Determining the relationships between bank capital, credit risk, cost inefficiency and profitability in Islamic banks: A comparative analysis between before and after Global Financial Crisis

Suganthi Ramasamy

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Suganthi Ramasamy

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LIST OF ABBREVIATIONS

2SLS	Two-Stage Least Square
ASSUTI	Asset Utilization
BC	Bank Capital
CAGR	Compound Annual Growth Rate
CAR	Capital Adequacy Ratio
CIE	Cost Inefficiency
CR	Credit Risk
FE	Fixed Effect
GCC	Gulf Cooperation Council
GFC	Global Financial Crisis
IAH	Investment Account Holder
IFSB	Islamic Financial Services Board
IIFS	Institutions, other than insurance institutions, offering only Islamic Finance Services
MENA	Middle East and North Africa
MGTEFF	Management Efficiency
NLTA	Net Loans to Total Assets
NPLs	Non-Performing Loans
OBSTA	Off-Balance Sheet items to Total Asset
OHEADTOTA	Overhead expenses to Total Asset
PLS	(i) Profit and Loss Sharing (ii) Pooled Least Square
PSIA	Profit Sharing Investment Accounts
RE	Random Effect
ROA	Return on Assets

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ABSTRACT

This study empirically determines the relationships between bank capital, credit risk, cost inefficiency and profitability in Islamic banks on a cross-country basis for the years between 2003 and 2012. Specifically the study aims to identify these relationships during the periods before and after the global financial crisis (GFC). Besides that, this study also determines the differences in these relationships in Islamic banks that operate in MENA and non-MENA regions. The extant literature on these relationships were concentrated largely in the conventional banks and have mixed conclusions. As the Islamic banks are subjected to *Shariah* – compliance, their financial instruments and operating system is different from conventional banks. Contrary to the general belief that Islamic banks were not affected by the effects of GFC due to its interest-free intermediation and profit-loss sharing system, evidences have indicated that both, Islamic and conventional banking systems, are equally vulnerable to financial shocks during extreme events. Using the yearly bank financial statement data collected from Bankscope database on 85 Islamic banks from 24 countries over a period of ten years, this study analyzed these relationships employing the appropriate regression techniques. The theoretical framework of this study used four main Islamic bank variables; bank capital, credit risk, cost inefficiency and profitability to determine the relationships between them, besides six other bank specific variables. The research methodology mainly used the panel data analysis in analysing the relationship between these variables.

The findings of this study reveal that low capitalized Islamic banks take on more credit risk, cost inefficient Islamic banks take on more credit risk and highly risky (in terms of credit risk) Islamic banks were

more cost inefficient for the periods before and after GFC and also in MENA and non-MENA regions. Another finding of this study reveals that, highly profitable Islamic banks take on less credit risk during the period before the GFC. However, the inverse was observed after GFC. Region wise, it is noted that highly profitable MENA region Islamic banks take less credit risk, while highly profitable non-MENA region Islamic banks take on more credit risk. The findings of this study also indicate that in Islamic banks, higher the bank capital, higher the profitability during both periods (before and after GFC) and also in Islamic banks that operate in MENA and non-MENA regions. Overall, this study found that the relationships between bank capital, credit risk, cost inefficiency and profitability in Islamic banks were generally similar during both the periods before and after the GFC. However, differences were noted in the directions of which cost inefficiency and profitability affects credit risk in MENA and non-MENA region. Cost inefficiency negatively affects credit risk of Islamic banks that operate in MENA region while the inverse is observed in Islamic banks that operate in non-MENA region. Profitability negatively affects credit risk of Islamic banks that operate in MENA region while the reverse condition is observed in Islamic banks that operate in non-MENA region.

ORIGINALITY STATEMENT

I, hereby declare that no material from this thesis has been accepted for the award of any other degree or diploma in any university or other institution and I, hereby affirm that to the best of my knowledge, the thesis contains no material previously published or written by another person, except where due reference is made in the text of the thesis.

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Suganthi Ramasamy

Date: 10th March 2015

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CHAPTER 1
RELATING BANK CAPITAL AND CREDIT RISK IN ISLAMIC BANKS

1.0 Introduction

Institutions that provide Islamic banking and financial services have proliferated to almost all countries in the world now. Islamic banking or the *Shariah* - compliant banking has become a viable alternative to conventional banking, providing a wide range of financial intermediary services. Though it was originally initiated to meet the requirements of Muslims, Islamic banking has now gained universal acceptance and is recognized as one of the fastest growing areas in Islamic finance employing Islamic religious principles into capitalism. Since 1963, when the first Islamic financial institution was established in Egypt, Islamic banking has grown rapidly and significantly over the past four decades. While the *Shariah* - compliant banking assets represents a small portion of the global banking assets, these Islamic financial institutions are reported to be growing at an average annual growth rate of over 20% per annum and set to exceed US$3.4 trillion by 2018 (John, 2014). According to the Islamic Financial Services Board (IFSB) in its 2014 report; the total Islamic finance assets grew to an estimated USD1.8 trillion by the end of 2013. Islamic banking remains the dominant sector within the Islamic financial services industry (IFSI) with approximately 80% of the total Islamic financial assets. The industry is estimated to have charted a compound annual growth rate (CAGR) of 17.04% between 2009 and 2013. This momentum of growth in Islamic banks is expected to continue at a higher pace in coming years.

In terms of capitalisation, the top ten Islamic banks worldwide command a market capitalisation of only 4.1% of the market capitalisation of the top ten conventional banks at the end of 2010. The IFSB in 2011 reported that Islamic banks in general, remained strongly resilient during the 2007/08 global financial crisis (GFC). Islamic banks managed to record profits while conventional banks recorded losses during the crisis and at the height of the GFC in 2008, the net profit of Islamic banks totaled US$4.74 billion in contrast to a total loss of US$4.2 billion incurred by the conventional banks (Grewal, 2011). Pursuant to this dynamics in the banking industry, the total assets of the top ten Islamic banks as a percentage of the top ten conventional banks increased from 0.8% in 2008 to 1.0% in 2010.

The essential feature that differentiates Islamic banking model from its conventional counterpart is the practice of *distributive justice* in financial intermediation, which is achieved through the profit and loss sharing arrangement with its depositors and borrowers. Islamic banking is governed by *Shariah* - compliant mechanism, which is an alternative to conventional interest based financial intermediation. Unlike that practiced in the conventional banking system, Islamic banks are prohibited from offering and charging fixed predetermined interest rate *(riba)* on deposits, loans and other financial products. *Shariah* scholars relate interest based conventional banking system as an imbalanced sharing of wealth in society which is considered exploitative. The notion of including any fixed interest rate which is agreed prior to the actual performance of the underlying asset completely disconnects the benefits of the outcome, which is prohibited in Islamic finance. Alternatively, the distribution of returns between depositors and Islamic financial intermediaries is based on a Profit and Loss Sharing (PLS) principle depicting an equator system of risk-return distribution between counterparties. Besides considering interest (riba) as impermissible, Islamic banks are also prohibited from investing in activities featuring extreme uncertainties and risks *(gharar),* activities that resembles gambling *(maisir)* and allocating wealth in activities that is religiously impermissible *(haram)* such as trading in alcohol, tobacco and other demoralizing instruments.

Islamic banking, governed by *Shariah* rules and regulations presents specific challenges in the allocation and distribution of funds, therefore their capital and balance sheet structure is different from those of the conventional banks. Essentially, the Islamic bank's capital structure is configured based on the shareholders equity and Investment Account Holder's (IAH) funds. Specifically, Islamic banks operational system can be differentiated from their conventional peers in the way the former allocate funds based on interest free basis and distribute profits and losses. Islamic bank's depositors holding Profit Sharing Investments Accounts (PSIA) are subjected to profit and loss sharing of the actual returns. Investment account holder's funds are invested transparently (with depositor's consent) in projects that have inherent risks without any possible guarantees on their deposits and returns.

Understanding the basic differences in the financial intermediation system is the key to differentiate the risk exposures between Islamic banks and conventional banks. Islamic banking system that operates on non-interest basis, PLS arrangements and trade financing with price mark-up techniques, has been generally perceived to be less risky (Akkizidis & Khandelwal, 2008; El-Hawary, Grais & Iqbal, 2007; Fiennes, 2007; Greuning & Iqbal, 2007; Khan & Bhatti, 2008; Sundararjan & Erico, 2002). However, Islamic banks are also subjected to the list of risks faced by conventional banks. These risks could have a magnified effect in Islamic banks as the financial instruments used are new (Fiennes, 2007). Besides that, the capital and balance sheet structure of Islamic banking exposes them to certain unique risks that are not found in conventional banking (El-Hawary et al., 2007; Fiennes, 2007; Khan and Ahmed, 2001; Sundararajan, 2007; Sundararajan & Errico, 2002). Islamic banking that manages PSIA funds for the Investment Account Holders are faced with unique risks such as fiduciary risk and displaced commercial risk (AAOIFI, 1999). Fiduciary risk means breaching of investment contract or mismanagement of funds by the bank (Anjum 2014). According to IFSB (2005), displaced commercial risk is the risk arising from assets managed on behalf of Investment Account Holders which is effectively transferred to the Islamic Financial Institution's own capital because the Institution forgoes part or all of its Mudarib's share on such fund, when it considers this necessary as a result of commercial pressure in order to increase the return that would otherwise be payable to the Investment Account Holder.

1.1 Islamic banking resilience to extreme economic conditions

The 2007/08 global financial crisis (GFC), has rekindled the interest in the study of Islamic banking performance and general financial stability, as *Shariah* - compliant banks have been touted to have emerged untouched and unscathed during the crises. The effect of the GFC that broke out in July 2007 had led many professionals and academics to ponder whether Islamic banking is really more resilient to the shocks and stresses than the conventional banking system. Generally, Islamic banks are perceived to be shielded from the adverse effects of the GFC due to lower exposure to the type of assets that affected the conventional banks besides the risk sharing and asset based operations practiced by them (Hasan & Dridi, 2010). Others have argued that Islamic banks are also vulnerable to the effects of the GFC as they too (like conventional banks), have relied on leverage and have undertaken significant risks (Hasan & Dridi, 2010).

According to Ahmed (2008), Islamic banks being unaffected during the GFC, created an attraction to non-Muslim customers who were affected by this turmoil in the conventional banking system. They began to recognize that Islamic banks are safer than conventional banks as they are immune to such crisis due to inherent business ethics stipulated by the *Shariah*. Consistent with this finding, by comparing the operations of Islamic and conventional banks before and during the GFC, Beck, Demirguc-Kunt & Merrouche (2010) found that Islamic banks were more resilient to the GFC shocks than their conventional peers. These authors concluded that the Islamic banking resilient was mainly due to their larger capital and liquidity buffers before the advent of the crisis in the summer 2007. Similarly, Abduh, Omar & Duasa (2011) found that in general, the experience of the 1997/98 Asian Financial Crisis, bank depositors have trusted Islamic banking to be more resilient in facing financial crises.

The 2007/08 GFC had also highlighted the importance of measuring and managing credit risk on extreme economic conditions in the banking system. The increasing number of bankruptcies recorded globally and competitive spreads of interest rates have made credit risk as the most important risk for Islamic and conventional banks (Dugar, 2007). Credit risk, which refers to the risk of counterparty's failure to meet their obligations, is the most common source of risks in any banking system. According to IFSB (2005), Islamic financial institutions also face similar exposure to counterparty's default in meeting their obligations of deferred payments and in taking delivery of an asset. However, credit risk mitigation processes for Islamic banks becomes more complicated with conditions imposed by *Shariah* - compliance. With an exception to deliberate procrastination, charging any additional payments as penalty on defaults by counterparties is prohibited in Islamic banks (Greuning & Iqbal, 2008).

Research by Cihak & Hesse (2008), Iqbal & Llewellyn (2002) and Sundararajan & Errico (2002) noted that the PLS arrangements in Islamic banks could transfer their credit risk to their IAH. This transfer has a potential to add the overall measure of risk into the asset side of the bank's balance sheet. This is mainly due to the condition created by this transfer that makes Islamic bank's debt holders to bear the risk of losses rather than the bank's equity holders. These authors also noted that PLS cannot be made dependent on collateral or guarantees to reduce the Islamic bank's credit risk. Research by Cihak & Hesse (2010) found that small Islamic banks tend to be financially stronger than large Islamic banks (in terms of their capital size), which may reflect challenges of credit risk management in large Islamic banks.

1.2 Balance sheet structure: Conventional vs. Islamic banks

In order to understand the risks inherent in banking systems, the balance sheet structure is one of the utmost important information to be analyzed. Table 1.1 shows the stylized balance sheet of a conventional commercial bank. On the liability side, the conventional bank accepts demand and saving deposits, issues term certificates such as certificate of deposits (CD), and has equity capital. The asset side is represented by a diversified portfolio of investments which includes marketable securities, short-term line of credits, and loans to corporate and retail customers.

Based on the stylized balance sheet structure of a conventional commercial bank, Iqbal & Greuning (2009) identified two issues in regard to risk management. First, accepting deposits (demand and savings) creates immediate predetermined liabilities that are completely disconnected from the outcomes of the investments undertaken through these deposits in the asset side which develops an asset – liability mismatch. Second, using short-term liabilities to finance medium to long-term assets exposes the bank to a maturity mismatch risk which prevents it from investing in long-term illiquid projects. Higher level of long-term corporate deposits posts another challenge of liquidity risk management in conventional banks. Besides that, certain specific funding source could expose the bank to market risk.

Table 1.1: Stylized balance sheet of a conventional bank - based on functionality

Assets	Liabilities
Loans and Cash advances to customers	Customers' deposits
Cash and cash balances with other banks	Dues to banks and other financial institutions
Investments in associates, subsidiaries and joint ventures	Other liabilities
Financial assets held for trading	Sundry creditors
Cash and cash balances with the central bank	Equity and reserves

Source: Iqbal & Greuning (2009)

Table 1.2 shows the stylized balance sheet structure of an Islamic bank which classifies the functionality and purpose of different financial instruments. The liability section of an Islamic bank balance sheet consists of demand deposits and investment accounts from customers. Islamic financing instruments and investing accounts which is synonym with loans to customers in conventional banks makes up the asset section of an Islamic bank.

Table 1.2: Stylized balance sheet of an Islamic bank - based on functionality

Application of funding	Sources of Funding
Cash balances	Demand deposits *(amanah)*
Financing assets *(murabaha, salam, ijara, istisna)*	Investment accounts *(mudarabah)*
Investment assets *(mudarabah, musharakah)*	Special investment accounts *(mudarabah, musharakah)*
Fee-based services *(ju'ala, kafala,* and so forth)	Reserves
Non-banking assets (property)	Equity capital

Source: Iqbal & Greuning (2009)

The nature of Islamic banks' financial intermediation is different from that of conventional banks. Therefore, the risks inherent in conventional and Islamic banking are also different. The trust financing contracts (*mudarabah)*, are the key to the Islamic banking financial intermediation. The key difference between Islamic and conventional banking operations stems from the principle of profit and loss sharing that links the depositors, the bank and the borrowers.

Under the *Mudarabah* contract, one party (the investor) provides capital *(maal)* for a project through the Islamic bank and the other party (the entrepreneur) provides labor to run the project. Profits and losses are shared by both parties (the financier who provides funds and the entrepreneur who is the trustee of the venture) according to a mutually agreed profit and loss sharing (PLS) ratio. If the venture generates profit, both the investor and entrepreneur share the reward of the project with the Islamic bank based on pre-agreed arrangements. In the event of a failure, all financial losses are borne by the investor while the entrepreneur loses his labor (Iqbal & Molyneux, 2005). This highlights that the risk is fairly distributed in Islamic financial system.

The principle of non-guaranteed return to the financier forms the main feature of a *Mudarabah* contract. This principle essentially excludes the Islamic bank from bearing any losses that arise from the venture. This is not the case in the conventional banking which subsists on interest bearing instruments. Loans in conventional banking are guaranteed by collaterals pledged upon its value and not merely by the performance of the loan itself. Therefore, in conventional banking the borrower has the full responsibility to bear the losses that arise from his venture. The conventional bank has the recourse guarantee to the depositor. The second important feature of a *Mudarabah* contract is the performance of the business venture that used the loan as investment. *"The financier or investor is not liable for losses beyond the capital he has contributed, and the entrepreneur or trustee does not share in financial losses except for the loss of his time and efforts"* (Maniam, Bexley &

James, 2000). The third feature of a *Mudarabah* contract is that the intermediary (i.e. an Islamic bank) has no control over the management of the business venture undertaken by the entrepreneur or trustee, making the Islamic bank to play a role of being just an agent.

Essentially, a "pass-through" concept which enables the transfer of all profit and losses to the provider of funds (depositor) becomes the main doctrine of the contractual agreement between an Islamic bank and its fund providers (Greuning & Iqbal, 2008). These authors also documented that, the holders of PSIA in Islamic banks somewhat have the same sentiments of its shareholders in sharing the profit and losses of the bank and also have no guarantee in getting back their principal amount deposited. This "pass-through" structure would basically make Islamic banks less exposed to asset-liability mismatches unlike conventional banks. Hence, the "pass-through" concept practiced in Islamic banks is synonym to what is practiced by funds management companies (Iqbal & Greuning, 2009).

However, in practice of risk-sharing and "pass through" concept seem to deviate from theory (Greuning & Iqbal, 2008). Islamic banks are in compromise to distribute profits to investment account holders despite having no or low profits (Greuning & Iqbal, 2008). This practice creates an unfair distribution and imposes a strain on equity value belonging to the shareholders, as profits to IAH will have to be paid out of equity (during low profits) resulting in Islamic banks facing "displaced commercial risk" (DCR). Moody's Investor Service (2008) indicated that the PLS principle might influence Islamic banks' capital structure resulting from variable profits in certain period. Under such circumstances, Islamic banks' need an additional capital that could cushion this volatility. This additional capital is usually known as investment risk reserve (IRR) or profit equalization reserve (PER) (Moody's Investor Service, 2008).

Table 1.3 shows the sources of funds in both Islamic and conventional banks. The Table indicates salient differences in the structure of the sources of funds between Islamic banks and conventional banks and thus the computation of the capital adequacy ratio (CAR) is different for both types of bank (Ariss & Sarieddine, 2007). Islamic banks capital is only made up of Tier 1 share capital and reserve. They do not have preferred shares or subordinate debts.

Table 1.3: Source of funds in Islamic and conventional banks

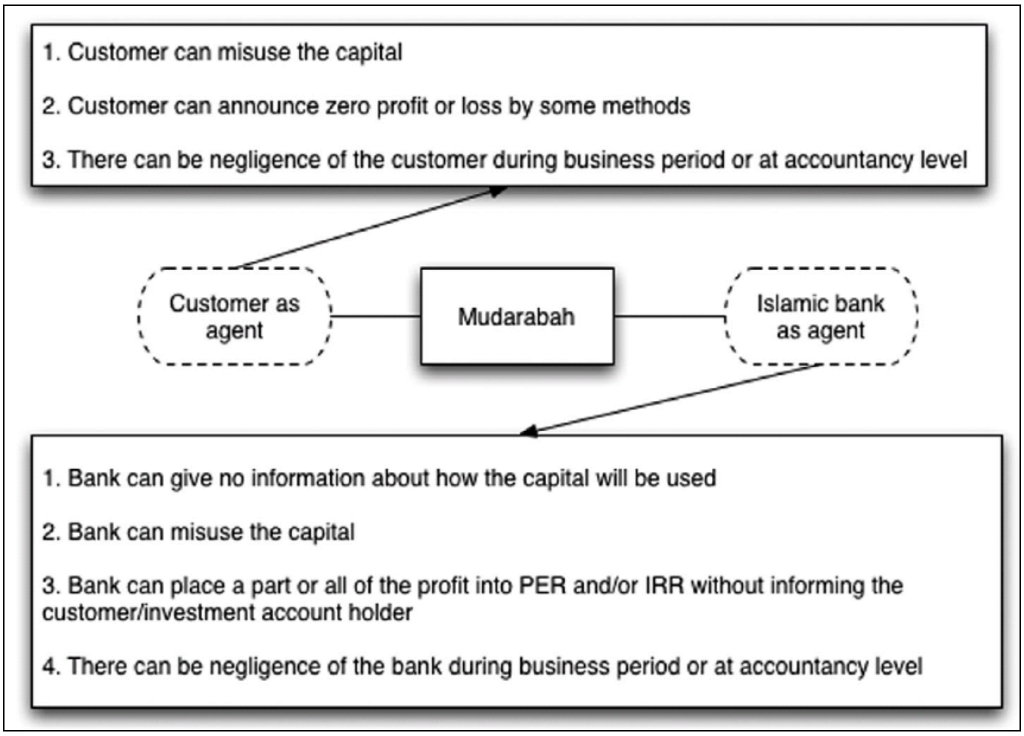
Islamic Bank	Conventional Bank
Current Accounts Saving Accounts Unrestricted Investment Accounts (UIA) Equity: Tier 1: Share capital + Reserve; Tier 2: Any Reserve or Donation (No preferred share or subordinated debt allowed); Tier 3: Nil	Current Accounts Savings Accounts Time Deposits Certificate of Deposits Equity: Tier 1: Share capital + Reserve; Tier 2: Cumulative Preference Shares + Subordinated Debt; Tier 3: portion of subordinated debt available only for market risk

Adapted from: Said & Al Hayek (2012)

Based on the discussion above, it is observed that there are several notable differences in the balance sheet of Islamic and conventional banks. Firstly, the “pass-through” concept in Islamic banks’ balance sheet reduces the asset - liability mismatch that exist in conventional banks. This is because the Islamic banks’ depositors’ returns are linked to the returns on the assets of the bank (Iqbal & Greuning, 2009). According to Pellegrina (2012), the possibility of shifting risks onto depositors raises the risk of moral hazard, thus all investors should look for a higher degree of safekeeping. According to Ameer (2012), there is information asymmetry in the profit sharing contract in Islamic banks as capital surplus investors *(Rabbul - mal)* do not have the right to participate in the management of investment in those banks. Ameer (2012) also found evidence that Islamic banks maintain records, but do not report adequately the progress and performance of invested entities under the second tier of *Mudarabah*. Secondly, conventional banks’ assets stand alone as loans to customer by the bank, whereas in Islamic banks, the assets and the sources of financing these assets are coupled together due to the PSIA. Thirdly, the nature of assets in Islamic banks is different than conventional banks. As conventional banks assets are concentrated with fixed income (low credit risk) debt securities, Islamic banks' assets are centered on the asset-based investments which bears credit risk and they are backed by real assets (Iqbal & Greuning, 2009).

As discussed earlier, the key difference between conventional banks and Islamic banks is the profit and loss sharing *(mudarabah)* operation. Though, there is key difference between Islamic banks and conventional banks, both face credit risk. The possible factors of credit risk in a *mudarabah* contract are shown in Figure 1.1.

Figure 1.1: Possible factors of credit risk in *Mudarabah* contract



Adapted from: Astrom (2013)

It can be elicited from Figure 1.1 that Islamic banks face information asymmetry and are not actually immune from credit risk arising from adverse selection and moral hazard.

1.3 Bank capital and credit risk

Banking institutions are highly regulated organizations as their core business is to borrow and lend public's money. They must be supervised by regulatory authorities to maintain ongoing ability to meet obligations on a daily basis, instill public confidence and meet regulatory requirements. Bank's capital is the key factor that indicates the level of credit risk that a bank can take on. Bank capital is a sustainable source of stable funding and a buffer to absorb expected and unexpected losses due to loan defaults. Every loan loss in a banking institution will be a loss in bank capital. The ratio between total bank capital and the risk weighted assets gives the capital adequacy ratio (CAR). CAR is an important indicator used by banking regulators to assess the soundness of bank operations. CAR plays a vital role in helping both conventional and Islamic banks to manage the level of credit risk in proportionate to the capital requirement. The central feature of the Basel Accord is the computation and meeting the minimum standard of CAR. Basel Accord II[1] stipulates that banks with international presence are required to hold capital equal to eight per cent of the risk-weighted assets. The denominator in the CAR computation is the total risk-weighted assets.

The Islamic Financial Services Board (IFSB) had also published a similar Capital Adequacy Standard for IIFS (institutions, other than insurance institutions, offering only Islamic finance services) based on the Basel II guidelines. According to IFSB, the minimum capital adequacy requirements for IIFS shall be a CAR of not lower than 8% for total capital (IFBS, 2005).

1. Basel II which is built on its previous document, Basel I, makes more detailed recommendations for banks on three main areas: risks, supervisory review and market discipline.

However, the framework developed for IIFS does not require regulatory capital for risk-weighted assets that are funded by profit – sharing investment accounts. The CAR framework for Islamic banks addresses the different nature of risks faced by Islamic banks and duly assigns adequate risk weights to different Islamic financing assets.

Banks regularly adjust their balance sheet in order to comply with the CAR requirement. Generally, during the GFC, just the core capital of banks was insufficient to absorb the losses created by significant impairment in the value of loan and security portfolios. This prompted banks to increase their capital level and reduce credit risk exposure. In efforts to enhance the resilience of banking sector in general and to avoid crisis like GFC in the future, the Basel committee drafted a new regulatory framework called Basel III which requires a more stringent capital in financial institutions (Basel Committee, 2010). Normally banks maintain capital ratios above the requirement and buffered with time-varying capital (ECB, 2007). Coupling this with the regulatory capital, banks form an internal target capital ratio. During capital crunch situations, banks reconcile their balance sheet gaps by increasing their internal target capital level. This can be achieved through an increase in core capital, adjustment in security portfolio and a reduction in lending to lessen their risk exposure. In extreme economic conditions, adding capital to absorb losses will be costly and any attempt to adjust capital upwards will eventually increase the cost of financing thus adversely impacting the general economy (Kashyap, Stein & Hanson, 2010; Miles, Feulner & O’Grady, 2010, Otker-Robe & Pazarbasioglu 2010). However, studies by Ahmad (2005), Kahane (1977) and Koehn & Santomero (1980) found that increase in capital ratio may actually result in more bank risk – taking in the Malaysian and the U.S. conventional banks respectively.

The existing literature in conventional banking has documented two hypotheses surrounding the relationship between bank capital and credit risk. These hypotheses are (i) the regulatory hypothesis; and (ii) the moral hazard hypothesis. The regulatory hypothesis and moral hazard hypothesis were introduced by Sinkey Jr. & Carter (1997). The regulatory hypothesis suggests that regulators constantly encourage banks to adjust their capital proportionately with the amount of credit risk taken (Altunbas, Carbo, Gardener & Molyneux, 2007). The moral hazard hypothesis, however notes a negative relationship between bank capital and credit risk. Moral hazard hypothesis predicts that banks with low capitalization will take on higher risks as they have less to lose in case of default (Horiuchi & Shimizu, 2001; Williams, 2004). A large part of the existing literature (both conventional and Islamic banks) which confines to theoretical perspective in discussing the relationship between bank's capital and risk positions, have often yield conflicting results. A positive relation between bank capital and credit risk would reflect the unintended consequences of a higher capital requirement, the risk preference of bank managers and shareholders (Shrieves & Dahl, 1992). While a negative relation between bank capital and credit risk can be explained by the moral hazard behavior of the managers of thinly capitalized banks.

Ahmad & Ahmad (2004) examined and compared the factors affecting credit risk in both Islamic and conventional banks in Malaysia. These authors found that bank capital is significantly negatively related to credit risk in conventional banks. This is consistent with Berger & DeYoung's (1997) moral hazard theory. However, there was a stark contrast in the results for Islamic banks. The results for Islamic banking showed that bank capital was positively associated with credit risk. This condition could possibly be explained by the PLS arrangement and the PSIA in Islamic banks that reduces the need to have large capital base to absorb losses created by loan defaults or increase in credit risk. This raises an investigative question as to whether bank capital and credit risk relationship is different for Islamic banks.

1.4 Motivation

As discussed earlier, the key difference between conventional banks and Islamic banks is the profit and loss sharing *(mudarabah)* operation. The relationship between bank capital, credit risk, cost inefficiency and profitability in Islamic banks would therefore be different due to the difference in the mode of operations between Islamic banks and conventional banks. Thus far, majority of the studies on Islamic bank performances were done solely either on MENA countries or non-MENA countries. Several studies have compared the performance of Islamic banks in the MENA region and the Asian region on efficiency (Noor & Ahmad, 2012; Sufian, Mohamad & Muhamed-Zulkhibri, 2008, Sufian, Noor & Majid, 2007; Sufian & Noor, 2009), and on profitability and efficiency (Akbar et al., 2011). None of these studies have compared Islamic banks in MENA and non-MENA countries on the relationships between bank capital, credit risk, cost inefficiency and profitability in total. Srairi (2009) only studied the cost and profit efficiency in conventional and Islamic banks in the GCC countries. Srairi (2009), recommended that future studies should compare the findings of his paper with analysis of banks from other emerging markets such as the Middle East and North Africa (MENA), Latin American countries, and the South Asian countries.

1.5 Problem Statement

According to a study by Dridi & Hasan (2010) for the International Monetary Fund (IMF), Islamic banks had recorded better performance in profitability, credit and asset growth in 2008. The cited IMF study finds that, Islamic banks have generally recorded sustainable credit growth in all of its banks through the years of GFC. This suggests that the system has great potential for further market share expansion and a possible contribution to market stability through the availability of credit. The same trend was observed in assets side, which was less affected by deleveraging and assets grew on average more than twice that of conventional banks during the period between 2007 and 2009. Studies by Ibrahim & Sukmana (2011) and Qureshi & Shaikh (2012) also found that Islamic banks were more resilient to the financial market volatility and fluctuations in economic activities during the 2007/08 GFC.

Contrary to the general belief that Islamic banks were not affected by the effects of GFC due to its interest-free intermediation and profit-loss sharing system, Kassim & Majid (2010) found that both the Islamic and conventional banking systems are equally vulnerable to financial shocks during extreme events. Hidayat & Abduh (2012)'s research pointed out that Islamic banking might have been resilient during the crisis but not after the crisis.

As compared to the performance of the conventional banks that recorded huge losses in Europe and the U.S. due to the effects of the GFC, Islamic banks seems to have performed better during the similar period of time. However, such a comparison would not lead to reliable conclusions about financial stability and the resilience of the Islamic banking sector as it excludes the appropriate control for varying conditions across financial systems in countries where Islamic banks operate. The extant literature that evaluated the resilience of Islamic banking system to GFC made generalized conclusions based on direct comparisons between Islamic banks and conventional banks. It must be noted that Islamic banking system itself is not homogenous in all jurisdictions. Islamic banks that operate in some jurisdictions have better risk mitigation, many financing sources and well diversified customer group. Others have less complex activities and different levels of leverage and liquidity. Nonetheless, all Islamic banks are vulnerable to negative spillover effects from the real economy and have operational shortcomings, among which the most pressing are: liquidity management, improvement and harmonization of regulatory and supervisory regime, and keeping the legal infrastructure updated in line with the pace of a rapidly changing financial landscape.

The literature on financial performance of Islamic banking is replete with studies based on cost, revenue and profit efficiencies. Bader, Mohamad, Ariff & Hassan (2008) examined cost, revenue and profit of Islamic banks and conventional banks in Africa, Asia and the Middle East and found no significant differences in the efficiency scores between both banking systems. Olson & Zoubi (2008) found similar results in their studies on banks that operated in Gulf Cooperation Council (GCC) region in terms of profitability. This contradicts the findings of Brown & Skully (2005) which examined Islamic banks in Africa, Asia and the Middle East. These authors found that Islamic banks in the Middle East are the most efficient, followed by Asia and Africa.

Islamic banking has become the fastest growing segment in the international financial system. According to the Islamic Finance 1Q2014 Performance Review by Kuwait Finance House, the largest Islamic banking markets are in the Middle East and North Africa

(MENA) region with the Gulf Cooperation Council (GCC) in focus and in Asia. MENA (excluding GCC) accounts for 45% of the total Islamic banking assets worldwide, the GCC on its own has a 37% share on aggregate, while Asian jurisdictions cumulatively make up the third largest domicile area for *Shariah* - compliant banking assets with a 13% share as at end of 2013.

Thus far, majority of the studies on Islamic bank performances were done solely either on MENA countries or non-MENA countries. Several studies have compared the performance of Islamic banks in the MENA region and the Asian region on efficiency (Noor & Ahmad, 2012; Sufian, Mohamad & Muhamed-Zulkhibri, 2008, Sufian, Noor & Majid, 2007; Sufian & Noor, 2009), and on profitability and efficiency (Akbar et al., 2011). None of these studies have compared Islamic banks in MENA and non-MENA countries on the relationships between bank capital, credit risk, cost inefficiency and profitability in total. Srairi (2009) only studied the cost and profit efficiency in conventional and Islamic banks in the GCC countries. Srairi (2009), recommended that future studies should compare the findings of his paper with analysis of banks from other emerging markets such as the Middle East and North Africa (MENA), Latin American countries, and the South Asian countries. Extending on Srairi's (2009) research gap, this study analyzes the relationship between bank capital, credit risk, cost inefficiency and profitability in MENA and non-MENA region, both before and after GFC.

1.6 Research Objectives

Based on the problem statement discussed above, the main objective of this study is to empirically determine the relationships between bank capital, credit risk, cost inefficiency and profitability in a selected sample of Islamic banks on a cross-country basis for the years between 2003 and 2012. Specifically the study aims to identify these relationships during the periods before and after the global financial crisis (GFC).

The second objective is to determine the differences in these relationships in Islamic banks that operate in MENA and non-MENA regions for the period of 2003 to 2012 and also for sub-periods of before and after the GFC.

1.7 Research Questions

To achieve the objectives of this study, the following six research questions have been configured. These research questions are repeatedly tested on: (1) all sample Islamic banks through the overall observation period of 10 years from 2003 to 2012; (2) all sample Islamic banks on sub-periods before GFC (2003 to 2007) and after GFC (2008 to 2012); (3) the sample Islamic banks in the MENA and non-MENA region; (4) the sample Islamic banks in the MENA and non-MENA regions on sub-periods before and after the GFC.

The research questions postulated to identify the relationships between bank capital, credit risk, cost inefficiency and profitability in Islamic banks are as follows:

1. *Is there a positive or negative relationship between the level of bank capital and credit risk in Islamic banks?*

   This research question is divided into two sub - questions:

   a. *Does credit risk positively or negatively affects bank capital in Islamic banks?* Jokipii & Milne (2008) and Fiordelisi, Marques-Ibanez & Molyneux (2011) found that credit risk positively affects bank capital of conventional banks.

On the other hand, an inverse relationship was noted by Deelchand and Padgett (2009) in the conventional banks.

b. *Does bank capital positively or negatively affects credit risk in Islamic banks?* If bank capital positively affects credit risk, the regulatory hypothesis is supported. If bank capital negatively affects credit risk, it would indicate the existence of moral hazard issue in the Islamic banks. Evidence supporting regulatory hypothesis was found by Altunbas et al. (2007) in conventional banks. Meanwhile, Lee & Hsieh (2013) found evidence supporting the moral hazard hypothesis in conventional banks.

2. *Is there a positive or negative relationship between the level of capital and cost inefficiency in Islamic banks?*

This research question is divided into two sub - questions:

a. *Does cost inefficiency positively or negatively affects bank capital in Islamic banks?* Altunbas et al. (2007) found that cost inefficiency positively affects bank capital of conventional banks. On the other hand, an inverse relationship was noted by Fiordelisi et al. (2011) in the conventional banks.

b. *Does bank capital positively or negatively affects cost inefficiency in Islamic banks?* Deelchand and Padgett (2009) found that bank capital significantly positively affects cost inefficiency of conventional banks. Meanwhile, Chan, Karim, Burton and Aktan (2013) found that bank capital significantly negatively affects cost inefficiency.

3. *Is there a positive or negative relationship between the level of capital and profitability in Islamic banks?*

This research question is divided into two sub - questions:

a. *Does profitability positively or negatively affects bank capital in Islamic banks?* Profitability may have a positive effect on bank capital if banks increase capital through retained earnings rather than through new equity issues.

b. *Does bank capital positively or negatively affects profitability in Islamic banks?* A common perception is that, well-capitalized banks should be more profitable than lowly capitalized banks. A well-capitalized Islamic bank could empower to build a strong position in market, thus attaining more profit. Therefore, if Islamic banks' capital positively affects profitability, this would support the <u>expected bankruptcy hypothesis</u> and the <u>signaling hypothesis</u> developed by Berger (1995). However existing evidences have proved otherwise. A well-capitalized Islamic bank may achieve less profit due to the capital maintenance problem.

4. *Is there a positive or negative relationship between credit risk and cost inefficiency in Islamic banks?*

This research question is divided into two sub - questions:

a. *Does cost inefficiency positively or negatively affects credit risk in Islamic banks?* If cost inefficiency positively affects credit risk (cost inefficient

Islamic bank take more risk to compensate the lower efficiency), this would support the bad management hypothesis. If cost inefficiency negatively affects credit risk (cost inefficient Islamic bank take less risk), this would support the skimping hypothesis.

b. *Does credit risk positively or negatively affects cost inefficiency in Islamic banks?* If credit risk positively affects cost inefficiency, then the bad luck hypothesis is supported. According to Berger & DeYoung (1997), this phenomenon exists because banks will incur extra operating costs in non-value-added activities, such as handling and supervising the recovery process of the non-performing loans.

