FINANCIAL STABILITY AND LIQUIDITY:
EVIDENCE FROM CONVENTIONAL AND ISLAMIC
BANKS IN THE GCC REGION

Doctorial Thesis

Doctor of Business Administration (DBA)

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DECLARATION

I hereby certify that the work embodied in this Dissertation Project is the result of original research and has not been submitted for a higher degree to any other University or Institution.

Salwa Shafik
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Thank you, Lord, for always being there for me.
ABSTRACT

This thesis examines the determinants of banks’ financial stability in countries of the Gulf Cooperation Council (GCC). In particular, we estimate empirical models using the Generalized Method of Moments (GMM) to test four hypotheses concerning the determinants of financial stability of conventional and Islamic banks. Our results are as follows: (i) Bank liquidity has a positive effect on its financial stability; and an increase in bank liquidity causes conventional banks in the GCC region to be more financially stable than their Islamic counterparts; (ii) Bank income diversity has a positive effect on its financial stability; (iii) Islamic banks on average are less financially stable than commercial banks; and (iv) The Global Financial Crisis (GFC) had no impact on banks’ financial stability in the GCC region. This study contributes to the academic literature in many different ways. Empirical research into bank financial stability and its determinants in the GCC region appears to be relatively scarce. Therefore, this study contributes to the banking literature by being the first to investigate the impacts of liquidity, income diversity, bank type and the GFC on banks’ financial stability in the GCC region.
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<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2SLS</td>
<td>2 Stage Least Squares</td>
</tr>
<tr>
<td>AAOIFI</td>
<td>Accounting and Auditing Organization for Islamic Financial Institutions</td>
</tr>
<tr>
<td>BCBS</td>
<td>Basel Committee on Banking Supervision</td>
</tr>
<tr>
<td>BIS</td>
<td>Bank for International Settlements</td>
</tr>
<tr>
<td>CDS</td>
<td>Credit Default Swap</td>
</tr>
<tr>
<td>CoVAR</td>
<td>Covariance Value-At-Risk Model</td>
</tr>
<tr>
<td>FDI</td>
<td>Foreign Direct Investment</td>
</tr>
<tr>
<td>GCC</td>
<td>Gulf Cooperation Council</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
</tr>
<tr>
<td>GFC</td>
<td>Global Financial Crisis</td>
</tr>
<tr>
<td>GMM</td>
<td>Generalized Method of Moments</td>
</tr>
<tr>
<td>IAS</td>
<td>International Accounting Standards</td>
</tr>
<tr>
<td>IMF</td>
<td>International Monetary Fund</td>
</tr>
<tr>
<td>IVS</td>
<td>Instrumental Variables</td>
</tr>
<tr>
<td>LLR</td>
<td>Lender of Last Resort</td>
</tr>
<tr>
<td>OLS</td>
<td>Ordinary Least squares</td>
</tr>
<tr>
<td>Acronym</td>
<td>Description</td>
</tr>
<tr>
<td>---------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td>PD</td>
<td>Probability of Default</td>
</tr>
<tr>
<td>PLS</td>
<td>Profit-and-Loss Sharing</td>
</tr>
<tr>
<td>PSIA</td>
<td>Profit Sharing Investment Account</td>
</tr>
<tr>
<td>UAE</td>
<td>United Arab Emirates</td>
</tr>
<tr>
<td>VaR</td>
<td>Value-at Risk</td>
</tr>
<tr>
<td>VIF</td>
<td>Variance Inflation Factor</td>
</tr>
</tbody>
</table>
CHAPTER 1: INTRODUCTION

1.1 Introduction

This thesis investigates factors determining the financial stability of banks within the Gulf Cooperation Countries (GCC). The central aim of this thesis is to empirically examine the significance of bank liquidity with respect to financial stability. The roles played by bank type (Islamic vis-à-vis conventional banks), income diversity, and the global financial crisis (GFC) in influencing the financial stability of banks are also examined.

The remainder of Chapter 1 is organised as follows. Section 1.2 describes the background and motivation for this thesis. Section 1.3 defines the research objective, with Section 1.4 presenting the data, methodology and results of the thesis. Section 1.5 lists the contributions and implications of the study. Section 1.6 details the thesis organisation and contents, and Section 1.7 concludes the chapter.

1.2 Background and Motivation

The recent GFC emphasised the lack of sound macro-prudential tools available for measuring and mitigating systemic solvency risk. The crisis also revealed that bank liquidity risk had substantial consequences for the stability and resilience of financial systems. The events of 2008 highlighted the wide-ranging and deep-rooted structural problems of the global financial system in terms of its soundness, stability and resilience.
While there is a large body of literature treating financial stability within the conventional banking system, there are few empirical studies covering the GCC region. Hence, it remains an under-researched area. This thesis attempts to address this gap, with a particular focus on the liquidity levels of banks and solvency risk implications.

The GFC has brought the impact of liquidity on economic and financial stability under scrutiny. On a global level, bank liquidity is viewed as having major influences on the financial system and real economy. It can promote risk-taking and drive up asset prices with negative consequences for bank stability within a market (Borio and Zhu, 2012). In response, the Basel Committee on Banking Supervision has proposed a new set of liquidity requirements, known as Basel 3, to complement its revised capital requirements framework, Basel 2. Hence, solvency and liquidity levels are now the two main pillars of banking. The former depends on the degree of credit creation and quality of investments and is influenced by the number of defaulters and investment growth, both of which can lead to unexpected losses. The latter arises from the maturity transformation function in banking as acquiring short-term liabilities to fund longer-term assets cause banks to be vulnerable to liquidity runs and shortfalls. Thus, maturity transformation gives rise to liquidity risk. This risk has grown exponentially in the last decade, along with disintermediation, globalisation, lax supervision and relaxed market discipline. Overall, lack of liquidity

---

1 Relaxed market discipline may induce small financial intermediaries to merge and be protected by “too-large-to fail” umbrella.
within bank portfolios can lead to large losses in asset/liability, as it generates financial distress and possibly insolvency. Therefore, liquidity transformation creates two extremes, i.e., the rationale for the existence of banks at one end and their vulnerability/exposure to other bank runs at the other (Diamond and Dybvig, 1983).

The GFC has highlighted the limitations of such a view of bank solvency, and has emphasised the inherent interdependencies between solvency and liquidity. The GFC has also shown that a number of banks facing liquidity risks may ultimately lead to systemic risk across the whole economy (Peacock et al., 2003), since liquidity risk is a function of system-wide market interferences. This phenomenon was witnessed throughout 2008, where an extreme lack of liquidity resulted in the failure of banks such as Lehman Brothers, Bear Stearns and Northern Rock. Therefore, extreme market conditions are likely to result from major market or credit losses. This highlights that liquidity and solvency are inherently connected within the banking sector. Furthermore, liquidity requirements could have significant consequences for restraining solvency risk as well as encouraging better risk management practices in banking.

An integrated risk framework is needed to assess the optimal levels of capital and liquidity required to support business plans, while adequately considering the carrying cost of liquidity buffers and the high opportunity cost of liquid asset portfolios. Since capital cannot mitigate liquidity risk, the latter needs to be explicitly reflected in a bank’s risk appetite statement,
including its impact on other risk types. As the global financial crisis permeated across all financial markets, it left no country or region immune to such market volatility.

This thesis focuses on financial stability within the Gulf Cooperation Countries (GCC), a unique region within the Middle East. Banks have known to collapse within the GCC region (Henry & Wilson, 2004), but not on as large a scale as evidenced across the global financial markets throughout the 2008 crisis. Bank assets within the GCC are growing at a rate of 15% every year (Ainley et al., 2007), and such progression will eventually cause analysts and central bankers to question their banks’ financial stability. Enhancing the resilience and stability of these banks involves the development of a vigorous national and international liquidity infrastructure. This is at present underdeveloped in nearly all of the countries in which Islamic finance services are offered. Previous empirical literature has only considered financial stability differences between Islamic and conventional banks based on size effects or the relative share of Islamic banks in the financial market. There is a gap in the empirical literature with respect to bank-specific endogenous factors causing variations in financial stability within the GCC region.

There is a large body of literature treating financial stability within the conventional banking system, with theoretical arguments discussing risks and the regulatory challenges in Islamic banking (Sundararajan & Errico, 2002; Sole, 2007; Jobst, 2007; Yudistira, 2004; Moktar, Naziruddin & Al-Habashi, 2006; Srairi, 2010). However, there are only a limited
number of empirical studies in this area. In particular, there is a paucity of empirical studies for the GCC region addressing individual banks’ liquidity levels and solvency risk implications. Hence, it remains an under-researched area. This thesis attempts to address this gap in the literature by empirically investigating the key factors determining the financial stability of banks in the GCC region.

The final motivation for this thesis is in connection with the econometric modelling aspect of the research question. So far, all studies reporting on this topic have not controlled for endogeneity issues amongst the variables. The present study makes use of a Generalized Method of Moments (GMM) estimation to evaluate the association of financial stability and liquidity within the GCC context. The justification for such an approach is based on the lack of understanding of whether liquidity affects financial stability or financial stability affects liquidity.

1.3 Research Objective

The key objective of this thesis is to gain a better understanding of the financial stability of banks within the GCC region. To achieve this, the following research question is addressed: “What are the determinants of banks’ financial stability in the GCC region?” To assess this question, we used the literature in order to develop four hypotheses, testing the impact of liquidity, income diversity, bank type (i.e., Islamic versus conventional bank cohort) and pre- and post-GFC proxies on the financial stability of banks. We also placed interaction variables between: (i) liquidity, income diversity...
and Islamic/conventional cohort; and (ii) Islamic/conventional cohort and pre- and post-financial crisis in order to evaluate the impact of such variables on banks’ financial stability.

1.4 Data, methodology and results

The sample consists of annual data from conventional and Islamic banks in Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and U.A.E, better known as the Gulf Cooperation Countries. The sample period is 2005-2012, with the cut-off for the Global Financial Crisis assumed to be 2009 (Beck, Demirguc-Kunt & Merrouche, 2013). Annual bank-specific data was gathered from Bankscope (Fitch Ratings & Bureau van Dijk, 2011), while country-specific macroeconomic data was gathered from the World Economic Outlook (IMF, 2012) database.

The estimation model has a financial stability proxy as its dependent variable, with a number of variables of interest together with control variables. Other variables are included to test the robustness of the results. As the literature is unclear as to whether liquidity affects financial stability or vice versa, a Generalized Method of Moments (GMM) estimation model was implemented. The GMM estimators mitigate the endogeneity problem within the prescribed model.

The key hypotheses tested in the thesis are outlined in Table 1.1. Our empirical results suggest that an increase in bank liquidity causes conventional banks to be more financially stable than their Islamic
counterparts in the GCC region. An increase in bank income diversity is found to be conducive to financial stability. However, the results reject the popular notion that Islamic banks are more financially stable than commercial banks. In general, we do not observe any detrimental effects of the GFC on the financial stability of GCC banks. In terms of asset quality proxies employed in addition to Z-score (financial stability), we find that liquidity exerts no statistically significant effect on both of the two chosen asset quality variables.

Table 1.1: Research question and hypotheses

Research question: What are the determinants of banks’ financial stability in the GCC region?

<table>
<thead>
<tr>
<th>Determinant</th>
<th>Hypothesis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquidity</td>
<td>$H_{1A}$: A bank's liquidity has a positive effect on its financial stability.</td>
</tr>
<tr>
<td></td>
<td>SUPPORTED</td>
</tr>
<tr>
<td></td>
<td>$H_{1B}$: Increases in bank liquidity cause conventional banks in the GCC region to be more financially stable than their Islamic counterparts.</td>
</tr>
<tr>
<td></td>
<td>SUPPORTED</td>
</tr>
<tr>
<td>Income Diversity</td>
<td>$H_2$: A bank's income diversity has a positive effect on its financial stability.</td>
</tr>
<tr>
<td>Bank type (Islamic vs. Conventional)</td>
<td>SUPPORTED</td>
</tr>
<tr>
<td>Global Financial Crisis</td>
<td>$H_3$: Islamic banks are more financially stable than commercial banks.</td>
</tr>
<tr>
<td></td>
<td>REJECTED</td>
</tr>
<tr>
<td></td>
<td>$H_4$: The GFC had a negative impact on banks’ financial stability in the GCC region.</td>
</tr>
<tr>
<td></td>
<td>REJECTED</td>
</tr>
</tbody>
</table>
1.5 Contributions and limitations

This is the first study to investigate the factors determining the financial stability of banks specifically focusing on the GCC region. There have been a number of studies investigating this topic within the Middle East and North Africa, but none have specifically addressed this unique region which is moving towards increased economic integration and possibly monetary union in the near future.

A GMM estimation model was employed to mitigate any endogeneity issues within the prescribed model. Overall, the positive effect of liquidity and income diversity on bank financial stability suggests that the GCC region operates in line with the rest of the banking system. But when liquidity is considered alongside bank type, it is the conventional banks that are more financially stable. This phenomenon may be attributed to Islamic banks’ liquidity risk management, which is generally more complex due to their limited range of Shari’ah-compliant short-term instruments. Furthermore, funding channels between Islamic banks and their respective central banks are also limited.

In terms of bank type, this is the first study of the GCC region to note that conventional banks are on average more stable than their Islamic counterparts. However, there is also an issue of scale at play. Large conventional banks are more stable than their Islamic counterparts, whereas small Islamic banks are more financially stable than their conventional counterparts. These results may well be attributed to a higher portfolio
concentration of fixed assets together with equity investments, which decreases the overall financial stability of large Islamic banks.

Furthermore, this is the first studies to assess the impact (if any) of the GFC on banks’ financial stability specifically in the GCC region. We will therefore indirectly assess the effectiveness of the local governments’ stimuli packages and capital injection programs on the region’s banking system.

Although there are a number of proxies for liquidity\(^2\), one of the main limitations of this study is that the findings are limited to the specific proxies adopted. We attempted to employ other measures that represent liquidity; however, the lack of data precluded us from utilising this ratio\(^3\). We were faced with the same scenario when we attempted to locate more control variables, but were limited in terms of the data. Notwithstanding this, the models are well diversified in terms of variables and we performed a number of robustness tests to determine the consistency of the results.

1.6 Thesis organisation and contents

This thesis is organised as follows. Chapter 2 provides an overview of the literature which examines the association between banks’ financial stability and liquidity. Chapter 3 discusses the data and the methodology employed to execute this study. Chapter 4 reports the results. Finally, in Chapter 5, the

\(^2\) This study uses three proxies of liquidity. The first proxy is the ratio of liquid assets/assets. The second proxy is the ratio of liquid assets to deposit and short-term funding. The third proxy is the ratio of loans to total assets (asset mix).

\(^3\) The Liquidity Coverage Ratio (LCR).
principal conclusions and implications of this thesis are presented. A discussion of the limitations of each study, and directions for future research, are also included.

1.7 Summary
This chapter has stated the main objective of this thesis, and listed the research question and hypotheses for achieving this objective. The motivation was outlined, together with the structure, content and contribution to the literature. Next, Chapter 2 provides an overview of the literature discussing the association of financial stability and liquidity within a GCC context.
CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter reviews the academic literature on the impacts of bank liquidity, income diversity, bank type and the global financial crisis on banks’ financial stability. The global financial crisis (GFC) has exacerbated issues concerning the stability and resilience of the financial systems across financial markets. The crisis was system-wide crises whose amplitude is unparalleled in current finance. It is systemic, in that it extends across the entire financial system. Stability of any financial system is a key to a sound economic environment. Conversely, instability has an adverse effect on the entire system.

Financial systems are prone to periods of instability; in recent years countries throughout the world have experienced severe bouts of financial instability. Typically, financial systems are affected by business cycles, where periods of instability follow periods of considerable growth. Fisher's (1933) seminal work attempted to address the possible causes leading to financial instability, arguing that there are two possible factors at play: (i) over-indebtedness in connection to equity, gold, or earnings, which instigates a boom phase; and (ii) deflation consisting of a decline in asset

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4 The term ‘financial instability’ means things such as the collapse of financial institutions, or the seizure of the financial system, or what Milne (2009b) describes as the ‘widespread disruption of financial flows’. 
value or a drop in the price level which instigates a depression phase. Fisher argues that the creation of the asset bubble emanates from over-indebtedness and over-speculation. Such an effect would be less serious if it was not funded by leverage in an imprudent manner as over-hang debt causes asset bubbles to grow at a faster rate (Anderloni & Vandone, 2010). Explicitly, over-indebtedness will possibly underpin overinvestment as well as over-speculation. The notion of printing money, either to fund massive capital expenditure projects, or even war, generally causes financial instability, as money is being printed expeditiously. In addition, financial instability may be triggered by ineffective monetary policy, irresponsible credit expansion and abundant liquidity, or by endogenous market forces. See Figures A2.1 and A2.2 of Appendix A.

Banks are generally considered as more exposed to financial instability as they face possible runs from the general public. However, bank collapses are not rare events, nor limited to certain geographic areas. The consequences of banks’ financial distress is disruptive to the community and has negative social consequences, significantly affecting the nation’s growth rate, causing governments or its central bank to intervene with rescue packages for the failing banking institutions. This phenomenon has recently caused policy makers globally, in particular central banks, to become more cognizant of what determines financial instability and what course of action may be taken to mitigate or prevent it.

When financial markets are in a state of stability, the economy’s mechanisms for pricing, allocating, monitoring and managing financial risks
(liquidity, credit, counterparty, market, etc.) are reasonably efficient in contributing to the performance of the country's economy (Schinasi, 2004). The literature on financial stability emphasizes the level of institutional failure as the main driver to adverse market fluctuations (Brunnermeier & Sannikov, 2012). Bank failures are commonly perceived to have absolutely contagion effects on the real economy, compared to failure of other types of industry. To some extent, bank failure is viewed as a threat to the total economy as it spreads in a domino-like fashion affecting the whole banking system on a national and world-wide trajectory due to the interconnectedness of the financial network. Distressed banks may well default on their interbank liabilities and consequently cause further banks to default (Shin, 2008). Therefore, the failure of one bank has the potential of triggering off system wide failures, more commonly referred to as systemic risk. After the sudden failure of Bearn Stearns with Lehman Brothers’ bankruptcy in September 2008, the Korean experience demonstrated the probability that similar institutions with similar balance sheets are eventually affected by contagion, affecting other segments of the financial sector (Tobias & Shin, 2009).

Extensive consequences of systemic risk could potentially result in severe financial crisis, overall decline in asset prices impairing growth capabilities within the economy, leading to overall unemployment, and possibly, social and political instability. Without a doubt, banks in general,

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5 A financial system is entering a phase of instability whenever its equilibrium and its performance are disrupted.

6 Systemic risk is the probability that collapse of even a small bank could result in the contagion effect and the whole payments could be disrupted.
endeavour for continuity and survival whilst dealing with possible threats and adverse factors. Systemic risk does not occur in isolation, besides environmental factors, it is affected by other types and sources of risk. Hence, financial institutions are interested in determining the causes, sources and consequences of such factors. Otherwise, these types of institutions may possibly face irrepressible challenges that could undermine their survival and continuity (Huang, Zhou & Zhu, 2009).

The following section presents views on the financial structures and stability, while Section 2.3 studies the new forms of financial institutions and associated risk. Section 2.4 reviews the financial instability and Systemic Risk, followed by liquidity risk in financial institutions. Furthermore, Sections 2.6 and 2.7 discuss the basic principles of Islamic banking and financial intermediation within Islamic banking. Section 2.8 discusses the structure of the GCC financial systems, with Section 2.9 looking into how Islamic banking risk differs from conventional. Section 2.10 investigates the specific risks to Islamic banks. Sections 2.11 and 2.12 describe the global financial crisis and the role and relevance of Islamic banking in promoting global financial stability. Finally, Section 2.13 concludes the chapter.

2.2 Financial structure and stability
There are two main facets to the stability debate: (i) the propensity for the economy to grow consistently; and (ii) its related financial stability. Most
studies circumvent the first facet and investigate the volatility of the country's economic growth by looking into the occurrences of economic booms and recessions. Monnin and Jokipii (2010) report an association among bank soundness and growth. Several views on the topic are postulated in the literature. Denizer, Lyigun and Owen (2002) report that a higher level of equity financing supports greater macroeconomic volatility, whereas Huizinga and Zhu (2006) report the opposite, generating uncertainty in the literature with regards to such an association. Rajan (2005) posits that the increasing complexity and interconnectedness of the modern financial system may create more financial sector induced procyclicality than in the past. As a result, contributes to systemic risk by affecting the probability and severity of the losses generated by other banks in systemic events.

In regards to the second facet, a number of scholars study the relationship amongst financial network structures and financial stability. Barrell, Davis, Karim and Liadze (2010) and Kato, Kobayashi and Saita (2010) develop current work on early detection signs for banking catastrophes by closely observing and measuring financial ratios like capital and liquidity proxies. They report higher capital buffers (as calculated by the ratio of equity to total assets) being negatively associated to financial stress, implying that during a crisis, liquid assets may well lower volatility and thus instability. Furthermore, higher liquidity buffers (as calculated by the ratios of liquid assets to deposits and to short-term funding) explicitly lessen the likelihood of financial crisis. Lund-Jensen (2012) finds that
financial interconnectedness among banks and other financial intermediaries, by utilizing noncore to core bank liabilities ratio, has a considerable positive effect on the likelihood of a wide systemic financial system crisis. Additionally, the Basel Committee on Banking Supervision (BCBS, 2010) accounts on the long-term economic impact of liquidity and capital standards requirements illustrate higher buffers may reduce the extent of business economic cycles.

2.3 New forms of financial institutions and associated risk

A bank's structure may be characterized in different ways, illustrating diverse implications for systemic risk and financial stability for the financial system. In market-based systems, financial institutions basically plying more of an non-traditional role within three activities: (i) non-deposit liabilities; (ii) relying on fee-based income source; and (iii) trading activities with superior use of innovative financial products, for example securitization and derivatives (Boot & Thakor, 2000). Conversely, the traditional bank-based intermediation7 is mainly focused on taking deposits and granting loans. Such an approach is inclined to be more dependent on net interest income as a key source of revenue.

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7 Traditional bank-based intermediation: banks tend to rely more on net interest income as their key source of profitability.
Market-based financial intermediation\(^8\), together with innovative complex products being offered, may potentially have led to structural features associated with the latest global financial crisis. Prior to the GFC, highly developed financial systems were more likely to carry out more market-based activities instead of the traditional bank-based institutions. Nonetheless, the regulatory framework had not been sufficiently proactive in updating itself in line with regulatory expectations, preserving a common sense of financial safety. This approach has led to new vulnerabilities within the financial system (IMF, 2009). The moves towards market-based financial intermediation i.e., non-traditional financial institution, and new financial products have contributed towards exacerbating systemic risk in the financial system. The slower reaction of larger banks to the turmoil was probably deep-rooted into organisational complexity, hampering an efficient use of both hard and soft information.

I. **Bank size and structure complexity:** The bank-size effect may possibly be addressed through an effective use of soft\(^9\) or hard information (Vacca, 2011). “Soft” information gathered through a strong bank-borrower relationship benefits simpler, smaller, banks (Freixas & Holthausen, 2005). In contrast, “Hard” information, for example quantitative rating models, allows banks to develop into

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\(^8\) Market-based financial intermediation: banks plying more of a non-traditional role by relying on trading activities, fee-based income sources and non deposit liabilities.

\(^9\) Bank business models have traditionally been built on information obtained from repeated interactions with customers, or “soft” information. Technology and transparently have shifted banks toward the use of hard information (credit registries or standardized scoring) and “arm’s length” transactions (IMF, 2006) for their traditional deposit and lending business, and toward more fee-based business. (Boot & Thakor, 2000).
larger and more complex institutions (Stein, 2002). However, the slower response of relatively larger size banks to the GFC was almost certainly deep-rooted into complexity of its financial network structures, hindering an effective use of information. However, Gai, Haldane and Kapadia (2011) find that concentration and complexity of the financial linkages may possibly lead to systemic liquidity crisis, totally threatening the resilience of the financial system. In theory, larger size banks generally benefit from economies of scale and scope. Big and complex banks are hard to resolve, that is too-big-to-fail, which increases the impact of crisis (Ueda & Weder di Mauro, 2012).

