)		(0.4489)		(0.0084)	
_cons	4.4127***	23.5500	27.3170***	20.9500	0.1849***	5.8700
	(0.1874)		(1.3041)		(0.0315)	
R-Squared	0.1568		0.1491		0.0971	
Observations	1,496.00		1,494.00		384.00	

Panel D: Islamic window banks

	ROAA		ROAE		Int-Income	
	Coef.	*t-Stat*	Coef.	*t-Stat*	Coef.	*t-Stat*
Loan Loss Provision	0.0800	1.6900	-0.0813	-0.3100	0.0029	0.2700
	(0.0473)		(0.2654)		(0.0105)	
Net Loans / Total Asset	-0.0301***	-4.5300	-0.1738***	-4.6800	0.0000	-0.0300
	(0.0066)		(0.0372)		(0.0012)	
Cost to Income Ratio	-0.0098**	-2.1400	-0.0709**	-2.7700	-0.0016	-1.6600
	(0.0046)		(0.0256)		(0.0010)	
Zscore	0.3751***	2.8500	3.6441***	4.9400	0.0258	1.6600
	(0.1315)		(0.7374)		(0.0155)	
_cons	3.4032***	7.2800	23.5374***	8.9800	0.2042***	2.3100
	(0.4675)		(2.6208)		(0.0884)	
R-Squared	0.0442		0.3326		0.0504	
Observations	305.00		305.00		161.00	

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