5. *Is there a positive or negative relationship between the credit risk and profitability in Islamic banks?*

This research question is divided into two sub - questions:

a. *Does profitability positively or negatively affects credit risk in Islamic banks?* If profitability positively affects credit risk, the banks are said to be engaging in moral hazard behavior or they are allocating more profits into loan loss reserves to shield against tax (bad management). If profitability negatively affects credit risk, this means greater performance reduces credit risk taking. Suhartono (2012) found that profitability significantly positively affects credit risk. On the other hand, Fiordelisi et al. (2011) found an inverse relationship between profitability and credit risk.

b. *Does credit risk positively or negatively affects profitability in Islamic banks?* A major portion of bank's operation involves borrowing and lending that leads to more credit risk. Profitability could be low as the banks try to mitigate credit risks. Another common perception is that if effective credit risk management really does matter to banks, then it should significantly contribute to higher profits. A negative relationship between credit risk and profitability in the conventional bank was found by Miller & Noulas (1997), Ramlall (2009), Sufian & Habibullah (2009) and Vong (2005).

6. *Is there a positive or negative relationship between the cost inefficiency and profitability in Islamic banks?*

This research question is divided into two sub - questions:

a. *Does profitability positively or negatively affects cost inefficiency in Islamic banks?* Chan (2008) found that profitability significantly positively (negatively) affects cost efficiency (cost inefficiency) in conventional banks.

b. *Does cost inefficiency positively or negatively affects profitability in Islamic banks?* Alexiou & Sofoklis (2009) found that cost inefficiency is significantly negatively related to profitability in the conventional banks.

1.8 Significance of the Study

As *Shariah* – compliant banking is gaining prominence, their financial products and services are also getting sophisticated to meet the demands of ever changing economic environment. They are viewed as a viable alternative to conventional banking that is more sustainable, ethically strong and upholds social distributive justice. In compliance to the ethical principles of Islamic religion, the banking system operates in strict confinements to the prohibitions set by Islamic scholars based on the *Shariah*. This study aims to empirically identify the implications of the relationships between bank capital, credit risk, cost inefficiency and profitability of Islamic banking on a cross - country basis. Specifically this study will identify these relationships in the periods before and after the global financial crisis. In addition to that, this study also attempts to identify the differences in these relationships in Islamic banks that operate in MENA and non-MENA regions. This is one of the first studies to empirically analyze the relationships between the four interconnecting factors.

The empirical findings of this study could provide newer evidences on Islamic banking resilience and its managerial efficiency. As the Islamic banking system operates on an asset based intermediation, the underlying assets should provide profitable returns without much uncertainty. Therefore, the relationships between Islamic bank capital, credit risk, cost inefficiency and profitability are essentially important to Islamic bank managers, the *Shariah* scholars, the other banking regulatory bodies and the government.

Besides adding to the existing literature on Islamic banking performance measures, the findings of this study would be useful in determining the tradeoff between the level of credit risk and capital that an efficient Islamic bank ought to take. Altunbas et al. (2007) found that cost inefficient European conventional banks appear to hold more capital and take on less risk. This would enable the Islamic banking industry and its regulators, to make better decisions in terms of risk management practices on extreme economic events.

The findings would also be useful in determining the impact of financial crisis on the relationships among bank capital, credit risk, cost inefficiency and profitability in Islamic banks. In addition, this study also determines whether the relationships among the four factors are different in Islamic banks that operate in different jurisdictions, specifically in MENA and non-MENA regions.

1.8 Organization of the Study

Chapter 1 provides an overview of bank capital and credit risk factors in Islamic banking system and introduces the objectives, research questions and significance of the research. Chapter 2 reviews the relevant literature to provide a more concrete foundation for the study regarding the relationships between bank capital, credit risk, cost inefficiency and profitability in Islamic banks. Chapter 3 describes the theoretical framework, methodology and the data employed in this empirical study. The data analysis and findings are presented in Chapter 4. Finally, Chapter 5 highlights the implications of the findings and concludes with the limitations and suggestions for future studies on this area.

CHAPTER 2
THEORY AND EVIDENCE

2.0 Introduction

This chapter reviews the relevant literature that documents the relationships between bank capital, credit risk, cost inefficiency and profitability. Simultaneously, this chapter also reviews the theories and hypotheses that are relevant to these relationships. The extent literature on these relationships has been largely documented in the conventional banking but not as many has been done on Islamic banking. Literature pertaining to bank capital and credit risk relationship is reviewed in Section 2.1. Section 2.2 reviews the literature on bank capital determinants. This is then followed by reviews on bank credit risk determinants in Section 2.3, while Section 2.4 focuses on the literatures pertaining to cost inefficiency determinants. Section 2.5 reviews the literatures pertaining to bank profitability determinants. This chapter is summarized in Section 2.6.

2.1 Bank capital and credit risk relationship

The difference between a bank's total assets and its liabilities constitutes the bank's capital. The bank's capital itself is made up of its owner's equity, reserves and retained earnings. However, the banking institutions are highly leveraged to the extent that only less than ten per cent of its total assets are funded by bank's own capital. Bank capital is both a means of funding the earnings - generating assets and a cushion of stability in order to absorb unexpected loan losses. Unexpected loan losses due to default by borrowers forms the credit risk for any financial institution. Every loan loss in a bank would translate to a capital loss to the bank. Bank capital is the governing factor for the level of credit risk a bank can be exposed to. In analyzing the relationship between bank capital and credit risk, the directional influences between these two items becomes a question. Is it the bank capital that influences the credit risk to change or the latter that influences the former to be adjusted? The directional effects determine the positive or negative relationship between bank capital and credit risk.

As bank capital is an important indicator of banks' stability, it should be managed effectively. Therefore, bank capital becomes a regulated item. According to Francis & Osborne (2012), the financial crisis prompted widespread interest in developing a better understanding of how capital regulation drives bank behavior. In most of the countries, regulators require banks to hold a minimum capital, primarily in the forms of share capital and some quasi-capital debt instruments. The history of capital requirements shows a step-wise development towards increasingly sophisticated approaches (Lind, 2005).

The best known key indicator used to assess the soundness and stability of any banking institution is the capital adequacy ratio (CAR). In conventional banks CAR measures the amount of capital reserve held for every unit of Risk-Weighted Asset (RWA). CAR plays a vital role in helping both conventional and Islamic banks to manage the level of credit risk they take on. This risk-based capital ratio of at least 8 per cent for credit risk were formalized in the 1988 Capital Accord, and capital requirements for market risks were added in 1996. This is known as the Basel Capital Accord or just Basel I[2].

2. Basel I, which is also known as the 1988 Basel Accord, is a document written by the Basel Committee on Banking Supervisor, which recommends certain standards and regulations for banks. The main recommendation of this document is that in order to lower credit risk, banks should hold enough capital to equal at least 8% of its risk-weighted assets. Most countries have implemented some version of this regulation.

The denominator in the computation of CAR is the total risk-weighted assets. The equation below shows the standard capital adequacy ratio (CAR) formula for conventional banks.

$$\text{CAR} = \frac{\text{Regulatory Capital}}{\text{Total Risk Weighted Assets}}$$

Note: Regulatory capital is the net worth of a firm defined according to the rules of a regulatory agency (such as securities and exchange commission).

Over the years, there have been many developments in the practice of measuring and managing credit risks in the conventional banking industry. New financial instruments like credit derivatives has emerged as risk hedging tools that have improved banks' ability to mitigate risks. Concurrently, the lending practices and its risk management have become complex and sophisticated with cross border dealings. The Basel I was replaced with the new capital requirement framework called Basel II. The Basel II, was initially published in June 2004, and was intended to create an international standard for banking regulators to control how much capital banks need to reserve in order to guard against the types of financial and operational risks banks face. This new capital adequacy framework attempted to accomplish this by setting risk and capital management requirements designed to ensure that a bank has sufficient capital for the risk the bank exposes itself to. Generally, these mean the greater risk to which the bank is exposed, the greater the amount of capital the bank needs to hold to safeguard its solvency and stability.

Unlike conventional banks, Islamic banks operate on a profit and loss sharing (PLS) system. Besides that, these *Shariah* - compliant banks take deposits and invest them on profit return rate basis. Customers' current accounts, savings accounts, investment accounts deposit and own equity are the sources of Islamic banks' funds for financing (Mokhtar, Abdullah & Al-Habshi., 2006). Islamic banks have three major types of depositors' funds, which are: (i) non-investment deposits; (ii) unrestricted profit-sharing investment deposits; and (iii) restricted profit-sharing investment deposits.

The principal amount of non-investment deposits are guaranteed by the Islamic banks. Islamic banks also share any excess money with these depositors as returns (not fixed ex-ante). Therefore, Islamic banks with larger proportion of non-investment deposits need higher financial cushion to support their operations. Meanwhile, the unrestricted profit-sharing investment account is an important feature on the Islamic banks' balance sheet as they share the profit or losses with these depositors. For the unrestricted profit–sharing investment account depositors, the Islamic bank's equity capital could be regarded as a financial engagement in a PLS contract which might provide the shareholders an incentive to actively monitor the bank's activities (Muljawan, 2006). On the other hand, for the restricted profit-sharing investment depositors, Islamic banks only provide administrative services as these investors themselves are actively involved in investment decision making. Therefore, Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI) recommends that restricted investment accounts be included as off-balance sheet items.

Incorporating the above mentioned attributes of Islamic banks, Islamic Financial Services Board (IFSB) had published a similar Capital Adequacy Standard for IIFS (institutions, other than insurance institutions, offering only Islamic finance services) based on Basel II guidelines. According to IFSB, the minimum capital adequacy requirements for IIFS shall be a CAR of not lower than 8% of total assets (IFBS, 2005). However, due to the difference between conventional banks and Islamic banks, the framework developed for IIFS does not require regulatory capital for risk-weighted assets that are funded by profit –

sharing investment accounts (PSIA). This standard precisely addresses the different nature of risks faced by Islamic banks due to their activities and assigns adequate risk weights to different Islamic financing modes. Therefore, the CAR for Islamic banks is adjusted with the pertinent refinements as shown below.

$$CAR = \frac{\text{Eligible Capital}}{\left\{\begin{array}{c}\text{Total Risk weighted Assets (Credit + Market Risks) Plus Operational Risks} \\ \text{Less} \\ \text{Risk weighted Assets funded by PSIA(Credit + Market Risks)}\end{array}\right\}}$$

Note: PSIA = profit-sharing investment accounts

Source: IFSB (2005)

The above equation shows the standard CAR formula for IIFS. The risk weighted assets (credit risk + market risk + operational risk) include those financed by both restricted and unrestricted PSIA. Since any losses arising from investments or assets financed by PSIA are borne by the investment account holders (IAH), it is not subjected to a regulatory capital requirement (IFSB, 2005). Therefore, assets funded by either unrestricted or restricted PSIA are excluded from the calculation of the capital ratio (IFBS, 2005). This is due to the fact that the depositors are supposed to be profit sharing and loss bearing. Since IAHs have to bear the risk themselves, the Islamic bank does not have to maintain additional capital for funds invested on behalf of IAHs (Farook, 2009). Using ratio analysis, Iqbal (2001) found that the Islamic banks are generally well capitalized compared to their conventional counterparts. Similar to Iqbal (2001), Chazi & Syed (2010)'s study reveals that Islamic banks maintain better capital ratios than their conventional counterparts.

In order to comply with the CAR requirement, banks adjust their balance sheet by either raising additional capital (maintaining the assets at its existing level) or by decreasing the risk-weighted assets (maintaining capital at its existing level). When banks adjust their capital ratio, their capital structure changes and so do their risk profile. As loans comprise a large portion of their assets, theoretically when banks decrease their lending (decrease their assets), their leverage falls. This will lead to a decrease in the expected default risk of the bank. However, studies by Ahmad (2005), Kahane (1977) and Koehn & Santomero (1980) found that an increase in capital ratio may actually result in more bank risk – taking. Chazi & Syed (2010) noted that capital ratios can be considered as a reliable source in predicting potential bankruptcies among banks. Higher percentage of CAR would not directly reduce the credit risk but would help to survive out of temporary credit disturbances since capital works as a cushion against credit risk.

Even though risk is inherent in all aspects of a commercial operation, for banks and financial institutions, the main risk that needs to be managed effectively is the credit risk. Credit risk is the risk of losses in the event of default of the borrower or in the event of deterioration of borrower's repayment capacity (Sundararajan, 2007). Credit risk, therefore, arises from the bank's dealings with or lending to corporate, individuals, and other banks or financial institutions (Gontarek, 1999).

Credit risk is not only a common risk in conventional banks but also in Islamic bank. The increasing number of bankruptcies globally and competitive spreads have made credit risk as most important risk for Islamic and conventional banks (Dugar, 2007). For banks to be more resilient during extreme economic events, effective credit risk mitigating tools becomes a fundamental requirement.

At large, the effect of credit risk is similar for both conventional and Islamic banks. However, as for the Islamic banks, the credit risk management is further complicated by additional externalities such as the *Shariah* prohibitions, financials instruments used and the debt recovery processes in the event of default by borrowers. Bashir (1999) agrees that Islamic banks need certain policies and regulations such as increased capital requirement standards, or restriction on bank activities as they are riskier than conventional banks. Finding by Khan & Ahmed (2001) and Samad & Hassan (1999) highlights that PLS mode of financial intermediation practiced by Islamic banks have higher credit risk than the conventional banking.

Study by Akhtar (2008) noted that Islamic banks lack risks mitigation instruments as they are prohibited from using several conventional risk hedging techniques specifically the financial derivative instruments. Likewise, Ariffin, Archer & Karim (2009), by surveying 28 Islamic banks across 14 countries, found that Islamic banks are exposed to similar risks as the conventional banks. However, they noted that the Islamic banks used risk measurement techniques which are technically less advanced compared to their conventional peers. Islamic banks often take on more risk compared to the conventional banks due to the lack of experience and unfamiliarity with the financial tools that could assist them (Srairi, 2009). Therefore, Islamic banks required more capital to manage its level of credit risk. Zaki, Sattar & Manzoor (2011)'s study concluded that in order to sustain long term stability, Islamic financial institutions need to mitigate their unique risks effectively.

Using a simultaneous equation model, Abedifar, Molyneux & Tarazi (2011) examined the Islamic banks' risk feature using 456 bank samples across 22 countries during the years

2001 to 2008. Their findings were mixed, depending on the proxy used to measure credit risk. When these authors used loan loss reserves to gross loans and problem loans to gross loans to measure credit risk, they found that Islamic banks have lower credit risk than their conventional counterparts. However, when they used loan loss provisions to gross loans to measure credit risk, they found the opposite. According to these authors, the mixed findings could be generally due to the higher withdrawal risk faced by the Islamic banks compared to their conventional peers. They noted that loans appeared to be written-off more frequently in the Islamic banks. They also observed that, compared to their conventional counterparts, Islamic banks have less opportunity to recover charged-off loans.

Previous literature argued that, as capital acts as a buffer against bank insolvency, thus regulations that force banks to hold more capital will reduce the likelihood of bankruptcy (Berger, Herring & Szego, 1995; Furlong & Keeley, 1989; Keeley & Furlong, 1990). Using Japanese banks' data, Konishi & Yasuda (2004) observed that the requirement for capital adequacy reduces the risk-taking incentives of banks. A similar finding was also noted by Abedifar et al. (2011). However, other researchers disagree and suggest that capital regulations may lead to increased risk taking by banks if they are allowed to react to capital restrictions by changing their portfolio composition (Kim & Santomero, 1988; Koehn & Santomero,1980; & Lam and Chen, 1985). Past studies which focused on the relationship between bank capital and credit risk found mixed results (Aggarwal & Jacques, 1998) and took into account the fact that both these variables are determined contemporaneously (Jacques & Nigro, 1997; Rime, 2001; and Shrieves & Dahl, 1992).

2.1.1 Bank capital as a determinant of credit risk

The existing research in conventional banking has identified two hypotheses surrounding the relationship between bank capital and credit risk. These hypotheses are (i) the regulatory hypothesis; and (ii) the moral hazard hypothesis. Some of the previous studies (Berger, 1995; Demirguc-Kunt & Huizinga, 2000; Iannotta, Nocera & Sironi, 2007; Pettway, 1976; Shrieves & Dahl, 1992; etc.) found that bank capital and risk are positively related, indicating that regulators encourage banks to increase their capital commensurably with the amount of risk taken, which refers to the ‘regulatory hypothesis’. This hypothesis suggests that banks are encouraged by the regulators to increase their capital level proportionately with the level of risk taken (Altunbas et al., 2007). According to Jacques & Nigro (1997) and Shrieves & Dahl (1992) this positive relation is partly due to the efficient monitoring by the markets. Regulatory hypothesis generally suggest that well capitalized banks tend to take on more risks. The moral hazard hypothesis, however notes a negative relationship between bank capital and credit risk. Moral hazard hypothesis predicts that low bank capitalization will lead to greater risk taking since these banks have relatively less capital to lose in the event of default (Horiuchi & Shimizu, 2001; Williams, 2004). According to Altunbas et al. (2007), moral hazard refers to banks increasing their risk position as capital declines, when both the leverage and the risk positions of the banks are already high. A major source of moral hazard in banking is said to be the governmental safety nets (Kauko, 2014).

Therefore, regulatory hypothesis suggests that bank capital positively affects credit risk, while moral hazard hypothesis points out that bank capital negatively affects credit risk. Section 2.1.1.1 reviews the literatures pertaining to the regulatory hypothesis while section 2.1.1.2 reviews past literatures on moral hazard hypothesis.

2.1.1.1 Regulatory hypothesis on bank capital and credit risk relationship

The regulatory hypothesis was introduced by Sinkey Jr. & Carter (1997). Originally, this hypothesis was established as an added justification on the usage of derivatives by conventional banks. This hypothesis suggests that banks must have sufficient capital in order to meet regulatory requirements in order to use derivatives. Even though this hypothesis was earlier introduced to explain derivatives usage, Altunbas et al. (2007) pointed out that the regulatory hypothesis suggests that regulators encourage banks to increase their capital proportionately with the amount of risk taken. This increase in capital, when the risk level rises, could also partly be due to efficient market monitoring from markets when capital positions are deemed inadequate (Berger, 1995; Calomiris & Kahn, 1991).

Actions taken by regulators and supervisors are important factors in explaining the positive relationship between bank capital and credit risk (see Aggarwal & Jacques, 1998, Editz, Michael & Perraudin, 1998, Jacques & Nigro, 1997 and Shrieves & Dahl, 1992). According to Merton & Bodie (1992), banks must maintain 'assurance capital' when participating in new activities due to regulatory capital requirements. They described that rather than frequent surveillance by bank regulators, an alternative measure would be the level of capital. In addition, bank capital is viewed as a creditworthiness measure of the bank.

Pettway (1976) found that bank capital is significantly positively related to credit risk using U.S. banks data from 1971 to 1974. Shrieves & Dahl (1992) investigated the relationship between changes in credit risk and capital in a large sample of banks. They found a positive relationship between capital-to-asset ratio and credit risk for the period of

1983 to 1986. Likewise, using data from the property/casualty insurance industry, Cummins & Sommer (1996) also found a positive relationship for capital and credit risk levels between 1979 and 1990. Similarly, Rime (2001) studied the capital requirements and bank behavior in the Swiss banking industry from 1989 to 1995 and also found a positive association between changes in credit risk and bank capital.

Altunbas et al. (2007) studied the relationship between bank capital and credit risk for a large sample of European banks between 1992 and 2000. They found that banks with higher capital level take on more risks, which supports the regulatory hypothesis where bank are generally encouraged by the regulators to hold more liquidity and capital in order to cover the credit risks taken. This evidence also indicates that credit risk and bank capital are positively related implying regulators' choice for capital as a mean of restriction on risk-taking activities.

Ahmad & Ariff (2007) studied the credit risk determinants in the emerging economy (India, Korea, Malaysia, Mexico and Thailand) commercial banks. By comparing them with the banks in the developed economies (Australia, France, Japan and the US), these researchers found that bank capital and credit risk are significantly positively related in Japan, Malaysia, and Mexico, indicating a support for regulatory hypothesis.

Hussein (2009) studied the credit risk of 138 commercial banks drawn from Southern African Development Community (SADC) countries between 1999 and 2005. One of their main findings was the strong relationship between credit risk-taking behavior and bank equity. The significant relationship implies that banks that hold higher capital level indulge in more risk taking, which is consistent with the regulatory hypothesis. This result was also consistent with the finding by Schmitz (2005) for the European banking. Chortareas, Girardone & Ventouri (2011) studied the credit risk in Eurozone's commercial banks. They found that bank capital significantly positively affects credit risk. This supports the regulatory hypothesis.

Thus far, the studies reviewed above covers conventional banking system. Although there is an operational difference between conventional banks and Islamic banks, the regulatory hypothesis could also be used to explain the bank capital and credit risk relationship in Islamic banks. Using a sample of 456 banks across 22 countries during the year 2001 to 2008, Abedifar et al. (2011) analyzed the Islamic banks credit risk and stability features. By employing a simultaneous equation model, they found that credit risk and bank capital are positively and significantly related as consistent with the findings of Altunbas et al. (2007). Fatnassi, Hasnaoui & Ftiti (2014) studied the impact of bank capital on risk in both conventional and Islamic banks in Gulf Cooperation Council (GCC) countries. Using bank-level data for 113 banks over the period between 2003 and 2011, they found that highly capitalized Islamic banks and highly capitalized conventional banks take on more risk.

2.1.1.2 Moral hazard hypothesis on bank capital and credit risk relationship

The moral hazard hypothesis was introduced by Sinkey Jr. & Carter (1997) as an extra justification on the usage of financial derivatives by banks. This hypothesis suggests that riskier banks might refrain from hedging to exploit government deposit insurance or engage in derivative activities for speculative reasons. By analyzing the determinants of banks' extent of derivative activities in Asia-Pacific, Yong, Faff, & Chalmers (2007) found that government-owned banks are less involved in derivative activities, indicating the possibility of moral hazard behavior in Asia-Pacific banks. Bank capital and the extent of derivative activities could be negatively related due to moral hazard behavior. Since there is a protection by government deposit insurance, banks that hold low level of capital, are more involved in derivative activities (Besanko & Kanatas, 1996).

Even though originally used in derivatives context, a negative association between capital and credit risk can also be referred to the "moral hazard hypothesis" where banks are able to exploit the existing flat deposit insurance schemes (Demirguc-Kunt & Kane, 2002). This evidence is consistent with the findings of Agusman, Monroe, Gasbarro & Zumwalt (2008), Brewer & Lee (1986), Jacques & Nigro (1997), Jahankhani & Lynge (1980) and Karels, Prakash & Roussakis (1989) who found that there is a negative relationship between equity-to-total assets and credit risk.

As opposed to the regulatory hypothesis, moral hazard hypothesis notes a negative relationship between bank capital and credit risk. This hypothesis predicts that low bank capitalization will lead to greater risk taking since these banks have relatively less capital to lose in the event of default (Horiuchi & Shimizu, 2001; Williams, 2004). Kwan & Eisenbeis (1997) used a simultaneous equation framework to test hypotheses about the interrelationships among bank interest rate and credit risk-taking, capitalization, and efficiency. They too found evidence that bank capital have a significantly negative effect on credit risk. Jacques & Nigro (1997) modified the simultaneous equations model developed by Shrieves & Dahl (1992) to incorporate the risk-based capital standards. These authors found that changes in bank capital and credit risk are negatively related, which is consistent with the documentations by Berger (1995) and McManus & Rosen (1991).

Berger & DeYoung (1997)'s study, however, revealed mixed results using different bank types. In thinly capitalized banks, capital is significantly negatively related to credit risk supporting the moral hazard hypothesis. This indicates that thinly capitalized banks take on more risky loans thus leading to higher defaults. On the other hand, in the all-banks sample, capital is significantly positively related to credit risk implying that the banks raise the level of capital in advance in order to provide a cushion against possible surge in non-performing loans (NPL). Horiuchi & Shimizu (1998) empirically investigated whether the slowdown in the credit supply of Japanese banks during the early 1990s was caused by the deterioration of their equity capital. These authors too found the capital affects banks' credit risk-taking negatively. Their panel data analysis supported the moral hazard hypothesis.

Van Roy (2005) studied the G-10 banks' compliance with the Basel I. Covering the period between 1988 and 1995, the author indicated that there was a strong negative correlation between bank capital and credit risk level changes. Likewise, study by Lindquist (2004) estimated a model for banks' buffer capital using an unbalanced bank-level panel data for Norwegian banks. Buffer capital is defined as the ratio of excess capital to risk-weighted assets. The results for savings bank sample in Lindquist (2004)'s study, suggested that there was a negative relationship between their buffer capital and credit risk level. Gambacorta & Mistrulli (2004) studied the bank capital and lending behavior using quarterly data for Italian banks from 1992 to 2001. Their result was consistent with Konishi & Yasuda (2004) and Kwan & Eisenbeis (1997), where bank capital is found to have a significantly negative effect on credit risk. Guillen (2006) tested the validity of different hypotheses commonly employed to explain the proportion of NPL's held by banks. Using causality analysis, the study found results that supported moral hazard hypothesis. The result complements the study by Berger & DeYoung (1997).

Altunbas et al. (2007) noted that the moral hazard hypothesis results from the (unintentional) consequences of regulators' actions. According to Kahane (1977), Kim & Santomero (1988) and Koehn & Santomero (1980), banks increase their asset risk in order to respond to regulators' actions which force them to increase their level of capital. The presence of agency problems between owners and stakeholders could also give rise to moral hazard hypothesis. According to Gorton & Rosen (1995), managers who are entrenched tend to seek more risk rather than taking less risk in an unhealthy banking industry (i.e. prone to more moral hazard). A similar inverse relationship between bank capital and credit risk was also noted by Hussain (2007) using data from developing and developed countries.

Ahmad & Ariff (2007) studied the credit risk determinants in the emerging economies (India, Korea, Malaysia, Mexico and Thailand) commercial banks and compared them with the banks in the developed economies (Australia, France, Japan and the US). Although they found evidence supporting regulatory hypothesis in Japan, Malaysia, and Mexico, they observed that the under-capitalized banks in Australia and India take on more risks. This indicates a negative relationship between credit risk and bank capital which supports the moral hazard hypothesis. This finding is consistent with the findings made by Berger & DeYoung (1997) and Park (1997).

Staikouras, Mamatzakis & Koutsomanoli-Filippaki (2008) examined the relationship between operating performance and various bank, market and macro characteristics in the new, enlarged, European banking landscape over the period between 1998 and 2005. In their study, the equity-to-assets ratio was negatively and significantly related to credit risk, which is consistent with the moral hazard hypothesis.

On the other hand, study by Williams (2004) found no strong statistical evidence of moral hazard behavior in European banks. A similar result was also found by Rossi, Schwaiger & Winkler (2009). They analyzed the managerial behavior of 278 banks in nine Central and Eastern European countries (the Czech Republic, Estonia, Hungary, Latvia, Lithuania Poland, Romania, Slovakia and Slovenia) for the period between 1995 and 2002. Adopting the Granger causality model proposed by Berger & DeYoung (1997), the evidence from their study did not support the moral hazard hypothesis.

Deelchand and Padgett (2009) employed two stage least square technique to analyze the relationships between credit risk, capital and cost inefficiency. Using the data of 263 Japanese cooperative banks between 2003 and 2006, Deelchand and Padgett (2009) found that low capitalized Japanese cooperative banks take on more credit risk. This evidence is consistent with the moral hazard hypothesis.

Bahrini (2011) empirically studied non-performing loans using Tunisian banks’ data over the period 1996 to 2007. The researcher found that bank capital significantly negatively affects credit risk. Thus the moral hazard hypothesis is verified in the Tunisian banking sector.

Similarly, Suhartono (2012) also found that bank capital has a negative impact on credit risk (measured by loan loss reserves) in the Indonesia's banking sector. According to the researcher, this means banks that have higher capital have lower credit risk as they set smaller loan loss provisions. On the other hand, it could also mean that lower capital banks take more credit risk as part of management gambling with the bank, thus supporting moral hazard hypothesis.

Likewise, Lee & Hsieh (2013) investigated the impact of bank capital on credit risk using data across 42 Asian countries during the period between 1994 and 2008. For the entire Asian banking sample, they found evidence indicating that bank capital is negatively related to credit risk, thereby supporting the moral hazard hypothesis. Moreover, according to these authors, this negative relationship implies that the regulator should closely monitor the banks in order to prohibit them from undertaking excessive risk.

Evidence of bank capital negatively affecting credit risk was also noted in Islamic banks. Taktak, Zouari & Boudriga (2010) explored the factors affecting credit risk using a sample of 66 Islamic banks over the period of 2001 to 2006. The found that well capitalized Islamic banks involve in less risky activities respecting profit and loss sharing principal in contrast with conventional banks.

Using a simultaneous equation model and a sample of 456 banks, Abedifar et al. (2011) investigated the risk feature of Islamic banking across 22 countries during the period of 2001 to 2008. They found that higher equity leads to lower credit risk. A similar finding was also noted by Abedifar, Molyneux & Tarazi (2012) using a larger sample (553 banks) across 24 countries during the period of 1999 to 2009. Shaban et al. (2014) found evidence of moral hazard hypothesis in the Indonesian Islamic banks.

In Islamic banks, *Shariah* - compliant equity-type contracts with depositors could effectively imply larger withdrawal risk than in conventional banks. Hence, higher leverage imposes stronger market discipline in Islamic banks (e.g., incentives to stronger loan screening standards and monitoring) that reduces moral hazard. Overall, there are various features in Islamic banking that appear to reduce credit risk. Loyalty could be induced and defaults could be discouraged due to the religious beliefs of borrowers and the greater discipline associated with higher deposits fragility which is exerted by risk aversion of the depositors (Abedifar et al., 2012). Moreover, the fact that Islamic banks act as business partners in their financing operations can mitigate moral hazard and adverse selection (Harris & Raviv, 1991). However, due to various factors such as the Islamic loan contracts' complexity, default penalties which are limited and PLS induced moral hazard incentives, Islamic banks are faced with greater credit risk (Abedifar et al., 2012).

According to Boyd & De Nicolo (2005), moral hazard can generally be reduced by having a lower rate of return as this allows easier repayment of loans. Thus, the default rate by borrowers will be lesser. As such, charging a lower return rate allows banks to respond to the moral hazard behavior on the part of borrowers. Islamic banks are more prone to moral hazard behavior as their return is uncertain under the profit-and-loss-sharing principle. Therefore, Islamic banks have strong incentives to discourage moral hazard behavior and then to charge lower rates. Aggarwal & Yousef (2000) pointed out that, in order to avoid moral hazard problems caused by PLS financing, Islamic banks generally use non-PLS instruments. Weill (2011) too noted that Islamic banks have incentives to charge lower return rates than conventional banks and face higher exposure to moral hazard behavior of borrowers.

Cihak & Hesse (2010) empirically studied the relative financial strength of Islamic banks in 19 banking systems with a substantial presence of Islamic banking. They noted that, given Islamic banks' limitations on standardization in credit risk management, monitoring the various PLS arrangements becomes rapidly much more complex as the scale of the banking operation grows, resulting in problems relating to adverse selection and moral hazard becoming more prominent.

Abdullah & Ahmad (2012) investigated the moral hazard implication by way of bank risk taking trailing the introduction of deposit insurance (DI) for the Islamic banks using the random effect model estimation for panel data. In their research, Malaysia was chosen as a sample for an Islamic banking system due to data availability and being the most advance country in Islamic banking. Their study revealed that Islamic banks have significantly higher operational risk after the introduction of deposit insurance. Their findings also suggest that the risk-based premium method would significantly mitigate the moral hazard problem. They also noted that the scrutiny of international regulations such as the Accounting and Auditing Organization for Islamic Financial Institution (AAOFI) and IFSB on the Islamic banks would overcome this moral hazard problem and place them at par with their conventional counterparts.

2.1.2 Credit risk as a determinant of bank capital

Using a sample of 174 large US banks between 1986 and 1991, Kwan & Eisenbeis (1997) examined the bank capital and credit risk relationship. They found that credit risk negatively affects bank capital. Similar to Kwan & Eisenbeis (1997), Deelchand and Padgett (2009) also found that high risk Japanese cooperative banks hold lesser amount of capital. According to them, regulators are not forcing these riskier banks to hold more capital. A similar inverse relationship between bank capital and credit risk was also noted by Hussain (2007) using data from banks in developing and developed countries.

On the other hand, Jokipii & Milne (2008) found that banks with relatively risky portfolios generally do hold more capital using data from European banks between 1997 and 2004. Fiordelisi, Marques-Ibanez & Molyneux (2011) examined the credit risk and bank capital using a large sample of banks in the European Union. They too found that credit risk positively affects bank capital.

A similar positive relationship between credit risk and bank capital was also noted in Islamic banks. Abedifar et al. (2011) investigated the credit risk feature of Islamic banking using a simultaneous modeling framework and a sample of 456 banks from 22 countries between 2001 and 2008. They found that higher credit risk level increases the level of equity capital.

2.2 Determinants of bank capital

From the earlier section, it is noted that credit risk affects bank capital. Bank capital is regularly been monitored to sustain the credit risk taken on by banks. Besides that, past literatures also noted other factors affecting bank capital such as the cost inefficiency, profitability, bank size and loan growth. The following section reviews the literature pertaining to these other determinants of bank capital.

2.2.1 Cost inefficiency as a determinant of bank capital

Bank capital and credit risk could also be simultaneously determined by the level of cost inefficiency of the banks (Hughes & Mester, 1998; Hughes & Moon, 1995; and Kwan & Eisenbeis, 1997). When a bank’s total operational cost is higher than the level benchmarked for an efficient bank with similar capacity of transactions, the bank is referred as cost inefficient (Altunbas et al., 2001). Therefore cost inefficiency has been widely measured instead of cost efficiency by researches in the recent period. Berger & DeYoung (1997) had employed Granger-causality techniques to test relationships among loan quality, cost efficiency, and bank capital using US banks’ data between 1985 and 1994. They found that cost inefficient banks are likely to have low capital. Likewise, a similar finding was also noted by Fiordelisi et al. (2011) who examined the cost efficiency and bank capital using a large sample of banks in the European Union. They too found that cost efficiency positively Granger-cause bank capital which means that cost inefficient banks are less capitalized.

However, the contrary was noted by Altunbas et al. (2007), who had analyzed the relationship between capital, risk and efficiency of European banks between 1992 and 2000. The evidence indicated that European banks which are inefficient tend to hold more capital. This supports the finding of Kwan & Eisenbeis (1997).

A similar finding was also noted among Japanese cooperative banks. Deelchand and Padgett (2009) employed two stage least square technique to analyze the relationships between credit risk, capital and cost inefficiency. Using a sample of 263 Japanese cooperative banks during the period between 2003 and 2006, Deelchand and Padgett (2009) found that cost inefficiency positively affect bank capital. According to the researchers, the presence of moral hazard is evident as cooperative banks which are inefficient are holding larger amounts of capital.

Soedarmono, Rous & Tarazi (2010) used monthly data over the period between 2004 and 2007 on 99 Indonesian commercial banks in order to identify the relationship between capital ratios, cost inefficiency and risk taking. Similar to Kwan & Eisenbeis (1997), Altunbas et al. (2007) and Deelchand and Padgett (2009), they also found that an increase in bank capital is associated with an increase in bank cost inefficiency.

Unlike the findings by Altunbas et al. (2007), Deelchand and Padgett (2009), Kwan & Eisenbeis (1997) and Soedarmo at al. (2010), an opposite finding was revealed by Abedifar et al. (2011) who studied the determinants of bank capital in Islamic banks. They found that cost inefficiency negatively affects Islamic banks' capital. This means, as the Islamic bank's cost inefficiency increases, its capital tend to erode. This is similar to the findings of Berger & DeYoung (1997) and Fiordelisi et al. (2011) in the conventional banks.

2.2.2 Profitability as a determinant of bank capital

Altunbas et al. (2007), Hughes & Mester (1998), and Hughes & Moon (1995) suggest that the puzzle between bank capital and credit risk is possibly influenced by the banking sector's profitability. Berger (1995) examined the bank capital and earnings relationship using U.S commercial banks' data. The study found positive causation in the Granger sense to run in both directions between bank capital and earnings. The positive Granger-causality from earnings to bank capital suggests that banks retain some of their marginal earnings in the form of equity increases. Jacques & Nigro (1997) used the simultaneous equations model to study the US banks' capital and profitability. They too found that profitability significantly positively affect bank capital. According to these authors, this finding was expected, because in equilibrium, riskier banks should have a higher expected income, and to the extent that a higher return was realized, they would tend to have had larger changes in capital.

Contrarily, Ahmad (2005) found no strong empirical relationship between banks earnings and bank capital among the Malaysian banks. Using data from 1995 to 2002, Ahmad (2005) found that bank earnings do not significantly drive the Malaysian bank managers' capital decisions, probably due to the lack in the existing self-regulatory incentives to hold adequate capital among domestic banks in order to protect their high charter value.

Similar to the findings of Berger (1995) and Jacques & Nigro (1997), a positive impact of profitability on bank capital was noted in Swiss banks by Rime (2001). The researcher studied the capital requirements and bank behavior in the Swiss banking industry from 1989 to 1995 and found that profitability positively affects bank capital. This indicates that banks which are profitable enhance their level of capital using retained earnings.