II. The concentration of financial linkages: In the last few years the current financial system has become much more concentrated, complex and interconnected. These unique network features are vital in shaping financial contagion (Gai et al., 2011). As banks grow in asset value, either through merger and/or acquisitions, the banking sector consequently becomes more concentrated, increasing profits and reducing the incentives to take risk. Though, higher concentration encourages banks to charge higher loan prices which in turn may well lead to higher risk taking by bank’s borrowers, consequently increasing systemic risk (Allen & Gale, 2007). Gai et al. (2011) demonstrates that in concentrated financial networks contagion is highly likely to occur particularly at higher levels of financial network connectivity. This phenomenon is exacerbated in a
concentrated network with not many key players, in particular when the level of liquidity is very volatile. Liquidity shocks occur within the most connected banks as financial distress spreads through the rest of the system, leading to systemic shocks. Therefore, Allan and Gale (2007) are correct in saying that highly connected financial networks are resilient to such shocks. Simon (1962) argues that the financial market has developed into a less hierarchical, less segmented and thus less decomposable system. Consequently, they are more vulnerable to systemic collapse.

III. The interconnectedness of network structures: One of the salient features of the modern global financial system is the increasing complexity of the linkage amongst financial institutions and market participants across geographic or institutional boundaries posing no barriers to trade (Acemoglu, Ozdaglar & Salehi, 2010). Technological improvements facilitate financial institutions to become more highly interrelated through interbank, repo, and other wholesale markets, on a domestic and global level. In effect, the financial innovation that ensued the GFC simultaneously increased the number and nature of connections between lenders and borrowers in the market. Certainly, the exponential growth in derivative and securitization markets provided an example of the extent of this phenomenon. The outstanding notional total of credit default swap (CDS) contracts increased tenfold, from $6 trillion to
$60 trillion in seven years starting in the year 2000. On the flip side though, interconnected markets improve opportunities for diversifying risks, creating an enormously globally integrated banking system (Freixas & Holthausen, 2005; Wagner, 2011). The source of strength for banks enables them to diversify risks whilst providing liquidity and investment opportunities to investors. However, the latest financial crisis exposed the vulnerability of such markets with complex connections amongst market players, magnifying information asymmetries and market frictions or other externalities. As the level of interconnectedness increase, systemic risk becomes more of a reality since institutions are further exposed to substantial systemic shocks. This phenomenon is evident when banks underestimate their likelihood of default (Acemoglu, Ozdaglar & Tahbaz-Salehi, 2013). System structure complexity and interconnectedness amongst financial institutions can increase risk or exacerbate systemic risk in the financial market (Allan & Gale, 2000). Highly interconnected financial institutions may well convey shocks to the economy. The Lehman Brothers example exemplified how shocks could be transmitted through money markets to short-term funding and eventually across the entire interbank markets. Thus, the spill over effect of bank panic or systemic risk has a multiplier effect on all financial institutions leading to a greater effect of bank failure in the financial system. Allen and Gale (2004a,

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10 A CDS is a derivative contract in which one party, the “seller,” agrees to insure another party, the “buyer,” from default on an underlying bond or index of bonds in exchange for a fee.
2007) studied the consequences of systemic risk due to liquidity shocks ensuing in domino effects, potentially leading to system failures. They argue that the interbank deposits are a key source for the transmission of liquidity shocks from one bank to another. Cont, Moussa and Santos (2012) argue that banks with high levels of interbank exposures are more likely to be systemically important within the financial system.

IV. **The Pro-cyclicality in the financial system:** This phenomenon is an example of the time-series dimension of financial stability. In general, pro-cyclicality cannot be eliminated, only mitigated (Gruss & Sgherri, 2009). As bank assets are tradable, banks modify their leverage levels and size of their balance sheets. This strategy exposes the bank to boom and bust fiscal cycles, as the mark-to-market rules magnify such trends (Shleifer & Vishny, 2010; Shin, 2008). By and large, asset shedding may well result in fire sale of bank assets, credit squeezes with significant negative consequences for macroeconomic outcomes and bank financial stability. Marked down asset values through fire sales more often than not cause a contagion risk leading to further losses for other similar financial institutions. The literature attributes this phenomenon to expanding risk tolerance, excessive leverage and an overextended balance sheet through an expanded financial cycle (Van den End & Tabbae, 2012).

V. **Tail risk:** With further assets traded and less conventional banking trade, banks may well accumulate larger, skewed exposures to
diverse type of risks (Acharya, Cooley, Richardson & Walter, 2010). In several cases, all through the global financial crisis, banks used products such as proprietary trading and structured investments to produce extra return which resulted in an increase in “Tail risk”, i.e. the risk of extreme events (Brunnermeier, Dong & Palia, 2012).

VI. **Wholesale Funding:** Access to wholesale funding may be denied if the bank is perceived as an excessive risk taker, particularly if the distance-to-default falls below a certain threshold (Agur, 2013). An unexpected funding interruption may possibly complicate a policy change, predominantly if this rare event affects numerous banks, leading to an overall systemic liquidity crisis event.

### 2.4 Financial Instability and Systemic Risk

In respect of investigative paradigms for different analysis on financial instability, Borio and Drehmann (2009a) list three model types: (i) self-fulfilling equilibria caused by exogenous events (Diamond & Dybvig, 1983); (ii) models with negative shocks may be systematic or idiosyncratic (Allen & Gale, 2004a) and as amplification mechanisms described by contagion formed as a result of informational and balance sheet linkages (Rochet & Tirole, 1996); and (iii) the Minsky (1992) endogenous cycle view of financial instability.

The notion of financial stability is often discussed in term of systemic risk and its sources. Interest in systemic risk analysis and
contagion has been drastically amplified due to the recent Global financial crisis. DeBandt, Hartmann and Peydro (2009) provide an inclusive survey of the literature associated with systemic risk. The review has exposed the inconsistencies and disagreements rather than consensus regarding the definition of systemic risk (Borio & Drehmann, 2009a).

There is no common consensus within the literature as to what constitutes systemic risk\(^{11}\), reflecting the range of the different factors and elements affecting the banking system. The general view is that the probability of experiencing a widespread failure of financial institutions, or freezing up of capital markets or a broad-based collapse of the economy in general, is triggered by an unpredicted rare event, typically a number of banks in receivership (Acharya & Richardson, 2009). Such an occurrence definitely causes credit or major liquidity problems which affects negatively the financial markets stability along with the economy at large. This is evidenced by the correlation for the most part or all the parts of the economy (Kaufman & Scott, 2003). A classical example of systemic risk in the financial industry is the bank run on Northern Rock, where the British government in 2007/08 was compelled to intervene to prevent any negative spill over effects on the UK and surrounding European economies.

The banking literature documents the presence of negative externalities from risk-taking activities at banks, and so becomes further prone to failure, and it is more probable to impose costs on the general

\(^{11}\) Systemic risk is the risk that uncertainty in one part of the financial system spreads to the entire system in a domino-like fashion. It focuses on contagion, where bank runs may well affect other domestic banks in the system through a decline in funding liquidity.
public. These costs possibly will arise, due to the contagion effect spilling from other institutions causing failure. These resulting in systemic risk, explicitly, the risk of a crisis in the financial sector and its spill-over to the financial system at large. This phenomenon does not necessarily need to originate from the local market, it may emanate also from overseas markets. Consequently, unregulated banks may possibly take excessive risk from a societal perspective (Keeley, 1990; Allen & Gale, 2000; Hellman et al., 2000; Repullo & Suarez, 2012). This argument provides a plain validation for imposing stringent regulation for risk-taking activities in banks. In general, banks desire to improve their risk/return profile. Regulators need to manage and reduce systemic risk. Therefore, major risks are subject to quantification imposed by the Basel regulations.

In recent times, a suite of empirical studies demonstrate how to quantify financial instability by capturing financial distress in banking industry. These studies are categorised into: (i) financial distress indicators that based on balance sheet figures like loan loss provisions or non-performing loans (Carson & Ingves, 2003); (ii) Financial soundness indicators as advocated by the IMF (Galati & Wooldirde, 2006). Given that market indicators classically based on equity and derivative instruments such as credit default-swaps (Tarashev & Zhu, 2008). This has been the more promising path of research on early warning indicators as it depends on indicators based on credit and asset markets (Alessi & Detken, 2011; Fornari & Lemke, 2010). Yet, these indicators reveal a view of financial instability that is based on endogenous cycles (Borio & Derhamn, 2009a);
and (iii) a third set of indicators based on Vector Auto-regression Models (VARs) and macro stress testing (Sorge, 2004; Borio & Drehmann, 2009a).

Within a macro-prudential regulation context, it is also critical not only to observe the level of systemic risk, but also to recognize the sources of risks within a financial system. Cerutti, Claessens & McGuire (2012) categorised the source of shocks to the financial system causing systemic failure into four categories of risks origination from the asset side, i.e. market and credit risk and the liability side, i.e. the funding risk of the banks’ balance sheets. There is also the interaction between the two sides leading to liquidity issues. Gauthier, Gravelle, Liu and Souissi (2011) notes that macro-prudential capital allocation methods usually reduce individual banks’ default probability by about 25 percent. This suggests that macro-prudential capital buffers to a large extent have the capacity to improve financial stability.

2.5 Liquidity Risk in Financial Institutions

The GFC re-emphasised the significance of liquidity to the functioning of financial markets and the banking sector, therefore liquidity risk is discussed extensively in this section. It is repeatedly defined in diverse ways: As excessive illiquidity, the buffer provided by the aggregation of liquid assets, or the capacity to raise capital at a “normal” cost. The rationale of liquidity is to provide adequate cash resources for the bank to produce sufficient cash in meeting its payment obligations (Choudhry, 2012). It is practical to split
the notion of liquidity into two main categories: market liquidity and funding liquidity (Brunnermeier & Pedersen, 2009) as the capacity of solvent banks to meet their payments with immediacy (Drehmann & Nikolaou, 2012). Liquidity risk is a critical risk since excessive illiquidity generally results in insolvency and collapses of financial institutions. In addition, liquidity risk is reliant on system-wide financial market disruptions, as the GFC demonstrated the extent of lack of liquidity in some parts of the financial markets. For example, unsecured interbank markets causes system-wide liquidity crisis. Further the main factor of the Lehman insolvency was the drying-up of banks’ liquidity, as a materialisation of systemic risk. The experiences of Bear Stearns and Northern Rock demonstrated that implementing capital and profitability benchmarks does not always guarantee bank liquidity. However, such extreme conditions are often the outcome of other risk, such as major market or credit losses (Acharya & Viseanathan, 2011). The latest events have shown that various types of risk may possibly and do impact on each other. Indeed, through periods of systemic shocks investor confidence drops and asset values plummet as credit default risk is put into question generating liquidity risk (Diamond & Rajan, 2011).

Liquidity risk is definitely endogenous to the financial market and a key driver of financial crises. The origin of liquidity risk lies within the failures of coordination amongst banks, depositors or traders, which in time leads to asymmetric information and market inefficiency (Acharya & Viswanathan, 2011). The literature argues (Nikolaou, 2009) that the
likelihood of illiquidity would suggest that there is a liquidity risk issue with a negative correlation between the bank's liquidity levels and its overall liquidity risk. Hence, the higher the liquidity risk, the higher the chance of banks becoming illiquid. The notion of liquidity is not really captured in an amount or a ratio as it is a qualitative representation of the bank’s financial position.

A general definition of liquidity risk describes a situation of mismatch, where the value of short-term assets is not adequate to match the short-term liabilities or unanticipated outflows. Hence, liquidity is the protection cushion helping the bank to meet its obligations throughout a complex market environment. A bank's liquidity risk also refers to its inability in raising funds at a reasonable cost and is the consequences of two key factors: (i) the market liquidity fluctuating over time; and (ii) the bank's liquidity. Equally both factors interact collectively to determine the market funding conditions (Nikolaou, 2009).

Funding liquidity risk is a key element to banking as maturity transformations occur where liquid short-term deposits cover illiquid long-term loans. Maturity transformation exposes banks to liquidity risk. By definition a bank engaging in “maturity transformation” is unable to honour unexpected demand for total withdrawals (Diamond & Dybvig, 1983). Rajan and Bird (2003) illustrated that “maturity transformation” is inherent to banks and does not rely on implicit safety nets. Therefore, banks are regarded structurally fragile due to this “maturity transformation” practice.

The most important role of banks in the financial market is providing
funding liquidity\textsuperscript{12} to market participants (Strahan, 2008) and promoting a greater efficient allocation of resources within the banking system.

The majority of investors desire assets with short-term maturities, for example short-term money market funds. It is allowing investors to withdraw funds at appropriate terms, on short notice accommodating their funding needs (Allen & Gale, 2007). The liabilities side represent the depositors’ funds which are withdrawn on demand providing depositors with precious flexibility in carrying out deposit transactions. Furthermore, market funding with short-term maturities may possibly not be rolled over at due date creating a liquidity shortage also exposing the banks to funding liquidity risk. Conversely, on the assets side of the balance sheet, long-term investments are continually illiquid and therefore risky since liquidation of such type of investments before maturity generally results in a loss (Drehmann & Nikolaou, 2012). This funding arrangement leaves the bank exposed to the risk of an inherent maturity mismatch (gap or liquidity gap), hence causing bank instability.

Banks also perform an essential function of overcoming information asymmetries. The confidential information inherent in bank investments makes banking an opaque industry. Besides, the special natures of the banking industry, banks are exposed to credit risk which may eventually jeopardise banks’ capability to pay back their depositors and investors. The resultant ambiguity about a bank’s solvency may well in fact trigger a “run”.

\textsuperscript{12} Funding liquidity is defined as the ability to settle debt obligations immediately when due (Drehmann and Nikolaou, 2010)
Hence, illiquidity may lead to bank’s insolvency. Gauging funding liquidity risk is important. In many cases practitioners construct a range of funding liquidity ratios and employ them as proxies for liquidity risk. Such measures may well be generated either by dynamic stress testing methods and scenario analysis or static balance sheet analysis. Matz and Neu (2006) provides a collection of liquidity and funding ratios that are repeatedly used at the individual bank level as liquidity risk proxies (e.g. funding ratio).

Liquidity cost may well rise due to temporary shortages of liquidity in the marketplace affecting the cost of funds for all market participants. The implications of market (systemic) liquidity risk\(^{13}\) are paramount from a financial stability perspective. In general, systemic (market) liquidity risks are commonly driven by asymmetric information concerning the probability where one or more financial institutions possibly insolvent, affecting the entire financial system. In extreme events, it may well lead to a financial crisis, (maturity mismatches was the prominent and salient aspect of the GFC). This causes diminishing financial stability, affecting the allocation of resources and consequently impacting the real economy (Hoggarth & Saporta, 2002; Ferguson, 2007). Given the significance of market liquidity risk (i.e. systemic risk) to financial system stability, it is the sort of liquidity risk that should directly alert regulators and policymakers. However, if banks are unsuccessful in addressing such risk or meeting the liquidity

\(^{13}\) A systemic liquidity shock is an aggregate shortage of liquidity; for example, a situation in which many institutions face liquidity shortages simultaneously, as opposed to one institution suffering a liquidity shortage. Systemic liquidity risk is the probability that this situation takes place. A liquidity shortage can manifest as an inability for banks to roll over funding (funding liquidity risk), the inability to trade assets at normal bid/ask spreads (market liquidity risk), or very frequently, both.
needs, liquidity risk increases with possible irreversible consequences such as insolvency risk, reputation risk and government bailout risk.

**Insolvency Risk**: A bank's inability to absorb losses generated by all types of risks is referred to as insolvency risk due to the bank's lack of available capital. It is clear that solvency is directly related to capital adequacy. A sound capital base is a basic precondition for a bank's solvency and should not be confused with bankruptcy risk. The latter consists of a bank defaulting on its debt obligations and it is unable to raise further funds to meeting its debt obligations. A bank's solvency is therefore related to its net worth emanating from its capital base and solvency precedes liquidity as the latter is cash related with a bank may be solvent but illiquid at the same time. This phenomenon gives rise to a critical principle in banking and it is better known as capital adequacy, where it refers to the minimum capital banks are allowed to retain in order to sustain all possible losses arising from every aspect of banking risk fulfilling acceptable solvency levels. The motivation of capital buffers is to set the default probability of the bank or the event where potential losses are prevented to exceed its capital base (Repullo, & Suarez, 2012).

Banks may well fail either because they are insolvent or as an aggregate shortage of liquidity may cause them to be insolvent (Diamond & Rajan, 2011). Severe financially stressed conditions causes solvency and liquidity to be directly related, and can each cause the other, where the latter triggers lack of funding and illiquidity. The reverse is also true as leveraged

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14 Capital buffers: provide insurance against losses
firms rely on collateral-based financing, subject to overcollateralization ratios. A fall in asset value exposes leveraged entities to comply with such ratio of over-collateralization than reducing its debt obligations by liquidating long-maturity assets at “fire sales” prices\textsuperscript{15} under adverse conditions as market liquidity for those type of assets is low (Brunnermeier, 2009). The sale of these assets below its fair value triggers losses, leads to an erosion of the bank’s wealth thus negatively affect bank’s solvency. A drop in asset prices affects asset valuations and their margin requirements for all banks in the system. Funding costs, profitability are affected generating systemic solvency concerns (Allen & Gale, 2007). As it is not clear which comes first, illiquidity or solvency, however in distressed situations solvency risk is compromised. This situation could be realigned by major capital injections from governments.

\textbf{Bailout Risk:} Governments all over the world, generally act as the lender of last resort, providing emergency liquidity intending to avoid bankruptcy of banks considered “too big to fail” or systemically important. This type of risk was clearly evident during the height of the global financial crisis where institutions like Fannie Mae, Freddie Mac and American Insurance Group (AIG) were successfully bailed out as they were deemed “too big to fail”. For example, AIG faced a “margin run” as explained in Gorton (2008). Various counterparties requested further collateral from the Insurance Group for its credit default swap trades. These events if left untreated would have caused irreversible damage to the economy. The bailout package

\textsuperscript{15} Fire sales of liquid assets (market liquidity risks).
served as a stopgap to protect depositors, prevent widespread banking panic resulting in runs on banks (Gorton & Huang, 2004). Therefore banks are provided with funds and subsequently they recapitalize their operation. In return, government receive preferred stock with potential cash dividends over time (Bowman, Davies & Kamin, 2011).

**Reputation Risk:** As defined by BCBS (2009) a loss of confidence in the integrity of the institution is caused by the adverse publicity regarding a bank’s business practices and associations. The BCBS updated this definition in 2011 with risk arising from negative perception on the part of customers, counterparties, shareholders, investors, debt-holders, market analysts, other relevant parties or regulators that can adversely affect a bank’s ability to maintaining existing, or establish new business relationships and continued access to sources of funding.

The GFC is an example where banks globally have experienced a dramatic loss of reputation. A bank’s reputation once tarnished usually experiences irreversible damage. It became apparent that not just simply systemic risk was a concern, but banks had to a large extent considered how the general public perceives them or so-called reputational risk (Hassan & Mahlknecht, 2011). This type of risk is multidimensional with many different aspects also mirroring the view of other market players (Choudhry, 2012). The reason this perception is vital, lies in the information asymmetry among banks and market participants (Scandizzo, 2011). As the banking system is highly interconnected, any failure in one institution typically spreads to other similar institutions, causing depositors in other institutions
to question the state of health of their banks and losing confidence. This possibly causes runs at these banks previously referred to as safe banks (e.g. Chari & Jagannathan 1988; Flannery 1996; Dasgupta 2004).

2.6 Basic principles of Islamic Banking

The Islamic banking system is based on a set of rules affecting its financial behaviour and outcomes. The primary source of these rules is the Shari’ah Law. Consequently, institutions and more rules have developed by authorities in pursuit of such economic policies, where the main objective is to further the development of an Islamic society (Iqbal & Mirakhor, 2007). Such economic rules and its institutions are expected to facilitate a vibrant and emergent economy within the confines of Islam. The seminal work of Abu Saud (1980) argues that the money and fiscal management needs to fit within an Islamic economy as defined by Islam. Therefore, as Islam precludes the use of interest - riba, in any shape or form the Islamic system is required to be organised, structured, and conducted in this manner (Ariff, 1998; Siddiqi, 2006). It is this principal of riba, i.e. no interest attached to the financial instruments that differentiates the Islamic system from conventional banking. The major proposition of this exclusion is the elimination of pure “debt-based” agreements from financial transactions (Askari, Iqbal & Mirakhor, 2009).

The Islamic banking industry is at present one of the fastest growing segments compared to other financial markets (Hesse, & Cihak, 2007). It exhibits an average annual growth rate of about 15 per cent (Iman &
Furthermore, the number of Islamic financial institutions has spread across 75 countries with over 300 institutions operating worldwide (El Qorchi, 2005). A number of factors contributed to this rapidly growing industry, ranging from a robust demand for Shari’ah-compliant products in Islamic nations to the development and consolidation of regulatory and legal Islamic banking frameworks (Hasan & Dridi, 2011). Other factors include increasing calls from classical investors for the purpose of diversification and the capability of Islamic financial institutions to develop innovative financial products that satisfy the needs of all types of investors, whether individual or corporate (Zaher & Hasan, 2001). Yet this hasty growth is a response to the request for Shari’ah compliant products emanating from financiers from the Middle East and other Muslim countries. It has also attracted non-Muslim investors from across the world, making Islamic finance a global phenomenon (Iqbal & Molyneux, 2005; Hasan & Dridi, 2011).

In Islamic banking, generally financial contracts and activities are conducted without interest, usury, or “riba”. Goods and services are permitted to carry a price, simultaneously not encouraging speculation (including short sales) or speculative behaviour, forbidden transactions featuring excessive uncertainties and risks (Ayub, 2007; Iqbal & Mirakhor, 2007; Rasem & Kassim, 2009). In addition, financing illicit activities that harmful to society are also prohibited (Askari et al., 2010). Therefore Islamic banking financial products are expected not to violate Shari’ah rules. Investments exposed to alcohol, gambling, or casinos are strictly
prohibited and closely uphold contractual obligations with total disclosure of information, thus, reducing information asymmetry and moral hazard (Askari et al., 2010). Such rules are based on the concepts of fairness, property rights, stability, growth and social justice as advocated by the Qur’an (Iqbal & Mirakhor, 2007).

**Table 2.1: Essential Features of Islamic Finance**

<table>
<thead>
<tr>
<th>Overarching Principles</th>
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<tr>
<td>Towards achieving the objectives of <em>Shari‘ah (Maqasid al-Shari‘ah)</em></td>
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<tr>
<td>✓ Protection of religion, life, lineage, intellect and wealth</td>
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<tr>
<td>✓ More equitable distribution of wealth</td>
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<td>✓ High ethical values-justice, fairness, trust, honesty and integrity</td>
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<th>Materiality and Validity of Transactions</th>
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<td>Economically productive underlying activates</td>
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<td>Avoidance of speculative transaction</td>
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<td>No involvement in illegal and unethical activates</td>
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<td>Avoidance of interest-based transaction</td>
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<td>Genuine trade and business transaction</td>
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<tr>
<th>Mutuality of Risk Sharing</th>
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<tr>
<td>Honouring both substance and form contract</td>
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<td>Entitlement of profit contingent upon risk taking</td>
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Many scholars argue that the key distinction between Islamic and conventional banking systems is the prohibition of interest (riba)\textsuperscript{16}. Guaranteed interest on a loan represents the most obvious example of Riba (Usury) in conventional banks (El Gamal, 2006). Askari et al. (2010) argues that the definite meaning of this term is ‘an excess’ and is interpreted as ‘any unjustifiable increase of capital, whether in loans or sales’ differentiating Islamic banking from conventional banking (p. 4). Therefore Islamic finance is rooted in trade (exchange of assets) rather than in money lending (charging interest on money lent). Saw and Wang (2008) assert that any fixed, positive predetermined rate connected with maturity and the principal (guaranteed despite of the investment’s performance) is deemed to be riba (usury or interest) and is therefore forbidden. Hence, this rule stress that any related or indirect benefits accruing to the lender are as well forbidden (Iqbal & Mirakhor, 2007; Kettell, 2011).