A similar relationship was also noted among Japanese cooperative banks. Deelchand and Padgett (2009) employed two stage least square technique to analyze the relationships between credit risk, capital and cost inefficiency. Using a sample of 263 Japanese cooperative banks between the period of 2003 and 2006, Deelchand and Padgett (2009) found that return on assets (ROA) and bank capital are positively related. This implies that banks that generate higher earnings are likely to hold more capital. According to the researchers, the possible explanation for this result is the dependency of cooperative banks on retained earnings compared to other banks because cooperative banks have lesser choices to increase their level of capital. In addition, cooperative banks are able to achieve higher ROA as they usually need substantial amount of investment in human resources and retail infrastructure.

A similar positive relationship between profitability and bank capital was also found in Islamic banks. Abedifar et al. (2011) studied the determinants of bank capital in Islamic banks using a simultaneous equation model by employing the data of 456 banks across 22 countries during the year 2001 to 2008. They found that profitability positively affects bank capital. This finding is similar to the finding of Berger (1995), Deelchand and Padgett (2009), Jacques & Nigro (1997) and Rime (2001) in the conventional banks.

2.2.3 Bank size as a determinant of bank capital

Bank capital can also be influenced by bank size. Larger banks tend to hold less capital due to their comparative advantage in terms of economies of scale in screening and monitoring activities as well as in terms of product diversification.

According to Shrieves & Dahl (1992), bank size may have an impact on bank capital levels due to its relationship to bank diversification, the nature of a bank's investment opportunity set, or to bank ownership characteristics and access to equity capital. However, they found that bank size had no effect on target capital levels overall using data from US banks. Meanwhile, using US conventional banks' data, Kwan & Eisenbeis (1997) found that bank size negatively affect the level of bank capital.

Similar negative relationship between bank size and bank capital was also noted in Japanese cooperative banks and Indonesian commercial banks. Deelchand and Padgett

(2009) employed two stage least square technique to analyze the relationships between credit risk, bank capital and cost inefficiency using a panel data sample of 263 Japanese cooperative banks between 2003 and 2006. They found that bank size and bank capital are negatively related even though it is not significant. This could be due to the fact that larger sized banks need to hold only lower level of capital because they are able to access new capital quickly. Furthermore, since the transaction costs are lower, these banks are also able to raise capital easily. Soedarmono et al. (2010) used monthly data over the period between 2004 and 2007 on 99 Indonesian commercial banks in order to determine the relationship between capital ratios, inefficiency and risk taking. Similar to Deelchand and Padgett (2009), they too found that bank size negatively influenced bank capital.

Similar studies have also been done in Islamic banks. Bashir (1999) examined the effects of scale (total assets) on the performance of Islamic banks. Using the data of two Sudanese banks, the study found that there is a negative relationship between bank size and the ratio of equity to capital similar to the finding by Kwan & Eisenbeis (1997) and Soedarmono et al. (2010) in the conventional banks. This implies that larger bank is systematically highly levered. Likewise, Abedifar et al. (2011) studied the determinants of bank capital in Islamic banks. They too found that bank size negatively affect bank capital.

Larger banks hold less capital because from a safety net perspective (systemic risk), larger banks can be viewed as ‘Too-Big-To-Fail’ or ‘Too-Big-To-Discipline-Adequately’ (Kane 2000; Mishkin 2006). Thus, a negative relationship exists between bank size and the bank capital. Therefore, bank size is included in this study as one of the controlled variable.

2.2.4 Loan growth as a determinant of bank capital

Bank capital can also be influenced by the magnitude of loan growth. An increase loan would positively affect the bank capital, since more bank capital is needed to cover risk incurred by the provision of loans (Ayuso, Perez & Saurina, 2004; and Jokipii and Milne, 2008).

Williams (2004) used the Granger causality model which was employed by Berger & DeYoung (1997) to examine the inter-temporal relationships between capital, loan loss provision and efficiency of European banks. The study observed that an increase in the bank's loan growth tend to increase the capital stock.

The opposite was found by Altunbas et al. (2007) and Foos, Norden & Weber (2007). Altunbas et al. (2007) analyzed the determinants of bank capital and found that loan growth significantly negatively affects bank capital. Foos et al. (2007) found that loan growth negatively affects bank capital using Bankscope data from more than 10,000 individual banks from the U.S., Canada, and 12 European countries, during 1997-2005. Therefore, loan growth is included in this study as one of the controlled variable.

2.3 Determinants of bank's credit risk

As mentioned earlier, credit risk happens when a borrower or counter party fails to meet its obligations in accordance with agreed terms. Samad (2004) found a significant difference in credit risk performance between conventional banks and Islamic banks. In their study, Kader & Asarpota (2007) noted that Islamic banks in UAE were relatively less risky compared to the UAE conventional banks. Similar result was also found by Samad &

Hassan (1999) using banks in Malaysia. Such similar evidence was also found by Masruki, Ibrahim, Osman & Wahab (2011) who observed that high credit risk are encountered by conventional banks due to the fact that their loan to deposit ratio is greater than their Islamic peers. Abedifar et al. (2012) also noted that Islamic banks exhibit lower credit risk than conventional banks.

However, the opposite was noted by Fayed (2013). Through the credit risk analysis of Islamic and conventional banks in Egypt for the period of 2008 to 2010, Fayed (2013) found that Islamic banks are faced with more credit risk as opposed to their conventional peers. On the other hand, Abdulle & Kassim (2012) studied the credit risk of Malaysian Islamic and conventional banks. Using data from 2006 to 2010, the study found no major differences in the credit risk between the Islamic and conventional banks.

Therefore in this section, the determinants of credit risk will be reviewed. From section 2.1.1, it is noted that bank capital affects credit risk. Past literature also noted other determinants of credit risk such as cost inefficiency, profitability, bank size, loan growth and management efficiency. The following section reviews these other determinants of credit risk.

2.3.1 Cost inefficiency as a determinant of credit risk

Berger & DeYoung (1997) had described two hypotheses based on modes of management behavior, that could potentially establish a link between cost inefficiency and problem loans (non-performing loan) using data from U.S. commercial banks from 1985 to1994. First of it is “Bad Management” hypothesis that is supported by the theory of higher cost inefficiency lead to higher problem loans. Bad management hypothesis implies that high cost inefficiency leads to greater amount of problem loans as bad managers do not effectively control the operating expenses and manage loan portfolio in a poor manner. Therefore, if cost inefficiency positively affects credit risk, it would support the bad management hypothesis. The underlying argument here is that bad management increases the likelihood of bank failures.

The other management behavior is the “Skimping” behavior which supports the theory that declines in cost inefficiency (increase in cost efficiency) lead to surges in problem loans. Skimping hypothesis implies the costs connected with monitoring of lending activities affect the quality of a bank’s loan portfolio. Berger & DeYoung (1997) found that NPLs increase when cost inefficiency increases. They concluded that cost efficiency may be an important indicator of future problem loans and problem banks. This evidence supported the bad management hypothesis. They also found that an increase in cost efficiency (decrease in cost inefficiency) tend to increase the problem loans (supporting the skimping behavior) among the most efficient banks. The authors noted that although the bad management hypothesis dominates the skimping hypothesis on average for the entire sample, this does not preclude the possibility of skimping behavior in individual banks.

Williams (2004) investigated management behavior using data from savings banks of European countries (Denmark, France, Germany, Italy, Spain and the United Kingdom) from 1990 to 1998. The research employed the Granger causality model used by Berger & DeYoung (1997) to examine the inter-temporal relationships between problem loans, efficiency and capitalization. Similar to Berger & DeYoung (1997)’s evidence in the U.S. banks, Williams (2004) also found strong evidence of bad management characteristic among the European banks. However, unlike Berger & DeYoung (1997), the study by

Williams (2004) did not observe any strong statistical evidence supporting skimping behavior hypothesis in the European banks.

Rossi, Schwaiger & Winkler (2005) analyzed the managerial behavior of 278 banks across nine Central and Eastern European countries during the period between 1995 and 2002. Employing the Granger causality model suggested by Berger & DeYoung (1997), the study found no evidence of bad management hypothesis unlike those found by earlier studies (ie. Berger & DeYoung, 1997 and Williams, 2004).

Guillen (2006) tested the validity of different hypotheses commonly employed to explain the proportion of NPLs held by US banks between 1984 and 1997. Using the causality analysis, the study found that the bad management and skimping hypotheses could explain the proportion of NPLs for banks over a period of ten years. The result complements the study of Berger & DeYoung (1997).

Study by Fiordelisi et al. (2011) examined the factors affecting European banks' credit risk-taking during the 1990s. Similar to Berger & DeYoung (1997), they too found that cost inefficient banks were more inclined to take credit risk compared to the cost-efficient banks. Chortareas et al. (2011) studied the cost efficiency and credit risk of commercial banks in the Eurozone. They too found that cost inefficiency positively affects credit risk implying that inefficient banks do not adequately control or monitor their operating costs and have a week loan portfolio management, hence declining the quality of their asset.

Evidence supporting bad management was also documented by Zago & Dongili (2006) who examined the bad loans and cost efficiency in Italian banks during the period from

1993 until 2004 and also by Podpiera & Weill (2008) who extended the Granger causality model developed by Berger & DeYoung (1997) on a panel of Czech banks between 1994 and 2005. Similar result was also noted by Das & Ghosh (2007) using samples comprising of Indian state-owned banks.

Deelchand and Padgett (2009) employed two stage least square technique to analyze the relationships between credit risk, capital and cost inefficiency. Using a panel data sample of 263 Japanese cooperative banks during the period between 2003 and 2006, Deelchand and Padgett (2009) found evidence that cost inefficiency positively affects credit risk. This evidence supports the bad management hypothesis implying that banks which are cost inefficient are more prone to risk-taking compared to the cost efficient banks.

Louzis, Vouldis & Metaxas (2012) examined the determinants of non-performing loans (NPLs) in the Greek banking sector. They found that cost inefficiency is strongly positively related to credit risk thus supporting the bad management hypothesis. Similar result was also found in Indonesian banks. Suhartono (2012) examined the determinants of credit risk in Indonesia's banking sector. The researcher found that cost inefficiency was positively related to credit risk indicating that cost inefficient banks take on more credit risk and are forced to provide more loan loss reserves. Their finding supports the bad management hypothesis whereby cost inefficient banks undertake excessive risk taking.

Evidence supporting skimping hypothesis was noted by Altunbas et al. (2007) who analyzed the relationship between bank capital, credit risk and cost inefficiency of banks in Europe between 1992 and 2000. The evidence indicated that cost inefficient European banks take less credit risk. This finding is opposite to the findings noted by Fiordelisi et al. (2011) in the European banks.

Analysis between credit risk and cost inefficiency has also been done in Islamic banks. Using 22 countries' Islamic banking data during the period 2001 to 2008, Abedifar et al. (2011) found result supporting the bad management hypothesis. Abedifar et al. (2011) found that cost inefficiency and credit risk are positively and significantly related in the Islamic banks. This finding is in-line with the findings made in conventional banks by Hughes & Mester (1998), Hughes & Moon (1995) and Kwan & Eisenbeis (1997) but contrary to the results of Altunbas et al. (2007).

Alam (2012) examined the relationship between credit risk and cost inefficiency within the two banking systems; conventional and Islamic. This study found that cost inefficiency positively affects credit risk in conventional banks, while an inverse relationship was noted in Islamic banks. This implies that bad management hypothesis is supported in the conventional banks, while skimping hypothesis is supported in the Islamic banks. The researcher noted that this finding clearly highlight the inherent difference between credit risk–cost inefficiency relationships between these two distinct bank types.

2.3.2 Profitability as a determinant of credit risk

The risk taking behavior of managers may be determined by the bank performance. According to Boudriga, Taktak & Jellouli (2010), highly profitable banks face less pressure on revenue creation, hence are not too highly constrained to be involved in risky credit offerings. Using return on assets (ROA) as a profitability measure, Godlewski (2004) found that banks' profitability negatively impacts the credit risk. A similar finding was also noted by Fiordelisi et al. (2011) who examined the factors affecting European banks' risk-taking during the 1990s. They found a negative relation between earnings and bad loans which implies that less efficient managers who are able to generate only a low profit per unit of capital invested, would also be responsible for a deterioration in credit quality.

However, Cannata & Quagliariello (2006) and Suhartono (2012) found the opposite result. Cannata & Quagliariello (2006) studied the credit risk of Italian banks using data from 1994 to 2003. They found that profitability as measured by ROA significantly positively affects credit risk. Similarly Suhartono (2012) examined the determinants of credit risk in Indonesia's banking sector and found that profitability as measured by return on assets, significantly positively affects credit risk. This means highly profitable banks put more into loan loss reserve. The researcher interpreted this result in two different ways. First, profit oriented banks are willing to take on more risk to earn more profit (moral hazard theory). Second, profitable banks put more loan loss reserves to shield against the tax (bad management theory). The researcher suggests that both moral hazard and bad management behavior might be intertwined in the result.

2.3.3 Bank size as a determinant of credit risk

Hu, Li & Chiu (2004) noted that larger sized banks have greater resources and experiences in handling bad borrowers. Meanwhile, smaller sized banks could face adverse selection problems caused by insufficient competencies and lack of experience in effectively assessing the borrower's credit quality. Furthermore, according to Cannata & Quagliariello (2006), large banks usually have higher investment opportunities, which may result in more diversified portfolios. Therefore larger sized banks would have lower credit risk.

Findings by Fischer, Gueyie & Ortiz (2000) and Hassan, Karels & Peterson (1994) support this claim as they found that bank size is significantly negatively related to credit risk of U.S. banks. Hu et al. (2004) also found an inverse relationship between bank size and credit risk in Taiwan banks.

However the opposite was noted by Bushman & Williams (2007). They used a large sample of banks domiciled in 28 countries between years 1994-2005 to study the loan loss behavior. Taking bank financial statement data from Bankscope and all market data from Datastream, Bushman & Williams (2007) found that bank size positively affects credit risk.

Similar result was also noted by Deelchand and Padgett (2009) who employed two stage least square technique to analyze the relationships between credit risk, capital and cost inefficiency. Using a panel data sample of 263 cooperative banks in Japan during the period between 2003 and 2006, Deelchand and Padgett (2009) found that bank size positively affects credit risk. This finding reveals that larger cooperative banks take on more credit risk than their smaller counterparts. Likewise, Marcucci & Quagliariello (2009) also found that bank size positively affects credit risk using Italian banks' quarterly data.

A positive relationship between bank size and credit risk was also noted in the Indonesian banking sector. Suhartono (2012) examined the determinants of credit risk in Indonesia's banking sector. The researcher noted that bank size positively affects credit risk. This indicates that larger banks takes on more credit risk compared to the smaller ones.

However, in Islamic banks an inverse relationship between bank size and credit risk was noted similar to the findings by Fischer et al. (2000) in the US conventional banks. Abedifar et al. (2011) investigated the risk feature of Islamic banking using a simultaneous modeling framework and a sample of 456 banks from 22 countries between 2001 and 2008. Consistent with possible diversification and the benefits from scale economies, the study found an inverse relationship between bank size and credit risk. Similar finding was also noted by Abedifar et al. (2012) by employing a sample of 553 banks across 24 countries during the period 1999 to 2009.

Alam (2012) studied the credit risk using conventional and Islamic banks' data across eleven countries that have dual banking system. The researcher noted that bank size positively affects credit risk in conventional banks, while a negative relationship was noted in Islamic banks.

2.3.4 Loan growth as a determinant of credit risk

The relation between loan growth and credit risk is vital as many authors treat loan growth as a proxy of bank risk as a whole (Skala, 2011). Salas & Saurina (2002) included loan growth as one of the main drivers of problem loans and concluded that a rapid credit expansion is one of the most important causes of problem loans.

Das & Ghosh (2007) examined the factors affecting credit risk of Indian state-owned banks for the period of 1994 to 2005. They found that higher loan growth increased the credit risk. The same finding was also found by Foos, Norden & Weber (2010). They investigated whether loan growth affects the riskiness of more than 10,000 individual banks in 14 major western countries during the period of 1997 to 2005. Their result suggests that loan growth is an important driver of bank credit risk.

However, the opposite was found by Kwan & Eisenbeis (1997) that loan growth negatively affects credit risk. Likewise, Fiordelisi et al. (2011) who studied the factors affecting the credit risk taking of European banks during the 1990s, also found that loan growth negatively affect credit risk. In similar context, using a sample of 10 main Tunisian banks, Boudriga & Jellouli (2008) found that there is a negative relationship between loan growth and credit risk. They argued that more concentrated the bank is in their credit activities, the better it controls the solvency of its borrowers.

Likewise, an inverse relationship between loan growth and credit risk was also noted among Italian and Japanese banks. Using a sample of 263 cooperative banks in Japan during the period between 2003 and 2006, Deelchand and Padgett (2009) found that loan growth as measured by net loans to total assets was inversely related to credit risk. Marcucci & Quagliariello (2009) found the same using Italian banks' quarterly data.

In Islamic banks, a similar negative relationship was found. Abedifar et al. (2011) investigated the risk feature of Islamic banking using a simultaneous modeling framework and a sample of 456 banks from 22 countries between 2001 and 2008. They found that loan growth is related to lower credit risk, which is similar to the finding by Clair (1992) in the Texas conventional banks. Abedifar et al. (2012) also found that loan growth negatively affects credit risk.

Alam (2012) studied the credit risk using conventional and Islamic banks' data from eleven countries that have dual banking system. The researcher noted that loan growth negatively affects credit risk in both conventional and Islamic banks.

2.3.5 Management efficiency as a determinant of credit risk

Management efficiency as measured by the earning assets to total assets ratio reflects a bank's management efficiency on its assets to earn interest income (Angbazo, 1997). A negative association between earning assets to total assets and credit risk infers an efficient management. Ahmad & Ariff (2007) analyzed the factors affecting the credit risk of emerging economy commercial banks in India, Korea, Malaysia, Mexico and Thailand and compared them with the ones in the developed economies such as Australia, France, Japan and the US. These authors found that management efficiency (measured by earning assets to total assets ratio) and credit risk are significantly related to each other in Malaysia, India and France. A positive relationship was noted in Malaysia and France suggesting that the higher the proportion of earning assets (which largely consist of loans), the greater is the tendency for banks in these countries to incur potentially high credit risk. Conversely, a negative relationship between management efficiency and credit risk was noted in India. This negative relationship is supported by the findings of Angbazo (1997).

Rahman (2009) studied the risk exposure of Malaysian banks. The researcher found that management efficiency significantly affects credit risk. An inverse relationship was noted between management efficiency and credit risk suggesting that Malaysian banks are efficient in terms of managing their risk exposure, particularly in relation to market fluctuation.

Similar studies have also been done in Islamic banks. Ahmad & Ahmad (2004) examined the factors affecting credit risk in Islamic banking operations in Malaysia. They also compared these factors with the ones from the conventional banks. They found management efficiency (measured by earning assets to total assets), strongly affects credit risk in Islamic banking. However, the study noted that in conventional banks, management efficiency does not significantly affect credit risk. They had expected a negative relationship between management efficiency and credit risk because lower the efficiency in earning assets' management would most likely lead to increase in credit risk. However their findings revealed otherwise for Islamic banks. The coefficient of Islamic banks' management efficiency is positive suggesting that a higher proportion of earning assets to total assets, if not properly managed, would result in higher credit risk. Meanwhile, for conventional banks a negative relationship was found suggesting that a lower efficiency in managing its earning assets would lead to a higher credit risk. This result supports the findings of Ahmad (2003) and Angbazo, Mei & Saunders (1998). According to the researchers, the opposite sign in the results above could be due to fact that the earning assets were all interest based in conventional banking and the immediate recognition of loan default. Meanwhile, the Islamic banks' earning assets are generally on *murabaha* and *mudarabah* mode of financing and the credit risk is transferred to its investment depositors and the loan defaults are not recognized (in the case of *mudarabah* on the part of the agent-entrepreneur) until PLS contract expire (see Sundararajan & Errico, 2002).

Similar to Ahmad & Ahmad (2004), How, Abdul Karim & Verhoeven (2005) also studied the credit risk in both conventional and Islamic banking. These authors found that the credit risk in both banking system is significantly determined by management efficiency as measured by earning assets to total assets.

2.4 Determinants of bank's cost inefficiency

An entity that produces or provides service is considered cost efficient if it is able to produce a given output at a minimum cost (Mokhtar et al., 2006). This means the farther the bank's operation cost to the benchmark bank, higher the cost inefficiency. Identifying the factors that affect the cost inefficiency would enable banks to formulate effective policies to decrease their cost inefficiency. Alkhalifa (1999) studied a sample of 1313 conventional banks operating in 39 countries drawn from BankStat database. This author found that interest-based banking systems operating in Islamic countries were cost inefficient compared to their counterparts operating in non-Islamic countries.

Similar finding was also noted by Al-Jarrah & Molyneux (2003) and Alshammari (2003). Al-Jarrah & Molyneux (2003) who studied the cost efficiency of 82 banks in Jordan, Egypt, Saudi Arabia and Bahrain during the period between 1992 and 2000. They found that Islamic banks are more cost efficient than conventional banks. Alshammari (2003) studied the cost efficiency of banks in Bahrain, Saudi Arabia, Kuwait, Oman, Qatar and the UAE. The researcher found that Islamic banks are more cost efficient relative their conventional counterpart. Similar evidence was also noted by Al-Jarrah & Molyneux (2005) using banks in Bahrain, Egypt, Jordan, and Saudi Arabia. Using cross-country data, they found that cost efficiency of Islamic banks is higher than their conventional counterparts.

Using the stochastic frontier approach, El-Gamal & Inanoglu (2005) studied the cost efficiency of Turkish banks over the period between 1990 and 2000. These authors compared the cost efficiencies of 4 Islamic special finance houses (SFHs) with 49 conventional banks. They found that the Islamic financial institutions are more cost efficient. Likewise, Hassan & Bashir (2005) also found that Islamic banks are more cost efficient than the conventional banks using financial ratio analysis. Shahid, Rehman, Niazi & Raoof (2010) compared the cost efficiency of Pakistan's Islamic and conventional banks. Their finding also revealed that Islamic banks perform better than conventional banks in terms of cost.

Similar result was also found by Hassan, Mohamed & Bader (2009). Using cross-country level data in 11 OIC countries over the period 1990 to 2005, they studied the cost efficiency of both Islamic and conventional banks. They documented that Islamic banks are more efficient in terms of cost. Using cross-country sample, Beck et al. (2010) found that Islamic banks are more cost efficient than the conventional banks. However, the study documented the opposite in a sample of countries with both Islamic and conventional banks.

The opposite was found by Iqbal (2001), Johnes, Izzeldin & Pappas (2009) and Mokhtar, Abdullah & Alhabshi (2008). Using cross-country data and ratio analysis, Iqbal (2001) examined the performance of the Islamic and conventional banks in Saudi Arabia, Kuwait, Bahrain, Egypt, UAE, Jordan, Qatar, Bangladesh, Malaysia and Turkey between the years 1990 and 1998. Iqbal (2001) found that the Islamic banks are less cost efficient compared to the conventional banks. Johnes et al. (2009) analyzed the cost efficiency of Gulf Cooperative Council (GCC) region's Islamic and conventional banks during the period between 2004 and 2007. Their findings revealed that Islamic banks were cost inefficient than conventional banks. Mokhtar et al. (2008) also found that Islamic banks' cost efficiency was lower compared to the cost efficiency of conventional banks in Malaysia. Similar result was also noted by Abdul-Majid, Saal & Battisti (2008) and Bader et al.

(2008) using cross-country data. Both the studies found that Islamic banks were less cost efficient than the conventional banks.

However, Abdul-Majid, Mohammed Nor & Said (2005) and Abedifar et al. (2011) noted a different finding. Abdul-Majid et al. (2005) analyzed the cost efficiency of Islamic and conventional banks in Malaysia using Stochastic Frontier Approach (SFA). The finding revealed no significant difference between the two types of banking system. Abedifar et al. (2011) also found no significant differences in the level of inefficiency of Islamic and conventional banks.

Cross-country research on Islamic banks in terms of cost efficiency analysis has remained limited. Brown (2003) studied the cost efficiency of Islamic banks in 14 countries that have sufficient data for at least three years in Asia, the Middle East and North Africa (MENA). Using a sample covering the period of 1998 to 2001 and the DEA analysis, the study found that Iran, Brunei and Yemen consistently had the most efficient Islamic banks. Meanwhile, Indonesia and Sudan had the least cost efficient Islamic banks.

In a similar analysis, Ariss, Rezvanian & Mehdian (2007) analyzed the cost efficiency of banks in six Gulf countries that are members of the GCC, namely Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and United Arab Emirates. Their study covered the period between 1999 and 2004. The findings indicate that banks in Oman, on average, have been the most cost efficient among GCC countries, followed closely by banks in Bahrain and Kuwait. On the other hand, the results showed a low cost efficient banking environment in UAE and Qatar, with Saudi Arabian banks being the least cost efficient.

Based on the discussions thus far, it was noted that cost inefficiency affects both bank capital and credit risk. Prior literature (Hughes & Mester, 1998; Hughes & Moon, 1995; and Kwan & Eisenbeis, 1997) noted that bank capital and credit risk may also be simultaneously determined by the level of cost inefficiency. Therefore, in this section, literatures pertaining to the determinants of cost inefficiency will be reviewed. Past literature noted several determinants of cost inefficiency such as bank capital, credit risk, profitability, bank size, loan growth and off-balance sheet items. The following section looks at these determinants of cost inefficiency.

2.4.1 Bank capital as a determinant of cost inefficiency

Mester (1993) investigated cost efficiency of the Third Federal Reserve District's banks using the stochastic cost frontier approach. The research utilized data of 214 banks from 1991 to 1992. The result indicated that bank capital negatively affects cost efficiency. Likewise, Mester (1996) also found a negative relationship between bank capital and efficiency.

Kwan & Eisenbeis (1997) analyzed the cost inefficiency using a sample of 352 banking organizations from second quarter of 1986 to the fourth quarter of 1995. These authors' too found that banks with larger capital operate more cost efficiently (less cost inefficiently) than lower capitalized banking organizations suggesting that level of capitalization is a good proxy for performance. Study by Fiordelisi et al. (2011) examined the determinants of bank cost inefficiency in Europe during the 1990s. These researchers found that bank capital significantly negatively affects cost inefficiency implying that well capitalized banks operate more cost efficiently. According to the researchers, well capitalized banks might have more incentive in order to operate more cost efficiently due to the fact that capital is more expensive than debt at the margin. Similar evidence was also observed by most of the previous literature analyzing the factors affecting bank cost efficiency (see Berger & De Young, 1997).

Similar relationship was also noted by Kablan (2007) who measured the factors affecting the cost efficiency of West African Economic Monetary Union (WAEMU)'s banks during the period between 1993 and 1994. This researcher found that bank capital positively impacts banks' cost efficiency level.

Chortareas et al. (2011) too found that Eurozone commercial banks' capital level is positively related to cost efficiency. This implies that moral hazard and informational frictions could be prevented with high level of bank capital, thus creating a more cost efficient bank. According to the researchers, higher capital may reflect greater incentives from the shareholders to monitor managers. This finding is similar to the finding by Berger (1995), Eisenbeis, Ferrier & Kwan (1999), Mester (1996) and Yildirim & Philippatos (2007). Similar finding was also found in Asian countries. Chan, Karim, Burton and Aktan (2013) examined bank cost inefficiency in seven East Asian countries between 2001 and 2008. They also found that bank capital significantly negatively affects cost inefficiency.

On the contrary, a negative relationship between bank capital (measured by equity to total assets ratios) and cost efficiency was found by Dacanay (2007) in the Philippines' commercial banks. A similar finding was also documented by Chan (2008). Chan (2008) studied the cost efficiency of the banks in several developing nations in the Asia, Middle East, and the African region between years 2000 to 2005. The researcher found that bank capital negatively affects cost efficiency. This finding implies that cost efficiency is high when the capital requirements are low.

Using Japanese banking data, Deelchand and Padgett (2009) also noted similar findings as Chan (2008) and Dacanay (2007). Deelchand and Padgett (2009) employed two stage least square technique to analyze the relationships between credit risk, capital and cost inefficiency. Using a sample of 263 cooperative banks in Japan during the period between 2003 and 2006, Deelchand and Padgett (2009) found that bank capital significantly positively affects cost inefficiency. This implies that banks that are well capitalized do not operate efficiently compared to the banks that hold low level of capital. This finding contradicts the results found by Kwan & Eisenbeis (1997).

On the other hand, the result in Islamic banks seems to support the findings of Kwan & Eisenbeis (1997). Abedifar et al. (2011) studied the determinants of cost inefficiency in Islamic banks and found that bank capital negatively affects cost inefficiency.

2.4.2 Credit risk as a determinant of cost inefficiency

Besides the bad management and skimping hypotheses, Berger & DeYoung (1997) had also developed another mode of management behavior called “Bad Luck” hypothesis to link credit risk and cost inefficiency. This hypothesis is supported if increases in credit risk lead to increase in cost inefficiency. Bad luck hypothesis implies that cost inefficiency increases due to the increase in the problem loans resulting from unexpected and external factors. The underlying argument is that external events such as economic slowdowns affect non-performing loan and these results in banks incurring extra costs to deal with these loans. This in turn, weakens cost efficiency. Using the data from U.S. conventional banks, Berger & DeYoung (1997) found that reduction in cost efficiency is led by an increase in the problem loans (supports the bad luck hypothesis). Likewise, Kwan & Eisenbesi (1997) also documented that credit risk positively affect cost inefficiency in larger sized banks. However, the opposite was found for smaller sized banks.

Similar to Berger & DeYoung (1997), Rossi et al. (2005) also documented evidence supporting bad luck hypothesis. Studying the managerial behavior of banks in the Central and Eastern European countries during the period between 1995 and 2002, Rossi et al. (2005) found evidence supporting the bad luck hypothesis implying that cost inefficiency are triggered by bad loans. Evidence supporting bad luck hypothesis was also found by Guillen (2006) and Chiu, Chen & Bai (2009). Chiu et al. (2009) studied the cost efficiency and credit risk in Taiwan banking industry. Using panel data for 43 Taiwanese commercial banks from year 1998 to 2002, the study found that loan quality factors have an impact on a bank's cost efficiency. The evidence generally indicated that the bank with a higher degree of problem loans drops down its cost efficiency.

Fiordelisi et al. (2011) also found that credit risk significantly positively affects cost inefficiency suggesting that management of a large amount of bad loans leads to cost inefficiency. It was noted in section 2.3.1 that Fiordelisi et al. (2011) found cost inefficiency positively affects credit risk. Therefore, it should be noted that the relationship between credit risk and cost inefficiency goes in both directions.

Evidence supporting bad luck hypothesis was also documented in Japanese banks. Deelchand and Padgett (2009) employed two stage least square technique to analyze the relationships between credit risk, capital and cost inefficiency. Using a sample of 263 cooperative banks in Japan during the period between 2003 and 2006, Deelchand and Padgett (2009) found that credit risk was significantly positively related to cost inefficiency implying that cost inefficiency stems out from the management of large amount of loans.

However, the contrary was noted by Kwan (2006) and Podpiera & Weill (2008). Using the data from commercial banks in Hong Kong, Kwan (2006) found that banks with more problem loans were associated with higher levels of cost efficiency. Podpiera & Weill (2008) extended the Granger causality model developed by Berger & DeYoung (1997) on a panel of Czech banks between 1994 and 2005. Their findings also rejected the bad luck hypothesis.

Findings in Islamic banks indicate a support for the bad luck hypothesis. Positive relationship between cost inefficiency and credit risk was documented by Abedifar et al. (2011) who studied the determinants of cost inefficiency in Islamic banks. These authors noted that higher risk increases cost inefficiency levels. This finding was in-line with the findings of Hughes & Mester (1998), Hughes & Moon (1995) and Kwan & Eisenbeis (1997) and contrary to the results of Altunbas et al. (2007) which were done using conventional banks' data.

Alam (2012) examined the relationship between credit risk and cost inefficiency within the two banking systems; conventional and Islamic. This study found that credit risk positively affects cost inefficiency in conventional banks (supports bad luck hypothesis), while an inverse relationship was noted in Islamic banks, which clearly highlight the inherent difference between credit risk - cost inefficiency relationships between these two distinct bank types. Alam (2012)'s findings does not show support for bad luck hypothesis in Islamic banks.

2.4.3 Profitability as a determinant of cost inefficiency

Studying the cost efficiency of banks in several developing nations in the Asia, Middle East, and the African region between the years 2000 and 2005, Chan (2008) found that profitability as measured by ROA significantly positively affects cost efficiency. This finding implies that banks that are able to generate more earnings in relation to their total assets tend to be more cost efficient.

Kalluru & Bhat (2009) studied the determinants of cost efficiency of conventional banks in India. By employing the Stochastic Frontier Approach (SFA) and the Tobit regression technique for the period between 1992 and 2006, the study found the cost efficiency of banks in India decreased during the period of analysis. The results also revealed that the earning capacity of banks is the main determinant of cost efficiency.

2.4.4 Bank size as a determinant of cost inefficiency

Karim (2001) analyzed the bank cost efficiency across selected ASEAN countries. The study reported that larger sized banks are more cost efficient relative to their smaller sized rivals. Maudos, Pastor, Perez & Quesada (2002) analyzed the cost efficiency in European banks by using balance sheets and income statement information of 832 banks over the period of 1993 and 1996. The countries included are Austria, Belgium, Finland, France, Germany, Italy, Luxembourg, Portugal, Spain and the UK. The study found that medium-sized banks (assets up to $10 billion) reach the highest levels of cost efficiency.

Using data between 1990 and 1999, Spathis, Kosmidou & Doumpos (2002) found that large banks are more cost efficient than the smaller ones. A similar finding was noted by Chortareas et al. (2011) and Chan et al. (2013). Chortareas et al. (2011) studied the cost efficiency in Eurozone's commercial banks. They found that bank size and cost efficiency are positively related suggesting that larger sized banks are able to achieve greater loan portfolio diversification relative to the smaller sized peers. Therefore, by achieving advantage in term of size, banks have greater cost efficiency levels. This finding is similar to the finding of Altunbas et al. (2007) and Yildirim & Philippatos (2007). Chan et al. (2013) examined cost inefficiency of banks in seven East Asian countries between 2001 and 2008. They too found that bank size significantly negatively affects cost inefficiency (positively affects cost efficiency).

The opposite was found by Christopoulos, Lolos & Tsionas (2002), Isik & Hassan (2002) and Kwan (2006). Christopoulos et al. (2002) measured the cost efficiency of Greek banks over the period between 1993 and 1998. Their findings revealed that large banks are less cost efficient than smaller ones. Isik & Hassan (2002) investigated the efficiency of Turkish banks during the period of 1988 to 1996. Using a regression analysis, the study found evidence of a strong negative relationship between bank size and cost efficiency. Kwan (2006) analyzed the cost efficiency of commercial banks in Hong Kong. The researcher found that the average large bank was less cost efficient than the average small bank.

Deelchand and Padgett (2009) also noted finding which is similar to Kwan (2006). Deelchand and Padgett (2009) employed two stage least square technique to analyze the relationships between credit risk, capital and cost inefficiency. Using panel data sample of

263 cooperative banks in Japan during the period between 2003 and 2006, Deelchand and Padgett (2009) found that bank size is positively related to cost inefficiency. Even though the result is insignificant, it suggests that larger sized banks are less cost efficient.

Mixed findings were noted in Islamic banks. Hussein (2003) analyzed the cost efficiency of 17 Islamic banks in Sudan between 1990 and 2000 using the stochastic cost frontier approach. The study found that smaller banks were relatively more cost efficient compared to the larger ones supporting the findings by Kwan (2006).

On the other hand, Srairi (2009) and Abedifar et al. (2011) noted the opposite. Srairi (2009) examined the Islamic bank efficiency in the banking industry of GCC countries. The researcher also found that bank size has negatively impacts cost inefficiency, implying that larger banks are more cost efficient than the smaller ones. Their findings are consistent with many other studies in the conventional banks (e.g., Chu & Lim, 1998 for Singapore banks; Papadopoulos, 2004 for the European banks; Pasiouras, 2008 for Greek banks). Abedifar et al. (2011) studied the determinants of cost inefficiency in Islamic banks. They too found that bank size negatively affect cost inefficiency.

2.4.5 Loan growth as a determinant of cost inefficiency

Kwan & Eisenbies (1997) found that banks' cost efficiency improves with loan growth rate. Study by Maudos et al. (2002) analyzed the cost efficiency in European banks by using balance sheets and income statement information of 832 banks over the period of 1993 to 1996. They too found that banks with a higher loans/assets ratio are more efficient. Fiordelisi et al. (2011) also found that loan growth negatively affects cost inefficiency. A similar finding was also noted by Kwan (2006) among the commercial banks in Hong Kong. Kwan (2006) found that loan growth positively affects cost efficiency.

Chan (2008) studied the bank cost efficiency in several developing nations in the Asia, Middle East, and the African region during the period between 2000 and 2005. The researcher found that loan growth as measured by the ratio of loans to total assets significantly positively affects cost efficiency. This finding implies that banks can become more cost efficient by specializing in loans disbursement process.

2.4.6 Off-balance sheet items as a determinant of cost inefficiency

Goddard, Molyneux & Wilson (2004) argued that for many European banks, the off-balance sheet business makes a significant contribution to total profit. Chan et al. (2013) examined cost inefficiency of banks in seven East Asian countries between 2001 and 2008. They found that off-balance sheet items significantly positively affect cost inefficiency. According to these researchers, this evidence is consistent with Hughes, Mester, & Moon (2001)'s reporting of the diversification of US banks into non-traditional activities increasing the level of institutional risk-taking, which in time leads to rises in (efficiency-damaging) management costs. Similar result was noted by Kwan (2006). Using the data of commercial banks in Hong Kong, the researcher found that cost efficiency decreases with the increase in off-balance sheet activities.

The opposite was found by Deelchand and Padgett (2009) by employing two stage least square technique to analyze the relationships between credit risk, capital and cost inefficiency. Using the data of 263 cooperative banks in Japan during the period between 2003 and 2006, Deelchand and Padgett (2009) found that off-balance sheet items is negatively related to cost inefficiency. Even though the finding is insignificant, it suggests that banks tend to be more cost efficient when they are more actively involved in off-balance sheet activities.

2.5 Determinants of bank's profitability

From the literature reviews earlier sections, it was noted that profitability affects both bank capital and credit risk. Even though most of these studies were based on conventional banks, there were several reviews in the Islamic banking context. According to several researches, Islamic banks perform as good as conventional banks in terms of profitability (Metwally, 1997; Nienhaus, 1988; Samad, 2004).

Using cross-country data and ratio analysis, Iqbal (2001) examined the performance of the Islamic and conventional banks in Saudi Arabia, Kuwait, Bahrain, Egypt, UAE, Jordan, Qatar, Bangladesh, Malaysia and Turkey. By comparing 12 conventional banks and 12 Islamic banks during the period between 1990 and 1998, Iqbal (2001) found that the Islamic banks were well profitable compared to the conventional banks. Hassan and Bashir (2005) studied the profitability of Islamic and conventional banks using financial ratio analysis. They too found that Islamic banks performed better compared to their conventional counterparts. Similarly, Kader and Asarpota (2007) found that United Arab Emirates (UAE) Islamic banks were relatively more profitable than conventional banks.

Samad (2004) examined the profitability Bahrain's 6 Islamic banks and 15 conventional banks. Using the data between years 1991 and 2001, the study documented that there is no significant difference in the profitability between the Islamic and conventional banks. A similar finding was also noted by Loghod (2010) and Sehrish, Saleem, Yasir, Shehzad &

Ahmed (2012). By analyzing the financial performance of Islamic and conventional banks in GCC region between years 2000 and 2005, Loghod (2010) found no significant differences between both banking system in terms of profitability. By comparing the financial performance of Islamic banks and conventional banks in Pakistan from year 2007 to 2011, Sehrish et al. (2012) found no significant differences in both the banking sectors' profitability.

Similar findings were also noted in the Malaysian Islamic banks. Abdulle & Kassim (2012) studied the profitability of Islamic and conventional banks in Malaysia. Using data from 2006 to 2010, the study found no major differences in profitability between the Islamic and conventional banks.

Several studies also noted that Islamic banks were less profitable than their conventional counterparts. Samad & Hassan (1999) observed that the profitability of Bank Islam Malaysia Berhad was low compared to the conventional banks in Malaysia. Likewise, Rosly & Bakar (2003) observed that the mainstream banks performed much better compared to the Islamic banks. Similarly, Masruki et al. (2011) also found that the profitability of Islamic banks were lesser than the conventional banks. Masruki et al. (2011) noted that the greater net financing and enhanced asset quality of conventional banks have led to their high profitability. Fayed (2013) also noted that conventional banks were more profitable than Islamic banks by comparing the performance of Islamic and conventional banks in Egypt for the period of 2008 to 2010.

In the next section, literatures pertaining to the determinants of profitability are reviewed. Past literatures noted several determinants of bank's profitability such as bank capital, credit risk, cost inefficiency, bank size, asset utilization and overhead expenses. The following section looks at these determinants of profitability.

2.5.1 Bank capital as a determinant of profitability

Generally, a better capitalized bank should be more profitable. This direct relationship between bank capital and profitability is supported by Berger (1995)'s expected bankruptcy hypothesis and signaling hypothesis. The expected bankruptcy hypothesis suggests that, by focusing on a broader scale, every subsequent increment in bank capital level should lead to the increment in the profitability due to lower insurance expenses on uninsured debt. Signaling hypothesis suggests that the by increasing the bank capital, management of the bank signals private information indicating that future prospects are going to be good.

Berger (1995) studied the bank capital and earnings relationship using U.S commercial banks' data from 1983 to 1989. This author found that bank capital and earnings are strongly positively related indicating that a bank that hold sufficient level of capital tend to have low expected bankruptcy costs and this in turn decreases the cost of its funding and improves the bank's profitability. Demirguc-Kunt & Huizinga (2000) analyzed banks' performance using bank-level data for a large number of banks in developed and developing countries between 1990 and 1997. These authors found that lagged equity variable positively affects bank profitability. According to them, this may indicate that well-capitalized banks face lower expected bankruptcy costs for themselves and their customers, thereby reducing their cost of funding. This finding is consistent with the evidence found by Demirguc-Kunt & Huizinga (1999) using banks from 80 countries over the period 1988 to 1995. They too noted that well-capitalized banks are more profitable.

Likewise, Goddard et al. (2004) analyzed the profitability of 665 banks from six European countries between 1992 and 1998. They found that the capital-to-assets ratio positively affects profitability. According to these authors, bank holding a high level of capital tend to generate high earnings. Similarly, capital is found to be positively associated with profitability (Berger, 1995; Bourke, 1989; Demirguc-Kunt & Huizinga, 2000; Iannotta et al., 2007; Jacques & Nigro, 1997; Molyneux & Thornton, 1992; and Rime, 2001).

Similar result was also noted by Havrylchyk & Jurzyk (2006) by analyzing the profitability of domestic and foreign banks using data for 265 banks in the Central and Eastern European Countries for the period of 1995 to 2003. They found that bank capital positively affects profitability. Athanasoglou, Delis & Staikouras (2006) studied the profitability of seven south eastern European region. Using annual bank level and macroeconomic data over the period of 1998 to 2002, they found that bank capital significantly positively affects profitability (measured by ROA). Athanasoglou, Brissimis & Delis (2005) suggested that capital is better modeled as an endogenous determinant of bank profitability, as higher profits may lead to an increase in capital (as described in Section 2.2.2). According to Athanasoglou, Brissimis & Delis (2008), bank capital highly significantly affect the profitability and empowers the banks to build a strong position in the market.

Kosmidou (2008) examined the profitability (as measured by return on assets) of 23 Greek banks. They found that bank capital and profitability are significantly positively related to each other. This result implies that well-capitalized banks face lower risks of going bankrupt which leads to the reduction of their funding costs. Kosmidou (2008)'s finding is consistent with previous studies such as Berger (1995), Demirguc-Kunt & Huizinga (1999) and Abreu & Mendes (2001).

Similar result was also noted by Uzhegova (2010). The researcher studied the profitability of more than 10 000 banks operating in more than 70 countries from 2002 to 2008. Uzhegova (2010) found that bank capital (measured by the ratio of equity to earning assets) was positively associated with profitability (measured by ROA).

Likewise, Lee & Hsieh (2013) investigated the impact of bank capital on profitability of 42 Asian countries' banks during the period between 1994 and 2008. They found that the bank capital positively affects profitability of the overall Asian banking. This finding is consistent with the earlier results found by Goddard et al. (2004), Iannotta et al. (2007), and Shim (2010).

Mixed results were noticed in the Islamic banks. Bashir (2001) analyzed the profitability determinants in Islamic bank in eight Middle Eastern countries. The study found that lower bank capital (high leverage) leads to higher profitability. However, Mirzaei (2011) noted an opposite finding. Using bank-level panel data of 175 Islamic and conventional banks in 12 Middle Eastern countries, Mirzaei (2011) studied the banks' performance. The researcher found that bank capital significantly positively affects the Islamic and the conventional banks' profitability (measured by ROA).

Similar to Mirzaei (2011), Bashir (2003) also found that the Islamic banks' profitability is affected by the increase in bank capital using cross-country panel data. Ansari & Kalil-ur-Rehman (2011) analyzed the profitability of conventional banks and Islamic banks in

Pakistan. They found that bank capital positively affects profitability in both banking systems.

In contrast, by analyzing the profitability of 22 conventional and Islamic banks in Pakistan between 2006 and 2009, Ali, Akhtar & Ahmed (2011) found that bank capital and profitability (computed using ROA) are significantly negatively related to each other. This finding is similar to the findings by Naceur & Goaied (2002) in the conventional banks and by Al-Tamimi (2005) in the Islamic banks, who found that the negative relationship was due to the problem of maintaining bank capital.

2.5.2 Credit risk as a determinant of profitability

Duca & McLaughlin (1990) concluded that variations in bank profitability are largely attributable to variations in credit risk, since increased exposure to credit risk is normally associated with decreased firm profitability. Miller & Noulas (1997) suggested that when financial institutions are exposed to more high-risk loans, the accumulation of unpaid loans are higher, thus profitability would be lower.

Kosmidou (2008) examined the profitability (as measured by return on assets) of 23 Greek banks. They found that credit risk was significantly negatively related to profitability. This indicated that highly risky banks are less profitable.

A study by Athanasoglou et al. (2008) found that an increased exposure to credit risk lowers profits. Similar studies by Athanasoglou et al. (2006) also found that credit risk is negatively and significantly related to bank profitability. Their result indicates that banks in the south eastern European region should focus more on credit risk management.

Ali et al. (2011) analyzed the profitability of 22 conventional and Islamic banks in Pakistan between 2006 and 2009. They found that credit risk is significantly negatively related to profitability as measured by ROA. This indicates that as credit risk increases, profitability of the banks decreases. This negative and significant association of credit risk with profitability is also supported in the conventional banks by Miller & Noulas (1997), Ramlall (2009), Sufian & Habibullah (2009) and Vong (2005).

2.5.3 Cost inefficiency as a determinant of profitability

Kosmidou (2008) examined the profitability (as measured by return on assets) of 23 Greek banks. The researcher observed that banks which are less cost efficient (more cost inefficient) tend to be less profitable.

Alexiou & Sofoklis (2009) studied the determinants of profitability in the Greek banking sector. Their result indicated that cost inefficiency is significantly negatively related to profitability. This suggests that efficient cost management is a prerequisite for improving the profitability of the Greek banking system. Their findings were in line with other banking studies (Athanassoglou et al., 2006; Bodla & Verma, 2006; Bourke, 1989; Molyneaux & Tornton, 1992; Vander Vennet, 2002).

2.5.4 Bank size as a determinant of profitability

The importance of controlling for size comes from the results of research by Fama & French (1995), who document that small firms have, on average, lower earnings scaled by book value of equity than large firms. If there are significant economies of scale, bank size would positively affect profitability (see Akhavein, Berger & Humprey, 1997; Bikker &

Hu, 2002; Bourke, 1989; Goddard et al., 2004; Molyneux & Thornton, 1992). Eichengreen & Gibson (2001), suggest that the effect of a growing bank's size on profitability may be positive up to a certain limit, beyond which the effect of bank size could be negative due to bureaucratic and other reasons.

Athanasoglou et al. (2006) studied the profitability of seven south eastern European regions. Using annual bank level and macroeconomic data over the period 1998 to 2002, they found that bank size significantly positively affects profitability as measured by ROA.

According to Kosmidou (2008), size of the banks is an important variable to determine profitability because larger banks pay less due to the allocation of their fixed cost and it also helps the banks to capture a large market share and high profitability. The author examined the profitability (as measured by return on assets) using unbalanced data of 23 Greek banks and found bank size to be positively related to profitability. This finding suggests that larger sized banks are more profitable.

Ali et al. (2011) analyzed the profitability of 22 conventional banks in Pakistan between 2006 and 2009. They found bank size to be insignificant but positively related to profitability as measured by ROA. The positive relationship between bank size and profitability is also found by Hauner (2005), Molyneux & Seth (1998), Ramlall (2009) and Sufian (2009). However, several studies have also documented a negative relationship between bank size and profitability such as Kosmidou (2008) and Spathis et al. (2002).

Several studies have also been done in Islamic banks to analyze the relationship between bank size and profitability. Bashir (1999) analyzed the profitability of two Sudanese banks.

The author found that the bank size and profitability are significantly related to each other, implying that larger sized Islamic banks are more profitable.

Cihak & Hesse (2008) studied the financial stability of 77 Islamic banks and 397 conventional banks during the period between 1993 and 2004. The study assessed the relative financial strength of Islamic banks compared to conventional banks. Their findings indicate that:

i. small Islamic banks are financially stronger than small conventional banks;
ii. large conventional banks are financially stronger than large Islamic banks; and
iii. small Islamic banks tend to be financially stronger than large Islamic banks.

Akhtar, Ali, & Sadaqat (2011) analyzed the profitability of Islamic banks in Pakistan between 2006 and 2009. They found bank size to be insignificant but negatively related to profitability as measured by ROA. Likewise, by comparing the profitability of Pakistan's Islamic and conventional banks, Ansari & Kalil-ur-Rehman (2011) found that generally larger sized banks have less profitability.

Using bank-level panel data of 175 Islamic and conventional banks in 12 Middle Eastern countries, Mirzaei (2011) studied the banks' performance. The researcher found that bank size significantly negatively affects both the Islamic and the conventional banks' profitability.

2.5.5 Asset utilization as a determinant of profitability

Miller & Noulas (1997) and Sufian & Habibullah (2009) noted that asset utilization (as measured by operating income to total assets ratio) is a highly effective bank specific indicator to measure banks profitability. Asset utilization significantly positively impacts bank profitability.

Vasiliou & Frangouli (2000) studied the impact of asset utilization on profitability of the Greek commercial banking market during the period of 1993 to 1997. They found that asset utilization is an important determinant of banks' profitability.

Ali et al. (2011) analyzed the profitability of 22 conventional banks in Pakistan between 2006 and 2009. They found that asset utilization is significantly positively related to profitability (measured by ROA). Therefore, asset utilization is included in this study as one of the controlled variable.

2.5.6 Overhead expenses as a determinant of profitability

Demirguc-Kunt & Huizinga (2010) studied bank returns using an international sample of 1,334 banks in 101 countries leading up to the 2007 financial crisis. They found that overhead expenses are significantly negatively related to profitability.

However, the findings in Islamic banks were mixed. Bashir (2003) utilized bank level data, to examine the performance indicators of Islamic banks across eight Middle Eastern countries between 1993 and 1998. The author found that overhead expenses positively affect profitability. Mirzaei (2011) studied the performance of 175 Islamic and conventional banks in 12 Middle Eastern countries using bank-level panel data. The researcher found that overhead expenses significantly negatively affect both conventional and Islamic banks' profitability. Therefore, overhead expenses are included in this study as one of the controlled variable.

2.6 Conclusions

This chapter reviewed the theoretical and empirical evidences on bank capital, credit risk, cost inefficiency and profitability. Literature pertaining to bank capital and credit risk relationship was reviewed in Section 2.1. Section 2.2 reviewed the literature pertaining to bank capital determinants. This was then followed by the review of literatures on credit risk determinants in Section 2.3. Next, Section 2.4 focused on the literatures pertaining to cost inefficiency determinants. This was then followed by Section 2.5, which documented the literatures pertaining to profitability determinants.

Evidences suggest that banks capital and credit risk can also be simultaneously determined by the level of cost inefficiency. These evidences are mostly from conventional banks. From the literature review, it can be concluded that there is link between bank capital, credit risk, cost inefficiency and profitability. Due to the differences in the mode of operations between Islamic banks and conventional banks, this study analyzed the relationship between bank capital, credit risk, cost inefficiency and profitability in the Islamic banks.

CHAPTER 3

THEORETICAL FRAMEWORK, DATA AND METHODOLOGY

3.0 Introduction

This chapter presents the theoretical framework, data and its sources, and the methodology used to empirically determine the relationships between bank capital, credit risk, cost inefficiency and profitability in Islamic banks; and to determine the differences in the above mentioned relationships (i) in the periods before and after global financial crisis (GFC) and (ii) in Islamic banks that operate in MENA and non-MENA regions for the years between 2003 and 2012.

Section 3.1 presents the theoretical framework that supports this study to empirically determine the relationships between bank capital, credit risk, cost inefficiency and profitability in Islamic banks on a cross-country basis. Meanwhile, Section 3.2 describes the data specifications and its sources that have been employed in this study. The methodologies undertaken to investigate the relationships between bank capital, credit risk, cost inefficiency and profitability of Islamic banking institutions are presented in Section 3.3. Finally, the chapter is summarized in Section 3.4.

3.1 Theoretical framework

The theoretical framework of this study is constructed based on four main variables that determine the relationships between them in the context of Islamic banks that are selected on a cross-country basis. The four main variables are: bank capital, credit risk, cost inefficiency and profitability. The descriptions of these variables are as follows:

Bank capital

Capital adequacy ratio (CAR) which is one of the key indicators used to assess the soundness of bank operations plays a vital role in helping both conventional and Islamic banks to manage credit risk. Generally, under the Basel I, banking institutions with international representations must have at least eight per cent capital against risk-weighted assets. The denominator in the computation of CAR is the total risk-weighted assets.

Figure 3.1 shows the standard capital adequacy ratio (CAR) formula for conventional banks that takes the fraction of regulatory capital and total risk weighted assets.

Figure 3.1: Standard CAR Formula for Conventional Banks

$$\text{CAR} = \frac{\text{Regulatory Capital}}{\text{Total Risk Weighted Assets}}$$

Note: Regulatory capital is the net worth of a firm defined according to the rules of a regulatory agency (such as the Securities and Exchange Commission).

Islamic Financial Services Board (IFSB) has published a similar Capital Adequacy Standard for institutions, other than insurance institutions, offering only Islamic finance services (IIFS) based on the Basel II guidelines. This standard prescribes the appropriate risk weights to meet the specific nature of Islamic banking instruments and activities that raises different risks in tandem with different financing modes. According to IFSB, the minimum capital adequacy requirement for IIFS is a CAR of not lower than 8% of its total capital (IFBS, 2005). However, this standard prescribed for IIFS, excludes PSIA from the requirement for regulatory capital as risks of this account is borne by the IAH.

Figure 3.2: Standard Capital Adequacy Ratio Formula for Islamic Banks

$$CAR = \frac{\text{Eligible Capital}}{\left\{\begin{array}{c}\text{Total Risk weighted Assets (Credit + Market Risks) Plus Operational Risks} \\ \text{Less} \\ \text{Risk weighted Assets funded by PSIA(Credit + Market Risks)}\end{array}\right\}}$$

Noted: PSIA = profit-sharing investment accounts
Source: IFSB (2005)

Figure 3.2 above, shows the standard CAR formula for IIFS. It is noted that, the risk weighted assets (credit risk + market risk + operational risk) includes those funded by restricted and unrestricted Profit Sharing Investment Accounts (PSIA). Since any losses arising from investments or assets financed by PSIA are borne by the Investment Account Holders (IAH), it is not subjected to the requirement of regulatory capital (IFSB, 2005). This is because the depositors are supposed to be profit sharing and loss bearing. Since IAHs have to bear the risk themselves, the Islamic bank does not have to maintain additional capital for funds invested on behalf of IAHs (Farook, 2009). For the purpose of this study, bank capital is computed using the equity to total assets ratio.

Credit risk

Credit risk, which refers to the risk of counterparty's failure to meet their obligations, is the most common source of risks in both, Islamic banks and conventional banks. According to IFSB (2005), IIFS concern themselves with the risk of counterparty's failure to meet their obligations in terms of receiving deferred payment and making or taking delivery of an asset. However, the Islamic bank's credit risk mitigation process becomes more challenging due to the *Shariah* – compliance. One of such challenges arises in the event of a default by the borrower where the Islamic banks are not allowed to charge any additional payments as penalty. This again is subjected to any intentional delay or default. (Greuning

& Iqbal, 2008). In this study, credit risk is measured using the fraction between loan loss reserves to total assets.

Study by Ahmad & Ahmad (2004) compared the factors affecting credit risk between Islamic and conventional banking operations. They found management efficiency, as measured by earning assets to total assets, significantly affects credit risk in Islamic banking. However, these authors noted that the management efficiency does not significantly affect credit risk in conventional banks. They had generally expected a negative relationship between management efficiency and credit risk because lower efficiency in managing earning assets would probably lead to higher credit risk in banks. However the findings of these authors revealed otherwise for Islamic banks. In Islamic banks the management efficiency positively affects credit risk implying that the credit risk would be higher if earning assets are higher and it is mismanaged. Meanwhile, in conventional banks, credit risk would be higher if earning assets are lower and it is not managed properly. This result is consistent with the findings of Ahmad (2003) and Angbazo et al. (1998). According to Ahmad & Ahmad (2004), the opposite sign in the results above could be due to fact that the earning assets were all interest based in conventional banking and the immediate recognition of loan default. Meanwhile, the Islamic banks' earning assets are generally on *murabaha* and *mudarabah* mode of financing and the credit risk is transferred to its investment depositors and any loan defaults are not recognized (in the case of *mudarabah* on the part of the agent-entrepreneur until PLS contract expire (see Sundararajan & Errico, 2002).

Moreover, Cihak & Hesse (2008), Iqbal & Llewellyn (2002) and Sundararajan & Errico (2002) and noted that the PLS arrangements in Islamic banks transfers the credit risk from the banks to their IAH. This transfer has the potential to add the overall measure of risk into the asset side of the bank's balance sheet. This is mainly due to the condition created by this transfer that makes Islamic banks debt holders to bear the risk of losses rather than the bank's equity holders. These authors also noted that the PLS cannot be made dependent on collateral or guarantees to reduce credit risk. Besides that, the extent literature (on both conventional and Islamic banking) that is confined to theoretical perspective have largely reported mixed findings pertaining to the relationship between bank capital and credit risk.

Cost inefficiency

When a bank's total operational cost is higher than the level benchmarked for an efficient bank with similar capacity of transactions, the bank is referred as cost inefficient (Altunbas, Gardener, Molyneux & Moore, 2001). According to Berger & Humphrey (1997), cost efficiency refers to how close the bank's operating cost is to a benchmark bank which produces the same units of output with the same inputs. This means the farther the bank's operation cost is to the benchmark bank's cost, the higher the cost inefficiency. Individual banks' cost inefficiency (CIE) is obtained using the stochastic frontier approach which is a widely used parametric approach in estimating bank cost efficiency.

Study by Al-Jarrah & Molyneux (2005) found that Islamic banks in the Arabian countries are more cost efficient than conventional banks. Using two outputs (loans and investments) and three inputs (labor, capital, and deposits), Al Shamsi, Aly & El-Bassiouni (2009) found that the average cost efficiency levels of all banks in the UAE were lower than those reported for developed countries.

According to Altunbas et al. (2007), Hughes & Mester (1998), Hughes & Moon (1995) and Kwan & Eisenbeis (1997), bank capital and credit risk may also be simultaneously determined by the level of cost inefficiency of the banks. Therefore, bank capital, credit risk and cost inefficiency are interrelated and any models developed to analyze the relationship between bank capital and credit risk would need to incorporate cost inefficiency.

Profitability

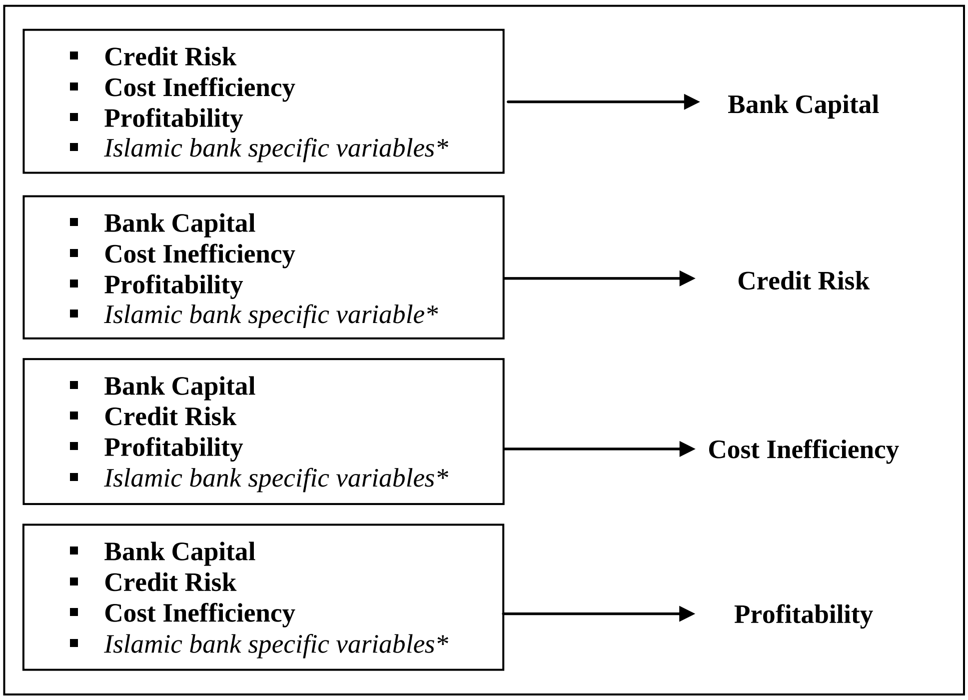
Literature have documented that bank profitability is related to bank capital, credit risk and cost inefficiency. Alexiou & Sofoklis (2009) noted that profitability is affected by bank capital and cost efficiency. Profitability was also found to be positively related to bank capital (Demstez, Saidenberg & Strahan, 1996 and Keeley, 1990). Berger (1995) also finds that there is a positive relationship between profitability and bank capital in U.S. banks. However a study by Athanasoglou et al. (2006) found that credit risk is significantly negatively related to bank profitability. In tandem with the earlier reviewed researches, this study will include profitability as an additional factor besides the three factors (bank capital, credit risk and cost inefficiency) to analyze the relationships among them. Banks' profitability proxy by return on average assets (ROA) is measured using annual net income to total assets ratio.

Hence, the first objective of this study is to empirically determine the relationships between bank capital, credit risk, cost inefficiency and profitability in the selected sample Islamic banks on a cross-country basis for the years between 2003 and 2012. Specifically this study aims to identify these relationships during the periods before and after the Global Financial Crisis (GFC).

The second objective is to determine the differences in these relationships in Islamic banks that operate in MENA region and non-MENA region for the overall period of observation (2003 to 2012) and also for sub-periods of before and after the GFC.

Figure 3.3 illustrates the theoretical framework of the objectives of this study. This study determines the relationships between the four main variables (bank capital, credit risk, cost inefficiency and profitability) in Islamic banks.

Figure 3.3: Theoretical Framework of the Relationships between Bank Capital, Credit Risk, Cost Inefficiency and Profitability in Islamic banks



*Bank size, net loan to total assets, management efficiency, off-balance sheet items, asset utilization and overhead expenses to total asset are the bank specific variables which are used in this study appropriately according to each of the equations.

Islamic bank capital is measured by the banks' equity to total assets ratio. The extant research in conventional banks have used this ratio to determine the level of bank capital (see Beck, et al., 2010; Flannery & Rangan, 2008; Furlong, 1992; Guidara, Lai, Soumare

& Tchana, 2013; Mamatzakis, 2009; Weill, 2011) while Abedifar et al. (2011), Ahmad & Noor (2011) and Al-Farisi & Hendrawan (2012) in measuring the level of capital in Islamic banks.

Meanwhile, credit risk analyzed in this study is the risk of losses in the event the borrower defaults or the borrower's repayment capacity deteriorates (Sundararajan, 2007). For the purpose of this study, credit risk is determined as the fraction between loan loss reserves to total assets. This measure had been used by Abedifar et al. (2011) to measure credit risk of Islamic banks. Studies by Altunbas et al. (2007), Rao & Lakew (2012), Sinkey Jr. & Carter (2000) and Yong et al. (2007) had used this ratio to measure credit risk of conventional banks that suggest, higher the loan loss reserve, higher the credit risk.

This study uses the cost inefficiency as another main variable in determining its relationship with bank capital, credit risk and profitability in Islamic banks. Cost inefficiency is measured by comparing an Islamic bank's observed operating costs to the 'best-practice' efficient cost frontier of a similar capacity Islamic bank. Cost inefficiencies of the sample Islamic banks are estimated using the stochastic frontier analysis technique, which is a widely used parametric approach in estimating bank cost inefficiency. Stochastic frontier analysis was proposed by Aigner et al. (1977) and Meeusen and Van den Broeck (1977).

The sample Islamic banks' cost inefficiencies are estimated using translog cost function specification as follows:

$$\ln TC_i \quad = \quad a_0 + \sum_i b_i \ln y_i + \sum_j c_j \ln w_j + \frac{1}{2}\sum_i \sum_m d_{im} \ln y_i y_m + \frac{1}{2}\sum_j \sum_k e_{jk} \ln w_j w_k + \sum_i \sum_j f_{ij} \ln y_i w_j + \varepsilon$$

where:

TC = Islamic banks' total costs (ln TC measures far an Islamic bank's cost is to what a best practice Islamic bank's cost would be for producing the same bundle of output under the same conditions)

y_i = Islamic banks' outputs (*i* = 1…m)

w_j = Islamic banks' inputs (*j* = 1…k)

This study employs three inputs and three outputs to measure the cost inefficiency of Islamic banks. The dependent variable is the total cost incurred by Islamic banks. The details of the inputs, outputs and the total cost are shown in Table 3.1.

Table 3.1: Inputs, Outputs and Total Cost for Cost Inefficiency Measurement

Category	Measurement	Supporting literatures
Inputs	Price of labour = Personnel expense / Total assets	*Islamic banks* - Yudistra (2004) and Mokhtar et al. (2006), Srairi (2009) *Conventional banks* – Pasiouras, Tanna & Zopounidis (2008), Delis & Papanikolaou (2009), Manlagnit (2009) and Aysan, Ertek &Ozturk (2011)
	Price of funds (deposits) = Interest expense* / Total deposits	*Islamic banks* - Yudistra (2004), Srairi (2009) *Conventional banks* - Pasiouras et al. (2008), Delis & Papanikolaou (2009), Manlagnit (2009) and Aysan et al. (2011)
	Price of fixed assets (physical capital) = Non-interest expense / Total fixed assets	I*slamic banks* - Yudistra (2004), Srairi (2009) *Conventional banks* - Pasiouras et al. (2008), Delis & Papanikolaou (2009), Manlagnit (2009) and Aysan et al. (2011)
Outputs	Total loans	*Islamic banks* - Yudistra (2004) *Conventional banks* - Pasiouras et al. (2008), Delis & Papanikolaou (2009), Manlagnit (2009) and Aysan et al. (2011)
	Other earning assets	*Islamic banks* - Yudistra (2004) *Conventional banks* - Pasiouras et al. (2008), Delis & Papanikolaou (2009) and Aysan et al. (2011)
	Off-balance sheet items	*Islamic banks* - Yudistra (2004) *Conventional banks* – Delis & Papanikolaou (2009), Aysan et al. (2011)
Total cost	Interest expense* + non-interest expense	I*slamic banks* - Srairi (2009) Conventional banks - Pasiouras et al. (2008)

*Interest expense (cost of funds) in Islamic banks is translated as the total income distributed to depositors.

In this study, profitability is measured using return on average assets (ROA). ROA is defined as net income to average assets ratio. ROA as a measure of Islamic banks' profitability was also used by Bashir (2001), Haron (2004), Hassan & Bashir (2005), Hassoune (2002), Ibrahim & Sukmana (2011), Karim, Mohamed Sami & Hichem (2010), Obeidat, El-Rimawi & Maqableh (2013) and Weill & Godlewski (2012).

3.1.1 Hypotheses development

Based on the theoretical framework of this study, the following hypotheses are formulated to identify the relationships between bank capital, credit risk, cost inefficiency and profitability in Islamic banks. These hypotheses are repeatedly tested on sets of different Islamic bank data and on different observation periods; firstly on all Islamic banks for the overall observation period, secondly on periods before and after the GFC and thirdly on Islamic banks that operate in MENA and non-MENA region.

Hypotheses on Islamic Bank Capital

To test the relationship of Islamic bank capital as the dependent variable with the three other independent variables i.e. credit risk, cost inefficiency and profitability, the following three hypotheses are postulated. These three hypotheses tests whether the credit risk, cost inefficiency and profitability significantly positively or negatively affects the bank capital in Islamic banks that are in observation.

$H1A_1$: In Islamic banks, credit risk significantly affects bank capital.

This hypothesis would test whether the credit risk significantly positively or negatively affects bank capital in Islamic banks.

$H1B_1$: In Islamic banks, cost inefficiency significantly affects bank capital.

This hypothesis would test whether the cost inefficiency significantly positively or negatively affects bank capital in Islamic banks.

$H1C_1$: In Islamic banks, profitability significantly affects bank capital.

This hypothesis would test whether the profitability significantly positively or negatively affects bank capital in Islamic banks. Profitability may have a positive effect on bank capital if banks increase capital through retained earnings rather than through new equity issues.

Hypotheses on Islamic Bank Credit Risk

The following three hypotheses are postulated to test the relationship of Islamic bank credit risk against three main independent variables (bank capital, cost inefficiency and profitability). These three hypotheses tests whether the bank capital, cost inefficiency and profitability significantly positively or negatively affects credit risk in Islamic banks that are in observation.

$H2A_1$: In Islamic banks, bank capital significantly affects credit risk.

This hypothesis would test whether bank capital significantly positively or negatively affects credit risk in Islamic banks. If bank capital positively affects credit risk, the <u>regulatory hypothesis</u> is supported. If bank capital negatively affects credit risk, it would indicate the existence of <u>moral hazard</u> issue in the Islamic banks. Moral hazard hypothesis implies that an increase in problem loans are caused by managers of weakly capitalized banks who are also less risk adverse with risk taking behavior.

$H2B_1$: In Islamic banks, cost inefficiency significantly affects credit risk.

This hypothesis would test whether cost inefficiency significantly positively or negatively affects credit risk in Islamic banks. If cost inefficiency positively affects credit risk (cost inefficient Islamic bank take more risk to compensate the lower efficiency), this would support the <u>bad management hypothesis</u>. Bad management hypothesis implies that high cost inefficiency leads to greater problem loans when bad managers inadequately control operating expenses and loan portfolios. If cost inefficiency negatively affects credit risk (cost inefficient Islamic bank take less risk), this would support the <u>skimping hypothesis</u>. Skimping hypothesis implies that costs associated with monitoring lending activities, adversely affect the quality of a bank's loan portfolio.

$H2C_1$: In Islamic banks, profitability significantly affects credit risk.

This hypothesis would test whether profitability significantly positively or negatively affects credit risk in Islamic banks. If profitability positively affects credit risk, the banks are said to be engaging in moral hazard behavior or they are allocating more profits into loan loss reserves to shield against tax (bad management). If profitability negatively affects credit risk, this means greater performance reduces credit risk taking.

Hypotheses on Islamic Bank Cost Inefficiency

The following three hypotheses are postulated to test the relationship of Islamic bank cost inefficiency against three main independent variables (bank capital, credit risk and profitability). These three hypotheses tests whether the bank capital, credit risk and profitability significantly positively or negatively affects cost inefficiency in Islamic banks that are in observation.

$H3A_1$: In Islamic banks, bank capital significantly affects cost inefficiency.

This hypothesis would indicate whether bank capital significantly positively or negatively affects cost inefficiency in Islamic banks.

$H3B_1$: In Islamic banks, credit risk significantly affects cost inefficiency.

This hypothesis would indicate whether credit risk significantly positively or negatively affects cost inefficiency in Islamic banks. If credit risk positively affects cost inefficiency, then the <u>bad luck hypothesis</u> is supported. Bad luck hypothesis implies that cost inefficiency increases due to the increase in the problem loans resulting from unexpected and external factor. According to Berger and DeYoung (1997), this phenomenon exists because banks will incur extra operating costs in non-value-added activities, such as handling and supervising the recovery process of the non-performing loans.

H3C$_1$: In Islamic banks, profitability significantly affects cost inefficiency.

This hypothesis would indicate whether profitability significantly positively or negatively affects cost inefficiency in Islamic banks. Hence, it would indicate whether highly profitable Islamic banks tend to be more cost inefficient or cost efficient.

Hypotheses on Islamic Bank Profitability

The following three hypotheses are postulated to test the relationship of Islamic bank profitability against three main independent variables (bank capital, credit risk and cost inefficiency). These three hypotheses tests whether the bank capital, credit risk and cost inefficiency significantly positively or negatively affects profitability in Islamic banks that are in observation.

H4A$_1$: In Islamic banks, bank capital significantly affects profitability.

This hypothesis would indicate whether bank capital significantly positively or negatively affects profitability in Islamic banks. A common perception is that, well-capitalized banks should be more profitable than lowly capitalized banks. A well-capitalized Islamic bank could empower to build a strong position in market, thus attaining more profit. Therefore, a positive relationship between Islamic banks' capital and profitability would support the <u>expected bankruptcy hypothesis</u> and <u>signaling hypothesis</u> developed by Berger (1995). However existing evidences have proved otherwise. A well-capitalized Islamic bank may achieve less profit due to the capital maintenance problem.

$H4B_1$: In Islamic banks, credit risk significantly affects profitability.