A number of valid reasons have been put forward to explain why interest or usury has been prohibited. Arguably, the principal justification put forward is the idea that money is treated as “potential” capital\textsuperscript{17}, and capital must not yield revenue unless shared with human exertion, except when risk is concerned (Olson & Zoubi, 2008). Scholars often claim the lack of a satisfactory theory of interest (Ariff, 1988; Siddiqi, 2006; Chapra & Ahmad, 1985) and argue that normally interest is paid on debt (since any

\textsuperscript{16} \textit{Riba} is the Arabic word for predetermine return on the use of money.

\textsuperscript{17} Two different strands of thought have dominated the definition of capital: capital as physical goods or real assets; and capital as a pool or fund, of money or financial assets. Both concepts are intimately related and are essential to capital theory and financial stability.
return of money on money due to the time value of money), not on capital
assets and has to be paid regardless of investment yield. In distinguishing
among interest as price for use of money and a return from capital
investment it is the risk sharing that is critical in Islamic finance. In a
borrower/lender relationship the latter has no responsibility concerning the
transformation of money into capital (Askari et al., 2010). Though, this
basic notion of risk sharing that contravenes Shari‘ah rules, complicating its
existence further to be part of the mainstream modern economies.

It is clear that Islamic banking promotes risk-sharing among the
providers of funds, i.e. the investors and the financial intermediary, i.e. the
bank and its user of funds or the entrepreneurs (Iqbal & Molyneux, 2005).
In Islamic banking, suppliers of funds become investors, rather than
creditors as interest is forbidden. Both the provider of the financial capital
and the entrepreneur share the project risks in return for a share of the profit
or loss (Askari et al., 2010). On the contrary, the investor is guaranteed a
predetermined interest rate under conventional banking and furthermore in
the later model, all the risks are born by the entrepreneur, i.e. borrower
(Iqbal & Molyneux, 2005). In conventional banking, whether the project
fails or succeeds, the capital provider is still rewarded with a predetermined
return (Kettell, 2011). In the pure Islamic banking model, both parties the
investor and the entrepreneur share in the profit or loss of the venture in an
equitable manner. Additionally, on this basis the financial institution is
exposed to risk besides sharing the returns of financing projects with the
investors (Iqbal & Molyneux, 2005). In Islamic finance, if there is an
expected return, then there is risk and if there is no evidence of a correlation between risk and return, then this financial arrangement is not allowed in Islamic banks. Under the Islamic doctrine, profit sharing is sought for rather than interest and Islamic banks acknowledge that profit emanates from an investment of financial capital shared with entrepreneurial effort. Interest is not part of the picture as this occurs from loaning money (Khan & Mirakhor, 1994).

Islamic banks have developed several Shari‘ah complaint products: Mudarabah (cost plus) and Musharakah (joint venture) transactions. These types of profit-sharing arrangements in effect place human capital on par with financial capital. In transactions where profit is not applicable, other modes of financing can be employed such as Ijara (leasing), Qard al-Hasanah (beneficence Loans) and Jo’alah (service charge) (Iqbal & Mirakhor, 2007).

2.7 Financial Intermediation within Islamic Banking

The beginning of Islamic banking occurred over three decades ago (Siddiqi, 2006), with ever-increasing globalization causing it to spread across several Islamic financial institutions to several different countries. Its standing has also amassed in the Middle-East region and also in non-Muslim countries like in Asia, Europe and the U.S. The market value of assets under management held under Islamic banking supervision at present stands at
over US$ 1.3 trillion (Taher, 2012) and growing faster than the conventional banking sector in several countries (Siddiqi, 2006).

Banks operating within the Islamic banking system perform similar fundamental functions as they do in the conventional model, while restricted to engage in transactions that involve *riba*, as they administrator the economy’s payments system as financial intermediaries. Like conventional banking, Islamic banks transform the business liabilities into a mixture of obligations aligned with investors’ preferences and circumstances. The type of deposits that Islamic banks hold are liabilities and its assets consist primary of securities emanating from the capital markets.

Whilst the conventional model is largely debt-based allowing for risk transfer, Islamic finance is more asset-based and centres on risk sharing, suggesting that an investment is generally structured on ownership or trade of assets, positioning Islamic banks closer to the real economy in comparison to the conventional model. Table 2.1 compares and contrasts the differences between risk sharing and transfer in both systems (Hasan & Dridi, 2011).
Table 2.2: Risk sharing and transfer in both banking systems

<table>
<thead>
<tr>
<th>Sources of Funds:</th>
<th>Islamic Banks Risk Sharing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depositors transfer the risk to the bank, which guarantees a pre-specified return.</td>
<td>Investors (profit sharing investment account holders, PSIA) share the risk and return with bank.</td>
</tr>
<tr>
<td>‘Return on PSIA is not guaranteed and depends on the bank’s performance. ‘</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>User of Funds:</th>
<th>Uses of Funds:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Borrowers are required to pay interest independent of the return on their project.</td>
<td>Banks share the risk in Mudharabah and Musharakah contracts and conduct sales contracts in most other contracts.</td>
</tr>
<tr>
<td>Banks transfer the risk through securitization or credit default swaps.</td>
<td></td>
</tr>
<tr>
<td>Financing is debt-based</td>
<td></td>
</tr>
</tbody>
</table>

Source: IMF (Hasan and Dridi, 2010, p. 8.)

There are three main categories of funding structures within Islamic banking: equity, trading and supporting-based. All three kinds of financing are bound by Shari’ah law which is free from riba (Zaher & Hassan, 2001). As mentioned earlier, the basic principle is that Islamic banking is an equity-based structure where all financial transactions are based on risk and profit-and-loss sharing principles. All financial assets are contingent claims.
and there are no debt instruments with fixed or floating interest rates (Askari et al., 2010). Such an approach allows Islamic banks to forfeit the need to allocate sufficient regulatory capital (Laeven & Levine, 2007). However, the information asymmetry and risk aversion existent within such systems, results in fixed claim liabilities on Islamic banking balance sheets. This demands the obligation of capital adequacy requirements, preserving systematic stability by realizing two principal aims: (i) safeguard risk aversive depositors by imposing the least amount of equity capital cushion together with an optimal assets/liability ratio, and (ii) providing the right incentives to the shareholder, thus promoting cautious conduct by the banks (Hassan & Mahlknecht, 2011).

Profit-and-loss sharing (PLS) transactions of services and goods and the delivery of fee-service activities all shape the foundation of banking agreements (Darrat, 1988). Theoretically, a special aspect that distinguishes Islamic banking from conventional banking is the profit-and-loss sharing schemes, with all contracts backed by real economic transactions involving a tangible asset. Chong and Liu (2009) find that Islamic banking system as practiced in Malaysia diverge from the profit-and-loss sharing modes and is not different from its Islamic counterpart. They also proposed that to a certain extent, the rapid growth in Islamic banking is basically spurred by the worldwide Islamic renaissance rather than by the attributes of the Islamic profit-and-loss sharing scheme. Furthermore, the authors argue that Islamic banks must be subjected to market regulations and supervision parallel to their conventional counterparts.
One of the key differences among the two banking models is that due to the restriction on charging interest, banks in effect have to rely principally on profit-sharing schemes. Islamic banks offer portfolios of securities to depositors/investor in the structure of risky investments such as “mutual funds” open-ended type packages (Iqbal & Mirakhor, 2007). On the contrary, conventional banks typically finance the assets by their own deposit contracts, resulting in solvency in addition to liquidity risks as their asset portfolios (i.e. loans). This necessitates risky payoffs and/or liquidation costs proceeding to maturity, funded by deposits often redeemable instantly at par. Conversely Islamic banks are agents on behalf of their investors/depositors, creating a pass-through intermediation amongst their savers and/or entrepreneurs. This process mitigates the risk that conventional banks experience (Askari et al., 2010).

The Islamic banking system promotes greater interdependence and closer associations amongst investment and deposit entities as banks agree to hold investment deposits on the basis of profit-sharing, delivering finance to business entities on a similar understanding (Iqbal & Llewellyn, 2002). Since the return on the liabilities (i.e. the deposits) are directly related to the return on the asset portfolios (i.e. the loans) and as the assets are structured around the investment opportunities, Islamic banking is exposed to tighter links with the rates of return in the real and financial sectors than in the conventional structure.

A number of economists from the 1980s have been developing an analytical banking model within an Islamic environment. The result of their
efforts delivered two complementary models: (i) profit-sharing concepts model connecting the assets and liabilities of the bank's balance sheet in accordance with the two-tier *Mudarabah* principles; (ii) splits the liability side of the bank balance sheet into one for demand deposits (transactions balances) along with the other for investments deposits requiring the bank to uphold 100 percent reserves against demand deposits. Although this stipulates no reserve requirement for the investment deposits, in the same way both models factor a probability of loan loss and mitigate such occurrences through the diversification of banks’ loan portfolios. See Table B2.3, of Appendix B.

Another feature of Islamic banks is the prohibition with respect to dealing with financial risk, as it is considered to be similar to gambling (Hassan & Mahlknecht, 2011). This is the general rule regarding Islamic banking. Although it has already been mentioned, it is important to note that Chong and Liu (2009) argue that Islamic banking in Malaysia differs from the classical PLS framework and hence resembles more conventional banking. Iqbal and Llewellyn (2002); Sundararajan and Errico (2002); World Bank and IMF (2005) note that PLS schemes shift the direct credit risk from banks to their investment. Moreover, it increases the overall degree of risk on the asset side of banks’ balance sheets, while making Islamic banks more exposed to risks generally endured by equity investors rather than debt-holders. Askari et al. (2010) suggest that this kind of risk is specific to Islamic banks, since conventional banks do not invest in equity-based types of assets. Furthermore, this type of investment may well cause
volatility in the bank’s earnings as a consequence of the credit, liquidity\textsuperscript{18}, and market risks\textsuperscript{19} connected to equity assets normally based on the principle of Mudarabah.

Further to the PLS schemes which make up the larger part of Islamic banking, there are also the non-profit sharing schemes. Such financing schemes are less risky, resembling conventional banking; however they are not immune to risks, as they are exposed to operational risks. Another specific risk characteristic for Islamic banking emanates from the special investment deposit vehicles, where levels of regulatory capital and return on investments are not defined (Archer, Abdel Karim & Sundararajan, 2010). Sundararajan and Errico (2002) argue that this characteristic affects Islamic banks’ effectiveness and flexibility to external shocks. The explicit threat of Islamic banking involves adequate capital and reserves, suitable assessment, and a robust framework to regulate the prudential environment banks operate in.

Another key difference between Islamic banks and commercial banks is that the former model does not permit investing in or funding the type of speculative instruments, conventional bank securities, and toxic assets, which unfavourably affected its counterparts and triggered the global credit crisis. Another major difference between Islamic and conventional banks is that the latter is independent of guarantees or collateral in

\textsuperscript{18}Liquidity is essential for banks to compensate for any fluctuations whether expected or unexpected in the balance sheet and to provide funds for growth. Liquidity risk also results when the bank’s ability to match the maturity of assets and liabilities is impaired.

\textsuperscript{19}Market risk results from changes in the prices of commodities, fixed income securities and equity instruments
mitigating credit risk (Mounira & Anas, 2008). Furthermore, the lending practice in interest based structure is designated as a credit risk\textsuperscript{20} operation. On the other hand, in the interest-free based structure, lending activities are replaced with equity partnership (\textit{Musharakah}) and investment contract (Iqbal & Mirakhor, 2011), making them equally vulnerable to market downturn.

Askari et al. (2010) found that more than 70 percent of a bank’s balance-sheet normally relates to this facet of risk management. Consequently, credit risk is one of the most important sources of bank collapse, hence understanding banks’ credit risk management is critical equally for both banking models.

\textbf{2.8 Structure of the GCC Financial Systems}

In May 1981, Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and UAE came together to form The Gulf Cooperation Council (GCC). This region holds more than 30% of the world’s oil reserves and supplies nearly 25% of the global petroleum needs (Srairi, 2010). The GCC country members share a number of socio-economic commonalities. All economies are driven by the extraction of gas and oil, being the single and salient sector in the entire region, excluding Bahrain where it’s acting as the main finance hub for the region. Since the region has a highly hydrocarbon-dependent trade structure,

\textsuperscript{20} Credit risk is the chance that a debtor or issuer of a financial instrument will not repay principal and other related investment cash flows according to the terms and conditions of the contract. In banking, it means that payments may be delayed or not made at all, which can cause cash flow problems and affect a bank’s liquidity.
the macroeconomic performance of GCC states are extremely sensitive to the global gas and oil price fluctuations, as an essential consequence of its heavy hydrocarbon dependence, the current account balance exposed to the instability in petrol prices. The instability in petrol prices more often than not has an impact on the current balance and also on the country’s real economic activities and ultimately government monetary balances (Khamis & Senhadji, 2010). With petroleum prices depressed in the 1980s, the entire GCC region experienced negative growth, followed by rapid credit growth in the period preceding the GFC as oil prices increased (Srairi, 2010). It is clear that as the GCC states are heavily dependent on hydrocarbon prices, they are susceptible to symmetric shocks (Al-Hassan, Khamis & Oulid, 2010). Therefore the similarities in the economic structures of the GCC region suggest similar strengths and weaknesses in the financial systems. The GCC region has subsequently grown into a global financial hub as an effect of the increase in oil prices, thus, the overall economies demonstrate growth rate exceeding the world average (IMF, 2012).

The GCC is a group of countries with similar characteristics and in 2001 the group indicated a desire to establish an economic and monetary union. Also in 2008 they advocated a European Union style market with a single currency by 2010. Collectively both concepts have not materialized as yet. Though all countries are committed to encourage policy coordination, decrease transaction cost, in addition to a more stable environment for investment and business (Buiter 2008; MacDonald & Al Faris, 2010). However, to achieve such objectives and in response to the
global scale of financial markets, the regulatory authorities in the GCC region adopted a policy of financial sector liberalization schedules to incorporate and advance their economies, such as liberalizing trade, promoting and support foreign direct investment (FDI) across the region, maintain interest rates liberalization, and allow entry of new private banks equally foreign and domestic, also strengthen the central bank’s supervisory capability and finally implement regulations and policies to progressively move the Gulf region toward market-based economies (Al-Obaidan, 2008).

The financial industry in the GCC states is largely dominated by the banking industry, which is concentrated within a small number of domestic banks, owned by central government and specialized government agencies, dominating the marketplace (Al-Obaidan, 2008). The system is regulated by barriers to entry and licensing restrictions for foreign banks operating within the GCC region. Yet, Bahrain is the exception to the rule as all other GCC countries have limits on foreign bank ownership. Consequently, cross-border banking is still relatively weak in the GCC region as it is generally controlled by a branch network, in most cases one branch only (Turk-Ariss, 2009). Nevertheless, barriers to entry and licensing restrictions consequently limit banking competition as a result. Banks are more likely to have better profit opportunities and capital cushions, and so are less likely to take on excessive risks, with positive repercussion for financial stability (Beck, De Jonghe & Schepens, 2012).

Traditional deposits and loans are the major sources and uses of funds within the GCC region and the availability of foreign liabilities as a
funding source is still restricted. During 2006-2007 the GCC region experienced an increase in interbank liabilities as funding sources particularly in Kuwait, Oman and Qatar. Their bank assets composed primarily of loans and securities investments with loans and Islamic finance products\(^21\) constituting about 50 percent in Saudi Arabia and 71 percent in U.A.E. of the banks’ portfolios (Al-Hassam, Khamis & Oulidi, 2010).

The capital adequacy ratio (CAR)\(^22\) within the banking sector in the GCC countries are above minimum standards by international comparisons and have sustainable leverage ratios compared to conventional banks (Srairi, 2009). In line with Hancock, Laing and Wilcox (1995) and Bear and McElravey (1993) banks in the GCC region, are able to increase their capital ratios as a buffer against systemic shocks to the market\(^23\). A bank is deemed to be adequately capitalised when its total capital/assets ratio\(^24\) exceeds 10% and their operations are characterized by good asset quality, and high levels of profitability (Islam, 2003a). Yet, the inherent risk of deterioration in asset quality is a continuous reminder of the contagion effect from the financial crisis on the banks’ balance sheets (Al-Hassan et al., 2010). In general, local banks are regulated by international accounting standards (IAS) along with the states’ central monetary authorities

\(^{21}\) Islamic products include *Istisna, Murabaha, Mudaraba, Ijara* and *Musharaka*.

\(^{22}\) The lower the capital/asset ratio the higher the risk of bank failure.

\(^{23}\) There are other reasons why banks may choose to hold capital above the regulatory minimum requirements. For example, Buser, Chen and Kane (1981) discussed regulatory cost as a motive.

\(^{24}\) In Bahrain, as regard to different categories of banks, the locally incorporated retail banks held the lowest CAR at 18.1 percent in 2008 versus 21 percent in 2007. Conventional wholesale banks held a CAR of 19.3 percent versus 19 percent in 2007.
strengthened their prudential environment by more regulation (Islam, 2003b).

In recent years Islamic banks have developed into a significance source of financial intermediation with the Middle East, North Africa and also globally. The Middle East and North African (MENA) region accounts for the largest share (70.9 percent) of Shari’ah-compliant assets, with Asia following at 22.7 percent of the market share. The surge in petroleum prices in the last few years increased the growth rate of the assets under the control of Islamic banks within the Middle East. The Islamic banking market share within the MENA region is split approximately equally among the GCC states at 35.6 percent and the non-GCC at 35.3 percent. In 2007, the Gulf States controlled approximately 35% ($178 billion) of the total assets within Islamic banks, concentrated in Bahrain, Kuwait and the UAE. As conventional banks within the GCC countries diversified their portfolio, they added Islamic services and products. The rise of a more liquid Islamic market with innovative investment products and an appetite to satisfy Gulf stakeholders contributed towards a significant demand for Shari’ah-complaint investments (Abdul Rahman, 2011).

Overall although that the recent financial turmoil affected both conventional and Islamic banks on a large-scale. The GCC states relatively sustained a favourable economic and business environment along with healthy, dynamic growth for both models Islamic and conventional banks. However in view of such progression, the pressure of globalization besides
changes in the worldwide financial environment is challenging the Gulf banking industry in many ways (Espinoza & Prasad, 2010).

Generally speaking, during the period of 2003-08, the GCC region performed well due to the oil booms, however like any other double edge sword, there is also a downside to such progress. Expanding economies raises investors and consumer confidence along with abundant liquidity fuelled unwarranted credit growth possibly causing inflation as well as asset price increases.

Furthermore, a number of banks in the GCC states became dependent on foreign financing and exposure to real estate/construction lending activities. This type of asset funding activities repeatedly contributed to the susceptibility of banks’ balance sheet as the economy was slowing down and asset prices declined. Overall the boom cycle in the corporate sector was coupled with higher leverage increasing the sector’s vulnerability to accessibility and cost of funding (Al-Hassan et al., 2010).

As the turmoil unfolded the GCC states were primarily affected through lack of trade and a shortage of liquidity in financial channels. By the end of 2008, the finance and external positions of the GCC governments were frankly affected due to a decline in oil prices and its relative demand. Simultaneously, the states experienced reversals of speculative capital inflows experienced in prior years. These changes tightened liquidity positions and subsequently disturbed investor and consumer confidence exacerbated by Lehman’s collapse in 2008 along with the subsequent
worldwide liquidity shortages coupled with firm deleveraging. Consequently, the GCC financial sector imbalances were being questioned, in particular in the United Arab Emirates (U.A.E), Bahrain and Kuwait, known for their close links with global credit and equity markets (Maghyereh & Awartani, 2012). Noticeably, the Lehman’s collapse amplified the need to realign the status quo to more realistic levels.

A consequence of the financial crisis was a steep drop in asset prices with credit default swap (CDS) spreads widening on sovereign debt, reflecting the inherent risk. Consequently, global liquidity conditions worsened with an overall slowdown in credit growth and economic activities, causing real estate prices in nearly the entire GCC region to drop (IMF, 2010). With sovereign funds and banks deleveraging their balance sheet, and oil prices and supply fell, the GCC’s fiscal surpluses declined distinctly. Stock and real estate prices also dropped, followed by the widening of CDS spreads on sovereign debt, coupled with the tightening of external funding for corporate and financial sectors. Consequently from an anticipated $2.5 trillion in projects at end of 2008, circa $575 billion were placed on hold by end of 2009 (IMF, 2010). Nevertheless, GCC banks remained profitable despite adverse market conditions as they absorbed loan losses through their capital adequacy ratios compared to banks in other countries that had previously high gearing and low capital adequacy ratios prior to the crisis (IMF, 2012). The GCC region’s major issues originated from bursting real estate bubbles and over-extended balance sheets. While the region did not experienced any bank failures like others, the GCC
banking system has been severely tested. However, they have benefited from support measures brought in by authorities as governments upheld spending levels, introducing special financial measures such as injected liquidity and capital to absorb the impact of such crisis, thus promoting growth in the GCC region (Figure 2.3). Evidence of positive spill-over for neighbouring countries was also detected (Kumah et al., 2010).

Figure 2.3: GCC Banks Support Package (2008-2009)


1. Pre/post-crisis change in government deposits and use of central bank facilities;
2. Includes purchases of bank assets, stock market intervention, etc;
3. Includes some double counting of capital liquidity support.

To offset the fallout from the GFC, GCC governments preserved or even increased spending levels in spite of a sharp decline in oil revenues during 2008-2009. Specifically, Saudi Arabia approved the largest fiscal stimulus (as a share of GDP) amongst the G-20. In addition they introduced special financial measures, including capital and liquidity injections. Moreover, to ease domestic credit conditions, GCC countries (excluding Qatar) lowered interest rates, as well as provided liquidity through money market operations and statutory changes, including reductions in reserve requirements and prudential loan-to-deposit ratios.
The GCC is more susceptible to a drop in oil demand and price than to an exposure to the European markets as a rapid drop in the global economy could bring on developments alike to what the states experienced in 2009. This also includes a significant fall in oil prices, interfering with capital flows. The GCC states have significant cash reserves to mitigate any sizeable shock and any consistent drop in oil prices over the short to medium term. To combat inflationary pressures, most GCC countries plan to reduce government spending to prevent the economy from overheating and also advance long term fiscal positions (IMF, 2012). It is crucial that inflation is curtailed as that has an impact on exchange rates. Baldwin (2005) argued that as the GCC countries use the U.S. dollar as a base of their financial transactions and currencies with any possible currency fluctuation being the main source of risk for Islamic financial institutions.

2.9 How does Islamic banking risk differ from conventional?

The Islamic banking model follows different principles to conventional and has its own set of risks. Mainstream literatures argue that the risks posed by Islamic banks to the financial system vary in several ways from those posed by their conventional counterpart. Ariffin, Archer and Karim (2009) affirm that in the Islamic model, “Risk’ is perceived as prohibition of *ghara*\(^{26}\) (uncertainty or speculation) and choice of contract. They argue that any

\(^{26}\)Ghara refers to acts and conditions in exchange contracts, the full implications of which are not clearly known to the parties. This is something very similar to “asymmetric information”. 
transaction or contracts should be free from these elements (i.e. risk, uncertainty or speculation). Hence, derivative contracts like futures and options where the value of the contract depends on the future value of the underlying asset, considered to be risky are barred from being used in Islamic banking. Even forward foreign exchange transactions are not allowed as the forward rates are determined by interest rate differentials (Kettell, 2011).