This hypothesis would indicate whether credit risk significantly positively or negatively affects profitability in Islamic banks. A major portion of bank's operation involves borrowing and lending that leads to more credit risk. Profitability could be low as the banks try to mitigate credit risks. Another common perception is that if effective credit risk management really does matter to banks, then it should significantly contribute to higher profits.

$H4C_1$: In Islamic banks, cost inefficiency significantly affects profitability.

This hypothesis would indicate whether cost inefficiency significantly positively or negatively affects profitability of Islamic banks.

3.2 Data specifications and its sources

Bank-specific data for the Islamic banks were obtained from the Bureau Van Dijk's Bankscope (Bankscope) database that includes financial statements (balance sheet and income statement) information on selected Islamic banking institutions for a period of 10 years between 2003 and 2012. All monetary values in the bank specific data are converted into U.S. dollars based on each year's average exchange rate to maintain uniformity in the data value. Bankscope database defines Islamic banks a specialization category which includes about 30 national and multi-lateral governmental banks that are members of the "International Association of Islamic Banks" (Heliopolis, EG) plus 20 non-member banks that are considered to be "Islamic" by Fitch Ratings.

Yearly bank data is used in this study which covers a period of 10 years between 2003 and 2012. These 10 year period were sub divided into (i) before global financial crisis (2003 to 2007) and (ii) after global financial crisis (2008 to 2012) in order to analyze the differences between before and after the Global Financial Crisis (GFC). This division enables the study to analyze the 5 years before the GFC and 5 years after the GFC. Originally, there were 152 Islamic banks available in this database as at October 2013. However, due to the requirement to fulfill at least 40% of the annual data of each bank continuously, only 85 Islamic banks were qualified. Based on this requirement financial data of these 85 Islamic banks were collected. Out of these 85 Islamic banks, 48 are from Middle East and North African (MENA) countries, while 37 are from non-MENA countries. However, due to incomplete and unavailability of data, the dataset was unbalanced. As such, a total of only 650 Islamic bank year observations were finally used in the analysis of this study (of which 395 are from MENA region and 255 are from non-MENA region). The list of 85 Islamic banks used in this study is provided in Appendix 1.

The sample covers Islamic banks from 24 countries. The detail of the sample is provided in Table 3.2.

Table 3.2: Summary of sample size (Region / Country wise)

Country	No. of Islamic Banks
MENA	**48**
Bahrain	10
Egypt	2
Iran	8
Jordan	2
Kuwait	5
Palestine	1
Qatar	3
Saudi Arabia	3
Tunisia	1
United Arab Emirates	9
Yemen	4
NON-MENA	**37**
Bangladesh	3
Brunei	1
Indonesia	2
Malaysia	13
Pakistan	6
Singapore	1
Sudan	4
Turkey	4
United Kingdom	3
Total	**85**

3.3 Research methodology – Relationships between bank capital, credit risk, cost inefficiency and profitability in Islamic banks

In this section, the equations for each of the dependent variables (bank capital, credit risk, cost inefficiency and profitability) are explained. This is then followed by the discussion on the panel data models used in this study.

3.3.1 Research model

Listed below are the equations tested to determine the factors affecting bank capital, credit risk, cost inefficiency and profitability. Equations 1 to 4 explain the factors that affect each of the dependent variable in Islamic banks pertaining to the sample specifications.

Bank capital as the dependent variable

$$BC_{it} = a_1 + b_1\, CR_{it} + c_1\, CIE_{it} + d_1\, ROA_{it} + e_1\, SIZE_{it} + f_1\, NLTA_{it} + \varepsilon \qquad \ldots\ldots\ldots\ldots\ldots \quad (1)$$

Credit risk as the dependent variable

$$CR_{it} = a_2 + b_2\, BC_{it} + c_2\, CIE_{it} + d_2\, ROA_{it} + e_2\, SIZE_{it} + f_2\, NLTA_{it} + g_2\, MGTEFF_{it} + \varepsilon \qquad \ldots\ldots\ldots\ldots\ldots \quad (2)$$

Cost inefficiency as the dependent variable

$$CIE_{it} = a_3 + b_3\, BC_{it} + c_3\, CR_{it} + d_3\, ROA_{it} + e_3\, SIZE_{it} + f_3\, NLTA_{it} + g_3\, OBSTA_{it} + \varepsilon \qquad \ldots\ldots\ldots\ldots\ldots \quad (3)$$

Profitability as the dependent variable

$$ROA_{it} = a_4 + b_4\, BC_{it} + c_4\, CR_{it} + d_4\, CIE_{it} + e_4\, SIZE_{it} + f_4\, ASSUTI_{it} + g_4\, OHEADTOTA_{it} + \varepsilon \qquad \ldots\ldots\ldots\ldots\ldots \quad (4)$$

where:

BC_{it}	-	Bank capital for bank *i* at time *t* (Equity to assets ratio)
CR_{it}	-	Credit risk for bank *i* at time *t* (Loan loss reserves as a fraction of total assets)
CIE_{it}	-	Cost inefficiency for bank *i* at time *t* (derived from stochastic cost frontier estimates)
ROA_{it}	-	Profitability for bank *i* at time *t* (Net income to total asset ratio)

Bank-specific variables

$SIZE_{it}$	-	Size of bank *i* at time *t* (Natural log of total assets)
$NLTA_{it}$	-	Net loans to total assets for bank *i* at time *t* (Loans to total assets ratio)
$MGTEFF_{it}$	-	Management efficiency for bank *i* at time *t* (Earning assets to total assets ratio)
$OBSTA_{it}$	-	Off-balance sheet items to total asset ratio for bank *i* at time *t*

$ASSUTI_{it}$ - Asset utilization ratio for bank i at time t (Operating income to total assets ratio)

$OHEADTOTA_{it}$ - Overhead expenses to total asset ratio for bank i at time t

Equation (1) explains Islamic banks' capital levels and it uses average annual bank capital as the dependent variable (BC). Bank capital is measured using the equity to total assets ratio.

Equation (2) explains Islamic bank credit risk based on annual loan - loss reserves as a proxy for banking risk as the dependent variable (CR). Loan loss reserves as a fraction to total assets is used as a measure of credit risk. Higher levels of loan - loss reserves are suggestive of greater credit risk.

Equation (3) examines the determinants of Islamic bank cost inefficiency (CIE) as the dependent variable. Individual banks' cost inefficiency (CIE) is obtained using the stochastic frontier approach which is a widely used parametric approach in estimating bank cost efficiency. Cost inefficiencies are estimated using three inputs and three outputs. The inputs are price of labour (measured by personal expenses to total asset ratio), price of funds (measured by the ratio of interest expenses to total deposits) and price of fixed assets (measured by non-interest expense to total fixed asset ratio). The outputs included total loans, other earning assets and off-balance sheet items. The higher the cost inefficiency value indicates that the Islamic banking institution is less efficient in terms of their costs. A lower value for cost inefficiency would be favorable.

Banks' profitability proxy by return on average assets (ROA) determinants is analyzed using Equation (4). ROA is measured using annual net income to total assets ratio.

Besides the four main dependent variables, six bank specific variables are also included in the analysis of this study. These bank specific variables include net loans to total assets (NLTA), as rapid loan growth may increase risk and adversely impact the capital and bank efficiency. The banks' asset size will be controlled by using natural log of total assets (SIZE). Management efficiency (MGTEFF) will be measured using the earning assets to total assets ratio. Off-balance sheet items' (OBSTA) effect on cost inefficiency will be measured using the off-balance sheet items to total asset ratio. The effects of overhead expenses and asset utilization on bank profitability will be analyzed using overhead expenses to total asset ratio (OHEADTOTA) and operating income to total assets ratio (ASSUTI) respectively.

3.3.2 Panel data analysis

As the observations of this study combines cross sectional and times series, panel data analysis deemed to be the most appropriate. In a multiple regression, when the independent variables are highly correlated, then there is a problem of multicollinearity. Multicollinearity is determined by calculating the variance inflation factors (VIF) for each of the regressors. The VIF for regressor *k* is calculated as follow:

$$\frac{1}{1-R_k^2}$$

where: R_k is the coefficient of multiple correlation between regressor *k* and the other regressors. VIF with a value of greater than 10 indicates collinearity problem. Therefore, this study starts by calculating the VIF values of the regressors in order to check for the multicollinearity problem. Only regressors which show a VIF value of less than 10 are included in the regression analysis.

This study employs four different variations of different models for panel data. These four different models are discussed in the below subsections.

3.3.2.1 Pooled least square model

First is the *pooled least square* (PLS) technique which pools times series and cross section data. This data are then analyzed using *ordinary least square* (OLS) method.

3.3.2.2 Fixed effect model

The second model is the *fixed effect* (FE) model. The fixed effects model allows the intercept of the regression to vary across the cross-sectional units. This method adds intercept (time series and cross section) dummy variable in order to capture any changes in the *intercept time series* atau *cross section*.

F-test is used in order to identify whether a PLS or a fixed effect model should be used. The hypothesis for the restricted F test is:

H_0 = *Pooled Least Square* model is appropriate

H_1 = *Fixed Effect* model is appropriate

3.3.2.3 Random effect model

The third model is the *random effect* (RE) model. The random effects model decomposes the residual variance into two parts (one part specific to the cross sectional unit and the other specific to the observation). This method, improves the least square efficiency process by including error terms for the cross section and time series. The random effect model is a variation of the *generalized least square* (GLS) method.

Breusch-Pagan test is used to identify whether to use a PLS or a random effect model. The hypotheses for the Breusch-Pagan test are:

H_0 = *Pooled Least Square* model is appropriate

H_1 = *Random Effect* model is appropriate

Meanwhile, Hausman test will be used in order to choose between a fixed effect and a random effect model. The hypothesis for the Hausman test are:

H_0 = *Random Effect* model is appropriate

H_1 = *Fixed Effect* model is appropriate

3.3.2.4 Two-stage least square model

The fourth model is the *two-stage least square* (2SLS) model. Equations (1) to (4) show that bank capital, credit risk, cost inefficiency and profitability could be endogenous variables. Endogenous variables are variables that are correlated with the error term in the equation. This endogeneity can make OLS estimators inconsistent and requires the use a simultaneous equation model. Therefore, to estimate the relationships between bank capital, credit risk, cost inefficiency and profitability, this study adopts a system of equations and estimates as suggested by Hughes & Mester (1998), Jacques & Nigro (1997), Kwan & Eisenbeis (1996), Rime (2001) and Shrieves & Dahl (1992). However, following Altunbas et al. (2007), this study uses the level data rather than changes of data due to the limited length of data period. To allow for simultaneity between bank capital, credit risk, cost inefficiency and profitability, this study employs two-stage least squares (2SLS) approach through panel data techniques. Equations (1) to (4) would be jointly estimated in the 2SLS approach. This approach would require the 2SLS regressions are employed to correct the potential bias caused by the simultaneity problem.

3.3.2.4.1 Order condition of identification

2SLS technique is classified as simultaneous equation model (SEM). SEM may have an identification problem. Identification can be determined using the *order condition of identification*. The order condition of identification is detailed below:

m = number of endogenous variable in a given equation

K = number of predetermined variable in the model (including intercept)

k = number of predetermined variable in a given equation

Then,

1. If K – k = m -1, the equation is exactly identified
2. If K – k > m -1, the equation is over-identified
3. If K – k < m -1, the equation is under-identified

If an equation is under-identified, then it is a dead-end case. Two-stage least square (TSLS) method can only be used if the equation is either exactly or over-identified.

Table 3.4 shows the order condition of the Equations 1 to 4 which are used in this study.

Table 3.4: Order condition of Equations 1 to 4

Equations	K	k	m	Order condition
Equation 1 (Bank capital as the dependent variable)	10	6	4	Over-identified
Equation 2 (Credit risk as the dependent variable)	10	7	4	Exactly identified
Equation 3 (Cost inefficiency as the dependent variable)	10	7	4	Exactly identified
Equation 4 (Profitability as the dependent variable)	10	7	4	Exactly identified

3.3.2.4.2 Instruments selection

2SLS approach is an instrumental variable (IV) estimation technique. Therefore, instrumental variables need to be selected in order the study to conduct the 2SLS analysis. This study uses the constant and the company specific variables (SIZE, NLTA, MGTEFF, OBSTA, ASSUTI and OHEADTOTA) as the instruments.

However, the instrument used must satisfy the following two conditions:

a. The instrument is uncorrelated with the error term (that is, the instrument is exogenous or valid)
b. The instrument must be correlated to the dependent variable (that is, the instrument is relevant or not weak)

In order to test whether the instrument selected is exogenous or not, this study employs the most commonly used Hausman test. This test is based on the comparison of the OLS and IV estimates. The null hypothesis in the Hausman test is that OLS estimates are consistent. In other words, instrumental variables estimation is not really required.

A software called Gretl which is used in this study, automatically provides the Sargan test results if the order condition of the equation is over-identified. In this study, only Equation

1 is over-identified. Therefore, Sargan test results are reported only for Equation 1. Rejecting the null hypothesis implies that one or more of the overidentifying restrictions are not valid (i.e. the instruments are inappropriate). If the test statistic is insignificant, then the set of instruments chosen are appropriate.

In order to test whether the instrument is weak or not, first stage F-test is usually used. However, this test can only be used if the model contains only one endogenous variable. Since this study considers more than one endogenous variable, weakness of the instrument is tested using the Cragg-Donald minimum eigenvalue. The null hypothesis is that the bias of the instrumental variable estimator exceeds the bias of the OLS estimator. Rejection of the null hypothesis indicates that the instruments used are neither weak nor invalid. Weak instruments can lead to serious problems in IV regression.

3.4 Chapter summary

This chapter is divided into three sections. Firstly, this chapter presented the theoretical framework of this study. The definition and explanation of the four key variables (bank capital, credit risk, cost inefficiency and profitability) were presented in this section. This is then followed by the research framework used in this study. The research framework highlights the dependent and the independent variables used in this study. Each of these variables is discussed in details in terms of their measurement and calculation. This is then followed by the postulation of the hypotheses for these variables which are tested in this study.

Secondly, this chapter described the data used in this study. It described the source of the data and the division of the observations into MENA and NON-MENA regions and also the division of the data into before and after global financial crisis.

Finally, the research methodology of this study is discussed. In the research method discussion, the four equations relating bank capital, credit risk, cost inefficiency and profitability are presented together with the bank specific variables used in the respective equations. As the study uses panel data, the details of panel data analysis are provided in this section. The panel data models in analyzing the relationship between bank capital, credit risk, cost inefficiency and profitability are presented. The panel data models used in this study are pooled least square, fixed effect, random effect and two-stage least square models. Each of these models is discussed in details in this section. The tests used to choose the appropriate model for each of the equations are also detailed out in this section.

CHAPTER 4

DATA ANALYSIS AND FINDINGS

4.1 Introduction

This chapter presents the data analysis and findings that meets the objectives of this study. The main objective of this study is to empirically determine the relationships between bank capital, credit risk, cost inefficiency and profitability in a selected sample of Islamic banks on a cross-country basis for the years between 2003 and 2012. Specifically the study aims to identify these relationships during the periods before and after the global financial crisis (GFC). The second objective is to determine the differences in these relationships in Islamic banks that operate in MENA and non-MENA regions for the period of 2003 to 2012 and also for sub-periods of before and after the GFC.

This chapter starts by providing the summary statistics on annual average bank capital, credit risk, cost inefficiency and profitability of the selected sample Islamic banks in section 4.1.1 through section 4.1.5. Then the panel data regression analysis and its findings on bank capital, credit risk, cost inefficiency and profitability are presented in the following order:

(i) for all selected sample Islamic banks over the 10 year period;

(ii) for all the Islamic banks before the GFC (2003 to 2007);

(iii) for all the Islamic banks after the GFC (2008 to 2012);

(iv) for Islamic banks in the MENA region over the 10 year period;

(v) for Islamic banks in the MENA region before the GFC (2003 to 2007);

(vi) for Islamic banks in the MENA region after the GFC (2008 to 2012);

(vii) for Islamic banks in the non-MENA region over the 10 year period;

(viii) for Islamic banks in the non-MENA region before the GFC (2003 to 2007);

(ix) for Islamic banks in the non-MENA region after the GFC (2008 to 2012)

Finally, this chapter's summary is presented in Section 4.11.

4.1.1 Summary statistics of average annual Islamic bank capital, credit risk, cost inefficiency and profitability on all selected sample Islamic banks over the 10 year period

Annual bank - specific data is used in this study over a period of 10 years from 2003 to 2012. Cross - country financial data of 85 Islamic banks were collected as the sample of this study. Therefore, the original total observations are 850 Islamic bank year. Out of these, 48 Islamic banks (or 480 Islamic bank year observations) are from Middle East and North African (MENA) countries, while 37 Islamic banks (or 370 Islamic bank year observations) are from non-MENA countries as mentioned in Section 3.2 of Chapter 3. However, due to incomplete and unavailability of data, the dataset was unbalanced. As such, a total of 650 Islamic bank year observations were finally used (of which 395 are from MENA region and 255 are from non-MENA region).

4.1.2 Summary statistics of average annual Bank Capital on all selected sample Islamic banks over the 10 year period

Table 4.1 shows the summarized average annual bank capital to total assets of all sample Islamic banks while Figure 4.1 plots the same data accordingly through the 10 year observation period. The annual average Islamic bank capital was derived using the equity-to-total assets ratio. This measure of average annual bank capital also been used by Furlong (1992), Flannery and Rangan (2008), Mamatzakis (2009), Rahman, Ibrahim & Meera (2009), Weill (2011), Abedifar et al. (2011), Beck, et al. (2010), Al-Farisi and

Hendrawan (2012) and Guidara et al. (2013). An increase in the equity to total assets ratio would reveal a reduction in the level of leverage (less risky position) of the Islamic banks.

Table 4.1: Average Annual Islamic Bank Capital to Total Assets

Year	Number of Banks	Mean %	Std. Dev
2003	45	13.70	14.38
2004	45	17.61	19.09
2005	60	18.35	14.12
2006	70	21.36	22.47
2007	77	19.75	18.44
2008	85	17.06	14.69
2009	72	16.57	16.06
2010	67	16.21	16.75
2011	69	15.58	18.12
2012	60	12.59	16.93

Figure 4.1: Average Annual Islamic Bank Capital to Total Assets

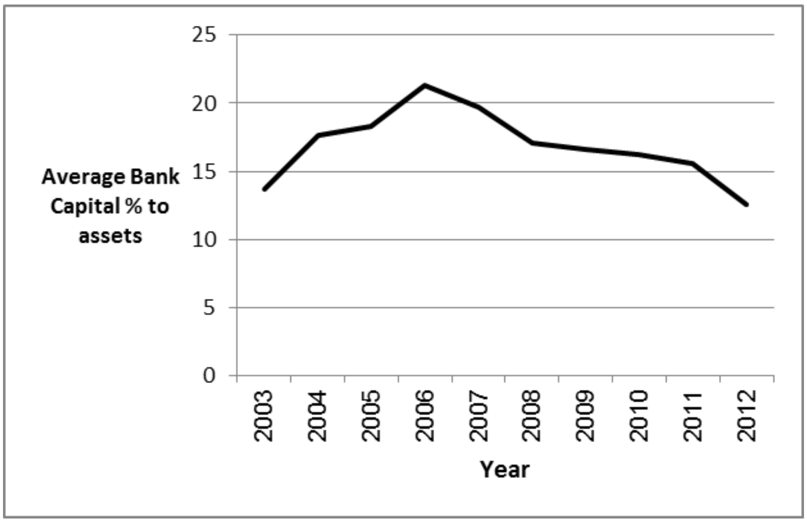


Table 4.1 and its plotted chart in Figure 4.1, describes that the average annual Islamic bank capital increased gradually from the year 2003 to 2006 where it was at the peak of 21.36% of its average total assets. From 2006 this indicator started to decline to the lowest record of 12.59% in 2012. This trend of increasing capital holding up to the year 2006 and its decline after that can be referenced to the effects of GFC on Islamic banks. It can be noted that the Islamic bank capital as a fraction of its total assets was increasing in the years

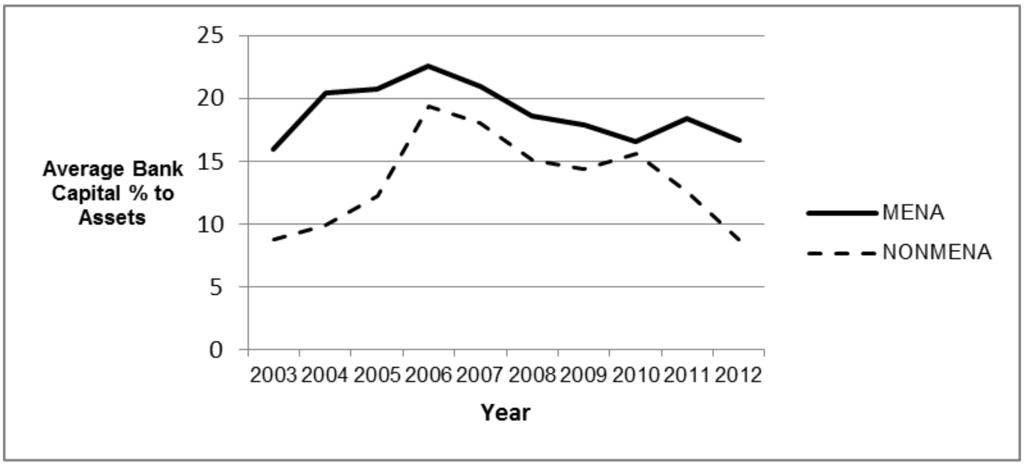
before the GFC indicating a decrease in the leverage (less risky position). Islamic banks' capital has been declining since the GFC, thus indicating an increase in the leverage (more risky position) of the Islamic banks. Similar observations were also made by Parashar and Venkatesh (2010), comparing the performance of conventional and Islamic banks in the Gulf Cooperation Council (GCC) before and during the GFC using ratio analysis method. These authors found that equity to total assets of Islamic banks had significantly reduced during the GFC period.

The summary of average annual Islamic bank capital to assets in MENA and Non-MENA countries are presented in Table 4.2 while Figure 4.2 plots the similar region-wise average bank capital.

Table 4.2: Average Islamic Bank Capital to Total Assets in MENA and Non-MENA region

	MENA		NON-MENA	
Year	Mean %	Std. Dev	Mean %	Std. Dev
2003	15.92	16.52	8.78	5.66
2004	20.42	21.59	9.87	3.68
2005	20.76	14.99	12.23	9.48
2006	22.62	18.44	19.35	28.00
2007	20.96	15.41	18.06	22.16
2008	18.56	13.98	15.11	15.54
2009	17.89	13.45	14.35	19.74
2010	16.59	12.96	15.57	22.01
2011	18.41	14.34	12.50	21.31
2012	16.62	11.51	8.82	20.24

Figure 4.2: Average Islamic Bank Capital to Total Assets (Region wise)



From Table 4.2 and Figure 4.2, it can be noted that the Islamic banks in the MENA region have been generally holding higher capital to total assets than its peers in non-MENA region throughout the 10 year period. Srairi (2009) also noted that the equity to total assets of banks in the GCC countries were generally higher than regulatory requirement of eight per cent. Bashir (2007) studied the performance of Islamic banks in a sample of 12 MENA countries. According to this researcher, Islamic banks in the MENA countries generally had higher equity to asset ratio and it could be due to high retained earnings, or the issuance of new equity. According to Bashir (2007), since Islamic banks do not have the options of discount borrowing from their central banks, or borrowing on the inter-bank market, keeping higher capital ratios may be needed to reduce the possibilities of insolvency or bank run.

4.1.3 Summary statistics of Average Annual Credit Risk of all selected sample Islamic banks over the 10 year period

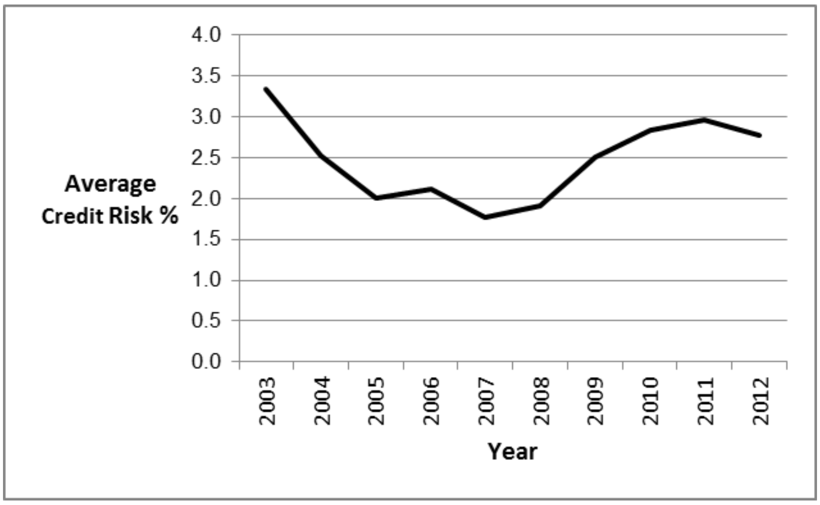
Table 4.3 summarizes the annual average credit risk of all sample Islamic banks over the 10 year observation period, while Figure 4.3 plots the same data. The bank credit risk is measured using the loan loss reserves as a fraction of total assets. Studies by Sinkey Jr. and

Carter (2000), Altunbas et al. (2007), Yong et al. (2007), Abedifar et al. (2011) and Rao and Lakew (2012) had also used this ratio to measure credit risk of banks.

Table 4.3: Average Annual Credit Risk of Islamic Banks

YEAR	Number of Banks	Mean %	Std. Dev
2003	45	3.35	3.67
2004	45	2.52	2.85
2005	60	2.00	2.52
2006	70	2.12	3.15
2007	77	1.78	2.86
2008	85	1.91	2.41
2009	72	2.51	2.80
2010	67	2.83	3.09
2011	69	2.96	4.91
2012	60	2.77	4.57

Figure 4.3: Average Annual Credit Risk of Islamic Banks



From Table 4.3 and Figure 4.3, it can be noted that the average credit risk of all sample Islamic banks was at its lowest in 2007 at 1.78%. However, this indicator has been increasing since then, implicating that the credit risk of Islamic banks has been increasing since the GFC.

The summary statistics of the average annual credit risk of Islamic banks according to the MENA and non-MENA regions are presented in Table 4.4 while Figure 4.4 plots the same data.

Table 4.4: Average Annual Credit risk of Islamic banks in MENA and Non- MENA region

Year	MENA		NON-MENA	
	Mean	Std. Dev	Mean	Std. Dev
2003	3.12	3.44	3.85	4.25
2004	2.53	3.11	2.50	2.07
2005	2.05	2.81	1.88	1.64
2006	1.72	1.67	2.77	4.59
2007	1.47	1.31	2.21	4.16
2008	1.64	1.51	2.27	3.21
2009	2.10	1.54	3.19	4.07
2010	2.70	2.27	3.05	4.17
2011	2.68	2.00	3.26	6.83
2012	2.76	2.13	2.78	6.07

Figure 4.4: Average Annual Credit Risk of Islamic Banks (Region wise)

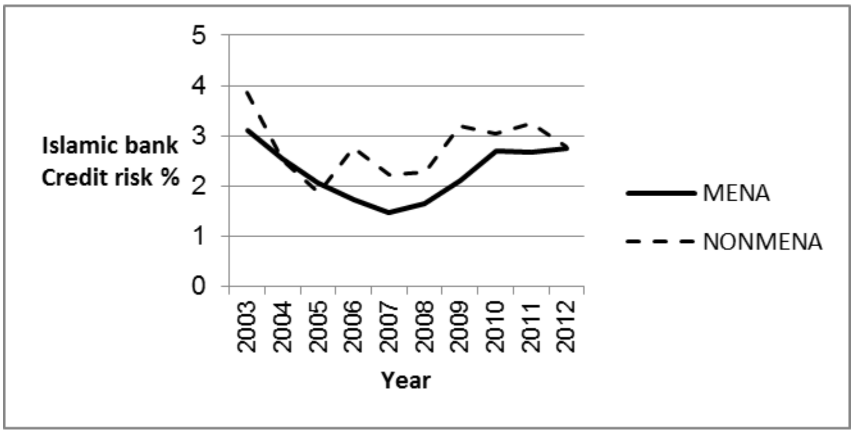


Table 4.4 and Figure 4.4, describes that generally Islamic banks in MENA region carries lesser credit risk compared to their counterparts in the non-MENA region. The credit risk of Islamic banks in both regions generally increased after the GFC period. Higher volatility (indicated by the standard deviation) in credit risk was generally noted in Islamic banks that operate in non-MENA region.

Based on earlier discussion on the average annual bank capital, it can be noted that Islamic banks in MENA region hold higher bank capital and carries lower credit risk as compared to the Islamic banks in non- MENA region. Based on the discussion in Section 4.1.2 (summary statistic on bank capital) and Section 4.1.3 (summary statistic on credit risk), the bank capital observations are moving in the opposite direction to the credit risk observations. Therefore, a negative relationship between bank capital and credit risk could be noted here.

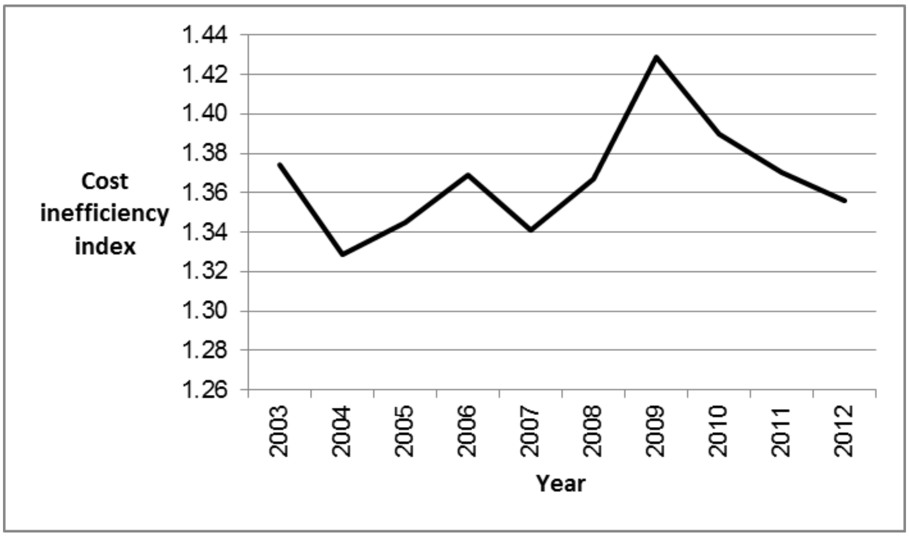
4.1.4 Summary statistics of Average Annual Cost Inefficiency of all selected sample Islamic banks over the 10 year period

Table 4.5 shows the summary statistics of annual average cost inefficiency of all sample Islamic banks over the 10 year observation period while Figure 4.5 plots the same data. According to Berger and Humphrey (1997), cost efficiency refers to how close the bank's operation cost as compared to the benchmark bank which produces the same units of output given the same inputs. This means the farther the bank's operation cost compared to the benchmark bank would indicate cost inefficiency. Cost inefficiencies of the sample Islamic banks are estimated using the stochastic frontier analysis technique, which is a widely used parametric approach in estimating bank cost inefficiency. Stochastic frontier approach has also been used by researchers such as Mokhtar et al. (2006), Mohamad, Hassan & Bader (2008), Srairi (2009), Karim et al. (2010), Saeed and Izzeldin (2014) to measure cost inefficiency. This study employs three inputs and three outputs to measure the cost inefficiency of the sample Islamic banks. The inputs are labour (measured by personnel expenses to total asset ratio), fund (measured by the ratio of interest expenses to total deposits) and fixed asset (measured by non-interest expense to total fixed asset ratio). The outputs included total loans, other earning assets and off-balance sheet items. A high cost inefficiency value indicates that the Islamic bank is less efficient in managing their costs. A lower value for cost inefficiency would be favorable.

Table 4.5: Average Annual Cost Inefficiency of Islamic banks

Year	Number of Banks	Mean Index	Std. Dev
2003	45	1.37	0.29
2004	45	1.33	0.21
2005	60	1.35	0.24
2006	70	1.37	0.32
2007	77	1.34	0.20
2008	85	1.37	0.20
2009	72	1.43	0.46
2010	67	1.39	0.25
2011	69	1.37	0.15
2012	60	1.36	0.15

Figure 4.5: Average Annual Cost Inefficiency (Year wise)



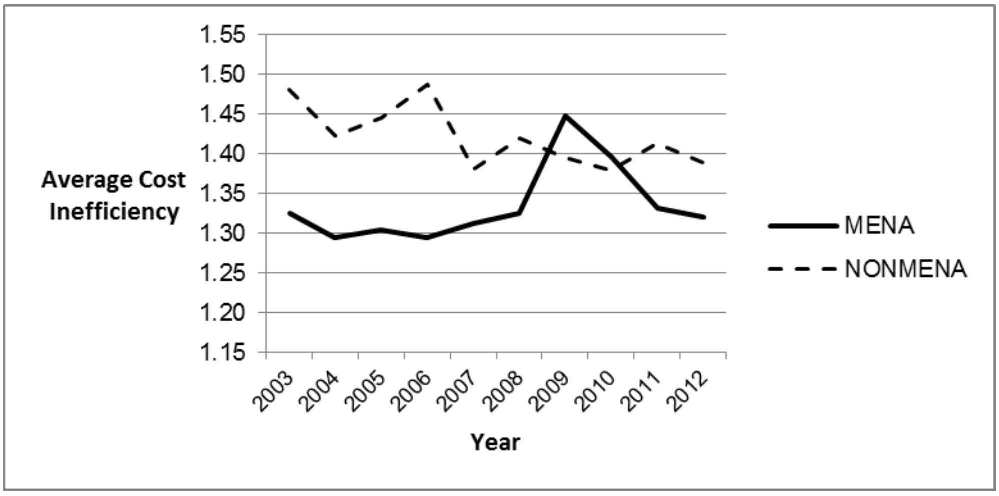
From Table 4.5 and Figure 4.5, it can be noted that the highest average cost inefficiency value was recorded in year 2009 at a mean index of 1.43. This high cost inefficiency can be linked to the after effect of the GFC which occurred in year 2008.

Table 4.6 provides the summary statistics of average annual cost inefficiency according to the Islamic banks in MENA and non-MENA regions, while Figure 4.6 plots the same data.

Table 4.6: Summary of Average Annual Cost Inefficiency of Islamic Banks (Region wise)

Year	MENA		NONMENA	
	Mean	Std. Dev	Mean	Std. Dev
2003	1.326	0.158	1.481	0.456
2004	1.295	0.132	1.424	0.336
2005	1.305	0.124	1.447	0.390
2006	1.294	0.127	1.487	0.467
2007	1.313	0.157	1.381	0.253
2008	1.326	0.138	1.420	0.242
2009	1.448	0.577	1.397	0.143
2010	1.396	0.305	1.380	0.114
2011	1.332	0.136	1.413	0.153
2012	1.321	0.153	1.389	0.134

Figure 4.6: Average Annual Cost Inefficiency (Region wise)



According to the average annual cost inefficiency data in Table 4.6 and Figure 4.6, Islamic banks in MENA region are less cost inefficient than the non-MENA region Islamic banks during the 10 year study period except in years 2009 and 2010. In those two years, Islamic banks in non-MENA region were noted to be less cost inefficient. Sufian and Noor (2009) did a comparative analysis on the performance of Islamic banks in MENA and Asian countries. These authors used an unbalanced sample of 37 Islamic banks operating in the MENA and Asian countries from 2001 to 2006 yielding 145 bank year observations. They found that Islamic banks in the MENA region exhibited higher technical efficiency compared to their Asian Islamic bank counterparts.

4.1.5 Summary statistics of Average Annual Bank Profitability on all selected sample Islamic banks over the 10 year period

Table 4.7 summarizes the statistics for average annual bank profitability on all sample Islamic banks over the 10 year observation period while Figure 4.7 plots these average profitability data. This study measures bank profitability using the return on average assets (ROA). Studies by Naceur (2003), Athanasoglou et al. (2005), Kosmidou (2008), Srairi (2009) and Raphael (2013) had also used this ratio to measure profitability of banks.

Based on the average annual profitability statistics in Table 4.7 and Figure 4.7, it can be noted that Islamic bank profitability depicts both upward and downward trends during the 10 year observation period. The highest average profitability was recorded in 2005 at 2.68% while the lowest was witnessed in 2009 at – 0.74%. A sharp drop in Islamic bank profitability can be noted from 2007 until 2009. This fall in Islamic bank profitability could also be referred to the effect of the GFC.