The uniqueness of the contracts used in Islamic banking together with their overall legal, governance and liquidity infrastructure does also present its own set of risks. In a profit and loss sharing (PLS) scenario, the direct credit risk shifts from banks to their investment depositors, increasing the overall degree of risk on the banks’ asset side of the balance sheets. In Islamic banks, the risk is generally borne by equity investors rather than debt holders.

Furthermore, the requirement to comply with Shari’ah law limits the number of risk-hedging techniques and instruments (such as swaps and derivatives) available compared to conventional banks. Islamic banks operate in less developed markets with non-existent interbank27 and government securities and money markets. The lender-of-last-resort facility operated by central banks is usually not the norm within Islamic banking. Overall, this disparity in regulatory environments are less of an issue due to recent developments in the Islamic money market with Islamic lender-of-

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27 At present, there is no equivalent of an inter-bank market in an Islamic system where banks could place overnight funds or borrow to satisfy temporary liquidity needs.
last-resort facilities now being adopted and liquidity support provided to all banks during periods of crises.

Unlike conventional banks, Islamic financing structures encourage risk-sharing principle. Furthermore, Ariffin et al. (2009) assert that Islamic bank contracts carry different credit risk exposures. Among the many types of contracts in Islamic banks, credit risk is expected to be higher in equity-based financing under Mudharabah and Musharakah contracts as a result of the asymmetric information. In these types of contracts, the obligor does not provide adequate information to the banker on the actual profit of the bank (Khan & Ahmed, 2001).

Islamic bank balance sheets contain long-term assets with short-term liabilities ensuing in maturity mismatches. The lack of a liquid money market and a secondary capital market for Islamic financial instruments exasperates the maturity mismatch issue (Ismal, 2010). Generally conventional banks address this mismatch risk by dynamically monitoring and managing banks’ liquidity needs, through the use of the interbank money markets set within an interest-based context. Therefore, Islamic banks are prohibited to use such markets depriving them with one less avenue to manage their funding requirements efficiently and effectively giving rise to potential liquidity risk. As a result, Islamic banks are obliged to provide guarantees to its depositors in case of a bank run. Abdul-Rahman (1999) noted that typically Islamic banks maintain nearly a 100% reserve requirement on their retail banking (demand deposit) operations.
In addition, the lack of sufficient Shari’ah compliant liquid instruments is also another determinant for liquidity risks in Islamic banks. The transformation of financial assets into negotiable financial instruments more often than not is unacceptable, thus once a debt (i.e. loan) has been created, it may well not be transferred to any other person except for par value. Furthermore, Islamic banks are prohibited from borrowing funds at short notice by way of discounting debt commitments. For example, using a collateralised loan facility offered by the central bank or “central bank discount window” is unacceptable. Essentially in most cases, central banks run a discount window as means of providing liquidity. In the GCC region, central banks do not use a discount window as an approach of providing short-term liquidity to principally sound banks that experience a provisional liquidity shortage. Neither had they intended to use it as a method for supporting fragile or insolvent banks. In the conventional system, central banks frequently introduced these particular mechanisms to deal with systemic crises. Also, the lack of Shari’ah compliant lender of last resort facility based on Islamic instruments further complicates the liquidity risk problem. Though, similar to conventional banks, this type of facility is typically available to Islamic banks, however, such arrangements are based on non-Shari’ah-compliant financial instruments (Askari et al., 2010).

Finally, Islamic banks are predominantly exposed to liquidity risk as sizeable part of its investment account funds are assigned to fund their illiquid long-term assets, such as Ijarah, Mudaraba, Musharaka and other PLS contracts. In contrast, equity-finance is less risky compared to leverage
funding; hence Islamic banks impose a different suite of risks on the banking sector (Čihák & Hesse, 2008).

2.10 Risks specific to Islamic banks

The risks faced by Islamic banks can be classified into two categories: (i) risks that are similar to their counterparts; and (ii) risks which are unique due to their compliance with the Shari’ah laws. Archer, Abdel Karim and Sundararajan (2010) critically assess the risks Islamic banks face and report that the risk profile of Islamic bank is comparatively like conventional interest-based banks. Islamic banks are still exposed to credit risk, market risk, liquidity risk and operational risk. In addition to those risks Islamic banks also have to tackle the challenges emanating from the different characteristics of the assets and liabilities structure. The profit-and-loss sharing scheme also introduces some additional risks. These unique risks are withdrawal risk, fiduciary risk and displaced risk28 (VanGreuning & Iqbal, 2008). Fiduciary risk29 is a class of operational risk, i.e. the probability of the bank being guilty of negligence or misconduct in implementing investors’ funds or through the deposit Mudarabah or Musharakah contracts, as Mudarib (Bank) becomes liability on the bank’s balance sheet. On the other hand displaced commercial risk is a type of market (rate of return) risk, i.e. ensuing in risk transfer associated with the shareholders’

28 Displaced commercial risk refers to the probability of the bank not being able to compete with other Islamic or conventional banks.
29 Fiduciary risk refers to the probability of the bank being guilty of negligence or misconduct in implementing investors’ funds or the deposit through Mudarabah or Musharakah.
investment accounts. This occurs as the bank is not able to pay competitive rates of return to its investors (Ariffin, Archer & Karim, 2009; Zainol & Kassim, 2010).

Khan and Ahmed (2001) investigate risk management practices in 17 Islamic financial institutions ranging over ten different countries surveying Islamic bankers followed by interviews. They report the rate of return risk as the most crucial risk the bank is exposed to. Whilst a *Murabaha* contract is not permitted to be repriced and cannot exercise derivative swaps to hedge this type of risk. The conclusions drawn from the interviews indicate their concerns of lack of an array of instruments like short-term financial assets and derivatives to hedge their risks. In addition the lack of money markets hinders risk management practices in Islamic banks.

2.11 The Global Financial Crisis

By 2007, a significant increase in mortgage delinquencies in the U.S. coupled with a countrywide decline across housing prices triggered off a full-fledged liquidity crisis and continued over the subsequent years and all over the world (Ellaboudy, 2010; Kassim & Majid, 2010). Despite the fact that every crisis has its individual specificities, the GFC has been astonishingly similar to a “classical banking crisis”, caused by prudential irregularities at few institutions, ensuing global liquidity crisis during 2008 and 2009. As a result, many banks across the world reported financial loss
with approximately 123 banks in the U.S. filing for bankruptcy, including Lehman Brothers, Bear Stearns and Merrill Lynch.

In the years prior to the GFC, the banking landscape had gone through main structural changes, with global financial institutions growing bigger in scale and scope. Moreover, their financial architecture complexity had amplified, adding to their lack of clarity. Banking and its financial instruments became less transparent and more interrelated through correlated risk exposures, resulting from progressively comparable investment strategies. Furthermore, the bank debt levels had significantly increased with shortened average maturities of funding, fuelled by intensified competition, technological development and deregulation in the banking industry (Hoenig & Morris, 2011). Without a doubt, this occurred within a scenario of heavy leverage, excessive risk-taking, extreme complexity and insufficient capital. See Table 2.4 for time line of major financial crises over the years.
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<tbody>
<tr>
<td>Boom characteristics</td>
<td>Credit expansion, high leverage, asset price increases (especially real estate), macro economic imbalances, flexible exchange rates</td>
<td>Asset price increases, high investment growth in IT</td>
<td>Asset price increases (stock and real estate), high growth, short term borrowing, current account deficits, high inflation, pegged exchange rates</td>
<td>Credit growth, asset price increases, inflation, fixed exchange rates</td>
</tr>
<tr>
<td>Trigger event</td>
<td>Falling house prices and the failure of Lehman Brothers</td>
<td>Higher FED rates</td>
<td>Thailand’s decision to let the baht float in July 1997</td>
<td>Wall Street crash 1929</td>
</tr>
<tr>
<td>Policy response</td>
<td>Expansionary monetary and fiscal policy, bail-outs</td>
<td>Expansionary monetary and fiscal policy</td>
<td>IMF bail-outs, depressed exchange rates</td>
<td>Initial tightening of monetary policy, exchange rate depreciation</td>
</tr>
</tbody>
</table>

However, a critical aspect of excessive risk-taking has been the growing maturity mismatch between assets and liabilities as the funding maturity becomes increasingly shorter. Additionally an excessive exposure to real estate lending increased the exposure of banks to macroeconomic variables and thus systemic risks. In view of poor macroeconomic variables, all these factors are connected increasing the risk of bank failure. Additionally, extensive interconnectedness and complex links amongst institutions and financial market participants also increased the risk failure since it increases banks’ opacity causing lack of trust within the public at large making banks further prone to runs.

The GFC highlighted the risk of global contagion and the possible resiliency of less integrated financial systems. (IMF, 2012) Research reveals that less internationally integrated banking structure perform moderately well in the global financial crisis, signifying that the bank’s funding structure is significant element of banks continued existence.

In addition, the crisis addresses the call for financial regulation to be enhanced and aligned with fiscal, monetary and further economic policies taking into consideration systemic risks as the current supervisory structures to a certain extent focus on risks facing individual bank rather than the complete financial system. Evidently, the latest event of financial instability has highlighted the weak links in the existing approaches. However, the GFC is an opportunity for investors and regulators to be aware of how volatile markets can be and its stability is explicitly critical for a sustainable and resilient financial system. The GFC sent a systemic shock to the total
financial system, threatening the stability of the financial system spreading the contagion risk across the economy. Hence, increased global interconnectedness necessitates enhanced macro-prudential supervision.

2.11.1 Contributing macroeconomic factors: In most of the advanced economies, a number of macroeconomic factors such as low interest rates and low inflation caused the banks’ balance sheets in the lead-up to the financial crisis to expand further (Blundell-Wignall & Atkinson, 2009). Global savings and investments imbalances particularly amongst the leading emerging economies and the U.S. continued as globalization increased. Emerging economies accumulated surpluses increasing their demand for safe assets; whilst the U.S. and European banks grew their loan portfolios mainly through securitization of illiquid assets such as the subprime mortgages. In Europe, imbalances developed inside the euro region as budget deficits worsen with countries like Spain and Portugal experiencing a booming property market leading up to the crisis. The stimulus to this growth was the slower economic progress in the early 2000 rising from the monetary policies in the US with Europe was rather light. The economic justification was based on increasing support that business cycle variations were getting smaller with lower and steadier inflation rates.

2.11.2 Lack of supervision, regulation and market discipline: In general, global banks considerably influence policy maker decision and thus further policy measures for global systemically important banks are adopted, where policies are based on the concerns such as adverse selection caused by systemically significant banks which present regulations do not absolutely
address. For greatest private benefits, banks identify outcomes which are sub-optimal as they do not consider these negative externalities such as the effect of the impairment or failure of big size, interlinked global banks. These events, in turn, send systemic shocks through the financial system destructing the real economy. In addition the moral hazard costs allied with especially an implicit governmental support guarantees thus, intensify excessive risk-taking by financial institutions. Also diminishing market discipline, causing competitive distortions ultimately boost the likelihood of distress at some point (Ahmed, 2009; Mirakhor, 2007; Askari et al., 2009). Finally the moral hazard related costs may well add to any direct costs that could be sustained by taxpayers (Basel iii, 2012).

However, the recommended reform for the financial system’ stability is merely ensured by restrictive credit expansion along with decreasing financial leverage, comprising the elimination of subsidies that promote moral hazard. Examples consist of subsidized deposit insurance plans ensuring the viability of the “too big to fail” institutions also confines the creation of money all the way through the fractional-reserve\(^{30}\) of conventional banking structure (Frederic, 2011). For this reason, may well assist banks to have adequate funds to meet customers’ demand for withdrawals also eventually to minimize the risk of bank collapse.

\(^{30}\text{Fractional-reserve banking: is the practice whereby banks retain only a portion of their customers’ deposits as readily available reserves (currency or deposits at the central bank) from which to satisfy demands for payment. The remainder of customer-deposited funds is used to fund investments or loans the bank makes to other customers. Therefore, fractional-reserve banking permits the money supply to grow.}\)
In most cases both risk sharing schemes and limiting fractional-reserve banking practice are intrinsically stable as well as socially more equitable with the public. Given that the Islamic financial industry and the community are directly linked also cannot be separated as in the conventional model. In the long run, offering assistance to banks may well be counterproductive with banks experiencing losses at the government’s expense, resulting in weaker banks and heavy tax burdens to fund bank bailouts.

- **The dilemma with capital requirements**: The capital requirements specified in the second Basle Accords, demonstrated to be ineffective in allowing banks to grow in a consistent and robust manner. Basel I and II rules stipulated very little common equity, with the existent capital levels providing little absorbing capacity which most likely triggered the crisis. Furthermore, the toxic asset and mortgage backed securities originating from the US were part of European banks’ balance sheets in significant amounts. As American and European banks followed different capital requirements, the U.S. largely maintained a separate leverage ratio requirement. In fact, low-risk assets, such as mortgage backed securities, attracted lower capital requirements in Europe than in the U.S.

- **Lack of market discipline and the too-large-to fail dilemma**: In general, similar financial institutions are expected to encounter complications simultaneously, but when financial institutions are facing difficulties all at once, this event set hurdle for policy response. Several views on the problem of “too-many-to fail” have
been postulate in the literature (Acharya et al., 2010). Evidence suggests that this problem results from the interconnectedness and correlation amongst similar financial institutions, therefore turn into systemic as a group (Brunnermeier et al., 2009). Theses similar and large financial institutions operate in the same global markets and undertake similar activities. They use a converged risk management systems causing homogeneous behaviour also intensifying the impact of shocks (Zhou, 2010). Overall, with the increasing complexity of new financial products and structures; highly leveraged institutions and the growing interconnectedness among these institutions in conjunction with increasing banking sector size consequently led to lack of transparency in banks’ balance sheets. New financial products permitted credit risk to be spread extensively, allowing investors to diversify their portfolios thus, enabling banks to mitigate exposures that alternatively would stay on the balance sheets. Regardless, the market seemed to reward larger size institutions by charging lower debt margins, suggesting that there was a feeling amongst market participants that the biggest financial institutions had an implicit public guarantee. Hence such institutions were thought too big besides important to fail (Haldane & May, 2011).

➢ **Lack of a systemic aspect**: Before the crisis, undoubtedly, there was an absence of an adequate, systemic (macro-prudential) aspect to banking regulation and supervision. The dilemma is that banks do
not have an incentive to completely internalize the social cost emanating from their own contribution to the systemic risks embedded within the actual business decisions. As no substitute supervisory or regulatory procedures are in place, systemic risks occurred as financial institutions grew larger. In turn, they continued dealing with more complex transactions, increasing their leverage levels as they engaged in excessive risk-taking strategies. The minimum capital requirements as advocated by the Basel Accord is based on the bank’s stand-alone risks with no precise evaluation or measure of the exposure of an asset to systemic risk, like for example the exposure of home and real estate loans to the business cycle. Yet, the liquidity risks emanating from short-term money market funding do not fall within the Basel II requirements. This is clearly problematic as excessive short-term money market funding facilitates the interconnectedness also eventually systemic risk within the financial system. In an expansionary lending cycle like the property bubble funded from the short-term markets normally suggests an increase in risk exposure on a bank’s asset side. Finally, the current regulations and supervision address risks that individual banks are exposed to rather than the entire financial system.

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31 Richardson (2012): “Why the Volcker Rule is a useful for managing systemic risk”.
2.12 The relevance of Islamic Banking in promoting global financial stability

The phenomenon of financial instability is a recurrent issue within modern economic history affecting nations at different levels of intensity. In a seminal study by Friedman and Schwartz (1963) financial instability is seen as a consequence of abundant liquidity and rapid growth in money creation due to unrestrained credit expansion and no early detection signals from the system. Minsky (1992) reflected on financial stability to be internal and inherent (endogenous) to the conventional financial model. Generally, a consequence of financial instability is economic downturn or depression and with credit expansion and ample liquidity, sustained by low interest rates, leading to speculative booms as well as asset price bubbles.

The financial crisis caused the general public to question whether Islamic banks are more or less affected by the crisis. Ahmed (2010) and Smolo and Mirakhor (2010) claim that Islamic banks are hardly affected by the GFC as all financial transactions are trade-based and asset-linked. As Islamic financial instruments are interrelated to the productivity of the underlying investments, promoting the social goal of “sharing” risks and rewards, whilst cushion the financial institutions against the intrinsic risks of excess, equally in booms and downturn (Askari et al., 2010). Therefore, Samad (2004) and Kia and Darrat (2007) claim that an interest-free banking system provides more stability compared to their conventional banking counterparts.
The Islamic banking system is still in its infancy but is spreading fast across the world, growing at a faster pace than their conventional counterparts as investors seek Islamic banking products (El-Quqa et al., 2009; Ahamed, 2009). This surge within the Islamic financial industry means that it’s become systemically important for the global financial system. As the industry grows, questions are raised on the performance and risk matrix of Islamic banks, and it has been significantly highlighted during the latest economic crisis. Chapra (2008) and Siddiqi (2006) argue that given that Islamic banks avoid interest and interest-based assets, it is inherently more stable than conventional banks, moreover they support the concept of profit sharing (PLS) principles that regulate Islamic banks, that it’s intrinsically a more stable than a system which is based on interest. Ahmed (2009) notes, if the principles of Islamic finance had been followed, then the financial crisis would have been mitigated. The key strength of the Islamic banking model derived from the inherent nature of its underlying principles and transactions along with an underlying dynamic economic activities generating genuine revenue along with wealth.

Hence a direct link is established among the financial transactions and productive flows, this shield the Islamic banks from any potential risk emanating from unwarranted leverage also imprudent risk-taking. As a general rule, the Islamic banking model is based on equity participation extended on activities with real economic values. Therefore, the growth of its financial assets is anticipated to grow in tandem with the underlying economic activities’ growth. In addition, to the interest-based activities,
Shari’ah laws and regulations also embrace ethical values and community-based ethics. Hence, it is argued that this approach avoids unfavourable outcomes like negative consequences of systemic risk (Kassim & Majid, 2010). Additionally, investors are engaged in the PLS process through Musharakah, and Murabahah as an effective measure for involving all stakeholders in sharing risks (DiVanna, 2006). What’s more, Islamic banks also appear to have withstood the latest financial turmoil, with various investors questioning its resilience to the crisis. As well as its unwillingness to take part in extremely speculative transactions or investments helped them evade dealing in tradeable debts measured with mark-to-market principles. Instead, transactions were based on tangible assets withstanding comparable financial turmoil.

The global crisis exposed the vulnerabilities of banks in the GCC region to varying degrees. The GCC region experienced significant increases in banking system credit during the 2003-08 oil booms, however like any other double edge sword; there is also a downside to such progress. Expanding economies raises consumer and investor confidence causing abundant liquidity due to excessive credit growth possibly causing inflation and asset price increases. Some GCC countries became dependent on foreign financing and exposure to real estate/construction industry. The corporate sector was associated with higher leverage increasing the sector’s vulnerability to cost of funding. As the global economic crisis unfolded the GCC countries were obviously affected through lack of trade and a shortage in liquidity in financial channels. By the second half of 2008, GCC
government finances and external positions experienced a decline in oil prices and reversals of speculative capital inflows experienced in prior years. These changes stretched liquidity conditions which increased NPLs sharply. Consequently, credit declined and liquidity conditions tightened affecting investor’s confidence exacerbated by Lehman’s collapse in September 2008. GCC financial sector imbalances came to the fore, particularly in the United Arab Emirates (U.A.E), Bahrain, and Kuwait, known these countries’ close links with global equity and credit markets. This alarms authorities that the recovery may well delayed by credit constraints (Espinoza & Prasad, 2010).

2.13 Summary

This chapter reviews the literature on the determinants of banks’ financial stability. In addition, it details deliberations on banking structure and its stability by listing the new forms of financial institutions and their associated risks, mainly size and complexity, concentration, interconnectedness, pro-cyclicality, tail risk and wholesale funding. Furthermore, a general overview of bank systemic risk is provided with specific attention to liquidity risk and its association to other risks like insolvency, bailout and reputation risk.

The literature on Islamic banking from an insolvency perspective is not abundant. A large body of descriptive literature exists on risk and related regulatory challenges in Islamic banking (Sole, 2007; Jobst, 2007), with few
empirical studies focusing on cost efficiency in Islamic and conventional banking (Moktar, Naziruddin & Al-Habashi, 2006). Other studies such as Čihák and Hesse (2008) measure bank stability within the Middle East and North Africa (MENA) region and include a number of country regions. For example, Čihák and Hesse (2008) provide empirical evidence on Islamic bank financial stability but include banks outside of the GCC region, giving rise to some potential sample selection and variable measurement issues with Iran having over 12 banks with assets exceeding 1 billion US dollars.\(^{33}\)

The current literature is not clear on the relationship between liquidity risk and financial stability within a GCC context as there are no studies to this effect. This region has engaged in a number of attempts to integrate their respective economies into a similar EU style economic region. Hence, the GCC has unique characteristics and therefore a study investigating this phenomenon is under researched.

Furthermore the importance of the oil price volatility has not been thoroughly investigated within the literature where its impact on banks’ financial stability is relatively unknown. As the period of this study captures the high and low of oil price (2005-2012), this study aims at delivering a contribution to the literature by analysing this phenomenon within the region’s financial stability.

\(^{33}\) The data are collected from Bankscope.
CHAPTER 3: DEVELOPMENT OF HYPOTHESES AND RESEARCH METHOD

3.1 Introduction

This chapter details the hypotheses development, and data and methodology employed in this thesis to analyse the determinants of financial stability in the GCC region. Section 3.2 develops the hypotheses; Section 3.3 describes the data and specifies the estimation model. Section 3.4 describes the estimation method and diagnostic testing. Section 3.5 explains the robustness checks used, and Section 3.6 summarises the chapter.

3.2 Testable Hypotheses

This section reviews the four hypotheses developed for testing based on the literature review presented in Chapter 2. The first hypothesis predicts a positive association between a bank’s financial stability and its liquidity level. The next hypothesis tests whether bank income diversity is positively associated with financial stability. Furthermore, it is inferred that Islamic banks are more stable (less risky) than conventional banks. Finally, we test whether Islamic banks are more resilient to financial crisis than their conventional counterparts.

3.2.1 The effect of bank liquidity levels on financial stability: By and large, in the banking sector, some types and sources of risk entail a high chance of negative consequences on the whole operation of banks and, in several occasions even its survival. As evident from the GFC, this crisis was
deep-rooted in the low solvency levels of banks’ balance sheets. In general, the literature on bank runs and liquidity crisis has focused on depositors’ panics (Diamond & Dybvig, 1983) or on weak fundamentals similar to a downturn in the business cycle (Gorton & Huang, 2004; Allen & Gale, 2004, 2007). The literature on banking stability has also suggested that asset liquidity has stability implications by way of affecting systemic risk (Aghion, Bacchetta & Banerjee, 2000; Peacock et al., 2003). Lack of liquidity possibly will lead to large losses in asset/liability portfolios, as it generates financial distress and insolvency. Diamond and Rajan (2005) argue that bank liquidity shortages may cause solvency problems, since banks’ illiquid assets are funded through short-term debt, overall liquidity shortage. Overall, this may drive bank failures. Asset liquidity openly benefits bank stability by encouraging banks to minimise balance sheets risks and facilitating asset liquidation in crisis. A number of scholars find that liquidity buffers mitigate exposure to idiosyncratic shock and save on liquidation costs. This makes it easier for banks to meet any unpredicted early withdrawals (Diamond & Rajan, 2005). Conversely, others argue that better asset quality facilitates asset liquidation in crisis, thus dis-incentivising banks to evade such liquidation. Consequently, banks may well take on additional risks, such as capital and credit risks, thus enhancing the probability of default (Wagner, 2010; Tabak, Fazio & Cajueiro, 2012).