Table 4.7: Summary Statistics of Average Annual Profitability of Islamic Banks

Year	Number of Banks	Mean %	Std. Dev
2003	45	1.16	2.71
2004	45	1.29	2.88
2005	60	2.68	3.73
2006	70	1.80	7.23
2007	77	2.41	3.41
2008	85	1.36	2.55
2009	72	-0.74	4.95
2010	67	-0.62	5.42
2011	69	0.73	2.49
2012	60	0.65	2.03

Figure 4.7: Average Annual Islamic Bank Profitability (Year wise)

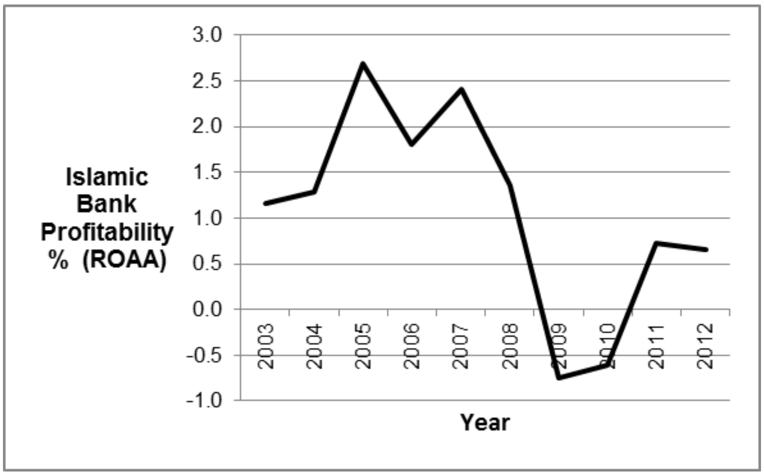
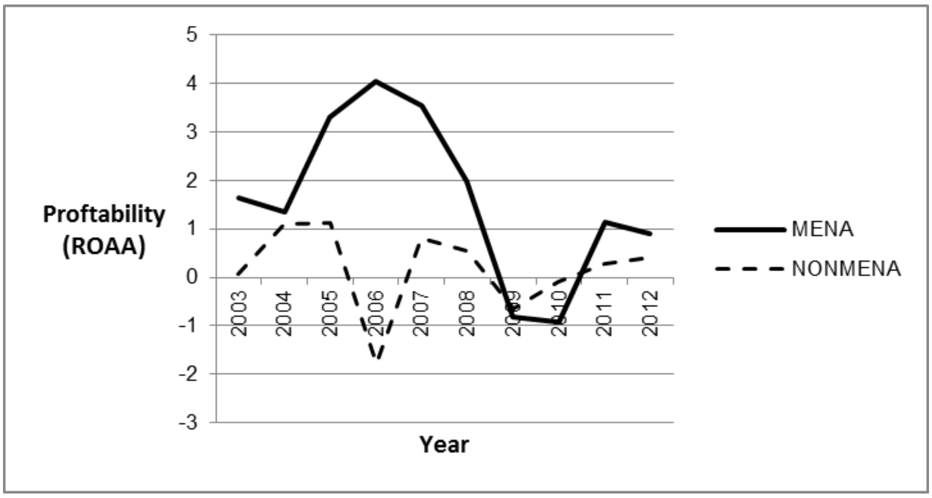


Table 4.8 provides the summary statistics of average annual bank profitability according to the Islamic banks that operate in MENA and non-MENA regions, while Figure 4.8 plots the region-wise average profitability.

Table 4.8: Average Annual Islamic Bank Profitability (Region Wise)

Year	MENA		NON-MENA	
	Mean %	Std. Dev	Mean %	Std. Dev
2003	1.649	2.742	0.070	2.390
2004	1.350	3.039	1.111	2.512
2005	3.300	3.783	1.123	3.175
2006	4.052	5.950	-1.778	7.728
2007	3.553	3.598	0.811	2.380
2008	1.994	2.764	0.535	1.975
2009	-0.810	5.429	-0.632	4.128
2010	-0.923	6.448	-0.098	3.067
2011	1.130	1.801	0.282	3.037
2012	0.903	1.367	0.421	2.499

Figure 4.8: Average Annual Islamic Bank Profitability (Region wise)



Based on Table 4.8 and Figure 4.8, it can be concluded that Islamic banks in the MENA region are more profitable than its counterparts in non-MENA region throughout the 10 year study period except in years 2009 and 2010. In those two years, Islamic banks in non-MENA region were more profitable. In 2009 and 2010, Islamic banks in the non-MENA region were also more efficient in terms of costs thus being able to record more profit. It can also be noted that in year 2006, Islamic banks in the MENA region had recorded the highest profitability while the non-MENA region hit its lowest profitability level.

Based on the earlier discussion, it can be noted that Islamic banks in the MENA region generally hold higher bank capital, carries lower credit risk, are more cost efficient and are also more profitable compared to their peers in the non-MENA region.

4.2 Determining the Relationships between Bank Capital, Credit Risk, Cost Inefficiency, and Profitability on *all selected sample Islamic banks for the overall 10 year observation period*

In this section, the results of the panel data analysis on the relationships between bank capital, credit risk, cost inefficiency and profitability on all selected sample Islamic banks for the overall 10 year observation period are presented. The results of the pooled least square analysis, fixed effect analysis, random effect analysis and two-stage least square analysis based on Equations 1 to 4 as listed out in chapter three are presented. Multicollinearity analysis was carried out by computing the Variance Inflation Factors (VIF) of the independent variables used in Equations 1 to 4. Based on the results as presented in Appendix 2, all the VIF values are less than 10, indicating that the independent variables used in Equations 1 to 4 are not highly correlated with each other. Therefore, none of the independent variables are excluded from Equations 1 to 4.

4.2.1 Pooled Least Square (PLS) Analysis on all selected sample Islamic banks for the overall 10 year observation period

The results of pooled least square analysis in determining the relationships between bank capital, credit risk, cost inefficiency and profitability on all selected sample Islamic banks through the 10 year observation period is presented in Table 4.9a. The results are interpreted based on the dependent variable that supports equations 1 to 4 in this regression analysis.

Bank Capital as dependent variable: The results reported in column one of Table 4.9a indicates that credit risk is significantly negatively related to bank capital at 10% significance level. The results also indicate that cost inefficiency is significantly negatively related to bank capital at 10% significance level, the bank size is significantly negatively related to bank capital at 1% significance level. However, the finding indicates that bank profitability and loan growth do not significantly affect bank capital.

Table 4.9a: Results of the Pooled Least Square (PLS) Analysis on all selected sample Islamic banks for the overall 10 year observation period (2003 to 2012)

Pooled OLS, using 650 bank year observations
Robust (HAC) standard errors

	Bank Capital *as dependent variable* *(1)*	***Credit Risk*** *as dependent variable* *(2)*	***Cost Inefficiency*** *as dependent variable* *(3)*	***Profitability*** *as dependent variable* *(4)*
Const.	58.446*** (13.626)	5.010 (4.151)	1.440*** (0.081)	-1.438 (1.039)
BC		-0.053 (0.049)	-0.003*** (0.001)	0.013 (0.013)
CR	-1.407* (0.771)		-0.002 (0.004)	-0.231*** (0.035)
CInE	-11.805* (6.543)	-0.301 (0.678)		0.331 (0.596)
ROA	-0.107 (0.339)	-0.219** (0.100)	-0.022*** (0.007)	
NLTA	-0.054 (0.045)	0.012 (0.010)	-0.001 (0.001)	
SIZE	-2.457*** (0.776)	-0.194 (0.312)	0.008 (0.011)	0.057 (0.055)
MGT_EFF		-0.002 (0.016)		
OBSTA			-0.000 (0.000)	
ASSUTI				1.019*** (0.113)
OHEADTOTA				-0.945*** (0.077)
Adjusted R-squared	0.172	0.166	0.174	0.663
F-statistics	28.031***	22.512***	23.758***	214.194***

Note: BC = Bank Capital; CR = Credit Risk; CInE = Cost Inefficiency; ROA = Return on Asset; NLTA = Net Loan to Total Assets; SIZE = Bank Size; MGT_EFF = Management Efficiency; OBSTA = Off Balance Sheet Items; ASSUTI = Asset Utilization Ratio; OHEADTOTA = Overhead Expenses to Total Assets; ***, **, and * statistically significant at the 1%, 5%, and 10% levels, respectively. Standard errors are given in parentheses.

Credit Risk as dependent variable: The results reported in column two of Table 4.9a indicate that, bank profitability is significantly negatively related to credit risk at 5% significance level. The results also show that bank capital, cost inefficiency, loan growth, and bank size and management efficiency do not significantly affect credit risk.

Cost Inefficiency as dependent variable: The results reported in column three of Table 4.9a indicate that, bank capital is significantly negatively related to cost inefficiency at 1% significance level. The result also indicates that, profitability is negatively related to cost inefficiency at 1% significance level. However, it reveals that credit risk, loan growth, bank size and off-balance sheet items are not significantly related to cost inefficiency.

Profitability as dependent variable: The results reported in column four of Table 4.9a indicate that, both credit risk and overhead expenses are significantly negatively related to profitability at 1% significance level. The results also indicate that asset utilization is significantly positively related to profitability at 1% significance level. However, the finding indicates that bank capital, cost inefficiency and bank size do not significantly affect bank profitability.

4.2.2 Fixed Effect (FE) Analysis on all selected sample Islamic banks for the overall 10 year observation period

Table 4.9b presents the result of fixed effect panel data analysis based on Equations 1 to 4 as listed out in chapter three. The results are interpreted based on the dependent variable that supports Equations 1 to 4 in this regression analysis.

Bank Capital as dependent variable: F-test is used in order to identify whether a PLS or a fixed effect model should be used. Based on column one of Table 4.9b, the F-test statistics is significant at 1% level for Equation 1 indicating that a fixed effect model would be appropriate to estimate this equation. The results indicate that credit risk and bank size are negatively related to bank capital at 1% level of significance. However, the results also indicate that cost inefficiency, bank profitability and loan growth do not significantly affect bank capital.

Table 4.9b: Results of the Fixed Effect analysis on all selected sample Islamic banks over the 10 year period (2003 to 2012)

Fixed-effects, using 650 bank year observations
Robust (HAC) standard errors

	Bank Capital *as dependent variable (1)*	***Credit Risk*** *as dependent variable (2)*	***Cost Inefficiency*** *as dependent variable (3)*	***Profitability*** *as dependent variable (4)*
Const.	58.326*** (10.915)	10.535*** (3.328)	1.686*** (0.229)	-1.103 (2.364)
BC		-0.078*** (0.029)	-0.003 (0.002)	0.040 (0.037)
CR	-1.278*** (0.427)		-0.002 (0.007)	-0.305*** (0.082)
CInE	-3.197 (2.619)	-0.622 (0.502)		0.240 (0.737)
ROA	-0.123 (0.247)	-0.119*** (0.031)	-0.025*** (0.008)	
NLTA	-0.007 (0.018)	0.004 (0.003)	-0.001 (0.001)	
SIZE	-4.333*** (1.096)	-0.526** (0.238)	-0.025 (0.026)	-0.058 (0.142)
MGT_EFF		-0.024** (0.012)		
OBSTA			-0.000 (0.000)	
ASSUTI				1.068*** (0.177)
OHEADTOTA				-0.880*** (0.106)
Adjusted R-squared	0.817	0.719	0.368	0.677
F-test statistic	27.993 ***	16.058***	3.352***	1.325**

Note: BC = Bank Capital; CR = Credit Risk; CInE = Cost Inefficiency; ROA = Return on Asset; NLTA = Net Loan to Total Assets; SIZE = Bank Size; MGT_EFF = Management Efficiency; OBSTA = Off Balance Sheet Items; ASSUTI = Asset Utilization Ratio; OHEADTOTA = Overhead Expenses to Total Assets; ***, **, and * statistically significant at the 1%, 5%, and 10% levels, respectively. Standard errors are given in parentheses.

Credit Risk as dependent variable: Based on column two of Table 4.9b, the F-test statistic is significant at 1% level for Equation 2 indicating that a fixed effect model would be appropriate to estimate this equation. The results indicate that bank capital and profitability are significantly negatively related to credit risk at 1% significance level, the bank size and management efficiency (measured by earning assets to total assets ratio) significantly negatively related to credit risk at 5% significance level. However, result also shows that cost inefficiency and loan growth are not significantly related to credit risk.

<u>Cost Inefficiency as dependent variable:</u> Based on column three of Table 4.9b, the F-test statistic is significant at 1% level for Equation 3 indicating that a fixed effect model would be appropriate to estimate this equation. The result also indicates that profitability is significantly negatively related to cost inefficiency at 1% significance level. Meanwhile, bank capital, credit risk, loan growth, bank size and off-balance sheet items are not significantly related to cost inefficiency.

<u>Profitability as dependent variable:</u> Based on column four of Table 4.9b the F-test statistic is significant at 1% level for Equation 4 indicating that a fixed effect model would be appropriate to estimate this equation. Credit risk and overhead expenses are negatively related to profitability at 1% significance level. The result also indicates that asset utilization is significantly positively related to profitability at 1% level of significance. However, bank capital, cost inefficiency and bank size are not significantly related to profitability.

4.2.3 Random Effect (RE) Analysis on all selected sample Islamic banks for the overall 10 year observation period (2003 to 2012)

Table 4.9c presents the result of random effect panel data analysis based on Equations 1 to 4 as listed out in chapter three. The results are interpreted based on the dependent variable that supports equations 1 to 4 in this regression analysis.

<u>Bank Capital as dependent variable:</u> Breusch-Pagan test is used to decide whether a PLS or a random effect model will be applicable. Based on column one of Table 4.9c, the Breusch-Pagan test statistic is significant at 1% level for Equation 1 indicating that a random effect model is preferred over a PLS model in estimating this equation. Meanwhile, Hausman test is used in order to choose between a fixed effect and a random effect model. The result shows that the Hausman test statistic is significant at 5% level. Therefore, fixed effect model would be the most appropriate to estimate Equation 1.

Table 4.9c: Results of the Random Effect Panel Data Analysis on all selected sample Islamic banks over the 10 year period (2003 to 2012)

Random-effects (GLS), using 650 bank year observations

	Bank Capital *as dependent variable* *(1)*	***Credit Risk*** *as dependent variable* *(2)*	***Cost Inefficiency*** *as dependent variable* *(3)*	***Profitability*** *as dependent variable* *(4)*
Const.	57.499*** (4.167)	9.030*** (1.486)	1.538*** (0.078)	-1.423* (0.857)
BC		-0.070*** (0.009)	-0.003*** (0.001)	0.013** (0.007)
CR	-1.292*** (0.161)		-0.002 (0.004)	-0.236*** (0.032)
CInE	-3.607** (1.486)	-0.543 (0.400)		0.333 (0.478)
ROA	-0.122 (0.090)	-0.125*** (0.021)	-0.024*** (0.002)	
NLTA	-0.009 (0.013)	0.004 (0.003)	-0.001*** (0.000)	
SIZE	-4.120*** (0.402)	-0.431*** (0.100)	-0.005 (0.009)	0.052 (0.069)
MGT_EFF		-0.018** (0.010)		
OBSTA			-0.000 (0.000)	
ASSUTI				1.022*** (0.038)
OHEADTOTA				-0.939*** (0.052)
Breusch-Pagan test (Chi-square)	1250.810***	876.358***	79.018***	0.466
Hausman test (Chi-square)	11.6212 **	17.046***	7.627	10.041***

Note: BC = Bank Capital; CR = Credit Risk; CInE = Cost Inefficiency; ROA = Return on Asset; NLTA = Net Loan to Total Assets; SIZE = Bank Size; MGT_EFF = Management Efficiency; OBSTA = Off Balance Sheet Items; ASSUTI = Asset Utilization Ratio; OHEADTOTA = Overhead Expenses to Total Assets; ***, **, and * statistically significant at the 1%, 5%, and 10% levels, respectively. Standard errors are given in parentheses.

<u>Credit Risk as dependent variable:</u> Based on column two of Table 4.9c, the Breusch-Pagan test statistic is significant at 1% level for Equation 2 suggesting that a random effect model is preferred over a pooled least square model in estimating this equation. Meanwhile, Hausman test statistic is significant at 1% level. This indicates that a fixed effect model would be the most appropriate model to estimated Equation 2.

Cost Inefficiency as dependent variable: Based on column three of Table 4.9c, the Breusch-Pagan test statistic is significant at 1% level. Therefore, a random effect model is preferred over a pooled least square model in estimating Equation 3. Meanwhile, Hausman test statistic is not significant indicating that random effect model would be the most appropriate model to estimated Equation 3. The random effect result indicates that bank capital, profitability and loan growth are significantly negatively related to cost inefficiency at 1% significance level. On the other hand, credit risk, bank size and off-balance sheet items are not significantly related to cost inefficiency.

Profitability as dependent variable: Based on column four of Table 4.9c, the Breusch-Pagan test statistic is not significant. This indicates that a PLS model is appropriate over a random effect model in estimating Equation 4. However, based on Table 4.9b, a fixed effect model would be appropriate to estimate Equation 4.

4.2.4 Two-Stage Least Square (TSLS) Analysis on all selected sample Islamic banks for the overall 10 year observation period (2003 to 2012)

Table 4.9d presents the result of two-stage least square panel data analysis and the specification tests (weak instruments test, Hausman test, and Sargan test) for Equations 1 to 4 as listed out in chapter three. The results are interpreted based on the dependent variable that supports equations 1 to 4 in this regression analysis.

Bank Capital as dependent variable: Based on column one of Table 4.9d, Hausman test is significant at 1% significance level. Therefore, it is appropriate to use TSLS. Sargan over-identification test indicates that Equation 1 is over-identified. The Sargan over-identification result is not significant indicating that all the instruments used in estimating Equation (1) are valid. The weak instrument test based on Cragg-Donald minimum eigenvalue is significant at 5% significance level. This indicates that the instruments used are neither weak nor invalid. The results show that none of the independent variables are significantly related to bank capital.

Table 4.9d: Results of the Two Stage Least Square Panel Data Analysis on all selected sample Islamic banks for the overall period of 10 years (2003 to 2012)

TSLS, using 650 bank year observations
Instruments: const. NLTA, SIZE, MGT_EFF, OBSTA, ASSUTI, OHEADTOTA,
Robust (HAC) standard errors

	Bank Capital *as dependent variable (1)*	***Credit Risk*** *as dependent variable (2)*	***Cost Inefficiency*** *as dependent variable (3)*	***Profitability*** *as dependent variable (4)*
Const.	11.555 (53.147)	21.946 (130.561)	0.073 (2.712)	-6.228 (5.369)
BC		0.729 (3.579)	-0.030 (0.073)	0.100 (0.101)
CR	21.303 (30.754)		0.890 (1.187)	0.197 (0.419)
CInE	-22.956 (42.461)	-21.388 (124.116)		1.008 (1.477)
ROA	2.102 (2.341)	-0.949 (4.537)	0.084 (0.136)	
NLTA	-0.407 (0.540)	0.067 (0.270)	-0.016 (0.017)	
SIZE	0.550 (6.296)	2.019 (10.805)	0.051 (0.237)	0.281 (0.238)
MGT_EFF		-0.250 (1.361)		
OBSTA			0.001 (0.001)	
ASSUTI				1.031*** (0.123)
OHEADTOTA				-1.104*** (0.188)
Instrumented	CR CInE ROA	BC CInE ROA	BC CR ROA	BC CR CInE
Hausman test (Chi-square)	58.435***	22.118***	464.731***	1.725
Sargan over-identification test statistic	0.186			
Weak instrument test - Cragg-Donald minimum eigenvalue	0.181**	0.003**	0.359**	1.038**

Note: BC = Bank Capital; CR = Credit Risk; CInE = Cost Inefficiency; ROA = Return on Asset; NLTA = Net Loan to Total Assets; SIZE = Bank Size; MGT_EFF = Management Efficiency; OBSTA = Off Balance Sheet Items; ASSUTI = Asset Utilization Ratio; OHEADTOTA = Overhead Expenses to Total Assets; ***, **, and * statistically significant at the 1%, 5%, and 10% levels, respectively. Standard errors are given in parentheses.

Credit Risk as dependent variable: The result in column two of Table 4.9d indicates that Hausman test is significant at 1% significance level. Therefore, it is appropriate to use

TSLS. Sargan over-identification test result is not available because Equation (2) is exactly identified as noted in Chapter 3 under the order condition analysis. As discussed in Chapter 3, TSLS method can be used if the equation is either exactly or over-identified. The weak instrument test based on Cragg-Donald minimum eigenvalue is significant at 5% significance level. This indicates that the instruments used are neither weak nor invalid. The results show that none of the independent variables are significantly related to credit risk.

Cost Inefficiency as dependent variable: Based on column three of Table 4.9d, Hausman test is significant at 1% significance level. Therefore, it is appropriate to use TSLS. Sargan over-identification test result is not available. This is because Equation (3) is exactly identified as noted in Chapter 3 under the order condition analysis. The weak instrument test based on Cragg-Donald minimum eigenvalue is significant at 5% significance level. This indicates that the instruments used are neither weak nor invalid. The results show that none of the independent variables are significantly related to cost inefficiency.

Profitability as dependent variable: Based on column four of Table 4.9d, Hausman test is not significant. Therefore, it is appropriate to use OLS. As mentioned in the earlier section, a fixed effect model is preferred over a pooled OLS.

4.2.5 The Summary of Panel Data Analysis Results for all selected sample Islamic banks over the 10 year period (2003 to 2012)

Table 4.9e summarizes the results of the Panel Data Analysis as discussed in Sections 4.2.1 through 4.2.4.

Table 4.9e: Summary of Panel Data Analysis Results for all selected sample Islamic banks over the 10 year period (2003 to 2012)

Dependent Variable	Appropriate Panel Data Model Used	Findings
Bank Capital	Two-Stage Least Square model	i. Credit risk **positively** affects bank capital. ii. Cost inefficiency **negatively** affects bank capital. iii. Profitability **positively** affects bank capital. iv. Loan growth **negatively** affects bank capital. v. Bank size **positively** affects bank capital.
Credit Risk	Two-Stage Least Square model	i. Bank capital **positively** affects credit risk. ii. Cost inefficiency **negatively** affects credit risk. iii. Profitability **negatively** affects credit risk. iv. Loan growth **positively** affects credit risk. v. Bank size **positively** affects credit risk. vi. Management efficiency **negatively** affects credit risk.
Cost Inefficiency	Two-Stage Least Square model	i. Bank capital **negatively** affects cost inefficiency. ii. Credit risk **positively** affects cost inefficiency. iii. Profitability **positively** affects cost inefficiency. iv. Loan growth **negatively** affects cost inefficiency. v. Bank size **positively** affects cost inefficiency. vi. Off-balance sheet items **positively** affect cost inefficiency.
Profitability	Fixed Effect model	i. Bank capital **positively** affects profitability. ii. Credit risk significantly **negatively** affects profitability. iii. Cost inefficiency **positively** affects profitability. iv. Bank size **negatively** affects profitability. v. Asset utilization significantly **positively** affects profitability. vi. Overhead expenses significantly **negatively** affects profitability

4.3 Determining the Relationships between Bank Capital, Credit Risk, Cost Inefficiency, and Profitability on *all selected sample Islamic banks for the period before GFC (2003 to 2007)*

In this section, the results of the panel data analysis on the relationships between bank capital, credit risk, cost inefficiency and profitability on all selected sample Islamic banks for the period before GFC (2003 to 2007) are presented. The results of the pooled least square analysis, fixed effect analysis, random effect analysis and two-stage least square analysis based on Equations 1 to 4 as listed out in chapter three are presented. Multicollinearity analysis was carried out by computing the Variance Inflation Factors (VIF) of the independent variables used in Equations 1 to 4. Based on the results as presented in Appendix 1, all the VIF values are less than 10, indicating that the independent variables used in Equations 1 to 4 are not highly correlated with each other. Therefore, none of the independent variables are excluded from Equations 1 to 4.

4.3.1 Pooled Least Square (PLS) analysis on all selected sample Islamic banks for the period before GFC (2003 to 2007)

The results of pooled least square analysis in determining the relationships between bank capital, credit risk, cost inefficiency and profitability on all selected sample Islamic banks for the period before GFC (2003 to 2007) is presented in Table 4.10a. The results are interpreted based on the dependent variable that supports Equations 1 to 4 in this regression analysis.

Bank Capital as dependent variable: The result reported in column one of Table 4.10a indicates that cost inefficiency is significantly negatively related to bank capital at 10% significance level. The result also shows that bank size is significantly negatively related to bank capital at 1% significance level. Meanwhile, credit risk, profitability and loan growth are not significantly related to bank capital.

Credit Risk as dependent variable: The results reported in column two of Table 4.10a indicate that at 1% significance level, loan growth is positively related to credit risk. On the other hand, bank capital, cost inefficiency, profitability, bank size and management efficiency are not significantly related to credit risk.

Cost Inefficiency as dependent variable: Column three of Table 4.10a indicates that at 5% significance level, bank capital and profitability are negatively related to cost inefficiency. The result also indicates that at 5% significance level, credit risk is positively related to cost inefficiency. It could also be noted from the result that loan growth is significantly negatively related to cost inefficiency at 10% significance level. Meanwhile, bank size and off-balance sheet items are not significantly related to cost inefficiency.

Table 4.10a: Results of the Pooled Least Square analysis on all selected sample Islamic banks before GFC (2003 to 2007) period

Pooled OLS, using 297 bank year observations
Robust (HAC) standard errors

	Bank Capital *as dependent variable (1)*	***Credit Risk*** *as dependent variable (2)*	***Cost Inefficiency*** *as dependent variable (3)*	***Profitability*** *as dependent variable (4)*
Const.	62.635*** (14.607)	-0.020 (2.291)	1.508*** (0.118)	-2.127* (1.200)
BC		-0.029 (0.025)	-0.002** (0.001)	0.031* (0.018)
CR	-1.042 (0.687)		0.010** (0.004)	-0.019 (0.059)
CInE	-13.338* (7.430)	1.411 (1.045)		0.461 (0.817)
ROA	0.295 (0.426)	-0.052 (0.040)	-0.020** (0.008)	
NLTA	-0.102 (0.087)	0.041*** (0.015)	-0.002* (0.001)	
SIZE	-2.580*** (0.974)	-0.087 (0.243)	0.001 (0.014)	0.072 (0.076)
MGT_EFF		-0.005 (0.020)		
OBSTA			-0.000 (0.000)	
ASSUTI				1.088*** (0.088)
OHEADTOTA				-1.008*** (0.087)
Adjusted R-squared	0.165	0.143	0.198	0.675
F-statistics	12.691***	9.201***	23.758***	103.355***

Note: BC = Bank Capital; CR = Credit Risk; CInE = Cost Inefficiency; ROA = Return on Asset; NLTA = Net Loan to Total Assets; SIZE = Bank Size; MGT_EFF = Management Efficiency; OBSTA = Off Balance Sheet Items; ASSUTI = Asset Utilization Ratio; OHEADTOTA = Overhead Expenses to Total Assets; ***, **, and * statistically significant at the 1%, 5%, and 10% levels, respectively. Standard errors are given in parentheses.

Profitability as dependent variable: The result reported in column four of Table 4.10a indicates that at 10% significance level, bank capital is positively related to profitability. A significant positive relationship between asset utilization and profitability is also noted at 1% significance level. The result also indicates that overhead expenses are significantly negatively related to profitability at 1% significance level. On the other hand, credit risk, cost inefficiency and bank size are not significantly related to profitability.

4.3.2 Fixed Effect (FE) Analysis on all selected sample Islamic banks for the period before GFC (2003 to 2007)

Table 4.10b presents the result of fixed effect panel data analysis on Equations 1 to 4 to analyze the relationships between bank capital, credit risk, cost inefficiency and profitability in all selected sample Islamic banks for the period before GFC (2003 to 2007). The results are interpreted based on the dependent variable that supports equations 1 to 4 in this regression analysis.

Bank Capital as dependent variable: F-test is used in order to identify whether a PLS or a fixed effect model should be used. Based on column one of Table 4.10b, the F test statistic is significant at 1% level. Therefore a fixed effect model would be appropriate to estimated Equation 1. The result indicates that bank size is significantly negatively related to bank capital at 1% significance level. However, the result reveals that credit risk, cost inefficiency, profitability and loan growth are not significantly related to bank capital.

Credit Risk as dependent variable: Based on column two of Table 4.10b, the F test statistic is significant at 1% level. This shows that a fixed effect model would be appropriate to estimated Equation 2. The result shows that loan growth is significantly positively related to credit risk at 10% significance level. On the other hand, bank capital, cost inefficiency, profitability, bank size and management efficiency are not significantly related to credit risk.

Table 4.10b: Results of the Fixed Effect Panel Data Analysis on all selected sample Islamic banks before GFC (2003 to 2007) period

Fixed-effects, using 297 bank year observations
Robust (HAC) standard errors

	Bank Capital *as dependent variable (1)*	***Credit Risk*** *as dependent variable (2)*	***Cost Inefficiency*** *as dependent variable (3)*	***Profitability*** *as dependent variable (4)*
Const.	57.907*** (13.874)	6.419* (3.445)	1.823*** (0.388)	-3.668 (3.690)
BC		-0.029 (0.019)	-0.003 (0.003)	0.025 (0.063)
CR	-0.422 (0.365)		-0.015* (0.008)	-0.091 (0.078)
CInE	-6.553 (6.002)	1.127 (0.853)		0.674 (1.648)
ROA	-0.535 (0.689)	-0.024 (0.049)	-0.028* (0.016)	
NLTA	-0.093 (0.108)	0.028* (0.016)	-0.005*** (0.002)	
SIZE	-3.217*** (1.230)	-0.402 (0.247)	-0.020 (0.044)	0.236 (0.219)
MGT_EFF		-0.043 (0.039)		
OBSTA			-0.000 (0.000)	
ASSUTI				1.105*** (0.240)
OHEADTOTA				-0.923*** (0.169)
Adjusted R-squared	0.844	0.675	0.571	0.778
F-test statistic	17.433 ***	7.170***	4.265***	2.749***

Note: BC = Bank Capital; CR = Credit Risk; CInE = Cost Inefficiency; ROA = Return on Asset; NLTA = Net Loan to Total Assets; SIZE = Bank Size; MGT_EFF = Management Efficiency; OBSTA = Off Balance Sheet Items; ASSUTI = Asset Utilization Ratio; OHEADTOTA = Overhead Expenses to Total Assets; ***, **, and * statistically significant at the 1%, 5%, and 10% levels, respectively. Standard errors are given in parentheses.

Cost Inefficiency as dependent variable: Column three of Table 4.10b shows that the F test statistic is significant at 1% level. Therefore a fixed effect model would be appropriate to estimated Equation 3. The credit risk is significantly positively related to cost inefficiency at 10% significance level. It could also be noted that profitability and loan growth are significantly negatively related to cost inefficiency at 10% and 1% significance level respectively. On the other hand, bank capital, bank size and off-balance sheet items are not significantly related to cost inefficiency.

<u>Profitability as dependent variable:</u> Based on column four of Table 4.10b, the F test statistic is significant at 1% level. This shows that a fixed effect model would be appropriate to estimated Equation 4. The result indicates that asset utilization is significantly positively related to profitability at 1% significance level. Meanwhile, overhead expenses are significantly negatively related to profitability at 1% significance level. However, the bank capital, credit risk, cost inefficiency and bank size are not significantly related to profitability.

4.3.3 Random Effect (RE) Analysis on all selected sample Islamic banks for the period before GFC (2003 to 2007)

Table 4.10c presents the result of random effect panel data analysis on Equations 1 to 4 to analyze the relationships between bank capital, credit risk, cost inefficiency and profitability in all selected sample Islamic banks for the period before GFC (2003 to 2007). The results are interpreted based on the dependent variable that supports equations 1 to 4 in this regression analysis.

<u>Bank Capital as dependent variable:</u> Breusch-Pagan test is used to decide whether to use a PLS or a random effect model. Based on column one of Table 4.10c, the Breusch-Pagan test statistic is significant at 1% level. This shows that a random effect model is preferred over a PLS model in estimating Equation 1. Meanwhile, Hausman test is used in order to choose between a fixed effect and a random effect model. The result shows that the Hausman test statistic is significant at 5% level. Therefore, a fixed effect model would be the most appropriate model to estimated Equation 1.

Table 4.10c: Results of the Random Effect Panel Data Analysis on all selected sample Islamic banks for the period before GFC (2003 to 2007)

Random-effects (GLS), using 297 bank year observations

	Bank Capital *as dependent variable* *(1)*	***Credit Risk*** *as dependent variable* *(2)*	***Cost Inefficiency*** *as dependent variable* *(3)*	***Profitability*** *as dependent variable* *(4)*
Const.	63.218*** (7.305)	2.667 (2.224)	1.653*** (0.113)	-2.493 (1.652)
BC		-0.035*** (0.011)	-0.003*** (0.001)	0.024** (0.012)
CR	-0.650** (0.268)		-0.013** (0.005)	-0.050 (0.063)
CInE	-7.326*** (2.814)	1.220* (0.668)		0.512 (0.815)
ROA	-0.426** (0.173)	-0.033 (0.038)	-0.025*** (0.003)	
NLTA	-0.104** (0.045)	0.035*** (0.010)	-0.004*** (0.001)	
SIZE	-3.381*** (0.713)	-0.211 (0.145)	-0.004 (0.013)	0.127 (0.147)
MGT_EFF		-0.020 (0.016)		
OBSTA			-0.000 (0.000)	
ASSUTI				1.079*** (0.067)
OHEADTOTA				-0.958*** (0.086)
Breusch-Pagan test (Chi-square)	210.365***	145.226***	30.386***	9.913***
Hausman test (Chi-square)	13.779 **	7.728	6.064	2.011

Note: BC = Bank Capital; CR = Credit Risk; CInE = Cost Inefficiency; ROA = Return on Asset; NLTA = Net Loan to Total Assets; SIZE = Bank Size; MGT_EFF = Management Efficiency; OBSTA = Off Balance Sheet Items; ASSUTI = Asset Utilization Ratio; OHEADTOTA = Overhead Expenses to Total Assets; ***, **, and * statistically significant at the 1%, 5%, and 10% levels, respectively. Standard errors are given in parentheses.

Credit Risk as dependent variable: Based on column two of Table 4.10c, the Breusch-Pagan test statistic is significant at 1% level. Therefore, a random effect model is preferred over a pooled least square model in estimating Equation 2. Meanwhile, the Hausman test statistic is not significant indicating that random effect model would be the most appropriate model to estimate Equation 2. The random effect results indicate that bank capital is significantly negatively related to credit risk at 1% significance level. The result also shows that cost inefficiency and loan growth are significantly positively related to credit risk at 10% and 1% significance level respectively. On the other hand, profitability, bank size and management efficiency are not significantly related to credit risk.

<u>Cost Inefficiency as dependent variable:</u> Column three of Table 4.10c shows that the Breusch-Pagan test statistic is significant at 1% level. Therefore, a random effect model is preferred over a pooled least square model in estimating Equation 3. Meanwhile, the Hausman test statistic is not significant indicating that random effect model would be the most appropriate model to estimate Equation 3. Bank capital, profitability and loan growth are found to be significantly negatively related to cost inefficiency at 1% significance level. Meanwhile, credit risk is significantly positively related to cost inefficiency at 5% significance level. On the other hand, bank size and off-balance sheet items are not significantly related to cost inefficiency.

<u>Profitability as dependent variable:</u> Based on column four of Table 4.10c, the Breusch-Pagan test statistic is significant at 1% level. Therefore, a random effect model is preferred over a pooled least square model in estimating Equation 4. Meanwhile, the Hausman test statistic is not significant indicating that random effect model would be the most appropriate model to estimate Equation 4. Bank capital and asset utilization are significantly positively related to profitability at 5% and 1% significance level respectively. The overhead expenses are significantly negatively related to profitability at 1% significance level. However, the result reveals that credit risk, cost inefficiency and bank size are not significantly related to profitability.

4.3.4 Two-Stage Least Square (2SLS) Analysis on all selected sample Islamic banks for the period before GFC (2003 to 2007)

Table 4.10d presents the result of two-stage least square panel data analysis and the specification tests (weak instruments test, Hausman test, and Sargan test) for Equation 1 through 4 as listed out in chapter three. The results are interpreted based on the dependent variable that supports equations 1 to 4 in this regression analysis.

Bank Capital as dependent variable: Based on column one of Table 4.10d, Hausman test is significant at 1% significance level. Therefore, it is appropriate to use TSLS. Sargan over-identification test indicates that Equation 1 is over-identified. The Sargan over-identification result in Table 4.10d is not significant indicating that all the instruments used in estimating Equation (1) are valid. The weak instrument test based on Cragg-Donald minimum eigenvalue is significant at 5% significance level. This indicates that the instruments used are neither weak nor invalid. Based on Table 4.10d, none of the independent variables are significantly related to bank capital.

Credit Risk as dependent variable: The result in column two of Table 4.10d indicates that Hausman test is not significant. Therefore, it is appropriate to use OLS. As mentioned in the earlier section, a random effect model is preferred over a fixed effect model and pooled OLS.

Cost Inefficiency as dependent variable: Based on column three of Table 4.10d, Hausman test is significant at 1% significance level. Therefore, it is appropriate to use TSLS. Sargan over-identification test result is not available. This is because Equation (3) is exactly identified as noted in Chapter 3 under the order condition analysis. The weak instrument test based on Cragg-Donald minimum eigenvalue is significant at 5%

significance level. This indicates that the instruments used are neither weak nor invalid. Based on Table 4.10d, none of the independent variables are significantly related to cost inefficiency.