A study by Rajhi and Hassairi (2012) of Islamic banks within a financial stability context demonstrates that liquidity buffers reduce liquidity risk and increase bank stability. Recently, the relative illiquidity of
bank assets has been considered by financial regulators to be a major cause of banking fragility, and, with the GFC demonstrating extreme lack of liquidity, resulting in the failure of banks such as Lehman Brothers, Bear Stearns and Northern Rock. This unique feature highlights that liquidity risk and solvency are inherently interrelated in the banking sector. Furthermore, liquidity requirements could also have significant consequences for restraining solvency risk as well as encouraging prudent risk management practices in banking. Hence, in view of the literature discussed in Chapter 2 and the above arguments, the following are the first of a suite of hypotheses to be tested in this thesis.

**H1A:** A bank's liquidity has a positive effect on its financial stability.

**H1B:** Increases in bank liquidity cause conventional banks in the GCC region to be more financially stable than their Islamic counterparts.

**3.2.2 The effect of a bank’s income diversity on its financial stability:** It has been argued in the literature that diversification in banking can be achieved via geographic expansion, or across financial products and services, or through a combination of geographic and business line diversifications. A bank's activities contribute towards its risk. Income diversity is one of the factors commonly associated with the insolvency of Islamic banks (Abdul-Majid, Saal & Battisti, 2010). Rajhi and Hssairi (2012) noted that as banks engage less in their traditional lending activities (those generating interest incomes) and diversify their product mix, they become less prone to fluctuations within economic cycles correlated with
loan portfolios. Conversely, a contrary view to the risk reduction debate by DeYoung and Roland (2001) is that exposure to volatility associated with economic cycle results in less insolvency risk. Yet, studies have provided mixed results; Nash and Sinkey (1997) have noted that commercial banks specialising in credit card lending report higher probability of insolvency than banks with a traditional product mix. Hence, the second hypothesis is as follows:

\[ H_2: \text{A bank's income diversity has a positive effect on its financial stability.} \]

This is a non-directional hypothesis; so a two-tailed test is conducted for this hypothesis.

3.2.3 The effect of bank type on financial stability: There are several features that may make Islamic banks more vulnerable to risk than their counterparts. In a profit- and loss-sharing (PLS) scenario, the direct credit risk shifts from banks to their investment depositors, potentially increasing the overall degree of risk on a bank’s asset side of the balance sheets. As profit and loss sharing schemes cannot be made on guarantees or collateral to reduce credit risk.

Islamic banks are intensely invested in short-term fixed-rate assets; they are exposed to profit rate risk, as they cannot exploit derivatives instruments for hedging reasons. This feature most likely exacerbates any mismatch between liabilities (deposits) and assets (loans) rates of return, leading to greater profit distribution management and thus higher Islamic bank risk and lower financial stability. Additionally, Islamic banks may also
invest in profit-sharing assets, exposing themselves to uncertain returns on these assets, potentially increasing risk. However, there are also several characteristics that may make Islamic banks less vulnerable to risk than their conventional counterparts. The risk-sharing scheme on the deposit side provides the bank with a layer of protection, in addition to its capital. Some Islamic banks may also utilise discretionary reserves to mitigate the effects of profit distribution management on shareholder earnings. This characteristic reduces potential mismatches in asset (loans) and liability (depositors) rates of return, mitigating shareholders’ revenue volatility, thereby increasing financial stability. In view of the mixed evidence, we developed the following hypothesis in line with trends in the mainstream literature:

\[ H_3: \text{Islamic banks are more financially stable than conventional banks.} \]

3.2.4 The effect of the GFC on the financial stability of banks: The GFC unfolded with obvious consequences on the GCC countries, as trade and liquidity levels suffered significantly. The GCC region experienced significant increases in banking system credit during 2003-2008 (IMF, 2010). The vibrant macroeconomic environment during the years prior to the crisis may be largely attributed to lower levels of nonperforming loans, together with favourable credit conditions within the banking system. Nevertheless, such prosperity, fuelled by inflation, triggered unmanageable credit portfolios and credit growth, along with an increase in asset values. This affluence encouraged corporations to take on more leverage, only to deleverage after the global credit squeezes, particularly in U.A.E, Bahrain
and Kuwait. While the worldwide deleveraging practice took hold, and production and oil prices plunged, the fiscal and external surpluses of the GCC states declined strikingly. Real estate and stock markets plunged, while external funding for the corporate and financial sectors tightened. Across the GCC region, economic activities tapered along with inflation and a decline in credit. Yet, banks remained profitable in the face of unfavourable conditions. In spite of the higher profitability of Islamic banks throughout the pre-GFC period, their average profitability during 2008-09 was parallel to that of their counterparts. As the crisis stirred the actual economy in 2009, Islamic banks experienced a sharp decline in profitability, whereas asset growth and credit remained robust (Hasan & Dridi, 2010).

The crisis affected investor confidence and distorted liquidity conditions; the bank collapses which occurred in September 2008 caused significant market uncertainty. As the GCC region is highly correlated with the global equity and credit markets, the region experienced an overall drop in asset prices, spreading further uncertainty. Since the GFC had a major impact on financial markets, and a robust and resilient financial system is the foundation for sustainable economic growth (Helleiner, 2011), the last hypothesis tests the following association:

H₄: The GFC had a negative impact on banks’ financial stability in the GCC.

This directional hypothesis was tested by converting the relevant two-tailed p-values into one-tailed p-values.
3.2.5 Summary of testable hypotheses: This chapter has drawn upon the banking literature to develop testable hypotheses predicting the determinants of banks’ financial stability within the GCC region. The first hypothesis predicts a positive impact from a bank's liquidity levels on its financial stability. The next hypothesis employs an income diversity proxy and finds a positive impact on banks’ financial stability. The Islamic/conventional dichotomous cohort is tested to evaluate its impact on bank financial stability. Finally, a pre- and post-GFC dummy is introduced to capture the impact of such crises on a bank’s stability, and infers that the GFC had a negative impact on financial stability.

3.3 Data and Model

This section describes the data and model utilised for empirical analysis. An outline of the sample selection procedure is presented in Section 3.3.1, followed by the details of the sample in Section 3.3.2. Section 3.3.3 concludes with a description of the model employed.

3.3.1 Sample Selection: The sample comprises of annual data from Islamic and commercial banks in Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and U.A.E, better known collectively as the Gulf Corporation Countries. Other financial entities, such as central banks and investment houses and non-bank financial firms, were excluded from the data set. This ensures the comparability of the dataset; as such entities differ in capital structures, business scope and regulatory environments. In addition, banks without
unconsolidated reports were excluded, removing the potential bias of non-
bank financial subsidiaries in the financial reports and any foreign
subsidiaries. As regards mergers and acquisitions, the target and acquiring
banks were treated separately as long as each bank continued to file
unconsolidated reports; otherwise they were dropped from the sample.
Banks without at least three consecutive financial reports were removed
from the dataset (Beck, Demirguc-Kunt & Merrouche, 2013).
Table 3.1 shows the filtering process and the number of GCC banks included in the final sample.

<table>
<thead>
<tr>
<th>Selection Process</th>
<th>Number of banks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial banks in operation during sample period</td>
<td>Bahrain Kuwait Oman Qatar Saudi UAE TOTAL</td>
</tr>
<tr>
<td>Exclude banks without unconsolidated reports</td>
<td>-24 -7 -2 -3 -4 -4 -44</td>
</tr>
<tr>
<td>Exclude banks without three years consecutive financial information</td>
<td>-3 -3 0 -1 -1 0 -8</td>
</tr>
<tr>
<td>Final sample size</td>
<td>23 28 12 13 14 37 127</td>
</tr>
</tbody>
</table>

This table shows the sampling and selection procedure undertaken in this thesis. Banks that do not report unconsolidated financial reports were excluded in order to remove bias emanating from subsidiary holdings. Due to the methodological choice, a minimum of three consecutive observation years was also required; therefore banks without three consecutive years of observations were excluded. The final sample size is 127 banks.

3.3.2 Sample Period and Data Sources: The sample period is from 2005-2012, with the Global Financial Crisis assumed to be 2008/09 (Beck et al., 2013), determined by a binary dummy with the value of 1 for 2009-2012, 0 otherwise, i.e., 2005-2008. Annual bank-specific data were gathered from Bankscope (Fitch Ratings & Bureau van Dijk, 2011), while country-specific macroeconomic data were gathered from the World Economic Outlook (IMF, 2012) database. In order to mitigate the data of outliers, the process of data winsorisation was employed. Accordingly, all bank-specific data were
winsorised at the 1% level; that is, all values below the 1st and above the 99th percentile (Tukey, 1962).

3.3.3 Modelling the determinants of Financial Stability: In line with Beck et al. (2013), this study employs two categories of financial stability, with the first being Z-score, followed by two asset quality proxies. Z-score is an absolute and balanced indicator of bank vulnerability, combining accounting measures of leverage, profitability and volatility. We attempted to use a third, which is the non-performing loans ratio. However, there were too many missing values, and therefore we had to remove this proxy from the dataset.

This thesis addresses a key aspect of the literature that has been ignored in prior studies and plays an important role in modelling financial stability. The interaction of financial stability and its explanatory variables mainly the banks’ liquidity level is not clear. Whether financial stability can be expressed in terms of liquidity or vice versa is an unresolved issue. Hence we have an endogeneity issue that has gone untested in prior studies. This thesis tests this association by measuring any changes in the association between financial stability and liquidity by allowing the coefficients of interest to change in the pre- and post-global financial crisis period. The prescribed model is primarily adopted from Čihák and Hesse’s sequence of bank stability studies (2008 & 2010). The resulting model is estimated as follows:
\[ FSI_{i,j,t} = \alpha + \beta_1 LIQ_{i,j,t-1} + \beta_2 IncDiv_{i,j,t-1} + \beta_3 IS_{i,j,t} + \beta_4 GFC_{i,j,t} + \sum_{k=1}^{p_1} \beta_{5k} BANKVAR_{k,i,j,t-1} + \sum_{l=1}^{p_2} \beta_{6l} MACROECO_{l,i,j,t} + \epsilon_{i,j,t} \] (3.1)

Where \( i \) denote banks, \( j \) denotes a country, \( p_1 \) is the number of bank variables, \( p_2 \) is the number of macroeconomic variables, \( t \) denotes time and \( \epsilon \) is the error term. \( FSI \) represents the financial stability indicators; \( LIQ \) represents the proxy for the banks’ liquidity levels one year before its respective financial stability indicator; \( IncDiv \) represents the proxy for banks’ income diversity; \( IS \) is a dummy variable, which takes the value of 1 for Islamic banks and 0 for commercial banks; \( GFC \) is another dummy variable, with 0 representing the pre-GFC period and 1 otherwise; the \( BANKVAR \) and \( MACROECO \) variables represent a bank-specific and a macroeconomic variable(s), respectively.

**Dependent Variable**

The financial stability literature associates bank failures with undesirable market instabilities. Bank failures normally affect the overall economy more than the failure of other business types. Bank failure spreads in a domino-style right through the banking industry and affects solvent as well as insolvent banks. The contagion effect was apparent during the GFC, with several financial institutions either liquidated or downgraded. Financially distressed banks may well default on their interbank liabilities, ensuing further liquidity problems for stressed banks (Shin, 2008). In general, the
failure of one single bank may initiate the risk of system-wide failures, explicitly known as systemic risk. Systemic risk is present when examining financially-based risks, while banks struggle for continued existence by developing mechanisms to manage and mitigate possible threats causing consequential adverse factors. Banks allocate resources to investigate the effects of systemic risk.

Periods of financial instability and subsequent bank failures are not rare events, and are not limited to certain geographic locations. The social cost of bank failure is generally high, affecting the nation’s business sentiment. Central banks, governments, and regulatory authorities are required to intervene to bail out ailing banks. As bank failures affect the whole business community, central banks and policy makers are concerned with the determinants of banking instability and the strategies to lessen such events.

The first FSI category is represented by a financial stability proxy characterised by Z-score. This variable has been extensively employed in recent literature to assess individual bank risk (Beck et al., 2010, 2013; Cihak & Hesse, 2006, 2008, 2010; Maechler, Mitra & Worrell, 2005; Boyd & Runkle, 1993), demonstrating the distance from insolvency (Turk-Ariss, 2010; Jens, 2011). The Z-score is an absolute and balanced indicator of bank vulnerability (Gropp, Vesala & Vulpes, 2006), combining accounting measures of leverage, profitability and volatility. Therefore, it is the most desirable measure in the banking literature (Gropp et al., 2006). This score indicates the number of standard deviations that a bank’s return on assets
The bank is insolvent, where losses surmount equity \((E<p)\), where \(E\) is equity, \(p\) is profits. Thus, a higher Z-score indicates that a bank is less risky and more stable (Leaven & Levine, 2008; Demirguc-Kunt & Huizinga, 2010; Demirguc-Kunt, Detragiache & Tressel, 2006). Whilst Z-score has its limitations, it represents an improvement over other measures employed in earlier studies. In contrast, interest margins, capitalisation and loan spreads are affected by a range of forces other than vulnerability, such as differences in risk-free interest rates, operating cost, market structure and varying capital regulation. Thus, the Z-score offers an objective measure of insolvency risk (Čihák & Hesse, 2010).

The second category of dependent variable is an asset quality proxy and is represented by either the ratio of loan loss reserves to gross loans \(AQ_1\), or the ratio of loan loss provisions to gross loans \(AQ_2\).

**Independent variables of interest:**

\(LIQ\) Represents bank liquidity, measured as the ratio of liquid assets to total assets.\(^{34}\) It is calculated by using the core measure of liquid assets as the numerator and total assets as the denominator. The ratio can be calculated using the broad measure of liquid assets as the numerator. This ratio provides an indication of the liquidity available to meet expected and

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\(^{34}\) Selection of liquidity indicator is constrained, since it is the only uniform indicator presented within Bankscope database. Thus probably different measure would gain more insight in the relation among insolvency and liquidity risk.
unexpected demands for cash. As the ratio increases, the bank is deemed to be more liquid and therefore less vulnerable to a bank run (IMF, 2009). Moreover, the average level of liquidity indicates the capability of banking sector to withstand shocks to their balance-sheets. In line with Beck et al. (2013), the liquidity proxy is lagged by one year and a positive coefficient is expected. It is expected that in both instances, a positive coefficient is reported. This ratio has also been employed in a prior study by Beck et al. (2013) to determine the sensitivity of bank runs. An interaction variable between liquidity levels and the bank type is included to capture the impact of the dichotomous banking cohort, where again a value of 1 is allocated to Islamic banks and 0 to otherwise, i.e., conventional. A negative sign is expected, where it is inferred that an extra unit of liquidity causes less financial stability in the Islamic cohort than in the conventional.

*IncDiv* Represents income diversity measured by either (i) average proportion of total sales revenue that it generates from activities, including trading revenues, commissions and fees and other activities for t-1 or (ii) Laeven and Levine’s (2007) measures income diversity by taking 1 less the absolute value of (net interest income – other operating income) dividing it by total operating income. Higher values
of the variable correspond to a higher degree of diversification. The income diversity measure takes values from 0 to 1 and is increasing in the degree of diversification. In line with IMF (2009), the net interest income of Islamic banks is the sum of the positive and negative income flows associated with the PLS arrangements. Rajhi and Hassairi (2012) notes that as banks are engaging less in their traditional lending activities (those generating interest income) and diversifying their product mix, they are becoming less prone to fluctuations within economic cycles correlated with loan portfolios. DeYoung & Roland (2001) find that exposure to volatility associated with economic cycles results in less insolvency risk. As there are contrary views to the risk reduction debate (Farook, Hassan & Clinch, 2012), there is no certainty with regard to the expected coefficient sign. An interaction variable between income diversity variables and the bank type is included to capture the impact of the dichotomous banking cohort, where again a value of 1 is allocated to Islamic banks and 0 to otherwise, i.e., conventional. A positive sign is expected, from which it is inferred that an extra unit of $INC-DIV$ causes greater financial stability in the Islamic cohort than in the conventional.
IS Represents a dummy variable for bank type. This variable is included to determine whether there are any significant differences in the financial stability of Islamic banks relative to their counterparts. We included a dummy variable that takes the value of 1 if the bank in question is an Islamic bank and 0 if it is a conventional bank. Therefore, in line with Čihák and Hesse (2010) the hypothesis we expect a positive coefficient.

GFC Represents the dummy variable for the global financial crisis. It takes the value of 0 if the data falls prior to 2009 and 1 otherwise, i.e., 2009 till 2012. This measure is in line with Beck et al. (2013). The recent financial turmoil exposed the vulnerabilities of both conventional and Islamic banks in the GCC region to varying degrees. It is often claimed in Islamic financial circles that Islamic banks have been more resilient to the GFC than their counterparts (IMF, 2010). On the other hand, the effect of such a crisis on their stability is unclear. In view of such events, the pressure of globalisation, in addition to changes in the worldwide financial environment, is challenging for the GCC banking industry in many ways. Therefore, a negative coefficient is expected.
Control variables

This study controls for an array of time-variant bank characteristics. There are two types of control variable: bank-specific and macro-economic. Each variable is discussed below, together with the expected coefficient. Whilst the explanatory variables in this study measure the relationship between bank stability and the fundamental determinants of stability, other measures such as bank-specific characteristics, need to be controlled for. The measure $BANKVAR_{i,j,t-1}$ is a vector of bank-specific variables discussed below.

CONC

This is measured by the Hirschman-Herfindahl concentration index of the banking market in a country $k$ at year $t$. This measure is employed to control for the effect of market dynamics on the level of risk faced by individual banks in the GCC. This index is calculated by taking the sum of the squares of the market shares of each individual bank based on total deposits held (Tirole, 1990). The index can have values from 0 to 1. Boyed & De nicolo (2005) noted that banks’ probability of failure is positively correlated with concentration. Higher levels of market concentration lead to lower banking sector stability and higher bank risk (Čihák & Hesse, 2006, 2008, 2010; Schaeck, Čihák & Hesse, 2009). The “concentration-fragility” view posits that banks in concentrated structures will be likely to receive better subsidies through implicit “too-large-to-fail” polices that increase risk-taking incentives and therefore enhance banking structure.
fragility (Berger et al., 2009). Nevertheless, higher concentration may well also lead to comfortable capitalisation levels, and as a result, a lower probability of insolvency (Farook et al., 2010). In view of the conflicting views, the expected coefficient sign is unclear.

**MKSH**

Market share. This represents the bank’s exposure to the market. It also measures the bank assets over a country’s total banking sector assets (Berger et al., 2004), i.e. the bank’s assets in terms of the total market in the country where the bank operates. A positive statistical relationship between financial stability measures and market structure is expected. This is in line with Berger et al., (2004), and Demirgüç-Kunt and Huizinga (2010).

**SIZE\textsubscript{t-1}**

This control variable proxies for bank size, based on the view that larger banks may well be less risky due to economies of scale enabling them to diversify their income streams (DeYoung & Roland, 2001). Conversely, larger banks may be riskier if they attempt to exploit the “too-large-to-fail” phenomenon (Iannotta, Nocera & Sironi, 2007). To capture the significance of bank size as regards stability, size is measured by taking the logs of the banks’ total assets for each year in $US for t-1 (Farook et al., 2012; Čihák & Hesse 2006, 2008, 2010) and a positive coefficient is expected.
**Macro-economic variables**

Whilst the explanatory variables in this study measure the relationship between bank stability and its determinants, macro-economic measures must be controlled for. The macro-economic environment is an important consideration in banking sector performance, and the following macro-economic variables were chosen in line with the literature. However, a critical aspect of excessive risk-taking has been the growing maturity mismatch between assets and liabilities as the funding maturity becomes increasingly short. Additionally, an excessive exposure to real-estate lending has increased the exposure of banks to macro-economic variables and thus systemic risks. The modern crisis highlights the importance of linking macro-economic conditions to the health of the financial system. In view of poor macro-economic variables, all these factors are connected with increasing the risk of bank failure. Extensive interconnectedness and complex links amongst institutions and financial market participants also increases the risk of failure, since these factors increase banks’ opacity. This may well cause a lack of trust by the public at large, making banks further prone to runs. The macro-economic and bank specific control variables are included in the model to take into account country- and bank-specific effects.

*LnGDP*  
In line with Čihák and Hesse (2008), the growth rate of GDP was used to control for the macro-economic cycle (business cycle) and its impact on the level of individual bank risk in every country (Čihák & Hesse, 2008). This variable was
based on the idea that surges in economic activity indicate improving banking conditions, consequently reducing the probability of insolvency. Conversely, a recession will have the opposite effect, with lower growth reflecting worse conditions for financial stability. Thus, a positive relation between the growth rate of GDP and bank solvency is expected.

\( \sigma_{\text{OIL}} \)

Represents the standard deviation of monthly oil prices over a year. The oil price is the backbone of the GCC economy, and most economic activities within the region are directly correlated with this key variable. This makes the region vulnerable to oil price uncertainties. If the global aggregate demand for oil dissipates, a prolonged plunge in oil prices is possible, leaving oil exporters worse off in terms of their fiscal and external balances. If this economic scenario is not controlled for, it will have an adverse impact on government spending exposing the GCC region to the risks associated with constant reliance on hydrocarbon revenues. However, as the oil-exporting governments possess heavy external asset buffers coupled with little government debt commitments, this helps mitigate the impact on non-oil activity in most GCC countries. Therefore, a positive coefficient is expected.

\( \text{INF} \)

To combat inflationary pressures, most GCC countries plan to reduce government spending to prevent the economy from...
overheating and also to advance long-term fiscal positions (IMF, 2012). It is crucial that inflation is curtailed, as this has an impact on exchange rates. Baldwin (2005) has argued that as the GCC countries use the U.S. dollar as the base for their financial transactions and currencies, any possible currency fluctuation is the main source of risk for Islamic financial institutions. Inflation was employed to represent price stability, as both contribute towards the stability of the banking sector as a whole. Hence, a negative coefficient is expected.