Table 4.10d: Results of the Two Stage Least Square Panel Data Analysis on all selected sample Islamic banks before GFC (2003 to 2007) period

TSLS, using 297 bank year observations
Instruments: const., NLTA, SIZE, MGT_EFF, OBSTA, ASSUTI, OHEADTOTA
Robust (HAC) standard errors

	Bank Capital *as dependent variable (1)*	***Credit Risk*** *as dependent variable (2)*	***Cost Inefficiency*** *as dependent variable (3)*	***Profitability*** *as dependent variable (4)*
Const.	85.617* (51.887)	-21.032 (33.644)	1.518 (1.529)	-11.514 (7.500)
BC		-0.295 (0.833)	-0.005 (0.035)	0.224* (0.127)
CR	12.607 (14.882)		0.397 (0.286)	0.335 (0.562)
CInE	-32.765 (39.318)	16.181 (30.548)		2.052 (3.186)
ROA	1.046 (1.107)	0.480 (1.300)	0.022 (0.042)	
NLTA	-0.693 (0.617)	-0.010 (0.140)	-0.018 (0.012)	
SIZE	-2.354 (2.287)	-0.904 (2.443)	-0.009 (0.102)	0.575 (0.383)
MGT_EFF		0.156 (0.346)		
OBSTA			0.000 (0.000)	
ASSUTI				1.027*** (0.145)
OHEADTOTA				-1.204*** (0.253)
Instrumented	CR CInE ROA	BC CInE ROA	BC CR ROA	BC CR CInE
Hausman test (Chi-square)	19.530***	2.689	164.96***	4.215
Sargan over-identification test statistic	0.935			
Weak instrument test - Cragg-Donald minimum eigenvalue	0.096**	0.018**	0.970**	0.623**

Note: BC = Bank Capital; CR = Credit Risk; CInE = Cost Inefficiency; ROA = Return on Asset; NLTA = Net Loan to Total Assets; SIZE = Bank Size; MGT_EFF = Management Efficiency; OBSTA = Off Balance Sheet Items; ASSUTI = Asset Utilization Ratio; OHEADTOTA = Overhead Expenses to Total Assets; ***, **, and * statistically significant at the 1%, 5%, and 10% levels, respectively. Standard errors are given in parentheses.

Profitability as dependent variable: Based on column four of Table 4.10d, Hausman test is not significant. Therefore, it is appropriate to use OLS. As mentioned in the earlier section, a fixed effect model is preferred over a pooled OLS.

4.3.5 The Summary of Panel Data Analysis finding for all selected sample Islamic banks for the period before GFC (2003 to 2007)

Table 4.10e summarizes the results of the Panel Data Analysis as discussed in Sections 4.3.1 through 4.3.4.

Table 4.10e: Summary of Panel Data Analysis finding for all selected sample Islamic banks before GFC (2003 to 2007) period

Dependent Variable	**Appropriate Panel Data Model Used**	**Findings**
Bank Capital	Two-Stage Least Square model	i. Credit risk **positively** affects bank capital. ii. Cost inefficiency **negatively** affects bank capital. iii. Profitability **positively** affects bank capital. iv. Loan growth **negatively** affects bank capital. v. Bank size **negatively** affects bank capital.
Credit Risk	Random Effect model	i. Bank capital significantly **negatively** affects credit risk. ii. Cost inefficiency significantly **positively** affects credit risk. iii. Profitability **negatively** affects credit risk. iv. Loan growth significantly **positively** affects credit risk. v. Bank size **negatively** affects credit risk. vi. Management efficiency **negatively** affects credit risk.
Cost Inefficiency	Two-Stage Least Square model	i. Bank capital **negatively** affects cost inefficiency. ii. Credit risk **positively** affects cost inefficiency. iii. Profitability **positively** affects cost inefficiency. iv. Loan growth **negatively** affects cost inefficiency. v. Bank size **negatively** affects cost inefficiency. vi. Off-balance sheet items **positively** affect cost inefficiency.
Profitability	Random Effect model	i. Bank capital significantly **positively** affects profitability. ii. Credit risk **negatively** affects profitability. iii. Cost inefficiency **positively** affects profitability. iv. Bank size **positively** affects profitability. v. Asset utilization significantly **positively** affects profitability. vi. Overhead expenses significantly **negatively** affects profitability

4.4 Determining the Relationships between Bank Capital, Credit Risk, Cost Inefficiency, and Profitability on *all selected sample Islamic banks for the period after GFC (2008 to 2012)*

In this section, the results of the panel data analysis of the relationships between bank capital, credit risk, cost inefficiency and profitability on all selected sample Islamic banks for the period after GFC (2008 to 2012) are presented. The results of the pooled least square analysis, fixed effect analysis, random effect analysis and two-stage least square analysis based on Equations 1 to 4 as listed out in chapter three are presented. Multicollinearity analysis was carried out by computing the Variance Inflation Factors (VIF) of the independent variables used in Equations 1 to 4. Based on the results as presented in Appendix 1, all the VIF values are less than 10, indicating that the independent variables used in Equations 1 to 4 are not highly correlated with each other. Therefore, none of the independent variables are excluded from Equations 1 to 4.

4.4.1 Pooled Least Square (PLS) analysis on all selected sample Islamic banks for the period after GFC (2008 to 2012)

Table 4.11a presents the result of pooled least square technique on Equations 1 to 4 to analyze the relationships between bank capital, credit risk, cost inefficiency and profitability in all selected sample Islamic banks for the period after GFC (2008 to 2012). The results are interpreted based on the dependent variable that supports equations 1 to 4 in this regression analysis.

Bank Capital as dependent variable: From column one of Table 4.11a, it can be noted that credit risk and bank size are significantly negatively related to bank capital at 5% significance level. It can also be noted that cost inefficiency and profitability are significantly negatively related to bank capital at 10% significance level. However, loan growth is not significantly related to bank capital.

Credit Risk as dependent variable: The results reported in column two of Table 4.11a indicate that cost inefficiency and profitability are significantly negatively related to credit risk at 10% and 5% significance level respectively. On the other hand, bank capital, loan growth, bank size and management efficiency are not significantly related to credit risk.

Table 4.11a: Results of the Pooled Least Square analysis on all selected sample Islamic banks for the period after GFC (2008 to 2012)

Pooled OLS, using 353 bank year observations
Robust (HAC) standard errors

	Bank Capital *as dependent variable* *(1)*	***Credit Risk*** *as dependent variable* *(2)*	***Cost Inefficiency*** *as dependent variable* *(3)*	***Profitability*** *as dependent variable* *(4)*
Const.	55.115*** (15.218)	9.011* (5.376)	1.379*** (0.105)	-1.041 (1.457)
BC		-0.077 (0.065)	-0.003** (0.001)	-0.010 (0.010)
CR	-1.779** (0.813)		0.010 (0.006)	-0.358*** (0.036)
CInE	-12.155* (6.678)	-1.830* (1.023)		0.009 (0.800)
ROA	-0.846* (0.438)	-0.422** (0.172)	-0.029* (0.015)	
NLTA	-0.036 (0.032)	0.007 (0.008)	-0.001 (0.001)	
SIZE	-1.990** (0.875)	-0.244 (0.329)	0.018 (0.016)	0.130* (0.069)
MGT_EFF		-0.013 (0.018)		
OBSTA			-0.000 (0.001)	
ASSUTI				0.879*** (0.184)
OHEADTOTA				-0.844*** (0.109)
Adjusted R-squared	0.194	0.284	0.171	0.695
F-statistics	17.938***	24.230***	13.071***	134.857***

Note: BC = Bank Capital; CR = Credit Risk; CInE = Cost Inefficiency; ROA = Return on Asset; NLTA = Net Loan to Total Assets; SIZE = Bank Size; MGT_EFF = Management Efficiency; OBSTA = Off Balance Sheet Items; ASSUTI = Asset Utilization Ratio; OHEADTOTA = Overhead Expenses to Total Assets; ***, **, and * statistically significant at the 1%, 5%, and 10% levels, respectively. Standard errors are given in parentheses.

Cost Inefficiency as dependent variable: Column three of Table 4.11a indicates that at 1% significance level, bank capital is significantly negatively related to cost inefficiency. The profitability is significantly negatively related to cost inefficiency at 10% significance level. However, credit risk, loan growth, bank size and off-balance sheet items are not significantly related to cost inefficiency.

Profitability as dependent variable: From column four of Table 4.11a, it can be noted that credit risk and overhead expenses are significantly negatively related to profitability at 1% significance level. It can also be noted that bank size is significantly positively related to profitability at 10% significance level. Asset utilization is also found to be significantly positively related to profitability at 1% significance level. On the other hand, bank capital and cost inefficiency is not significantly related to profitability.

4.4.2 Fixed Effect (FE) analysis on all selected sample Islamic banks for the period after GFC (2008 to 2012)

Table 4.11b presents the result of fixed effect panel data analysis on Equation 1 to 4.

Table 4.11b: Results of the Fixed Effect Panel Data Analysis on all selected sample Islamic banks for the period after GFC (2008 to 2012)

Fixed-effects, using 353 bank year observations
Robust (HAC) standard errors

	Bank Capital *as dependent variable (1)*	***Credit Risk*** *as dependent variable (2)*	***Cost Inefficiency*** *as dependent variable (3)*	***Profitability*** *as dependent variable (4)*
Const.	54.311*** (9.423)	16.983*** (5.089)	1.777*** (0.565)	-9.599* (5.331)
BC		-0.151* (0.081)	-0.002 (0.004)	0.107* (0.064)
CR	-1.110* (0.572)		-0.010 (0.012)	-0.192 (0.137)
CInE	-0.936 (2.088)	-0.953** (0.445)		0.503 (0.769)
ROA	0.252 * (0.144)	-0.092 (0.060)	-0.028* (0.016)	
NLTA	0.006 (0.006)	0.000 (0.002)	-0.001 (0.001)	
SIZE	-4.368*** (1.180)	-1.121** (0.521)	-0.034 (0.065)	0.778* (0.466)
MGT_EFF		-0.022 (0.016)		
OBSTA			-0.001** (0.000)	
ASSUTI				0.946*** (0.247)
OHEADTOTA				-0.788*** (0.114)
Adjusted R-squared	0.932	0.806	0.435	0.724
F-test statistic	45.702 ***	12.068***	2.930***	1.429**

Note: BC = Bank Capital; CR = Credit Risk; CInE = Cost Inefficiency; ROA = Return on Asset; NLTA = Net Loan to Total Assets; SIZE = Bank Size; MGT_EFF = Management Efficiency; OBSTA = Off Balance Sheet Items; ASSUTI = Asset Utilization Ratio; OHEADTOTA = Overhead Expenses to Total Assets; ***, **, and * statistically significant at the 1%, 5%, and 10% levels, respectively. Standard errors are given in parentheses.

Bank Capital as dependent variable: F-test is used in order to identify whether a PLS or a fixed effect model should be used. Based on column one of Table 4.11b, the F test statistic is significant at 1% level. Therefore a fixed effect model would be appropriate to estimated Equation 1. The credit risk and bank size are significantly negatively related to bank capital at 10% and 1% significance level respectively. Table 4.11b also reveals that profitability is significantly positively related to bank capital at 10% significance level. Meanwhile, cost inefficiency and loan growth are not significantly related to bank capital.

Credit Risk as dependent variable: Based on column two of Table 4.11b, the F test statistic is significant at 1% level. This shows that a fixed effect model would be appropriate to estimated Equation 2. Bank capital is significantly negatively related to credit risk at 10% significance level. Table 4.11b also reveals that cost inefficiency and bank size are significantly negatively related to credit risk at 5% significance level. On the other hand, profitability, loan growth and management efficiency are not significantly related to credit risk.

Cost Inefficiency as dependent variable: Column three of Table 4.11b shows that the F test statistic is significant at 1% level. Therefore a fixed effect model would be appropriate to estimated Equation 3. It could be noted that profitability and off-balance sheet items are significantly negatively related to cost inefficiency at 10% and 5% significance level respectively. On the other hand, bank capital, credit risk, loan growth and bank size are not significantly related to cost inefficiency.

Profitability as dependent variable: From column four of Table 4.11b, it can be noted that the F test statistic is significant at 5% level. This shows that a fixed effect model would be appropriate to estimated Equation 4. The result reported indicates that bank capital and bank size are significantly positively related to profitability at 10% significance level. The result also indicates that asset utilization is significantly positively related to profitability at 1% significance level. Meanwhile, overhead expenses are significantly negatively related to profitability at 1% significance level. However, credit risk and cost inefficiency are not significantly related to profitability.

4.4.3 Random Effect (RE) analysis on all selected sample Islamic banks for the period after GFC (2008 to 2012)

Table 4.11c presents the result of random effect panel data analysis on Equations 1 to 4.

Bank Capital as dependent variable: Breusch-Pagan test is used to decide whether to use a PLS or a random effect model. Based on column one of Table 4.11c, the Breusch-Pagan test statistic is significant at 1% level. This shows that a random effect model is preferred over a PLS model in estimating Equation 1. Meanwhile, Hausman test is used in order to choose between a fixed effect and a random effect model. The result shows that the Hausman test statistic is significant at 1% level. Therefore, a fixed effect model would be the most appropriate model to estimated Equation 1.

Credit Risk as dependent variable: Based on column two of Table 4.11c, the Breusch-Pagan test statistic is significant at 1% level. Therefore, a random effect model is preferred over a pooled least square model in estimating Equation 2. Meanwhile, Hausman test statistic is significant at 1% level. Therefore, a fixed effect model would be the most appropriate model to estimated Equation 2.

Table 4.11c: Results of the Random Effect Panel Data Analysis on all selected sample Islamic banks for the period after GFC (2008 to 2012)

Random-effects (GLS), using 353 bank year observations

	Bank Capital *as dependent variable* *(1)*	***Credit Risk*** *as dependent variable* *(2)*	***Cost Inefficiency*** *as dependent variable* *(3)*	***Profitability*** *as dependent variable* *(4)*
Const.	51.128*** (5.298)	11.522*** (1.990)	1.413*** (0.117)	-1.324 (1.109)
BC		-0.096*** (0.014)	-0.003** (0.001)	-0.007 (0.009)
CR	-1.143*** (0.147)		-0.010* (0.005)	-0.351*** (0.039)
CInE	-1.396 (1.310)	-1.125** (0.533)		-0.004 (0.609)
ROA	0.212** (0.092)	-0.160*** (0.034)	-0.028*** (0.004)	
NLTA	0.003 (0.010)	0.001 (0.004)	-0.001 (0.000)	
SIZE	-3.886*** (0.581)	-0.563*** (0.160)	-0.013 (0.013)	0.148 (0.096)
MGT_EFF		-0.018 (0.013)		
OBSTA			-0.000 (0.001)	
ASSUTI				0.886*** (0.051)
OHEADTOTA				-0.824*** (0.070)
Breusch-Pagan test (Chi-square)	486.563***	285.883***	43.530***	0.929
Hausman test (Chi-square)	18.964***	48.323***	4.336	27.381***

Note: BC = Bank Capital; CR = Credit Risk; CInE = Cost Inefficiency; ROA = Return on Asset; NLTA = Net Loan to Total Assets; SIZE = Bank Size; MGT_EFF = Management Efficiency; OBSTA = Off Balance Sheet Items; ASSUTI = Asset Utilization Ratio; OHEADTOTA = Overhead Expenses to Total Assets; ***, **, and * statistically significant at the 1%, 5%, and 10% levels, respectively. Standard errors are given in parentheses.

Cost Inefficiency as dependent variable: Column three of Table 4.11c shows that the Breusch-Pagan test statistic is significant at 1% level. Therefore, a random effect model is preferred over a pooled least square model in estimating Equation 3. Meanwhile, the Hausman test statistic is not significant indicating that random effect model would be the most appropriate model to estimate Equation 3. The random effect result shows that bank capital, credit risk and profitability are significantly negatively related to cost inefficiency. On the other hand, loan growth, bank size and off-balance sheet items are not significantly related to cost inefficiency.

Profitability as dependent variable: Based on column four of Table 4.11c, the Breusch-Pagan test statistic is not significant. This shows that a PLS model is preferred over a random effect model in estimating Equation 4. However, as mentioned earlier, based on Table 4.11b, a fixed effect model would be appropriate to estimate Equation 4.

4.4.4 Two-Stage Least Square (2SLS) Analysis on all selected sample Islamic banks for the period after GFC (2008 to 2012)

Table 4.11d presents the result of two-stage least square panel data analysis and the specification tests (weak instruments test, Hausman test, and Sargan test) for Equation 1 through 4 as listed out in chapter three. The results are interpreted based on the dependent variable that supports equations 1 to 4 in this regression analysis.

Bank Capital as dependent variable: Based on column one of Table 4.11d, Hausman test is significant at 1% significance level. Therefore, it is appropriate to use TSLS. Sargan over-identification test indicates that Equation 1 is over-identified. The Sargan over-identification result is not significant indicating that all the instruments used in estimating Equation (1) are valid. The weak instrument test based on Cragg-Donald minimum eigenvalue is significant at 5% significance level. This indicates that the instruments used are neither weak nor invalid. Based on Table 4.11d, none of the independent variables are significantly related to bank capital.

Credit Risk as dependent variable: The result in column two of Table 4.11d indicates that Hausman test is significant at 1% significance level. Therefore, it is appropriate to use TSLS. The weak instrument test based on Cragg-Donald minimum eigenvalue is significant at 5% significance level. This indicates that the instruments used are neither weak nor invalid. Based on Table 4.11d, none of the independent variables are significantly related to credit risk.

Table 4.11d: Results of the Two Stage Least Square Panel Data Analysis on all selected sample Islamic banks after GFC (2008 to 2012) period

TSLS, using 353 bank year observations
Instruments: const. NLTA, SIZE, MGT_EFF, OBSTA, ASSUTI, OHEADTOTA
Robust (HAC) standard errors

	Bank Capital *as dependent variable (1)*	***Credit Risk*** *as dependent variable (2)*	***Cost Inefficiency*** *as dependent variable (3)*	***Profitability*** *as dependent variable (4)*
Const.	15.181 (17.374)	-13.891 (72.978)	-1.364 (3.155)	2.672 (6.773)
BC		-0.947 (4.677)	-0.030 (0.072)	-0.112 (0.141)
CR	4.116 (6.259)		0.706 (0.839)	-0.496 (0.352)
CInE	-2.997 (10.095)	23.380 (101.911)		-0.327 (1.863)
ROA	-0.047 (0.579)	0.548 (2.871)	0.009 (0.063)	
NLTA	-0.080 (0.077)	-0.030 (0.205)	-0.008 (0.009)	
SIZE	-0.203 (2.383)	-2.850 (12.508)	0.212 (0.306)	-0.085 (0.286)
MGT_EFF		0.285 (1.346)		
OBSTA			0.008 (0.009)	
ASSUTI				0.890*** (0.181)
OHEADTOTA				-0.706** (0.293)
Instrumented	CR CInE ROA	BC CInE ROA	BC CR ROA	BC CR CInE
Hausman test (Chi-square)	32.011***	43.921***	357.131***	1.915
Sargan over-identification test statistic	2.578			
Weak instrument test - Cragg-Donald minimum eigenvalue	0.461**	0.020**	0.312**	1.047**

Note: BC = Bank Capital; CR = Credit Risk; CInE = Cost Inefficiency; ROA = Return on Asset; NLTA = Net Loan to Total Assets; SIZE = Bank Size; MGT_EFF = Management Efficiency; OBSTA = Off Balance Sheet Items; ASSUTI = Asset Utilization Ratio; OHEADTOTA = Overhead Expenses to Total Assets; ***, **, and * statistically significant at the 1%, 5%, and 10% levels, respectively. Standard errors are given in parentheses.

Cost Inefficiency as dependent variable: Based on column three of Table 4.11d, Hausman test is significant at 1% significance level. Therefore, it is appropriate to use TSLS. Sargan over-identification test result is not available. This is because Equation (3) is exactly identified as noted in Chapter 3 under the order condition analysis. The weak instrument test based on Cragg-Donald minimum eigenvalue is significant at 5% significance level. This indicates that the instruments used are neither weak nor invalid. Based on Table 4.11d, none of the independent variables are significantly related to cost inefficiency.

Profitability as dependent variable: Based on column four of Table 4.11d, Hausman test is not significant. Therefore, it is appropriate to use OLS. As mentioned in the earlier section, a fixed effect model is preferred over a pooled OLS.

4.4.5 The Summary on Panel Data Analysis finding for all selected sample Islamic banks for the period after GFC (2008 to 2012)

Table 4.11e summarizes the results of the Panel Data Analysis as discussed in Sections 4.4.1 through 4.4.4.

Table 4.11e: Summary of Panel Data Analysis finding for all selected sample Islamic banks for the period after GFC (2008 to 2012)

Dependent Variable	**Appropriate Panel Data Model Used**	**Findings**
Bank Capital	Two-Stage Least Square model	i. Credit risk **positively** affects bank capital. ii. Cost inefficiency **negatively** affects bank capital. iii. Profitability **negatively** affects bank capital. iv. Loan growth **negatively** affects bank capital. v. Bank size **negatively** affects bank capital.
Credit Risk	Two-Stage Least Square model	i. Bank capital **negatively** affects credit risk. ii. Cost inefficiency **positively** affects credit risk. iii. Profitability **positively** affects credit risk. iv. Loan growth **negatively** affects credit risk. v. Bank size **negatively** affects credit risk. vi. Management efficiency **positively** affects credit risk.
Cost Inefficiency	Two-Stage Least Square model	i. Bank capital **negatively** affects cost inefficiency. ii. Credit risk **positively** affects cost inefficiency. iii. Profitability **positively** affects cost inefficiency. iv. Loan growth **negatively** affects cost inefficiency. v. Bank size **positively** affects cost inefficiency. vi. Off-balance sheet items **positively** affect cost inefficiency.
Profitability	Fixed Effect model	i. Bank capital significantly **positively** affects profitability. ii. Credit risk **negatively** affects profitability. iii. Cost inefficiency **positively** affects profitability. iv. Bank size significantly **positively** affects profitability. v. Asset utilization significantly **positively** affects profitability. vi. Overhead expenses significantly **negatively** affects profitability

4.5 Determining the Relationships between Bank Capital, Credit Risk, Cost Inefficiency, and Profitability of *Islamic banks in MENA region for the overall period of 10 years (2003 to 2012)*

In this section, the results of the panel data analysis of the relationships between bank capital, credit risk, cost inefficiency and profitability of Islamic banks in MENA region for the overall 10 year observation period are presented. The results of the pooled least square analysis, fixed effect analysis, random effect analysis and two-stage least square analysis based on Equations 1 to 4 as listed out in chapter three are presented. Multicollinearity analysis was carried out by computing the Variance Inflation Factors (VIF) of the independent variables used in Equations 1 to 4. Based on the results as presented in Appendix 1, all the VIF values are less than 10, indicating that the independent variables used in Equations 1 to 4 are not highly correlated with each other. Therefore, none of the independent variables are excluded from Equations 1 to 4.

4.5.1 Pooled Least Square (PLS) analysis on Islamic banks in MENA region for the overall period of 10 years (2003 to 2012)

Table 4.12a presents the result of pooled least square technique on Equation 1 to 4 to analyze the relationships between bank capital, credit risk, cost inefficiency and profitability in Islamic banks in MENA region for the overall period of 10 years (2003 to 2012). The results are interpreted based on the dependent variable that supports equations 1 to 4 in this regression analysis.

Bank Capital as dependent variable: From column one of Table 4.12a, it can be noted that profitability is significantly positively related to bank capital at 5% significance level. It can also be noted that bank size is significantly negatively related to bank capital at 1% significance level. However, bank capital, cost inefficiency and loan growth are not significantly related to bank capital.

Credit Risk as dependent variable: The results reported in column two of Table 4.12a indicate that profitability is significantly negatively related to credit risk at 1% significance level. On the other hand, bank capital, cost inefficiency, loan growth, bank size and management efficiency are not significantly related to credit risk.

Cost Inefficiency as dependent variable: Column three of Table 4.12a indicates that at 10% significance level, bank capital is significantly negatively related to cost inefficiency. However, credit risk, profitability, loan growth, bank size and off-balance sheet items are not significantly related to cost inefficiency.

Table 4.12a: Results of the Pooled Least Square (PLS) analysis on Islamic banks in MENA region for the overall period of 10 years (2003 to 2012)

Pooled OLS, using 395 bank year observations
Robust (HAC) standard errors

	Bank Capital *as dependent variable* *(1)*	***Credit Risk*** *as dependent variable* *(2)*	***Cost Inefficiency*** *as dependent variable* *(3)*	***Profitability*** *as dependent variable* *(4)*
Const.	52.882*** (16.532)	1.048 (2.175)	1.314*** (0.082)	-1.938 (1.424)
BC		0.002 (0.011)	-0.002* (0.001)	0.036* (0.020)
CR	0.085 (0.464)		0.006 (0.005)	-0.227** (0.101)
CInE	-7.674 (8.785)	-0.572 (0.698)		0.690 (0.926)
ROA	0.511** (0.230)	-0.097*** (0.031)	-0.016 (0.010)	
NLTA	-0.019 (0.028)	0.004 (0.004)	-0.001 (0.001)	
SIZE	-2.982*** (1.042)	0.042 (0.138)	0.019 (0.012)	0.035 (0.077)
MGT_EFF		-0.000 (0.017)		
OBSTA			-0.001 (0.001)	
ASSUTI				1.031*** (0.152)
OHEADTOTA				-0.979*** (0.146)
Adjusted R-squared	0.138	0.035	0.150	0.593
F-statistics	13.586***	3.403***	12.559***	96.483***

Note: BC = Bank Capital; CR = Credit Risk; CInE = Cost Inefficiency; ROA = Return on Asset; NLTA = Net Loan to Total Assets; SIZE = Bank Size; MGT_EFF = Management Efficiency; OBSTA = Off Balance Sheet Items; ASSUTI = Asset Utilization Ratio; OHEADTOTA = Overhead Expenses to Total Assets; ***, **, and * statistically significant at the 1%, 5%, and 10% levels, respectively. Standard errors are given in parentheses.

Profitability as dependent variable: It can be noted from column four of Table 4.12a that bank capital and asset utilization are significantly positively related to profitability at 10% and 1% significance level respectively. It can also be noted that credit risk and overhead expenses are significantly negatively related to profitability at 5% and 1% significance level respectively. On the other hand, cost inefficiency and bank size are not significantly related to profitability.

4.5.2 Fixed Effect (FE) Analysis on Islamic banks in MENA region for the overall period of 10 years (2003 to 2012)

Table 4.12b presents the result of fixed effect panel data analysis on Equations 1 to 4 in determining the relationships between bank capital, credit risk, cost inefficiency and profitability in Islamic banks that operate in MENA region for the overall period of 10 years (2003 to 2012).

Table 4.12b: Results of the Fixed Effect (FE) Analysis on Islamic banks in MENA region over the 10 year period (2003 to 2012)

Fixed-effects, using 395 bank year observations
Robust (HAC) standard errors

	Bank Capital *as dependent variable* *(1)*	***Credit Risk*** *as dependent variable* *(2)*	***Cost Inefficiency*** *as dependent variable* *(3)*	***Profitability*** *as dependent variable* *(4)*
Const.	55.398*** (14.307)	10.819*** (3.972)	1.467*** (0.144)	-0.707 (3.134)
BC		-0.047*** (0.017)	-0.003 (0.002)	0.089 (0.075)
CR	-0.638* (0.332)		0.000 (0.011)	-0.331** (0.141)
CInE	-2.678 (3.057)	-0.327 (0.652)		0.076 (1.142)
ROA	0.186 (0.222)	-0.104*** (0.031)	-0.018 (0.011)	
NLTA	0.004 (0.011)	0.004 (0.003)	-0.001 (0.001)	
SIZE	-4.028** (1.493)	-0.622* (0.335)	0.002 (0.015)	-0.197 (0.257)
MGT_EFF		-0.028* (0.016)		
OBSTA			-0.001*** (0.000)	
ASSUTI				1.077*** (0.197)
OHEADTOTA				-0.803*** (0.172)
Adjusted R-squared	0.818	0.421	0.334	0.607
F-test statistic	34.970 ***	6.395***	4.723***	12.500***

Note: BC = Bank Capital; CR = Credit Risk; CInE = Cost Inefficiency; ROA = Return on Asset; NLTA = Net Loan to Total Assets; SIZE = Bank Size; MGT_EFF = Management Efficiency; OBSTA = Off Balance Sheet Items; ASSUTI = Asset Utilization Ratio; OHEADTOTA = Overhead Expenses to Total Assets; ***, **, and * statistically significant at the 1%, 5%, and 10% levels, respectively. Standard errors are given in parentheses.

Bank Capital as dependent variable: F-test is used in order to identify whether a PLS or a fixed effect model should be used. Based on column one of Table 4.12b, the F test statistic is significant at 1% level. Therefore a fixed effect model would be appropriate to estimated Equation 1. The credit risk and bank size are significantly negatively related to bank capital at 10% and 1% significance level respectively. Meanwhile, cost inefficiency, profitability and loan growth are not significantly related to bank capital.

Credit Risk as dependent variable: Based on column two of Table 4.12b, the F test statistic is significant at 1% level. This shows that a fixed effect model would be appropriate to estimated Equation 2. The bank capital and profitability are significantly negatively related to credit risk at 1% significance level. The result also reveals that bank size and management efficiency are significantly negatively related to credit risk at 10% significance level. On the other hand, cost inefficiency and loan growth are not significantly related to credit risk.

Cost Inefficiency as dependent variable: Column three of Table 4.12b shows that the F test statistic is significant at 1% level. Therefore a fixed effect model would be appropriate to estimated Equation 3. It could be noted that off-balance sheet items are significantly negatively related to cost inefficiency at 1% significance level. On the other hand, bank capital, credit risk, profitability, loan growth and bank size are not significantly related to cost inefficiency.

Profitability as dependent variable: From column four of Table 4.12b, it can be noted that the F test statistic is significant at 1% level. This shows that a fixed effect model would be appropriate to estimated Equation 4. The result reported in Table 4.12b indicates that credit risk and overhead expenses are significantly negatively related to profitability at 5% and 1% significance level respectively. The result also indicates that asset utilization is significantly positively related to profitability at 1% significance level. However, bank capital, cost inefficiency and bank size is not significantly related to profitability.

4.5.3 Random Effect (RE) Analysis on Islamic banks in MENA region for the overall period of 10 years (2003 to 2012)

Table 4.12c presents the result of random effect panel data analysis on Equations 1 to 4 in determining the relationships between bank capital, credit risk, cost inefficiency and profitability in Islamic banks that operate in MENA region for the overall period of 10 years (2003 to 2012).

Bank Capital as dependent variable: Breusch-Pagan test is used to decide whether to use a PLS or a random effect model. Based on column one of Table 4.12c, the Breusch-Pagan test statistic is significant at 1% level. This shows that a random effect model is preferred over a PLS model in estimating Equation 1. Meanwhile, Hausman test is used in order to choose between a fixed effect and a random effect model. The result shows that the Hausman test statistic is significant at 10% level. Therefore, a fixed effect model would be the most appropriate model to estimated Equation 1.

Credit Risk as dependent variable: Based on column two of Table 4.12c, the Breusch-Pagan test statistic is significant at 1% level. Therefore, a random effect model is preferred over a pooled least square model in estimating Equation 2. Meanwhile, Hausman test statistic is significant at 5% level. Therefore, a fixed effect model would be the most appropriate model to estimated Equation 2.

Table 4.12c: Results of the Random Effect (RE) Analysis on Islamic banks in MENA region for the overall period of 10 years (2003 to 2012)

Random-effects (GLS), using 395 bank year observations

	Bank Capital *as dependent variable (1)*	***Credit Risk*** *as dependent variable (2)*	***Cost Inefficiency*** *as dependent variable (3)*	***Profitability*** *as dependent variable (4)*
Const.	54.260*** (5.038)	5.573*** (1.829)	1.359*** (0.109)	-1.938 (1.258)
BC		-0.023** (0.011)	-0.002* (0.001)	0.036*** (0.010)
CR	-0.585*** (0.203)		0.003 (0.006)	-0.227*** (0.065)
CInE	-2.842* (1.708)	0.026 (0.479)		0.690 (0.788)
ROA	0.205** (0.089)	-0.099*** (0.023)	-0.017*** (0.003)	
NLTA	0.003 (0.011)	0.004 (0.003)	-0.001** (0.000)	
SIZE	-3.847*** (0.518)	-0.239** (0.116)	0.014 (0.012)	0.035 (0.099)
MGT_EFF		-0.013 (0.011)		
OBSTA			-0.001 (0.001)	
ASSUTI				1.031*** (0.051)
OHEADTOTA				-0.979*** (0.085)
Breusch-Pagan test (Chi-square)	996.593***	184.635***	50.845***	0.248
Hausman test (Chi-square)	10.445*	14.688**	5.815	25.821***

Note: BC = Bank Capital; CR = Credit Risk; CInE = Cost Inefficiency; ROA = Return on Asset; NLTA = Net Loan to Total Assets; SIZE = Bank Size; MGT_EFF = Management Efficiency; OBSTA = Off Balance Sheet Items; ASSUTI = Asset Utilization Ratio; OHEADTOTA = Overhead Expenses to Total Assets; ***, **, and * statistically significant at the 1%, 5%, and 10% levels, respectively. Standard errors are given in parentheses.

Cost Inefficiency as dependent variable: Column three of Table 4.12c shows that the Breusch-Pagan test statistic is significant at 1% level. Therefore, a random effect model is preferred over a pooled least square model in estimating Equation 3. Meanwhile, the Hausman test statistic is not significant indicating that random effect model would be the most appropriate model to estimate Equation 3. The random effect result shows that bank capital, profitability and loan growth are significantly negatively related to cost inefficiency. On the other hand, credit risk, bank size and off-balance sheet items are not significantly related to cost inefficiency.

Profitability as dependent variable: Based on column four of Table 4.12c, the Breusch-Pagan test statistic is not significant. This shows that a PLS model is preferred over a random effect model in estimating Equation 4. However, as mentioned earlier, based on Table 4.12b, a fixed effect model would be appropriate to estimate Equation 4.

4.5.4 Two-Stage Least Square (2SLS) Analysis on Islamic banks in MENA region for the overall 10 year observation period (2003 to 2012)

Table 4.12d presents the result of two-stage least square panel data analysis and the specification tests (weak instruments test, Hausman test, and Sargan test) for Equation 1 through 4 as listed out in chapter three. The results are interpreted based on the dependent variable that supports equations 1 to 4 in this regression analysis.

Bank Capital as dependent variable: Based on column one of Table 4.12d, Hausman test is significant at 1% significance level. Therefore, it is appropriate to use TSLS. Sargan over-identification test indicates that Equation 1 is over-identified. The Sargan over-identification result is not significant indicating that all the instruments used in estimating Equation (1) are valid. The weak instrument test based on Cragg-Donald minimum eigenvalue is significant at 5% significance level. This indicates that the instruments used are neither weak nor invalid. The profitability is significantly positively related to bank capital at 1% significance level. The table also shows that bank size is negatively related to bank capital at 1% level of significance.

Credit Risk as dependent variable: Based on column two of Table 4.12d, Hausman test is not significant. Therefore, it is appropriate to use OLS. As mentioned in the earlier section, a fixed effect model is preferred over a pooled OLS.

Table 4.12d: Results of the Two Stage Least Square Panel Data Analysis on Islamic banks in MENA region for the overall period of 10 years (2003 to 2012)

TSLS, using 395 bank year observations
Instruments: const., NLTA, SIZE, MGT_EFF, OBSTA, ASSUTI, OHEADTOTA
Robust (HAC) standard errors

	Bank Capital *as dependent variable (1)*	***Credit Risk*** *as dependent variable (2)*	***Cost Inefficiency*** *as dependent variable (3)*	***Profitability*** *as dependent variable (4)*
Const.	14.535 (11.994)	1.933 (4.252)	-1.774 (3.226)	4.151 (7.488)
BC		0.125 (0.125)	0.037 (0.050)	-0.045 (0.170)
CR	6.569 (6.858)		0.662 (1.624)	0.484 (1.284)
CInE	14.210 (10.673)	-3.002 (4.518)		-3.574 (4.561)
ROA	1.507*** (0.457)	-0.232 (0.208)	0.006 (0.151)	
NLTA	-0.013 (0.037)	0.002 (0.005)	-0.003 (0.006)	
SIZE	-3.891*** (0.993)	0.529 (0.486)	0.121 (0.233)	-0.140 (0.595)
MGT_EFF		-0.024 (0.033)		
OBSTA			0.006 (0.011)	
ASSUTI				1.094 (0.296)
OHEADTOTA				-0.698 (0.355)
Instrumented	CR CInE ROA	BC CInE ROA	BC CR ROA	BC CR CInE
Hausman test (Chi-square)	55.267***	3.784	360.751***	3.554
Sargan over-identification test statistic	2.534			
Weak instrument test - Cragg-Donald minimum eigenvalue	0.420**	0.626**	0.203**	0.201**

Note: BC = Bank Capital; CR = Credit Risk; CInE = Cost Inefficiency; ROA = Return on Asset; NLTA = Net Loan to Total Assets; SIZE = Bank Size; MGT_EFF = Management Efficiency; OBSTA = Off Balance Sheet Items; ASSUTI = Asset Utilization Ratio; OHEADTOTA = Overhead Expenses to Total Assets; ***, **, and * statistically significant at the 1%, 5%, and 10% levels, respectively. Standard errors are given in parentheses.