An overview of the variables used in the model is recorded in the Table 3.2.
Table 3.2: Detailed representation of variables used in the model

<table>
<thead>
<tr>
<th>Data Description</th>
<th>Measure</th>
<th>Variable</th>
<th>Description</th>
<th>Source</th>
<th>Predicted Sign</th>
<th>Variable unique/critical to the present study</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dependent Variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dependent variable 1</td>
<td>Z-score</td>
<td>\textit{FSI}</td>
<td>(Total Equity/Assets +Average Return on Assets)/Standard Deviation of Return on Assets over the years</td>
<td>Čihák and Hesse (2008), Boyd and Runkle (1993)</td>
<td>N/A</td>
<td>Using the Z-score as a measure of bank-specific stability.</td>
</tr>
<tr>
<td><strong>Explanatory Variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bank-specific variable</td>
<td>Liquidity</td>
<td>\textit{LIQ}_1</td>
<td>Liquid assets/total assets (liquid asset ratio)</td>
<td>Financial soundness indicators (FSIs). IMF</td>
<td>+</td>
<td>The level of liquidity indicates the ability of the bank to withstand shocks to its balance sheet</td>
</tr>
<tr>
<td>Bank-specific variable</td>
<td>Liquidity</td>
<td>\textit{LIQ}_2</td>
<td>The ratio of liquid assets to deposit and short-term funding</td>
<td>Financial soundness indicators (FSIs). IMF</td>
<td>+</td>
<td>Indicator of maturity matching. To assess the sensitivity to bank run. “stability”</td>
</tr>
<tr>
<td>Bank-specific variable</td>
<td>Liquidity</td>
<td>\textit{LIQ}_3</td>
<td>Ratio of loans to total assets (asset mix)</td>
<td>Financial soundness indicators (FSIs). IMF</td>
<td>+</td>
<td>Captures the effect of illiquidity on a bank’s financial strength</td>
</tr>
<tr>
<td>sector-specific variable</td>
<td>Market Share</td>
<td>\textit{MKSH}</td>
<td>Bank assets over total country’s banking sector assets</td>
<td>Author’s calculations based on BankScope database</td>
<td>+</td>
<td>Captures the effect of CR on a bank’s instability. Z-score is inversely related to CR.</td>
</tr>
<tr>
<td>Bank-specific variable</td>
<td>Islamic bank dummy</td>
<td>\textit{IS}</td>
<td>1 represents Islamic banks, 0 otherwise</td>
<td>Author’s calculations based on BankScope database</td>
<td>+</td>
<td>Assesses any differential impacts between Islamic and conventional banks.</td>
</tr>
<tr>
<td>Variable Type</td>
<td>Control/Variable</td>
<td>Description</td>
<td>Source(s)</td>
<td>Sign</td>
<td>Notes</td>
<td></td>
</tr>
<tr>
<td>-----------------------</td>
<td>------------------</td>
<td>------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------</td>
<td>------</td>
<td>-------</td>
<td></td>
</tr>
<tr>
<td>Bank-specific variable</td>
<td>GFC dummy</td>
<td>GFC Pre-GFC is represented by 0, 1 otherwise.</td>
<td>Author’s calculations based on BankScope database</td>
<td>-</td>
<td>Assesses any differential impacts between Islamic and conventional banks.</td>
<td></td>
</tr>
<tr>
<td>Bank-specific variable</td>
<td>Control variable</td>
<td>SIZE The natural logarithm of total assets</td>
<td>Author’s calculations based on BankScope database</td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bank-specific variable</td>
<td>Control variable</td>
<td>IncDiv 1- abs(net interest income-operating income)/total operating income</td>
<td>Laeven and Levine (2007); DeYoung &amp; Roland (2001)</td>
<td>+</td>
<td>Controls for the extent to which banks diversify from traditional lending activates to other activities.</td>
<td></td>
</tr>
<tr>
<td>Banking sector variable</td>
<td>Control variable</td>
<td>CONC Herfindahl index: sum of squared market shares (in terms of total deposits held) of all banks in the country.</td>
<td>Schaeck, Čihák and Wolfe (2006); Čihák and Hesse (2008).</td>
<td>-</td>
<td>Controls for market dynamics on bank riskiness.</td>
<td></td>
</tr>
<tr>
<td>Macroeconomic variable</td>
<td>Control variable</td>
<td>lnGDP Natural logs of GDP.</td>
<td>International Financial Statistics (IMF)</td>
<td>+</td>
<td>Controls for macro-economic cycles.</td>
<td></td>
</tr>
<tr>
<td>Macroeconomic variable</td>
<td>Control variable</td>
<td>INF Year-over-year percentage change in consumer price index.</td>
<td>International Financial Statistics (IMF)</td>
<td>-</td>
<td>Controls for CPI.</td>
<td></td>
</tr>
</tbody>
</table>
3.4 Estimation technique

This section describes the preliminary diagnostic testing undertaken and summarises the methodological choices made. Section 3.4.1 details the initial diagnostic testing procedures, and Section 3.4.2 shows how endogeneity was dealt with. Section 3.4.3 documents the methodological approach taken in regards to Generalised Methods of Moments (GMM). Section 3.4.4 describes the techniques for testing for validity of instruments.

3.4.1 Diagnostic Testing: Initial diagnostic testing of data included tests for multicollinearity and heteroscedasticity. Table 3.3 displays the correlation coefficients between the variables employed in the estimation model. While the high correlations between $LIQ_1$ and $LIQ_2$ were expected, correlations between $SIZE$, $lnGDP$ and $LIQ_2$ are higher than 0.05 in magnitude. Thus, a Variance Inflation Factor (VIF) test was performed to test for multicollinearity. The results in Panel A of Table 3.4 show a mean VIF score of 2.1, and each variable individually returns a score below the critical value of 10. Therefore, despite the observed high correlation values, multicollinearity is not an estimation issue in regressions.

In addition, a Breusch-Pagan test was performed to test for homoscedasticity in the error terms (Table 3.4). Breusch-Pagan tests the null hypothesis that the variance of the residuals is constant (constant residuals imply that errors are homoscedastic), utilising a Lagrange multiplier (LM) test with a chi-squared distribution (Breusch & Pagan, 1979). The results, reported in Table 3.4 Panel $B_1$, reject the null hypothesis that the variance of
the residuals is constant, suggesting that heteroscedasticity is present in the dataset.
### Table 3.3 Correlation matrix

<table>
<thead>
<tr>
<th></th>
<th>LIQ₁</th>
<th>LIQ₂</th>
<th>LIQ₃</th>
<th>MKSH</th>
<th>SIZE</th>
<th>IncDiv</th>
<th>CONC</th>
<th>lnGDP</th>
<th>σ_OIL</th>
<th>INF</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIQ₁</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LIQ₂</td>
<td>0.329</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LIQ₃</td>
<td>-0.354</td>
<td>-0.141</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MKSH</td>
<td>-0.106</td>
<td>-0.089</td>
<td>0.203</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SIZE</td>
<td>0.263</td>
<td>0.076</td>
<td>0.509</td>
<td>0.703</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IncDiv</td>
<td>0.012</td>
<td>0.017</td>
<td>-0.033</td>
<td>0.019</td>
<td>-0.045</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CONC</td>
<td>-0.137</td>
<td>-0.067</td>
<td>0.065</td>
<td>0.323</td>
<td>0.153</td>
<td>-0.467</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>lnGDP</td>
<td>0.1072</td>
<td>0.096</td>
<td>-0.036</td>
<td>0.090</td>
<td>-0.137</td>
<td>0.387</td>
<td>0.077</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>σ_OIL</td>
<td>0.031</td>
<td>-0.041</td>
<td>-0.005</td>
<td>0.039</td>
<td>-0.255</td>
<td>-0.045</td>
<td>-0.071</td>
<td>0.601</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>INF</td>
<td>-0.030</td>
<td>0.023</td>
<td>-0.107</td>
<td>0.005</td>
<td>-0.096</td>
<td>0.543</td>
<td>-0.117</td>
<td>0.319</td>
<td>0.000</td>
<td>1</td>
</tr>
</tbody>
</table>

This table reports the Pearson correlation coefficients between explanatory variables for the GCC region over the sample period 2005-2012. LIQ₁ is the liquid assets/total assets; LIQ₂ is the ratio of liquid assets to deposit and short-term funding; LIQ₃ is the ratio of loans to total assets; SIZE is the natural logarithm of total assets; INC-DIV is the net interest income operating income/total operating income; CONC is the Herfindahl index; lnGDP is the natural log of Gross Domestic Product; σ_OIL is the measured as the standard deviation of the oil price.
Table 3.4 Diagnostic testing statistics

Panel A: Variance Inflation Factor Test Statistic

<table>
<thead>
<tr>
<th>LIQ_1</th>
<th>LIQ_2</th>
<th>LIQ_3</th>
<th>MKSH</th>
<th>SIZE</th>
<th>IncDiv</th>
<th>CONC</th>
<th>lnGDP</th>
<th>σ_{oil}</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.31</td>
<td>1.68</td>
<td>1.93</td>
<td>2.15</td>
<td>3.45</td>
<td>1.80</td>
<td>1.82</td>
<td>1.48</td>
<td>2.90</td>
<td>2.1</td>
</tr>
</tbody>
</table>

Panel B_1: Breusch-Pagan Test Statistics

<table>
<thead>
<tr>
<th>H_0: Constant Variance</th>
<th>chi2</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>142.37</td>
<td>0.001</td>
</tr>
</tbody>
</table>

Panel B_2: Hausman Specification Test Statistics

<table>
<thead>
<tr>
<th>H_0: Difference in coefficients not systematic</th>
<th>chi2</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>47.00</td>
<td>0.001</td>
</tr>
</tbody>
</table>

This table presents the results from diagnostic testing. LIQ_1 is the liquid assets/total assets; LIQ_2 is the ratio of liquid assets to deposit and short-term funding; LIQ_3 is the ratio of loans to total assets; SIZE is the natural logarithm of total assets; IncDiv is the net interest income operating income/total operating income; CONC is the Herfindahl index; lnGDP is the natural log of Gross Domestic Product; σ_{oil} is the measurement of oil price; INF is the change in consumer price index. The Variance Inflation Factor (VIF) tests for multicollinearity, the Breusch-Pagan test is for heteroscedasticity, and the Hausman Specification tests for endogeneity.
3.4.2 Testing for Endogeneity: The estimation models employed in this study may be subject to endogeneity concerns between financial stability and liquidity measures. From a theoretical perspective, it can be suggested that an increase in liquidity may be driven by lower financial stability, or that decreased financial stability may be driven by a decision to hold more liquid assets (Gorton, 2009). Several studies have uncovered that liquidity makes banks less susceptible to idiosyncratic shock, since banks can meet unexpected deposit demands (Diamond & Rajan, 2005; Carletti et al., 2007). Conversely and surprisingly, Wagner (2010) argues that increased liquidity of bank assets may increase banking instability. Banks may have an incentive to acquire additional risks (capital and credit risk), increasing the probability of default, which more than offsets the positive direct impact on stability (Wagner, 2010; Tabak et al., 2012). Within an empirical setting, this unknown causality causes the error terms to be correlated. This phenomenon violates a critical assumption for the best linear unbiased estimation (BLUE), making traditional OLS estimates biased.

To test for this potential endogeneity, a Hausman specification test was performed. The Hausman specification test compares the coefficients obtained by the OLS estimation, fitting fixed-effects with the coefficients obtained by generalised least squares estimation fitting random-effects (Hausman, 1978). The results, in Panel $B_2$ of Table 3.4, indicate that endogeneity is present, by rejecting the null hypothesis (difference in coefficients is not systematic) at the 1% level. This makes OLS an inappropriate regression estimation method to estimate Equation 3.1.
Given the above-mentioned diagnostic results, there are two widely accepted methods: two stage least squares (2SLS) and generalised method of moments (GMM). Within this context, GMM is the more appropriate, as it is robust for heteroscedasticity. It removes firm specific fixed effects, and provides more efficient estimates in “short and wide” panel data sets where \( T \) (representing time) is small and \( N \) (representing number of observations) is large (Arellano & Bover, 1995). Given the nature of the data set and violation of homoscedastic errors, GMM is the preferred choice.

3.4.3 Generalised Method of Moments: In order to address the research question identified in Chapter 1, we selected the methodology of Arellano and Bover (1995) and Blundell and Bond (1998) over Arellano and Bond’s (1991) difference GMM estimator. The latter was designed to account for fixed firm effects in addition to dealing with panel data that have fewer time periods (\( T \)) than cross sections (\( N \)), by taking lags of regressors by “differencing” them (Arellano and Bond, 1991). Arellano and Bover (1995) find, however, that taking lags of the independent variables as instruments causes the difference estimator to be biased. Thus they suggest a technique which combines regressions in differences as well as regressions in levels, called the System GMM.

Since the data are an unbalanced panel, forward orthogonal deviation within the difference transformation is utilised (Arellano & Bover, 1995). This method has the advantage of filling in gaps in the dataset. The mean of future observations is deducted from the first \( T-1 \) observations during the difference transformation. It preserves the sample size in panels
which leads the estimator to work better as compared to transformation by first-difference (Hayakawa, 2009).

There is a shortcoming of utilising forward orthogonal deviations due to the introduction of a potential bias. By utilising the system GMM method, which utilises the untransformed level equation and the difference equation, this bias is minimised by employing lags of pre-determined variables as Instrumental Variables (IVs) simply at the levels equation (Blundell & Bond, 1998). Since pre-determined variables are designated and employed as IVs merely within the levels equation the variables are still uncorrelated with the contemporaneous error term. Hence, the bias of possible correlation with the error term is removed.

The shortcoming of the GMM is that there is a proliferation of instruments employed to generate moment conditions (Roodman, 2009b). This may lead to over-fitting of the endogenous variable and weakening of the traditional tests utilised to detect such an over-fit, resulting in misspecified tests of model validity. Therefore, in line with Roodman (2009b), we addressed this concern by restricting the amount of lags for instrumental variables, and failing the instrument matrix by separating the set of instruments into GMM.

3.4.4 Testing the Validity of the Model: In regards to testing the validity of the total IV set employed within the regression (i.e. validity of the GMM, pre-determined and exogenous approaches), two techniques were utilised to examine the validity of instruments. These were the Sargan test of over-
identifying restrictions, and the Hansen test of over-identifying restrictions. Whilst the Hansen test is weakened by instrument proliferation, the Sargan test relies on the assumption of homoscedasticity (Roodman, 2009a).

In spite of the methodological option we employed in this thesis, in search of lesser instrument proliferation, the likelihood of weak performance of the Hansen test is a concern. In order to make certain of the precision of the Hansen test, difference-in-Hansen tests were executed on the GMM-style IV. This guarantees the validity of the subsets of instruments. The null hypothesis is that the IV subset selected is exogenous, and failure to reject supports that the initial Hansen $J$-statistic is not under-rejecting due to instrument proliferation of predetermined and exogenous-style IVs. Thus, this subsequent test of model validity make certain that both the validity of the GMM style IV in addition to ensures the first test is not biased by instrument proliferation.

The third test for instrument validity is to determine that there was no serial correlation in the transformed error term. The Durbin-Watson test for autocorrelation was acknowledged to be unsuitable. Consequently, the Arellano-Bond (1991) test for autocorrelation was executed as an alternative. Additionally, since the GMM system is run on first differences, autocorrelation at that point is anticipated, and rejection of AR (1) is also likely. Thus, failure to reject the null indicates there is no evidence of autocorrelation in the second order first-differenced errors (Roodman, 2009a).
3.5 Robustness

This section summarises further techniques employed to make certain of the robustness of the results. First of all, although we analysed results from the one-step GMM regression (Arellano & Bond, 1991; Arellano & Bover, 1995), the two-step regression (Arellano & Bond, 1991) results were obtained as well to evaluate robustness. In addition, in order to ensure the robustness of the instrument minimisation method, a system GMM utilising the full instrument set was employed (Arellano & Bover, 1995). To make certain of the validity of inferences derived from regression estimates utilising the entire sample period (2005-2012), a separate regression over a sample period of 2005-2008 was run.

3.6 Chapter Summary

This chapter contains a discussion of the hypotheses development, of the data and the method for sample selection, and of the variables and the model used to empirically investigate the research question: what are the determinants of banks’ financial stability in the GCC region?

Section 3.2 discussed the hypotheses development, and Section 3.3 has given a detailed rationale for the data and the methodology employed to answer the main research question. Section 3.4.2 has shown that endogeneity was a problem with the model, and provided reasons for why GMM was chosen over 2SLS to account for it. As shown in Section 3.4.3, great care must be taken to ensure the GMM estimator is efficient.
Therefore, potential problems arising from using GMM are tackled sequentially with GMM implemented for this thesis. A system GMM using forward orthogonal deviations which also minimises instrument count to avoid under rejection of the Hansen test. Furthermore, Section 3.4.4 has outlined the tests performed to ensure the validity of the instruments chosen, thus ensuring the results obtained from the GMM are efficient.

The next chapter presents and discusses the empirical results.
CHAPTER 4: RESULTS AND DISCUSSION

4.1 Introduction
This chapter attempts to test the four hypotheses related to the research question outlined in Chapter 2, i.e., what are the determinants of banks’ financial stability in the GCC region? Section 4.2 discusses the summary statistics for the variables used in the empirical models. Section 4.3 presents the results and hypotheses testing emanating from the empirical analysis, followed by Section 4.4, which provides robustness checks. Section 4.5 presents a chapter summary.

4.2 Summary Statistics
This section discusses the main characteristics of Islamic and commercial banks. The summary statistics of the key financial ratios and macroeconomic variables are reported in Table 4.1, and are based on samples of 292 Islamic banks and 588 commercial bank observations. Most financial ratios selected for this study report statistically significant differences at the 1% statistical level between the Islamic and commercial banks over the entire sample period. The financial stability ratios report statistical differences at the 1% and 10% levels of statistical significance. FSI represents Z-score measures, where a higher value suggests a more stable bank. Conversely, a lower value represents a less stable bank. AQ₁ and AQ₂ are contrary indicators of asset quality. Contrary to FSI, a high AQ₁ and AQ₂
value implies low financial stability. Our findings suggest that the commercial banks are more financially sound than Islamic banks. $AQ_1$ represents the ratio of loan loss reserves to gross loans, and $AQ_2$ represents the ratio of loan loss provisions to gross loans. Thus, $AQ_1$ and $AQ_2$ can be viewed as the inverse measures of asset quality. Table 4.1 shows that Islamic banks have higher $AQ_1$ and $AQ_2$ than commercial banks. This suggests that Islamic banks are more reliant on low-quality assets than their conventional counterparts, which makes them more financially unstable.

This is a critical observation within this study, which will be further investigated in the empirical models with relevant control variables. The pattern continues with the liquidity variables; all ratios are also different at the 5% and 10% statistical significance levels amongst the two cohorts. While there are noticeable differences between the two cohorts, no definite conclusions may be drawn from such summary statistics, as the empirical models can provide results after controlling for bank-specific and other macro-economic variables. However, it is clear that the cohorts of Islamic and commercial banks within the GCC region are statistically different. When the sample is split into a pre- and post-GFC time period as in Table 4.2, we find that the financial stability and liquidity ratios for the pre-GFC period are not statistically different from those of the post-GFC period. This finding holds for both commercial and Islamic banks. The $IncDiv$ measure for Islamic banks is higher than that of their conventional counterparts, suggesting that the former are more diversified in terms of their income
flows. In terms of concentration levels measured amongst the two cohorts, once again, the Islamic cohort is higher than the conventional.
Table 4.1 Summary Statistics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Difference in Mean</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
<th>Skewness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panel A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$FSI_1$</td>
<td>(-6.54)***</td>
<td>14.35</td>
<td>23.97</td>
<td>16.39</td>
<td>20.03</td>
<td>-3.50</td>
</tr>
<tr>
<td>$AQ_1$</td>
<td>(5.31)***</td>
<td>10.19</td>
<td>5.82</td>
<td>16.43</td>
<td>10.61</td>
<td>0.00</td>
</tr>
<tr>
<td>$AQ_2$</td>
<td>(1.77)*</td>
<td>1.92</td>
<td>1.04</td>
<td>7.94</td>
<td>2.39</td>
<td>-25.00</td>
</tr>
<tr>
<td>$LIQ_1$</td>
<td>(1.67)*</td>
<td>0.21</td>
<td>0.23</td>
<td>0.13</td>
<td>0.15</td>
<td>0.00</td>
</tr>
<tr>
<td>$LIQ_2$</td>
<td>(1.47)**</td>
<td>3.22</td>
<td>3.44</td>
<td>0.98</td>
<td>1.02</td>
<td>-1.86</td>
</tr>
<tr>
<td>$LIQ_3$</td>
<td>(1.01)*</td>
<td>46.39</td>
<td>52.24</td>
<td>24.47</td>
<td>23.61</td>
<td>0.00</td>
</tr>
<tr>
<td>$MKSH$</td>
<td>(1.50)**</td>
<td>0.55</td>
<td>0.78</td>
<td>0.02</td>
<td>1.66</td>
<td>0.09</td>
</tr>
<tr>
<td>$IncDiv$</td>
<td>(0.33)</td>
<td>-0.72</td>
<td>-1.61</td>
<td>5.13</td>
<td>23.13</td>
<td>-42.30</td>
</tr>
<tr>
<td>$Conc$</td>
<td>(5.11)***</td>
<td>13.77</td>
<td>5.17</td>
<td>13.14</td>
<td>15.42</td>
<td>8.06</td>
</tr>
<tr>
<td>Panel B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$lnGDP$</td>
<td></td>
<td>39.85</td>
<td>15.62</td>
<td>1.31</td>
<td>15.25</td>
<td>58.64</td>
</tr>
<tr>
<td>$σ_{oil}$</td>
<td></td>
<td>25.40</td>
<td>3.61</td>
<td>4.67</td>
<td>41.89</td>
<td>41.89</td>
</tr>
<tr>
<td>$Inf$</td>
<td></td>
<td>5.56</td>
<td>2.12</td>
<td>4.03</td>
<td>8.67</td>
<td>8.67</td>
</tr>
</tbody>
</table>

This table provides the summary statistics for the variables used in the model for the GCC region over the sample period 2005-2012. $FSI$ represents the total equity divided by total assets plus the average return on assets divided by the standard deviation of return on assets over the years; $AQ_1$ represents the loss reserves divided by the gross loans; $AQ_2$ represents the loan loss provisions divided by the gross loans; $LIQ_1$ represents the liquid assets divided by the total assets; $LIQ_2$ represents the ratio of liquid assets to deposit and short-term funding; $LIQ_3$ represents the ratio of loans to total assets; $IncDiv$ represents 1 less the absolute amount of the net interest income minus operating income divided by the total operating income; $Conc$ represents the Herfindahl index, the sum of squared market shares in terms of total deposits held by all banks in the country. $lnGDP$ is the natural log of GDP per capita; $σ_{oil}$ is the standard deviation of oil prices over a year; $Inf$ is the annual rate of inflation. ***, **, and * indicate significance at 1%, 5%, 10%, respectively. In terms of number of observations for the two cohorts, there are 292 for Islamic and 588 for conventional. N= 880.
Table 4.2 Difference in means of summary statistics

<table>
<thead>
<tr>
<th></th>
<th>Islamic Pre (N)</th>
<th>Post (N)</th>
<th>Diff in mean</th>
<th>Pre Mean</th>
<th>Post Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>FSI</td>
<td>166</td>
<td>126</td>
<td>(0.75)</td>
<td>14.56</td>
<td>13.85</td>
</tr>
<tr>
<td>AQ1</td>
<td>166</td>
<td>126</td>
<td>(-3.35)</td>
<td>8.74</td>
<td>12.10</td>
</tr>
<tr>
<td>AQ2</td>
<td>166</td>
<td>126</td>
<td>(1.75)</td>
<td>1.16</td>
<td>2.92</td>
</tr>
<tr>
<td>LIQ1</td>
<td>166</td>
<td>126</td>
<td>(0.01)</td>
<td>0.22</td>
<td>0.20</td>
</tr>
<tr>
<td>LIQ2</td>
<td>166</td>
<td>126</td>
<td>(0.47)*</td>
<td>3.25</td>
<td>3.17</td>
</tr>
<tr>
<td>LIQ3</td>
<td>166</td>
<td>126</td>
<td>(-4.26)</td>
<td>44.40</td>
<td>49.02</td>
</tr>
<tr>
<td>IncDiv</td>
<td>166</td>
<td>126</td>
<td>(2.56)***</td>
<td>0.39</td>
<td>-2.18</td>
</tr>
<tr>
<td>Conc</td>
<td>166</td>
<td>126</td>
<td>(-2.12)***</td>
<td>6.21</td>
<td>15.33</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Comm. Pre (N)</th>
<th>Post (N)</th>
<th>Diff in mean</th>
<th>Pre Mean</th>
<th>Post Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>FSI</td>
<td>126</td>
<td>462</td>
<td>(-0.45)</td>
<td>23.95</td>
<td>24.00</td>
</tr>
<tr>
<td>AQ1</td>
<td>126</td>
<td>462</td>
<td>(-0.175)</td>
<td>5.79</td>
<td>5.86</td>
</tr>
<tr>
<td>AQ2</td>
<td>126</td>
<td>462</td>
<td>(0.494)**</td>
<td>0.08</td>
<td>1.34</td>
</tr>
<tr>
<td>LIQ1</td>
<td>126</td>
<td>462</td>
<td>(0.017)</td>
<td>0.22</td>
<td>0.20</td>
</tr>
<tr>
<td>LIQ2</td>
<td>126</td>
<td>462</td>
<td>(0.713)</td>
<td>3.48</td>
<td>3.37</td>
</tr>
<tr>
<td>LIQ3</td>
<td>126</td>
<td>462</td>
<td>(0.361)</td>
<td>51.98</td>
<td>52.55</td>
</tr>
<tr>
<td>IncDiv</td>
<td>126</td>
<td>462</td>
<td>(3.09)**</td>
<td>0.04</td>
<td>-3.67</td>
</tr>
<tr>
<td>Conc</td>
<td>126</td>
<td>462</td>
<td>(-3.11)***</td>
<td>4.27</td>
<td>10.40</td>
</tr>
</tbody>
</table>

This table provides the figures comparing the same ratios between 2005-07 and 2008-12 contexts. FSI represents the total equity divided by total assets plus the average return on assets divided by the standard deviation of return on assets over the years; AQ1 represents the loss reserves divided by the gross loans; AQ2 represents the loan loss provisions divided by the gross loans; LIQ1 represents the liquid assets divided by the total assets; LIQ2 represents the ratio of liquid assets to deposit and short-term funding; LIQ3 represents the ratio of loans to total assets; IncDiv represents 1 less the absolute amount of the net interest income minus operating income divided by the total operating income; Conc represents the Herfindahl index, the sum of squared market shares in terms of total deposits held by all banks in the country. The Difference in Mean test is an unpaired t-test between Islamic and commercial banks for difference in their means, with the null hypothesis H0: difference in mean = 0.***, ** and * indicate significance at 1%, 5%, 10%, respectively.

Once again, no firm conclusions may be drawn from such results, but it is clear that the GFC did not affect the financial stability and liquidity ratios.

4.3 Empirical Results

This section presents the empirical results for the determinants of the financial stability of banks in the GCC. Equation 1, presented in Chapter 3,
was estimated in order to test hypotheses $H_1$ to $H_4$, specifically, the significance and sign of the coefficient of the variables for the liquidity variable, income diversity, bank type and the global financial crisis. These are the variables of interest as they are pertinent to the research question; the other variables in the model are control variables. We closely examined whether the effects of $LIQ$, $IncDiv$ and $GFC$ on the stability of Islamic banks differed from the effects on their commercial counterparts. We also tested three different models with respect to each dependent variable as we make use of interaction variables for each model. Excessive use of interaction variables would result in the variables being highly correlated, so we mitigated this risk by running three different models, i.e. Models 1 to 3.

The effects of liquidity on two inverse indicators of asset quality ($AQ_1$ and $AQ_2$) were also examined. We re-estimated Models 1 to 3 by replacing $FSI$ by either $AQ_1$ or $AQ_2$ as the dependent variable. The results are presented in Tables A4.1 and A4.2 in the Appendix. The results suggest that liquidity exerts no statistically significant effect on asset quality of either Islamic or conventional banks. The coefficient of the dummy variable for Islamic banks is positive and statistically significant in five out of six models, suggesting that Islamic banks hold lower-quality assets than their conventional counterparts. This is in line with the summary statistics presented in Table 4.1. In general, we found that the asset quality of banks has improved in the post-GFC period, particularly if asset quality is measured in terms of $AQ_2$, the ratio of loan loss provisions to gross loans (see Table A4.2). Finally, an increase in banking market concentration
(Conc) leads to an improvement in asset quality. This finding is robust to the use of alternative measures of asset quality and empirical models (see Tables A4.1 and A4.2).

The rest of this section is structured as follows. Section 4.3.1 presents the results regarding the effect of bank liquidity on financial stability; Section 4.3.2 presents the results regarding the effect of income diversity ($H_2$); Section 4.3.3 presents results regarding the effect of the Islamic and Commercial cohort ($H_3$); and finally, Section 4.3.4 presents results regarding the effect of the GFC ($H_4$).

4.3.1 The effect of bank liquidity on financial stability ($H_1$): The first hypothesis can be restated as follows: A bank's liquidity has a positive effect on its financial stability.

As evidenced in Table 4.3, the $LIQ_1$ variable is consistently positive and statistically significant at the 5% level across the three models. The $FSI$ dependent variable represents the Z-score measure, and it is clear that as bank liquidity increases, financial stability also increases. This implies that asset liquidity enhances bank financial stability. Therefore, banks with more liquid assets are more stable and less vulnerable to bank runs. This finding is in line with Rajhi and Hassairi (2012) study of Islamic banks within a financial stability context, which illustrated that higher level of liquidity increase bank stability.

However, it is unknown whether the Islamic/conventional cohort influences this inference.
The second part of the first hypothesis can be restated as follows:

*Increases in bank liquidity causes conventional banks in the GCC region to be more financially stable than their Islamic counterparts.* Therefore, an interaction variable \( LIQ_1 IS \) was included in Model 1 of Table 4.3. The coefficient associated with this interaction variable is negative and statistically significant at the 1% level, suggesting that an increase in liquidity causes conventional banks to be more financially stable and less vulnerable to failure than their Islamic counterparts. This is perhaps due to the fact that Islamic banks hold liquid assets with low and highly volatile returns.\(^{35}\) Thus, an increase in the liquidity ratio by 1 percentage point reduces the Z-score for Islamic banks by 0.1186 (= 0.2947 – 0.4132) points but increases the Z-score for commercial banks by 0.2947 points. Recent trends have led to an increase in short-term cash holdings by GCC banks, but the lack of suitable instruments creates a liquidity trap. For example, Islamic banks are prohibited from investing in highly liquid low-risk securities such as government treasury securities or certificates of deposit.

The model in Table 4.3 is replaced by \( AQ_1 \) and later on by \( AQ_2 \). The results are subsequently presented in Appendix Tables A4.1 and A4.2. The signs of the coefficients in Appendix Tables A4.1 and A4.2 are similar to those in Table 4.3, but none of them are statistically significant. One interpretation of such results is that \( AQ_1 \) and \( AQ_2 \) are asset quality proxies, reflecting the quality of loan portfolio and any discrepancy across banks. It

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\(^{35}\)The International Islamic rating agency (IIRA) defines liquid assets as cash or cash equivalents, short-term placements to banks and liquid investments such as Government paper and quoted Sukuk.
may also be the case where as a result of special internal guidelines and policies relating to problem loan categorization, reserve requirements and write-off procedures are executed. Yet FSI remains the preferred proxy for bank stability. Therefore, based on such results, we may accept Hypothesis 1.

4.3.2 The effect of a bank’s income diversity on its financial stability

(H2): The second hypothesis is as follows: A bank's income diversity has a positive effect on its financial stability.

The income diversity variable (IncDiv) can determine whether the diversity of bank activities plays a part in decreasing or increasing bank risk. Higher values for the variable correspond to a higher degree of diversification. In consideration of the fact that better diversified banks are expected to be less risky, we controlled for diversification and for variation in the structure of a bank’s income, measured by the income diversity index employed by Leaven and Levine (2007). The IncDiv variable is significantly and positively related to Z-score, suggesting that income diversity increases the financial soundness of banks whether they are Islamic or conventional. This is in line with the results reported by Farook et al. (2012), Hassan and Čihák (2010), but is contrary to those reported by Čihák and Hesse (2010), who found a significant negative relationship between the Z-score and IncDiv.

To further capture differences in bank type, we attached the IS proxy as an interaction variable to the income diversity variable. As evidenced in Table 4.3, IncDiv*IS is positive and significant at the 1% level. Therefore, greater income diversity tends to increase Z-score in Islamic banks, suggesting that
income diversity has greater impact on Islamic banks’ financial stability compared to their conventional counterparts. Hence, Islamic banks benefit from greater financial stability gains if they diversify their activities. A move from lending based activities to other sources of income may thus enhance the stability of these banks. Yet, controlling for these type of variables is essential, since there are particular major differences in these variables among Islamic banks and their counterparts. Therefore, based on the above-mentioned evidence, we support the hypothesis that a bank's income diversity positively affects its financial stability.

4.3.3 The effect of bank type on financial stability

(H3): The third hypothesis is as follows: Islamic banks are more financially stable than commercial banks.

To estimate the impact of bank type on the Z-score, the IS variable is represented as 1 for Islamic banks, 0 for commercial. The coefficient of the dummy variable for Islamic banks is negative and statistically significant, suggesting that Islamic banks are more risky than commercial banks. This finding does not (in general) support the above hypothesis, although it is in line with Abdi (2010), who found a negative relationship at the 5 percent confidence level.

As stated previously in the literature, the theoretical financial stability advantage Islamic banks were likely to have has been to a certain extent due to their higher equity capital to total asset ratios than commercial banks. Banks with high equity levels are subject to less capital risk, and
hence may be more stable (Leaven & Levine, 2007). Since Islamic banks’
debt to equity ratio on average is less than 33% (lower leverage), these
banking institutions thus are expected to deal with financial shocks (Ariff &
Iqbal, 2011) since higher level of debt to equity ratio can produce a volatile
earnings as a result of the additional interest expenses. Islamic banks ought
to be in a better position than conventional banks in terms of mitigating the
adverse effects of credit risk (probability of default), as they possess
adequate assets and deposits to meet due commitments. This finding may
well be attributed to the fact that conventional banks hold a greater diversity
of short-term liquid assets, including Certificates and Treasury Bills along
with other negotiable instruments that could be converted to cash before
maturity.

On the contrary, this finding could also be due to many other factors,
as Islamic banks are heavily invested in equity investments and short-term
fixed rate assets, exposing them to profit rate risk. This leads to greater
profit distribution management and consequently higher risk and lower
financial stability. Also, increased dependence of Islamic banks on non-
interest income loans that cannot be converted to cash before maturity and
have a fixed duration may well increase the volatility of portfolios without
increasing the average profit.

This is in line with Leptit, Rous & Tarazi (2008), who have found
that banks with a higher non-interest income exhibit a higher insolvency
risk. Furthermore, asset risk in Islamic banking is concentrated within fewer
sectors, with property being a main target for investment (Rahman, Ibrahim
& Meera, 2009). Hence, this finding may reflect the region’s higher exposure to the real estate and construction sectors, particularly in Qatar and the UAE (Hasan and Dridi, 2010). Losses due to the restructuring of Dubai debts and the crisis in Europe may also contribute. The construction boom in the GCC means that it is not unusual to find Islamic banks which have half of their assets related to real estate. Different to conventional banks, real-estate exposure for Islamic banks does not take the structure of loan. But, the exposure normally takes the structure of profit-sharing contracts.

In terms of the two asset quality variables ($AQ_1$ and $AQ_2$) we expect the opposite sign. The sign and size of such variables in Table 4.3 are in line with expectations and are mostly statistically significant at the 5% level. The prior literature provides conflicting evidence regarding the stability of Islamic banks. Chong and Liu (2009) found that there are no significant stability differences between Islamic and conventional banks, where as other studies consistently suggest that Islamic banks are more stable (Chapra 2003, 2008; Siddiqi, 2006; and Čihák & Hesse, 2010). Therefore in view of such results and contrary to Čihák and Hesse (2008) we can report that Islamic banks are less financially stable than their conventional counterparts. Hence, $H_3$ is rejected.

\footnote{Commercial banks have more flexibility in debt restructuring, since they can offer liquidity to their customers, which facilities regulatory and compliance requirements for debt restructuring.}
4.3.4 The effect of the Pre- and Post-GFC periods on banks' financial stability

\((H_4)\): The final hypothesis can be stated as follows: The global financial crisis had a negative impact on banks’ financial stability in the GCC.

The \textit{GFC} variable is represented as 0 for the pre-GFC period (2005-2008), and as 1 for the post-GFC period (2009-2012). Thus, a negative and significant coefficient is expected. The coefficient of the \textit{GFC} dummy in Table 4.3 is not statistically different from zero at the 5 percent significance level, implying that the global financial crisis had no effect on financial stability of GCC banks. In addition, the coefficient of the interaction variable, \textit{GFC\_IS} is statistically insignificant at the 5 percent level, which suggests that the impact of bank type on financial stability is not moderated by the GFC. Therefore, we do not find any evidence in favour of the hypothesis that the GFC had a negative impact on GCC banks’ financial stability \((H_4)\). In Appendix Tables A4.1 and A4.2, we also examine the effects of GFC on asset quality measures - \textit{AQ_1} and \textit{AQ_2}. We find that the GFC had a statistically significant (at the 5\% level) influence on \textit{AQ_2} only, and the effect is negative.
Table 4.3 Regression Results – LIQ

\[ FSI_{ij,t} = \alpha + \beta_1 LIQ_{ij,t-1} + \beta_2 IncDiv_{ij,t} + \beta_3 IS_{ij,t} + \beta_4 GFC_{ij,t} + \sum_{k=1}^{p1} \beta_{4k} BANKVAR_{k,ij,t-1} + \sum_{l=1}^{p2} \beta_{4l} MACROECO_{l,ij,t-1} + e_{ij,t} \]

<table>
<thead>
<tr>
<th>Dependent Variable - FSI</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIQ(_{ij,t})</td>
<td>0.2947</td>
<td>0.1842</td>
<td>0.1836</td>
</tr>
<tr>
<td></td>
<td>(4.16)**</td>
<td>(3.04)**</td>
<td>(3.03)**</td>
</tr>
<tr>
<td>LIQ(_{ij,t})*IS (Interaction variable)</td>
<td>-0.4132</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>(-3.56)**</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>IncDiv</td>
<td>0.0421</td>
<td>0.0342</td>
<td>0.0421</td>
</tr>
<tr>
<td></td>
<td>(2.49)**</td>
<td>(2.80)**</td>
<td>(2.58)**</td>
</tr>
<tr>
<td>IncDiv*IS (Interaction variable)</td>
<td>-</td>
<td>0.3443</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>(3.91)**</td>
<td>-</td>
</tr>
<tr>
<td>IS</td>
<td>-0.1058</td>
<td>-0.8758</td>
<td>-0.9958</td>
</tr>
<tr>
<td></td>
<td>(-0.03)</td>
<td>(-6.95)**</td>
<td>(-5.19)**</td>
</tr>
<tr>
<td>GFC</td>
<td>0.0731</td>
<td>-0.2873</td>
<td>-0.2622</td>
</tr>
<tr>
<td></td>
<td>(0.05)</td>
<td>(-0.20)</td>
<td>(-0.15)</td>
</tr>
<tr>
<td>GFC*IS (Interaction variable)</td>
<td>-</td>
<td>-</td>
<td>0.7891</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
<td>(-0.31)</td>
</tr>
<tr>
<td>MKSH</td>
<td>1.3130</td>
<td>1.2021</td>
<td>1.2214</td>
</tr>
<tr>
<td></td>
<td>(2.43)**</td>
<td>(2.18)**</td>
<td>(2.19)**</td>
</tr>
<tr>
<td>Conc</td>
<td>-0.0161</td>
<td>-0.0139</td>
<td>-0.0115</td>
</tr>
<tr>
<td></td>
<td>(-0.90)</td>
<td>(-0.78)</td>
<td>(-0.66)</td>
</tr>
<tr>
<td>lnGDP</td>
<td>-0.0051</td>
<td>-0.0073</td>
<td>0.0022</td>
</tr>
<tr>
<td></td>
<td>(-0.22)</td>
<td>(-0.30)</td>
<td>0.10</td>
</tr>
<tr>
<td>(\sigma_{OIL})</td>
<td>-0.0111</td>
<td>-0.0058</td>
<td>-0.0095</td>
</tr>
<tr>
<td></td>
<td>(-1.56)</td>
<td>(-0.68)</td>
<td>(-1.13)</td>
</tr>
<tr>
<td>Inf</td>
<td>0.433</td>
<td>0.001</td>
<td>0.0111</td>
</tr>
<tr>
<td></td>
<td>-1.01</td>
<td>-1.22</td>
<td>-0.66</td>
</tr>
<tr>
<td>Constant</td>
<td>0.7642</td>
<td>1.0484</td>
<td>1.9685</td>
</tr>
<tr>
<td></td>
<td>(9.97)**</td>
<td>(9.73)**</td>
<td>(9.30)**</td>
</tr>
</tbody>
</table>
In terms of control variables, we include a number of those used in prior studies. The \( MKSH \) variable is statistically significant at the 5% or 1% level in Table 4.3 and Appendix Table A4.1 respectively, suggesting that a bank’s market share has an impact on a bank’s financial stability. The regression results in Appendix Tables A4.1 and A4.2 show that the \( Conc \) variable is also negatively and statistically significant at the 1 percent level for 99 percent confidence interval, suggesting this variable has an effect on bank stability. This finding is in contrast to the results reported by Čihák and Hesse (2010), who found a negative relationship between this variable and \( Z \)-score. These results suggest that banks that operate in concentrated...
markets are likely to be more financially stable, as banks in concentrated markets may well be more profitable and consequently more profoundly capitalised. However, since Conc is not significant in Table 4.3, we cautiously assert that Conc has an impact on bank soundness. With regards to the other control variables, there are no others that are statistically significant.

In terms of the overall fit of all the models employed in this study the FSI variable has the highest Wald Chi and adjusted R squared measures. The lowest is with the FSI₃ model, putting into question the validity of the asset quality proxies for measuring financial stability. The Arellano-Bond AR (1) test for autocorrelation of the residuals rejects the hypothesis that the errors are not autocorrelated. The AR (2) p–values are above 5%, suggesting that the errors are uncorrelated and therefore are not rejected. The AR (1) test for autocorrelation of the residuals rejects the hypothesis that the errors are not autocorrelated with p–values above 5%. This ensures that the orthogonality conditions prescribed by Arellano-Bond are met. Finally, the Hansen J-Statistic for over-identifying restrictions also suggests that the selected instruments are appropriate.
4.4 Robustness of the results

In order to test the robustness of the findings using alternative liquidity measures, Table 4.4 reports the regression results with two other measures of liquidity—\( LIQ_2 \) and \( LIQ_3 \). Models 4 to 6 employ \( LIQ_2 \) as one of their variables of interest, whereas Models 7 to 9 use \( LIQ_3 \). In general, the effect of \( LIQ_1 \) in Table 4.3 is more pronounced than that of \( LIQ_2 \) and \( LIQ_3 \) in Table 4.4, suggesting that \( LIQ_1 \) has a greater impact on bank financial stability than the other variables. Overall, the results associated with the four variables of interest (\( LIQ^*IS; \) \( IncDiv^*IS; \) \( IS; \) and \( GFC^*IS \)) corroborate the results reported in Table 4.3.

The coefficients of \( IS \) are statistically insignificant in Model 1 but significant in Models 4 and 7, implying that the effect of the \( IS \) dummy (bank type) depends on how we define liquidity. Similarly, the coefficient of \( MKSH \) is significant at the 5% level when we use either \( LIQ_1 \) or \( LIQ_2 \) as a measure of liquidity, but it becomes insignificant when we use \( LIQ_3 \) as a measure of liquidity. The dummy variable for Islamic bank (\( IS \)) negatively moderates the effect of \( LIQ_1 \) on \( FSI \) but positively moderates the effect of \( LIQ_3 \) on \( FSI \). In terms of control variables, irrespective of how many models we developed, we did not detect statistical significance, except in the case of \( MKSH \), suggesting that a bank’s market share has an impact on a bank’s financial stability.
Table 4.4 Regression Results – Dependent variable $FSI$ with $LIQ_2$ and $LIQ_3$ as liquidity measures

$$FSI_{it} = \alpha + \beta_1 LIQ_{i,t-1} + \beta_2 IncDiv_{i,t-1} + \beta_3 IS_{i,t} + \beta_4 GFC_{i,t} + \sum_{k=1}^{p1} \beta_{2k} BANKVAR_{k,i,t-1} + \sum_{l=1}^{p2} \beta_{3l} MACROECO_{l,i,t-1} + \varepsilon_{i,t}$$

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>$LIQ_2$</th>
<th>$LIQ_2$</th>
<th>$LIQ_2$</th>
<th>$LIQ_3$</th>
<th>$LIQ_3$</th>
<th>$LIQ_3$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$LIQ$</td>
<td>0.0162</td>
<td>0.0099</td>
<td>0.0116</td>
<td>0.0474</td>
<td>0.1424</td>
<td>0.1441</td>
</tr>
<tr>
<td></td>
<td>(2.11)**</td>
<td>(1.35)</td>
<td>(1.60)</td>
<td>(3.95)**</td>
<td>(4.00)**</td>
<td></td>
</tr>
<tr>
<td>$LIQ*IS$</td>
<td>-0.0426</td>
<td></td>
<td></td>
<td>0.2704</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>(-2.54)**</td>
<td>-</td>
<td>-</td>
<td>(4.02)**</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>IncDiv</td>
<td>0.0415</td>
<td>0.0332</td>
<td>0.0415</td>
<td>0.0398</td>
<td>0.0358</td>
<td>0.0521</td>
</tr>
<tr>
<td></td>
<td>(2.54)**</td>
<td>(2.61)**</td>
<td>(2.58)**</td>
<td>(2.68)**</td>
<td>(2.61)**</td>
<td>(2.58)**</td>
</tr>
<tr>
<td>IncDiv*IS</td>
<td>-</td>
<td>0.3436</td>
<td>-</td>
<td>-</td>
<td>0.3024</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(4.11)**</td>
<td>-</td>
<td>(3.81)**</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>IS</td>
<td>-0.7421</td>
<td>-0.9170</td>
<td>-0.9417</td>
<td>-0.2160</td>
<td>-0.3094</td>
<td>-0.9128</td>
</tr>
<tr>
<td></td>
<td>(-4.76)**</td>
<td>(-7.16)**</td>
<td>(-5.23)**</td>
<td>(-7.03)**</td>
<td>(-6.39)**</td>
<td>(-5.20)**</td>
</tr>
<tr>
<td>GFC</td>
<td>0.6257</td>
<td>0.0958</td>
<td>0.3544</td>
<td>1.5213</td>
<td>1.0218</td>
<td>0.8111</td>
</tr>
<tr>
<td></td>
<td>(0.45)</td>
<td>(0.07)</td>
<td>(0.20)</td>
<td>(1.14)</td>
<td>(0.74)</td>
<td>(0.47)</td>
</tr>
<tr>
<td>GFC*IS</td>
<td>-</td>
<td>-</td>
<td>0.8214</td>
<td>-</td>
<td>-</td>
<td>1.3709</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.33)</td>
<td>-</td>
<td>-</td>
<td>(0.58)</td>
</tr>
<tr>
<td>MKSH</td>
<td>1.1785</td>
<td>1.0112</td>
<td>1.1639</td>
<td>0.8353</td>
<td>0.7324</td>
<td>0.7252</td>
</tr>
<tr>
<td></td>
<td>(1.96)**</td>
<td>(2.45)**</td>
<td>(1.94)**</td>
<td>(1.33)</td>
<td>(1.12)</td>
<td>(1.11)</td>
</tr>
<tr>
<td>Conc</td>
<td>-0.0236</td>
<td>0.0031</td>
<td>-0.2095</td>
<td>-0.0236</td>
<td>-0.0244</td>
<td>-0.0220</td>
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<tr>
<td></td>
<td>(-1.24)</td>
<td>(0.18)</td>
<td>(-1.12)</td>
<td>(-1.25)</td>
<td>(-1.25)</td>
<td>(-1.14)</td>
</tr>
<tr>
<td>lnGDP</td>
<td>0.0104</td>
<td>0.0158</td>
<td>0.0122</td>
<td>0.0292</td>
<td>0.0267</td>
<td>0.0287</td>
</tr>
<tr>
<td></td>
<td>(0.42)</td>
<td>(0.64)</td>
<td>0.49</td>
<td>(1.20)</td>
<td>(1.04)</td>
<td>(0.13)</td>
</tr>
<tr>
<td>$\sigma_{Oil}$</td>
<td>-0.0041</td>
<td>0.0052</td>
<td>-0.0038</td>
<td>-0.0061</td>
<td>-0.0041</td>
<td>-0.0041</td>
</tr>
<tr>
<td></td>
<td>(-0.52)</td>
<td>(-0.65)</td>
<td>(-0.48)</td>
<td>(-0.75)</td>
<td>(-0.53)</td>
<td>(-0.52)</td>
</tr>
<tr>
<td>Inf</td>
<td>0.433</td>
<td>0.001</td>
<td>0.0111</td>
<td>0.433</td>
<td>0.001</td>
<td>0.0111</td>
</tr>
<tr>
<td></td>
<td>-1.01</td>
<td>-1.22</td>
<td>-0.66</td>
<td>-1.01</td>
<td>-1.22</td>
<td>-0.66</td>
</tr>
</tbody>
</table>
Constant               2.1982  2.3155  2.2269  2.1642  1.4384  1.4902  
                     (12.28)**  (12.73)**  (11.85)**  (9.97)**  (5.73)**  (5.76)**  

<table>
<thead>
<tr>
<th>No. Observations</th>
<th>880</th>
<th>880</th>
<th>880</th>
<th>880</th>
<th>880</th>
<th>880</th>
<th>880</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wald Chi$^2$</td>
<td>92.10</td>
<td>136.45</td>
<td>69.86</td>
<td>282.02</td>
<td>216.28</td>
<td>166.31</td>
<td></td>
</tr>
<tr>
<td>Prob$&gt;$ Chi$^2$</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td></td>
</tr>
<tr>
<td>R squared</td>
<td>0.0738</td>
<td>0.0623</td>
<td>0.0697</td>
<td>0.1214</td>
<td>0.0983</td>
<td>0.0966</td>
<td></td>
</tr>
<tr>
<td>Hansen Stat J-</td>
<td>0.265</td>
<td>0.333</td>
<td>0.337</td>
<td>0.265</td>
<td>0.3</td>
<td>0.337</td>
<td></td>
</tr>
<tr>
<td>AR(1)</td>
<td>p= 0.001</td>
<td>p= 0.034</td>
<td>p= 0.010</td>
<td>p= 0.001</td>
<td>p= 0.034</td>
<td>p= 0.010</td>
<td></td>
</tr>
<tr>
<td>AR(2)</td>
<td>p= 0.107</td>
<td>p= 0.091</td>
<td>p= 0.655</td>
<td>p= 0.107</td>
<td>p= 0.091</td>
<td>p= 0.655</td>
<td></td>
</tr>
</tbody>
</table>

Notes: t-statistics are given in parentheses. These are calculated using Windmeijer's (2005) robust standard errors to correct for heteroscedasticity and autocorrelation. The Hansen J-statistics used to test the null hypothesis that the model is valid. FSI represents the total equity divided by total assets plus the average return on assets divided by the standard deviation on the assets; LIQ1 represents the liquid assets divided by the total assets; IS is the dummy variable, which takes the value of 1 for Islamic banks and 0 for commercial banks; GFC is a dummy variable, taking the value of 1 from 2009 onwards and 0 before 2009. Size is measured by taking the natural log of total assets; Inc represents 1 less the absolute amount of the net interest income plus operating income divided by the total operating income; Conc represents the Herfindahl index of banking market concentration; lnGDP is the natural log of GDP per capita; $\sigma_{oil}$ is the standard deviation of oil prices over a year; Inf is the annual rate of inflation. ***, ** and * indicate significance at the 1%, 5% and 10% levels respectively. The impacts of LIQ, IncDiv and GFC on FSI correspond to directional hypotheses, whilst the impact of IS on FSI corresponds to a non-directional hypothesis. Hence, a one-tailed p-value is calculated for the former hypotheses, whilst a two-tailed p-value is calculated for the latter. LIQ*IS, IncDiv*IS and GFC*IS are interaction variables.

Furthermore, in line with Beck et al (2013), we test for bank size and its interaction with Islamic/conventional banking cohort to determine whether these combinations have an impact on bank financial stability. We split the sample according to the natural log of their asset size. Specifically, we split the sample into banks above the 75th percentile being referred to as large banks (LB), between the 25th and 75th percentiles being medium banks (MB) and banks below the 25th percentile referred to as small banks (SM). As a robustness test we repeat this classification without taking natural logs and report similar results.

It is clear from Model 1 in Table 4.5 that the large conventional banks are more
financially stable than their Islamic counterparts. This result is evident when $FSI$ is placed as a dependent variable as a 1% statistical significance is reported. These results may well be attributed to equity investment ($PLS$) and a higher portfolio concentration of fixed assets which actually decreases the financial stability of large Islamic banks. Also may be due to its higher loan to asset ratios reflecting that Islamic banking prohibits of investment in non-lending operations.

Yet, the pattern changes with the medium and small banking cohort type. Model 1 in Table 4.5 demonstrates that in terms of all three bank sizes ($LB$ – large banks; $MB$– medium banks and $SB$ – small banks) bank size has an impact on its financial stability. When the interaction variable $IS$ is linked to the bank size measure, it is clear that bank type has an impact on bank’s financial stability.

The medium bank size measure has no effect on bank financial stability, however in terms of small Islamic banks; Model 1 in Table 4.5 suggests that Islamic banks are more financially stable than their conventional counterparts. Hence, the soundness of small Islamic banks may well be due to its higher equity to total assets in comparison to their small counterparts. Banks with higher equity levels are subject to less capital risk and possibly are more financially stable (Leaven and Levine, 2007). This in line to the results reported in Čihák and Hesse (2010) who find a similar effect of banks size on financial stability.

In terms of Models 2 and 3 in Table 4.5, the $R$ squared drops significantly suggesting that such models may not befitting the data satisfactorily within the model and therefore may not be a appropriate models for bank financial stability. Hence the focus remains on Model 1 in Table 4.5.
### Table 4.5 Comparing Islamic and conventional banks across different size groups.

\[ FSI_{ijt} = \alpha + \beta_1 LB_{ijt} IS_{ijt} + \beta_2 MB_{ijt} IS_{ijt} + \beta_3 SB_{ijt} IS_{ijt} + \epsilon_{ijt} \]

<table>
<thead>
<tr>
<th>Model</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependent Variable</td>
<td>( FSI )</td>
<td>( AQ_1 )</td>
<td>( AQ_2 )</td>
</tr>
<tr>
<td>( LB \ast IS )</td>
<td>-1.4526</td>
<td>2.4866</td>
<td>1.4189</td>
</tr>
<tr>
<td>( MB \ast IS )</td>
<td>-0.6127</td>
<td>4.767</td>
<td>-0.6917</td>
</tr>
<tr>
<td>( SB \ast IS )</td>
<td>0.9301</td>
<td>-4.0645</td>
<td>0.7143</td>
</tr>
<tr>
<td>Constant</td>
<td>2.3799</td>
<td>5.8194</td>
<td>1.0639</td>
</tr>
<tr>
<td>No. Observations</td>
<td>880</td>
<td>880</td>
<td>880</td>
</tr>
<tr>
<td>Wald Chi²</td>
<td>62.26</td>
<td>39.46</td>
<td>4.60</td>
</tr>
<tr>
<td>Prob&gt; Chi²</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.2039</td>
</tr>
<tr>
<td>R squared</td>
<td>0.0591</td>
<td>0.0251</td>
<td>0.0064</td>
</tr>
</tbody>
</table>

Notes: t-statistics are given in parentheses. These are calculated using Windmeijer’s (2005) robust standard errors to correct for heteroscedasticity and autocorrelation. The Hansen J-statistics used to test the null hypothesis that the model is valid. \( FSI \) represents the total equity divided by total assets plus the average return on assets divided by the standard deviation on the Assets; represents the loss reserves divided by the gross loans; \( AQ_1 \) represents the loan loss provisions divided by the gross loans; \( AQ_2 \) represents the loss reserves divided by the gross loans; ***, **, * indicate significance at the 1%, 5% and 10% level, respectively.

- \( LB \): Large Size Bank; \( MB \): Medium Size Bank; \( SB \): Small Size Bank.
4.5 Chapter Summary

This chapter presents and discusses the results from the system GMM estimator in order to test the four hypotheses relating to the research question of this thesis: *What are the determinants of banks’ financial stability in the GCC region?*

The empirical results support Hypothesis 1, where a positive and statistically significant association between financial stability and liquidity was found. In terms of Hypothesis 2, a positive statistical relationship was detected between a bank’s income diversity and its financial stability, suggesting that banks with diverse product mixes are less subject to the volatility associated with economic cycles and therefore, more stable. Conventional banks were found to be more stable than Islamic banks in the GCC region. Once again, this result is robust to different financial stability and liquidity indicators. Hence, Hypothesis 3 is rejected. In terms of the last hypothesis, i.e., the association between the GFC and financial stability, there is no overwhelming evidence in support of any link between the two variables in the context of GCC banks.

The next chapter provides a conclusion for this thesis.
CHAPTER 5: CONCLUSION

5.1 Introduction
This final chapter reviews the main findings of this thesis. The financial stability of banks plays a critical role within the banking sector in the GCC region. As this is an under-researched topic, this thesis provides several contributions to the literature. Section 5.2 summarises the results of the four hypotheses in an attempt to address the research question. The contributions and implications of the main findings are shown in Section 5.3. Finally, Section 5.4 discusses the limitations of each empirical study, and provides suggestions for future research.

5.2 Summary and conclusions
This thesis examines the determinants of banks’ financial stability in the GCC region. The sample comprises of annual data from Islamic and conventional banks in Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and the U.A.E., better known as the Gulf Corporation Countries. Other financial entities, such as central banks, investment houses and non-bank financial firms were excluded from the data set. The sample period is from 2005-2012, with the Global Financial Crisis assumed to be in 2008/09 (Beck et al., 2013). Annual bank-specific data was gathered from Bankscope (Fitch Ratings & Bureau van Dijk, 2011), while country-specific macro-economic data was gathered from the World Economic Outlook (IMF, 2012) database.
The empirical models employed in this study may be subject to endogeneity concerns between financial stability and liquidity measures. To test for this potential endogeneity, a Hausman specification test was performed. The Hausman specification test compared the coefficients obtained by the OLS estimation, fitting fixed-effects with the coefficients obtained by generalised least squares estimation fitting random-effects (Hausman, 1978). Within this context, we employed a Generalized Method of Moments model, as it is robust to heteroscedasticity. We tested four hypotheses, and our results are as follows: (i) An increase in bank liquidity causes conventional banks in the GCC region to be more financially stable than their Islamic counterparts; (ii) Bank income diversity has a positive effect on financial stability; (iii) Islamic banks on average are less financially stable than commercial banks; and (iv) the GFC had no impact on banks’ financial stability in the GCC.

5.3 Contributions and implications of empirical findings
This study contributes to the academic literature in many different ways. Empirical research into bank financial stability and its determinants in the GCC region appears to be relatively scarce. Only a few studies using cross-country comparisons have been conducted on the GCC region. Previous empirical literature has only considered Islamic and conventional banking costs and efficiency in the GCC region (Srairi, 2010). Therefore, this study contributes to the banking literature by being the first to investigate the
effect of liquidity, income diversity, bank type and the global financial crisis on bank financial stability in the GCC region.

Key features of the proposed Basel III liquidity guidelines include a proposal for using liquid assets in managing stress events. This provision boosts the systemic benefits of maintaining liquidity buffers, explicitly the avoidance of fire-sale externalities along with financial contagion. Liquidity risk and solvency risk are inherently interrelated in banking, and may well be directly coupled. Hence, an endogeneity issue that has gone untested in prior studies may be at play here. This lack of prior studies of the interaction between liquidity, solvency and bank stability motivated this study. In particular, the issue of whether liquidity enhances bank stability and if this association is affected by income diversity.

We also found that the global financial crisis had no impact on banks’ financial stability. This suggests that the cash injection programs that the governments implemented to stimulate the economy had the consequences they were designed to achieve.

5.4 Limitations and future research
This thesis is not without its limitations. One that needs to be mentioned is the missing data in terms of certain financial ratios, which precluded us from employing such variables in our analysis. This characteristic is symptomatic of the GCC region. As regards future research, it is suggested
that empirical analysis is carried out to analyse the effectiveness of macro-prudential tools in avoiding financial instability using the Covariance Value-at-Risk model (CoVAR). The result would be a thorough assessment of the systemic importance of individual banks. Within this framework of systemic importance, further studies of the inter-linkages among liquidity and capital regulations would be beneficial to industry and academic literature. Also the consistent implementation of the harmonised liquidity requirements across jurisdictions would also be a significant contribution.
APPENDIX - A

Appendix Table A4.1: The augmented model with interaction variables

\[ FSI_{ij,t} = \alpha + \beta_1 LIQ_{ij,t-1} + \beta_2 IncDiv_{ij,t} + \beta_3 IS_{ij,t} + \beta_4 GFC_{ij,t} + \sum_{k=1}^{P1} \beta_{5,k} BANKVAR_{k,ij,t-1} + \]
\[ \sum_{l=1}^{P2} \beta_{6,l} MACROECO_{lij,t} + \epsilon_{ij,t} \]

<table>
<thead>
<tr>
<th>Dependent Variable – ( AQ_1 )</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>( LIQ_1 )</td>
<td>0.3678</td>
<td>0.3232</td>
<td>0.3272</td>
</tr>
<tr>
<td></td>
<td>(1.51)</td>
<td>(0.99)</td>
<td>(0.99)</td>
</tr>
<tr>
<td>( LIQ_1 \ast IS )</td>
<td>-1.3501</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>(-0.13)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>( IncDiv )</td>
<td>-0.0186</td>
<td>-0.0082</td>
<td>-0.0192</td>
</tr>
<tr>
<td></td>
<td>(-1.27)</td>
<td>(-2.12)**</td>
<td>(-1.32)</td>
</tr>
<tr>
<td>( IncDiv \ast IS )</td>
<td>-</td>
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<td>-</td>
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<tr>
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<td>( IS )</td>
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<tr>
<td></td>
<td>(1.75)**</td>
<td>(3.87)***</td>
<td>(3.76)***</td>
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<tr>
<td>( GFC )</td>
<td>-1.7178</td>
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<tr>
<td></td>
<td>(-1.88)*</td>
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<td>(-0.64)</td>
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<tr>
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<tr>
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<td>-</td>
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<td>( MKSH )</td>
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<tr>
<td></td>
<td>(-3.20)***</td>
<td>(-3.14)***</td>
<td>(-3.09)***</td>
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<td></td>
<td>(-2.96)***</td>
<td>(-2.89)***</td>
<td>(-2.99)***</td>
</tr>
<tr>
<td>( lnGDP )</td>
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<td></td>
<td>(-0.22)</td>
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<td>(-1.13)</td>
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<tr>
<td>( Inf )</td>
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<td></td>
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<td></td>
<td>(9.97)***</td>
<td>(9.73)***</td>
<td>(9.30)***</td>
</tr>
</tbody>
</table>

No. Observations 880 880 880

Wald Chi² 57.65 78.85 55.43

Prob> Chi² 0.0000 0.0000 0.0000

R squared 0.0572 0.0972 0.0586

Hansen J-Stat 0.265 0.300 0.337

AR(1) p= 0.001 p= 0.034 p= 0.010
Notes: *-statistics are given in parentheses. These are calculated using Windmeijer’s (2005) robust standard errors to correct for heteroscedasticity and autocorrelation. The Hansen J-statistics used to test the null hypothesis that the model is valid. AQ1 represents the total equity divided by total assets plus the average return on assets divided by the standard deviation on the Assets; represents the loss reserves divided by the gross loans; LIQ1 represents the liquid assets divided by the total assets; IS is the dummy variable, which takes the value of 1 for Islamic banks and 0 commercial banks; GFC is a dummy variable, taking the value of 1 from 2009 onwards and 0 before 2009. Size is measured by taking the natural log of total assets; Inc represents the 1 less the absolute amount of the net interest income plus operating income divided by the total operating income; Conc represents the Herfindahl index of banking market concentration; \(lnGDP\) is the natural log of GDP per capita; \(\sigma_{oil}\) is the standard deviation of oil prices over a year; Inf is the annual rate of inflation. AR (1) measures autocorrelation at the first moment in the difference transformation, AR (2) measures autocorrelation at the second moment in the difference transformation. ***, **, * indicate significance at the 1%, 5% and 10% level, respectively. LIQ, IncDiv and GFC are directional hypotheses, whilst IS is a non-directional hypothesis, hence a one-tailed p-value is calculated for the former hypotheses, whilst a two-tailed p-value is calculated for the latter.
### Appendix Table A4.2: The augmented model with interaction variables

#### Appendix Table A4.2 Regression Results – LIQ₂

\[
AQ₂_{i,j,t} = \alpha + \beta₁LIQ_{i,j,t-1} + \beta₂IncDiv_{i,j,t-1} + \beta₃IS_{i,j,t-1} + \beta₄GFC_{i,j,t-1} + \sum \beta₅BANKVAR_{i,j,t-1} + \sum \beta₆MACROECON_{j,t-1} + \varepsilon_{i,j,t}
\]

<table>
<thead>
<tr>
<th>Dependent Variable – AQ₂</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIQ₁</td>
<td>1.4686</td>
<td>0.1379</td>
<td>0.2113</td>
</tr>
<tr>
<td></td>
<td>(1.47)</td>
<td>(0.10)</td>
<td>(0.15)</td>
</tr>
<tr>
<td>LIQ₁*IS</td>
<td>-0.4577</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>(-1.10)</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>IncDiv</td>
<td>-0.0107</td>
<td>-0.0051</td>
<td>-0.0110</td>
</tr>
<tr>
<td></td>
<td>(-1.32)</td>
<td>(-3.66)**</td>
<td>(-1.36)</td>
</tr>
<tr>
<td>IncDiv*IS</td>
<td>-</td>
<td>-0.2583</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>(-1.27)</td>
<td></td>
</tr>
<tr>
<td>IS</td>
<td>1.9190</td>
<td>0.7456</td>
<td>1.7061</td>
</tr>
<tr>
<td></td>
<td>(1.63)</td>
<td>(1.66)*</td>
<td>(2.70)***</td>
</tr>
<tr>
<td>GFC</td>
<td>-1.1920</td>
<td>-0.8824</td>
<td>-0.5774</td>
</tr>
<tr>
<td></td>
<td>(-2.85)**</td>
<td>(-2.18)**</td>
<td>(-2.28)**</td>
</tr>
<tr>
<td>GFC*IS</td>
<td>-</td>
<td>-</td>
<td>-1.7510</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>(-1.86)*</td>
<td></td>
</tr>
<tr>
<td>MKSH</td>
<td>-0.0089</td>
<td>-0.0142</td>
<td>-0.0096</td>
</tr>
<tr>
<td></td>
<td>(-0.17)</td>
<td>(-0.26)</td>
<td>(-0.18)</td>
</tr>
<tr>
<td>Conc</td>
<td>-0.0095</td>
<td>-0.0076</td>
<td>-0.0097</td>
</tr>
<tr>
<td></td>
<td>(-3.12)**</td>
<td>(-2.80)**</td>
<td>(-3.10)***</td>
</tr>
<tr>
<td>lnGDP</td>
<td>-0.0018</td>
<td>-0.0073</td>
<td>0.0022</td>
</tr>
<tr>
<td></td>
<td>(-0.22)</td>
<td>(-0.30)</td>
<td>0.10</td>
</tr>
<tr>
<td>Oil</td>
<td>-0.0111</td>
<td>-0.0058</td>
<td>-0.0095</td>
</tr>
<tr>
<td></td>
<td>(-1.56)</td>
<td>(-0.68)</td>
<td>(-1.13)</td>
</tr>
<tr>
<td>Inf</td>
<td>0.433</td>
<td>0.001</td>
<td>0.0111</td>
</tr>
<tr>
<td></td>
<td>-1.01</td>
<td>-1.22</td>
<td>-0.66</td>
</tr>
<tr>
<td>Constant</td>
<td>0.7642</td>
<td>1.0484</td>
<td>1.9685</td>
</tr>
<tr>
<td></td>
<td>(9.97)***</td>
<td>(9.73)***</td>
<td>(9.30)***</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. Observations</td>
<td>880</td>
<td>880</td>
<td>880</td>
</tr>
<tr>
<td>Wald Chi²</td>
<td>20.79</td>
<td>19.29</td>
<td>20.43</td>
</tr>
<tr>
<td>Prob&gt; Chi²</td>
<td>0.0162</td>
<td>0.0368</td>
<td>0.0476</td>
</tr>
<tr>
<td>R squared</td>
<td>0.0576</td>
<td>0.0502</td>
<td>0.0500</td>
</tr>
<tr>
<td>Hansen J-Stat</td>
<td>0.265</td>
<td>0.300</td>
<td>0.337</td>
</tr>
<tr>
<td>AR(1)</td>
<td>p= 0.001</td>
<td>p= 0.034</td>
<td>p= 0.010</td>
</tr>
<tr>
<td>AR(2)</td>
<td>p= 0.107</td>
<td>p= 0.091</td>
<td>p= 0.655</td>
</tr>
</tbody>
</table>

Notes: t-statistics are given in parentheses. These are calculated using Windmeijer’s (2005) robust standard errors to correct for heteroscedasticity and autocorrelation. The Hansen J-statistics used to test the null hypothesis that the model is valid. AQ₂ represents the total...
equity divided by total assets plus the average return on assets divided by the standard deviation on the Assets; represents the loss reserves divided by the gross loans; LIQ1 represents the liquid assets divided by the total assets; IS is the dummy variable, which takes the value of 1 for Islamic banks and 0 commercial banks; GFC is a dummy variable, taking the value of 1 from 2009 onwards and 0 before 2009. Size is measured by taking the natural log of total assets; Inc represents the 1 less the absolute amount of the net interest income plus operating income divided by the total operating income; Conc represents the Herfindah lindex of banking market concentration; lnGDP is the natural log of GDP per capita; σoil is the standard deviation of oil prices over a year; Inf is the annual rate of inflation. AR (1) measures autocorrelation at the first moment in the difference transformation. AR (2) measures autocorrelation at the second moment in the difference transformation. ***, **,* indicate significance at the 1%, 5% and 10% level, respectively. LIQ, IncDiv and GFC are directional hypotheses, whilst IS is a non-directional hypothesis, hence a one-tailed p-value is calculated for the former hypotheses, whilst a two-tailed p-value is calculated for the latter.
Figure A2.1: The boom phase


Figure A2.2: The bust phase

APPENDIX – B

Table B2.3: Balance Sheet of an Islamic bank

### Glossary

**Arabic Terms Used In the Paper**

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sharī’ah</strong></td>
<td>Refers to the divine guidance as given by the Qur’an and the Sunnah and embodies all aspects of the Islamic faith, including beliefs and practices.</td>
</tr>
<tr>
<td><strong>Ribā</strong></td>
<td>Literally means increase or addition, and refers to the ‘premium’ that must be paid by the borrower to the lender along with the principal amount as a condition for the loan or an extension in its maturity. It is regarded by a predominant majority of Muslims to be equivalent to interest.</td>
</tr>
<tr>
<td><strong>Gharar</strong></td>
<td>Uncertainty of outcome caused by ambiguous conditions in contracts of deferred exchange.</td>
</tr>
<tr>
<td><strong>Mudārabah</strong></td>
<td>An agreement between two or more persons whereby one or more of them provide finance, while the others provide entrepreneurship and management to carry on any business venture whether trade, industry or service, with the objective of earning profits. The profit is shared by them in an agreed proportion. The loss is borne only by the financiers in proportion to their share in total capital. The entrepreneur’s loss lies in not getting any reward for his/her services.</td>
</tr>
<tr>
<td><strong>Mushārakah</strong></td>
<td>An Islamic financing technique whereby all the</td>
</tr>
</tbody>
</table>

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partners share in equity as well as management. The profits can be distributed among them in accordance with agreed ratios. However, losses must be shared according to the share inequity.

<table>
<thead>
<tr>
<th><strong>Mudarib</strong></th>
<th>Investment Manager</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Istisna</strong></td>
<td>A contract whereby a manufacture agrees to produce and deliver specific-described products at a given price on a given date in the future. This is a type of sale where a commodity is transacted before it comes into existence. It is important for the validity of this type of contract that the price is fixed with the consent of the parties.</td>
</tr>
<tr>
<td><strong>Jo’alah</strong></td>
<td>The undertaking of one party (bank or employer) to pay a specified amount of money to another party in return for rendering a specified service in accordance with the terms of contract.</td>
</tr>
<tr>
<td><strong>Qard al-Hasanah</strong></td>
<td>Loan extended without interest or any other compensation form the borrower.</td>
</tr>
</tbody>
</table>

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