Cost Inefficiency as dependent variable: Based on column three of Table 4.12d, Hausman test is significant at 1% significance level. Therefore, it is appropriate to use TSLS. Sargan over-identification test result is not available. This is because Equation (3) is exactly identified as noted in Chapter 3 under the order condition analysis. The weak instrument test based on Cragg-Donald minimum eigenvalue is significant at 5% significance level. This indicates that the instruments used are neither weak nor invalid.

Based on Table 4.12d, none of the independent variables are significantly related to cost inefficiency.

Profitability as dependent variable: Based on column four of Table 4.12d, Hausman test is not significant. Therefore, it is appropriate to use OLS. As mentioned in the earlier section, a fixed effect model is preferred over a pooled OLS.

4.5.5 The Summary of Panel Data Analysis finding for Islamic banks in MENA region over the 10 year period (2003 to 2012)

Table 4.12e summarizes the results of the Panel Data Analysis as discussed in Sections 4.5.1 through 4.5.4.

Table 4.12e: Summary of Panel Data Analysis finding for Islamic banks in MENA region over the 10 year period (2003 to 2012)

Dependent Variable	**Appropriate Panel Data Model Used**	**Findings**
Bank Capital	Two-Stage Least Square model	i. Credit risk **positively** affects bank capital. ii. Cost inefficiency **positively** affects bank capital. iii. Profitability significantly **positively** affects bank capital. iv. Loan growth **negatively** affects bank capital. v. Bank size significantly **negatively** affects bank capital.
Credit Risk	Fixed Effect model	i. Bank capital significantly **negatively** affects credit risk. ii. Cost inefficiency **negatively** affects credit risk. iii. Profitability significantly **negatively** affects credit risk. iv. Loan growth **positively** affects credit risk. v. Bank size significantly **negatively** affects credit risk. vi. Management efficiency significantly **negatively** affects credit risk.
Cost Inefficiency	Two-Stage Least Square model	i. Bank capital **positively** affects cost inefficiency. ii. Credit risk **positively** affects cost inefficiency. iii. Profitability **positively** affects cost inefficiency. iv. Loan growth **negatively** affects cost inefficiency. v. Bank size **positively** affects cost inefficiency. vi. Off-balance sheet items **positively** affect cost inefficiency.
Profitability	Fixed Effect model	i. Bank capital **positively** affects profitability. ii. Credit risk significantly **negatively** affects profitability. iii. Cost inefficiency **positively** affects profitability. iv. Bank size **negatively** affects profitability. v. Asset utilization significantly **positively** affects profitability. vi. Overhead expenses significantly **negatively** affects profitability

4.6 Determining the Relationships between Bank Capital, Credit Risk, Cost Inefficiency, and Profitability on *Islamic banks in MENA region for the period before GFC (2003 to 2007)*

In this section, the results of the panel data analysis of the relationships between bank capital, credit risk, cost inefficiency and profitability of Islamic banks in MENA region for the period before GFC (2003 to 2007) are presented. The results of the pooled least square analysis, fixed effect analysis, random effect analysis and two-stage least square analysis based on Equations 1 to 4 as listed out in chapter three are presented. Multicollinearity analysis was carried out by computing the Variance Inflation Factors (VIF) of the independent variables used in Equations 1 to 4. Based on the results as presented in Appendix 1, all the VIF values are less than 10, indicating that the independent variables used in Equations 1 to 4 are not highly correlated with each other. Therefore, none of the independent variables are excluded from Equations 1 to 4.

4.6.1 Pooled Least Square (PLS) results on Islamic banks in MENA region for the period before GFC (2003 to 2007)

Table 4.13a presents the result of pooled least square technique on Equations 1 to 4 in determining the relationships between bank capital, credit risk, cost inefficiency and profitability in Islamic banks that operate in MENA region for the period of before GFC (2003 to 2007). The results are interpreted based on the dependent variable that supports equations 1 to 4 in this regression analysis.

Bank Capital as dependent variable: From column one of Table 4.13a, it can be noted that cost inefficiency and bank size are significantly negatively related to bank capital at 5% significance level. It can also be noted that profitability is significantly positively related to bank capital at 1% significance level However, bank capital and loan growth are not significantly related to bank capital.

Table 4.13a: Results of the Pooled Least Square (PLS) analysis on Islamic banks in MENA region before GFC (2003 to 2007) period

Pooled OLS, using 195 bank year observations
Robust (HAC) standard errors

	Bank Capital *as dependent variable (1)*	***Credit Risk*** *as dependent variable (2)*	***Cost Inefficiency*** *as dependent variable (3)*	***Profitability*** *as dependent variable (4)*
Const.	86.302*** (25.606)	-2.295 (3.932)	1.343*** (0.081)	-4.657** (2.334)
BC		0.010 (0.014)	-0.003*** (0.001)	0.048 (0.032)
CR	0.386 (0.555)		0.010** (0.004)	-0.101 (0.072)
CInE	-41.579** (18.314)	3.771* (2.158)		2.488 (1.641)
ROA	1.359*** (0.345)	-0.030 (0.041)	0.002 (0.002)	
NLTA	0.057 (0.094)	0.034** (0.017)	-0.001* (0.001)	
SIZE	-2.570** (1.153)	-0.104 (0.203)	0.010 (0.011)	0.094 (0.090)
MGT_EFF		-0.019 (0.032)		
OBSTA			-0.001* (0.000)	
ASSUTI				1.087*** (0.154)
OHEADTOTA				-1.042*** (0.227)
Adjusted R-squared	0.275	0.065	0.212	0.521
F-statistics	15.705***	3.249***	9.699***	36.155***

Note: BC = Bank Capital; CR = Credit Risk; CInE = Cost Inefficiency; ROA = Return on Asset; NLTA = Net Loan to Total Assets; SIZE = Bank Size; MGT_EFF = Management Efficiency; OBSTA = Off Balance Sheet Items; ASSUTI = Asset Utilization Ratio; OHEADTOTA = Overhead Expenses to Total Assets; ***, **, and * statistically significant at the 1%, 5%, and 10% levels, respectively. Standard errors are given in parentheses.

Credit Risk as dependent variable: The results reported in column two of Table 4.13a indicate that cost inefficiency and loan growth are significantly positively related to credit risk at 10% and 5% significance level respectively. On the other hand, bank capital, profitability, bank size and management efficiency are not significantly related to credit risk.

Cost Inefficiency as dependent variable: Column three of Table 4.13a indicates that at 1% significance level, bank capital is significantly negatively related to cost inefficiency. Credit risk is found be significantly positively related to cost inefficiency at 5% significance level. Table 4.13a also indicates that at 10% significance level, loan growth and off-balance sheet items are significantly negatively related to cost inefficiency. However, profitability and bank size are not significantly related to cost inefficiency.

Profitability as dependent variable: It can be noted from column four of Table 4.13a that asset utilization is significantly positively related to profitability at 1% significance level. It can also be noted that overhead expenses are significantly negatively related to profitability at 1% significance level. On the other hand, bank capital, credit risk, cost inefficiency and bank size are not significantly related to profitability.

4.6.2 Fixed Effect (FE) Analysis on Islamic banks in MENA region for the period before GFC (2003 to 2007)

Table 4.13b presents the result of fixed effect panel data analysis on Equation 1 to 4 in determining the relationships between bank capital, credit risk, cost inefficiency and profitability in Islamic banks that operate in MENA region for the period of before GFC (2003 to 2007).

Bank Capital as dependent variable: F-test is used in order to identify whether a PLS or a fixed effect model should be used. Based on column one of Table 4.13b, the F test statistic is significant at 1% level. Therefore a fixed effect model would be appropriate to estimated Equation 1. Table 4.13b indicates that cost inefficiency is significantly negatively related to bank capital at 1% significance level. Meanwhile, credit risk, profitability, loan growth and bank size are not significantly related to bank capital.

Table 4.13b: Results of the Fixed Effect (FE) Analysis on Islamic banks in MENA region for the period before GFC (2003 to 2007)

Fixed-effects, using 195 bank year observations
Robust (HAC) standard errors

	Bank Capital *as dependent variable* *(1)*	***Credit Risk*** *as dependent variable* *(2)*	***Cost Inefficiency*** *as dependent variable* *(3)*	***Profitability*** *as dependent variable* *(4)*
Const.	63.979*** (18.267)	4.284 (4.169)	1.600*** (0.192)	-10.065* (5.899)
BC		0.020 (0.024)	-0.004*** (0.001)	0.048 (0.107)
CR	0.260 (0.294)		0.013 (0.008)	-0.084 (0.070)
CInE	-23.653*** (7.492)	4.682 (3.417)		4.298 (2.737)
ROA	-0.041 (0.676)	-0.002 (0.034)	0.001 (0.002)	
NLTA	0.060 (0.083)	0.021 (0.014)	-0.001 (0.001)	
SIZE	-2.155 (1.448)	-0.594** (0.257)	-0.023 (0.020)	0.466 (0.394)
MGT_EFF		-0.062 (0.055)		
OBSTA			-0.001 (0.001)	
ASSUTI				1.174*** (0.342)
OHEADTOTA				-1.138*** (0.342)
Adjusted R-squared	0.862	0.507	0.636	0.670
F-test statistic	25.182***	4.914***	7.635***	8.740***

Note: BC = Bank Capital; CR = Credit Risk; CInE = Cost Inefficiency; ROA = Return on Asset; NLTA = Net Loan to Total Assets; SIZE = Bank Size; MGT_EFF = Management Efficiency; OBSTA = Off Balance Sheet Items; ASSUTI = Asset Utilization Ratio; OHEADTOTA = Overhead Expenses to Total Assets; ***, **, and * statistically significant at the 1%, 5%, and 10% levels, respectively. Standard errors are given in parentheses.

Credit Risk as dependent variable: Based on column two of Table 4.13b, the F test statistic is significant at 1% level. This shows that a fixed effect model would be appropriate to estimated Equation 2. Table 4.13b, shows that bank size is significantly negatively related to credit risk at 5% significance level. On the other hand, bank capital, cost inefficiency, profitability, loan growth and management efficiency are not significantly related to credit risk.

Cost Inefficiency as dependent variable: Column three of Table 4.13b shows that the F test statistic is significant at 1% level. Therefore a fixed effect model would be appropriate to estimated Equation 3. It could be noted from Table 4.13b that bank capital is significantly negatively related to cost inefficiency at 1% significance level. On the other hand, credit risk, profitability, loan growth, bank size and off-balance sheet items are not significantly related to cost inefficiency.

Profitability as dependent variable: From column four of Table 4.13b, it can be noted that the F test statistic is significant at 1% level. This shows that a fixed effect model would be appropriate to estimated Equation 4. The result indicates that asset utilization is significantly positively related to profitability at 1% significance level. The result also shows that overhead expenses are significantly negatively related to profitability at 1% significance level. However, bank capital, credit risk, cost inefficiency and bank size are not significantly related to profitability.

4.6.3 Random Effect (RE) Analysis on Islamic banks in MENA region for the period before GFC (2003 to 2007)

Table 4.13c presents the result of random effect panel data analysis on Equation 1 to 4 in determining the relationships between bank capital, credit risk, cost inefficiency and profitability in Islamic banks that operate in MENA region for the period of before GFC (2003 to 2007).

Bank Capital as dependent variable: Breusch-Pagan test is used to decide whether to use a PLS or a random effect model. Based on column one of Table 4.13c, the Breusch-Pagan test statistic is significant at 1% level. This shows that a random effect model is preferred over a PLS model in estimating Equation 1. Meanwhile, Hausman test is used in order to choose between a fixed effect and a random effect model. The result in Table 4.13c shows that the Hausman test statistic is significant at 1% level. Therefore, a fixed effect model would be the most appropriate model to estimated Equation 1.

Table 4.13c: Results of the Random Effect (RE) Analysis on Islamic banks in MENA region for the period before GFC (2003 to 2007)

Random-effects (GLS), using 195 bank year observations

	Bank Capital *as dependent variable (1)*	***Credit Risk*** *as dependent variable (2)*	***Cost Inefficiency*** *as dependent variable (3)*	***Profitability*** *as dependent variable (4)*
Const.	72.502*** (10.986)	-1.020 (3.399)	1.436*** (0.078)	-6.281* (3.231)
BC		0.009 (0.015)	-0.003*** (0.001)	0.047** (0.020)
CR	0.229 (0.292)		0.012*** (0.003)	-0.096 (0.095)
CInE	-26.468*** (5.854)	4.428*** (1.514)		3.332* (2.008)
ROA	0.183 (0.185)	-0.021 (0.045)	0.002 (0.002)	
NLTA	0.053 (0.049)	0.031*** (0.011)	-0.001 (0.001)	
SIZE	-2.634*** (0.879)	-0.181 (0.167)	-0.002 (0.009)	0.170 (0.228)
MGT_EFF		-0.037* (0.022)		
OBSTA			-0.001** (0.000)	
ASSUTI				1.078*** (0.106)
OHEADTOTA				-1.018*** (0.219)
Breusch-Pagan test (Chi-square)	168.025***	79.014***	89.141***	3.648*
Hausman test (Chi-square)	15.383***	6.415	5.663	3.422

Note: BC = Bank Capital; CR = Credit Risk; CInE = Cost Inefficiency; ROA = Return on Asset; NLTA = Net Loan to Total Assets; SIZE = Bank Size; MGT_EFF = Management Efficiency; OBSTA = Off Balance Sheet Items; ASSUTI = Asset Utilization Ratio; OHEADTOTA = Overhead Expenses to Total Assets; ***, **, and * statistically significant at the 1%, 5%, and 10% levels, respectively. Standard errors are given in parentheses.

Credit Risk as dependent variable: Based on column two of Table 4.13c, the Breusch-Pagan test statistic is significant at 1% level. Therefore, a random effect model is preferred over a pooled least square model in estimating Equation 2. Meanwhile, the Hausman test statistic is not significant indicating that random effect model would be the most appropriate model to estimate Equation 2. The random effect result from Table 4.13c shows that cost inefficiency and loan growth are significantly positively related to cost inefficiency at 1% significance level. On the other hand, bank capital, profitability and bank size are not significantly related to credit risk.

Cost Inefficiency as dependent variable: Based on column three of Table 4.13c, the Breusch-Pagan test statistic is significant at 1% level. Therefore, a random effect model is preferred over a pooled least square model in estimating Equation 3. Meanwhile, the Hausman test statistic is not significant indicating that random effect model would be the most appropriate model to estimate Equation 3. The random effect result from Table 4.13c shows bank capital and off-balance sheet items are siginificantly negatively related to cost inefficiency at 1% and 5% significance level respectively. Credit risk is found to be significantly positively related to cost inefficiency at 1% significance level. On the other hand, profitability, loan growth and bank size are not significantly related to cost inefficiency.

Profitability as dependent variable: Based on column four of Table 4.13c, the Breusch-Pagan test statistic is significant at 10% level. Therefore, a random effect model is preferred over a pooled least square model in estimating Equation 4. Meanwhile, the Hausman test statistic is not significant indicating that random effect model would be the most appropriate model to estimate Equation 4. The random effect result from Table 4.13c shows bank capital, cost inefficiency and asset utilization are significantly positively related to profitability. Overhead expenses are found to be significantly negatively related to profitability at 1% significance level. On the other hand, credit risk and bank size are not significantly related to profitability.

4.6.4 Two-Stage Least Square (2SLS) Analysis on Islamic banks in MENA region for the period before GFC (2003 to 2007)

Table 4.13d presents the result of two-stage least square panel data analysis and the specification tests (weak instruments test, Hausman test, and Sargan test) for Equation 1 through 4 as listed out in chapter three. The results are interpreted based on the dependent variable that supports equations 1 to 4 in this regression analysis.

Bank Capital as dependent variable: Based on column one of Table 4.13d, Hausman test is significant at 1% significance level. Therefore, it is appropriate to use TSLS. Sargan over-identification test indicates that Equation 1 is over-identified. The Sargan over-identification result in Table 4.13d is not significant indicating that all the instruments used in estimating Equation (1) are valid. The weak instrument test based on Cragg-Donald minimum eigenvalue is significant at 5% significance level. This indicates that the instruments used are neither weak nor invalid. Based on Table 4.13d, profitability is significantly positively related to bank capital at 1% significance level. The table also shows that bank size is negatively related to bank capital at 1% level of significance.

Credit Risk as dependent variable: Based on column two of Table 4.13d, Hausman test is not significant. Therefore, it is appropriate to use OLS. As mentioned in the earlier section, a random effect model is preferred over a fixed effect model and pooled OLS.

Cost Inefficiency as dependent variable: Based on column three of Table 4.13d, Hausman test is significant at 1% significance level. Therefore, it is appropriate to use TSLS. Sargan over-identification test result is not available. This is because Equation (3) is exactly identified as noted in Chapter 3 under the order condition analysis. The weak instrument test based on Cragg-Donald minimum eigenvalue is significant at 5%

significance level. This indicates that the instruments used are neither weak nor invalid. Based on Table 4.13d, none of the independent variables are significantly related to cost inefficiency.

Table 4.13d: Results of the Two Stage Least Square Panel Data Analysis on Islamic banks in MENA region for the period before GFC (2003 to 2007)

TSLS, using 195 bank year observations
Instruments: const., NLTA, SIZE, MGT_EFF, OBSTA, ASSUTI, OHEADTOTA,
Robust (HAC) standard errors

	Bank Capital *as dependent variable (1)*	***Credit Risk*** *as dependent variable (2)*	***Cost Inefficiency*** *as dependent variable (3)*	***Profitability*** *as dependent variable (4)*
Const.	22.853 (27.339)	41.978 (177.083)	-1.392 (3.991)	-7.316 (8.581)
BC		0.607 (2.360)	0.065 (0.105)	0.094 (0.075)
CR	0.935 (4.829)		0.101 (0.284)	-0.633 (0.730)
CInE	9.064 (24.198)	-35.308 (151.205)		4.288 (6.905)
ROA	1.768*** (0.436)	-1.203 (4.802)	-0.105 (0.161)	
NLTA	0.118 (0.180)	-0.044 (0.296)	-0.013 (0.016)	
SIZE	-3.661*** (1.259)	2.801 (11.268)	0.264 (0.377)	0.220 (0.234)
MGT_EFF		-0.250 (0.959)		
OBSTA			0.006 (0.010)	
ASSUTI				1.010*** (0.185)
OHEADTOTA				-1.080*** (0.250)
Instrumented	CR CInE ROA	BC CInE ROA	BC CR ROA	BC CR CInE
Hausman test (Chi-square)	13.176***	4.845	53.020***	1.855
Sargan over-identification test statistic	4.087			
Weak instrument test - Cragg-Donald minimum eigenvalue	1.026**	0.053**	0.093**	1.172**

Note: BC = Bank Capital; CR = Credit Risk; CInE = Cost Inefficiency; ROA = Return on Asset; NLTA = Net Loan to Total Assets; SIZE = Bank Size; MGT_EFF = Management Efficiency; OBSTA = Off Balance Sheet Items; ASSUTI = Asset Utilization Ratio; OHEADTOTA = Overhead Expenses to Total Assets; ***, **, and * statistically significant at the 1%, 5%, and 10% levels, respectively. Standard errors are given in parentheses.

Profitability as dependent variable: Based on column four of Table 4.13d, Hausman test is not significant. Therefore, it is appropriate to use OLS. As mentioned in the earlier section, a random effect model is preferred over a fixed effect model and pooled OLS.

4.6.5 The Summary of Panel Data Analysis finding for Islamic banks in MENA region before GFC (2003 to 2007) period

Table 4.13e summarizes the results of the Panel Data Analysis as discussed in Sections 4.6.1 through 4.6.4.

Table 4.13e: Summary of Panel Data Analysis finding for Islamic banks in MENA region before GFC (2003 to 2007) period

Dependent Variable	**Appropriate Panel Data Model Used**	**Findings**
Bank Capital	Two-Stage Least Square model	i. Credit risk **positively** affects bank capital. ii. Cost inefficiency **positively** affects bank capital. iii. Profitability significantly **positively** affects bank capital. iv. Loan growth **positively** affects bank capital. v. Bank size significantly **negatively** affects bank capital.
Credit Risk	Random Effect model	i. Bank capital **positively** affects credit risk. ii. Cost inefficiency significantly **positively** affects credit risk. iii. Profitability **negatively** affects credit risk. iv. Loan growth significantly **positively** affects credit risk. v. Bank size **negatively** affects credit risk. vi. Management efficiency significantly **negatively** affects credit risk.
Cost Inefficiency	Two-Stage Least Square model	i. Bank capital **positively** affects cost inefficiency. ii. Credit risk **positively** affects cost inefficiency. iii. Profitability **negatively** affects cost inefficiency. iv. Loan growth **negatively** affects cost inefficiency. v. Bank size **positively** affects cost inefficiency. vi. Off-balance sheet items **positively** affect cost inefficiency.
Profitability	Random Effect model	i. Bank capital significantly **positively** affects profitability. ii. Credit risk **negatively** affects profitability. iii. Cost inefficiency significantly **positively** affects profitability. iv. Bank size **positively** affects profitability. v. Asset utilization significantly **positively** affects profitability. vi. Overhead expenses significantly **negatively** affects profitability

4.7 Determining the Relationship between Bank Capital, Credit Risk, Cost Inefficiency, and Profitability on *Islamic banks in MENA region for the period after GFC (2008 to 2012)*

In this section, the results of the analysis of the relationships between bank capital, credit risk, cost inefficiency and profitability of Islamic banks in MENA region for the period after GFC (2008 to 2012) are presented. The results of the pooled least square analysis, fixed effect analysis, random effect analysis and two-stage least square analysis based on Equations 1 to 4 as listed out in chapter three are presented. Multicollinearity analysis was carried out by computing the Variance Inflation Factors (VIF) of the independent variables used in Equations 1 to 4. Based on the results as presented in Appendix 1, all the VIF values are less than 10, indicating that the independent variables used in Equations 1 to 4 are not highly correlated with each other. Therefore, none of the independent variables are excluded from Equations 1 to 4.

4.7.1 Pooled Least Square (PLS) analysis on Islamic banks in MENA region for the period after GFC (2008 to 2012)

Table 4.14a presents the result of pooled least square technique on Equations 1 to 4 in determining the relationships between bank capital, credit risk, cost inefficiency and profitability in Islamic banks that operate in MENA region for the period after GFC (2008 to 2012).

<u>Bank Capital as dependent variable:</u> From column one of Table 4.14a, it can be noted that bank size is significantly negatively related to bank capital at 5% significance level. However, bank capital, cost inefficiency, profitability and loan growth are not significantly related to bank capital.

Table 4.14a: Results of the Pooled Least Square (PLS) analysis on Islamic banks in MENA region for the period after GFC (2008 to 2012)

Pooled OLS, using 200 bank year observations
Robust (HAC) standard errors

	Bank Capital *as dependent variable* *(1)*	***Credit Risk*** *as dependent variable* *(2)*	***Cost Inefficiency*** *as dependent variable* *(3)*	***Profitability*** *as dependent variable* *(4)*
Const.	52.402*** (15.331)	2.081 (1.920)	1.224*** (0.137)	-2.057 (1.635)
BC		-0.011 (0.012)	-0.003** (0.002)	0.016 (0.011)
CR	-0.524 (0.540)		-0.014 (0.017)	-0.487*** (0.160)
CInE	-5.542 (5.199)	-0.509 (0.539)		-0.034 (0.894)
ROA	-0.141 (0.268)	-0.182*** (0.050)	-0.036** (0.017)	
NLTA	-0.024 (0.018)	-0.001 (0.002)	-0.001 (0.001)	
SIZE	-2.956** (1.246)	0.139 (0.143)	0.033 (0.021)	0.257* (0.131)
MGT_EFF		0.001 (0.014)		
OBSTA			0.001 (0.002)	
ASSUTI				0.836*** (0.249)
OHEADTOTA				-0.849*** (0.125)
Adjusted R-squared	0.133	0.122	0.222	0.670
F-statistics	7.118***	5.607***	10.466***	68.207***

Note: BC = Bank Capital; CR = Credit Risk; CInE = Cost Inefficiency; ROA = Return on Asset; NLTA = Net Loan to Total Assets; SIZE = Bank Size; MGT_EFF = Management Efficiency; OBSTA = Off Balance Sheet Items; ASSUTI = Asset Utilization Ratio; OHEADTOTA = Overhead Expenses to Total Assets; ***, **, and * statistically significant at the 1%, 5%, and 10% levels, respectively. Standard errors are given in parentheses.

Credit Risk as dependent variable: The results reported in column two of Table 4.14a indicate that profitability is significantly negatively related to credit risk at 1% significance level. On the other hand, bank capital, cost inefficiency, loan growth, bank size and management efficiency are not significantly related to credit risk.

Cost Inefficiency as dependent variable: Column three of Table 4.14a indicates that at 5% significance level, bank capital and profitability are significantly negatively related to cost inefficiency. However, credit risk, loan growth, bank size and off-balance sheet items are not significantly related to cost inefficiency.

Profitability as dependent variable: From column four of Table 4.14a, it can be noted that credit risk and overhead expenses are significantly negatively related to profitability at 1% significance level. It can also be noted from Table 4.14a that bank size and asset utilization are significantly positively related to profitability at 10% and 1% significance level respectively. On the other hand, bank capital and cost inefficiency are not significantly related to profitability.

4.7.2 Fixed Effect (FE) analysis on Islamic banks in MENA region for the period after GFC (2008 to 2012)

Table 4.14b presents the result of fixed effect panel data analysis on Equation 1 to 4 in determining the relationships between bank capital, credit risk, cost inefficiency and profitability in Islamic banks that operate in MENA region for the period after GFC (2008 to 2012).

Bank Capital as dependent variable: F-test is used in order to identify whether a PLS or a fixed effect model should be used. Based on column one of Table 4.14b, the F test statistic is significant at 1% level. Therefore a fixed effect model would be appropriate to estimated Equation 1. The result indicates that profitability is significantly positively related to bank capital at 1% significance level. The result also indicates that bank size is significantly negatively related to bank capital at 1% significance level. Meanwhile, credit risk, cost inefficiency, and loan growth are not significantly related to bank capital.

Table 4.14b: Results of the Fixed Effect (FE) Analysis on Islamic banks in MENA region for the period after GFC (2008 to 2012)

Fixed-effects, using 200 bank year observations
Robust (HAC) standard errors

	Bank Capital *as dependent variable* *(1)*	***Credit Risk*** *as dependent variable* *(2)*	***Cost Inefficiency*** *as dependent variable* *(3)*	***Profitability*** *as dependent variable* *(4)*
Const.	60.229*** (11.535)	13.726** (5.800)	-0.215 (1.276)	-25.506** (10.045)
BC		-0.044 (0.055)	0.013 (0.015)	0.334*** (0.124)
CR	-0.217 (0.256)		-0.047* (0.026)	-0.527* (0.277)
CInE	2.061 (1.630)	-1.589*** (0.430)		-0.039 (0.895)
ROA	0.437*** (0.145)	-0.142*** (0.052)	-0.040* (0.021)	
NLTA	0.004 (0.003)	-0.001 (0.001)	-0.000 (0.000)	
SIZE	-5.444*** (1.468)	-0.612 (0.503)	0.188 (0.133)	2.402** (1.038)
MGT_EFF		-0.039** (0.017)		
OBSTA			-0.004** (0.002)	
ASSUTI				0.799*** (0.236)
OHEADTOTA				-0.753*** (0.126)
Adjusted R-squared	0.952	0.588	0.489	0.749
F-test statistic	70.977***	5.645***	3.145***	2.307***

Note: BC = Bank Capital; CR = Credit Risk; CInE = Cost Inefficiency; ROA = Return on Asset; NLTA = Net Loan to Total Assets; SIZE = Bank Size; MGT_EFF = Management Efficiency; OBSTA = Off Balance Sheet Items; ASSUTI = Asset Utilization Ratio; OHEADTOTA = Overhead Expenses to Total Assets; ***, **, and * statistically significant at the 1%, 5%, and 10% levels, respectively. Standard errors are given in parentheses.

Credit Risk as dependent variable: Based on column two of Table 4.14b, the F test statistic is significant at 1% level. This shows that a fixed effect model would be appropriate to estimated Equation 2. Table 4.14b, shows that cost inefficiency and profitability are significantly negatively related to credit risk at 1% significance level. Table 4.14b also reveals that management efficiency is significantly negatively related to credit risk at 5% significance level. On the other hand, bank capital, loan growth and bank size are not significantly related to credit risk.

Cost Inefficiency as dependent variable: Column three of Table 4.14b shows that the F test statistic is significant at 1% level. Therefore a fixed effect model would be appropriate to estimated Equation 3. It could be noted from Table 4.14b that credit risk and profitability are significantly negatively related to cost inefficiency at 10% significance level. It could also be noted that off-balance sheet items are significantly negatively related to cost inefficiency at 5% significance level. On the other hand, bank capital, loan growth and bank size are not significantly related to cost inefficiency.

Profitability as dependent variable: From column four of Table 4.14b, it can be noted that the F test statistic is significant at 1% level. This shows that a fixed effect model would be appropriate to estimated Equation 4. The result indicates that bank capital, bank size and asset utilization are significantly positively related to profitability. The result also shows that credit risk and overhead expenses are significantly negatively related to profitability. However, cost inefficiency is not significantly related to profitability.

4.7.3 Random Effect (RE) analysis on Islamic banks in MENA region for the period after GFC (2008 to 2012)

Table 4.14c presents the result of random effect panel data analysis on Equations 1 to 4 in determining the relationships between bank capital, credit risk, cost inefficiency and profitability in Islamic banks that operate in MENA region for the period after GFC (2008 to 2012).

Bank Capital as dependent variable: Breusch-Pagan test is used to decide whether to use a PLS or a random effect model. Based on column one of Table 4.14c, the Breusch-Pagan test statistic is significant at 1% level. This shows that a random effect model is preferred over a PLS model in estimating Equation 1. Meanwhile, Hausman test is used in order to choose between a fixed effect and a random effect model. The Hausman test statistic is not significant indicating that random effect model would be the most appropriate model to estimate Equation 1. The random effect result shows that cost inefficiency and profitability are significantly positively related to bank capital. Bank size is found to be significantly negatively related to bank capital. On the other hand, credit risk and loan growth are not significantly related to cost inefficiency.

Table 4.14c: Results of the Random Effect (RE) Analysis on Islamic banks in MENA region for the period after GFC (2008 to 2012)

Random-effects (GLS), using 200 bank year observations

	Bank Capital *as dependent variable (1)*	***Credit Risk*** *as dependent variable (2)*	***Cost Inefficiency*** *as dependent variable (3)*	***Profitability*** *as dependent variable (4)*
Const.	55.563*** (5.782)	5.189*** (1.950)	1.133*** (0.211)	-2.643 (1.880)
BC		-0.016 (0.016)	-0.002 (0.002)	0.026 (0.020)
CR	-0.221 (0.191)		-0.031** (0.013)	-0.544*** (0.106)
CInE	1.782* (1.011)	-1.300*** (0.420)		-0.102 (0.956)
ROA	0.420*** (0.071)	-0.159*** (0.027)	-0.035*** (0.005)	
NLTA	0.002 (0.007)	-0.001 (0.003)	-0.001 (0.000)	
SIZE	-4.861*** (0.662)	0.062 (0.147)	0.046** (0.022)	0.315* (0.168)
MGT_EFF		-0.015 (0.012)		
OBSTA			0.000 (0.002)	
ASSUTI				0.847*** (0.071)
OHEADTOTA				-0.818*** (0.108)
Breusch-Pagan test (Chi-square)	308.382***	83.702***	15.429***	0.571
Hausman test (Chi-square)	8.205	11.470*	18.583***	52.667***

Note: BC = Bank Capital; CR = Credit Risk; CInE = Cost Inefficiency; ROA = Return on Asset; NLTA = Net Loan to Total Assets; SIZE = Bank Size; MGT_EFF = Management Efficiency; OBSTA = Off Balance Sheet Items; ASSUTI = Asset Utilization Ratio; OHEADTOTA = Overhead Expenses to Total Assets; ***, **, and * statistically significant at the 1%, 5%, and 10% levels, respectively. Standard errors are given in parentheses.

Credit Risk as dependent variable: Based on column two of Table 4.14c, the Breusch-Pagan test statistic is significant at 1% level. Therefore, a random effect model is preferred over a pooled least square model in estimating Equation 2. Meanwhile, Hausman test statistic is significant at 10% level. Therefore, a fixed effect model would be the most appropriate model to estimated Equation 2.

Cost Inefficiency as dependent variable: Column three of Table 4.14c shows that the Breusch-Pagan test statistic is significant at 1% level. Therefore, a random effect model is preferred over a pooled least square model in estimating Equation 3. Meanwhile, Hausman test statistic is significant at 1% level. Therefore, a fixed effect model would be the most appropriate model to estimated Equation 3.

Profitability as dependent variable: Based on column four of Table 4.14c, the Breusch-Pagan test statistic is not significant. This shows that a PLS model is preferred over a random effect model in estimating Equation 4. However, as mentioned earlier, based on Table 4.14b, a fixed effect model would be appropriate to estimate Equation 4.

4.7.4 Two-Stage Least Square (2SLS) Analysis on Islamic banks in MENA region for the period after GFC (2008 to 2012)

Table 4.14d presents the result of two-stage least square panel data analysis and the specification tests (weak instruments test, Hausman test, and Sargan test) for Equation 1 through 4 as listed out in chapter three. The results are interpreted based on the dependent variable that supports equations 1 to 4 in this regression analysis.

Table 4.14d: Results of the Two Stage Least Square Panel Data Analysis on Islamic banks in MENA region for the period after GFC (2008 to 2012)

TSLS, using 200 bank year observations
Instruments: const., NLTA, SIZE, MGT_EFF, OBSTA, ASSUTI, OHEADTOTA
Robust (HAC) standard errors

	Bank Capital *as dependent variable (1)*	***Credit Risk*** *as dependent variable (2)*	***Cost Inefficiency*** *as dependent variable (3)*	***Profitability*** *as dependent variable (4)*
Const.	21.590 (18.520)	-3.025 (23.778)	-1.490 (1.724)	-10.719 (93.827)
BC		0.138 (1.220)	0.069* (0.037)	0.796 (5.141)
CR	6.306 (10.719)		-0.430 (0.863)	-8.037 (46.592)
CInE	14.562* (8.391)	-1.898 (23.373)		-13.653 (67.767)
ROA	1.408 (1.371)	-0.204 (1.087)	-0.096 (0.105)	
NLTA	-0.005 (0.025)	0.001 (0.011)	0.000 (0.002)	
SIZE	-4.669** (1.838)	0.654 (4.953)	0.321 (0.202)	4.117 (23.533)
MGT_EFF		0.002 (0.088)		
OBSTA			-0.000 (0.010)	
ASSUTI				-0.355 (7.134)
OHEADTOTA				0.634 (7.654)
Instrumented	CR CInE ROA	BC CInE ROA	BC CR ROA	BC CR CInE
Hausman test (Chi-square)	54.300***	5.655	265.964***	4.513
Sargan over-identification test statistic	0.001			
Weak instrument test - Cragg-Donald minimum eigenvalue	0.170**	0.020**	0.165**	4.513**

Note: BC = Bank Capital; CR = Credit Risk; CInE = Cost Inefficiency; ROA = Return on Asset; NLTA = Net Loan to Total Assets; SIZE = Bank Size; MGT_EFF = Management Efficiency; OBSTA = Off Balance Sheet Items; ASSUTI = Asset Utilization Ratio; OHEADTOTA = Overhead Expenses to Total Assets; ***, **, and * statistically significant at the 1%, 5%, and 10% levels, respectively. Standard errors are given in parentheses.

Bank Capital as dependent variable: Based on column one of Table 4.14d, Hausman test is significant at 1% significance level. Therefore, it is appropriate to use TSLS. Sargan over-identification test indicates that Equation 1 is over-identified. The Sargan over-identification result is not significant indicating that all the instruments used in estimating Equation (1) are valid. The weak instrument test based on Cragg-Donald minimum eigenvalue is significant at 5% significance level. This indicates that the instruments used are neither weak nor invalid. Based on the result, cost inefficiency is significantly positively related to bank capital at 10% level. The table also shows that bank size is significantly negatively related to bank capital at 5% level.

Credit Risk as dependent variable: Based on column two of Table 4.14d, Hausman test is not significant. Therefore, it is appropriate to use OLS. As mentioned in the earlier section, a fixed effect model is preferred over a random effect model and pooled OLS.

Cost Inefficiency as dependent variable: Based on column three of Table 4.14d, Hausman test is significant at 1% significance level. Therefore, it is appropriate to use TSLS. Sargan over-identification test result is not available. This is because Equation (3) is exactly identified as noted in Chapter 3 under the order condition analysis. The weak instrument test based on Cragg-Donald minimum eigenvalue is significant at 5% significance level. This indicates that the instruments used are neither weak nor invalid. Based on the result, bank capital is significantly positively related to cost inefficiency at 10% significance level.

Profitability as dependent variable: Based on column four of Table 4.14d, Hausman test is not significant. Therefore, it is appropriate to use OLS. As mentioned in the earlier section, a fixed effect model is preferred over a random effect model and pooled OLS.

4.7.5 The Summary on Panel Data Analysis finding for Islamic banks in MENA region after GFC (2008 to 2012) period

Table 4.14e summarizes the results of the Panel Data Analysis as discussed in Sections 4.7.1 through 4.7.4.

Table 4.14e: Summary of Panel Data Analysis finding for Islamic banks in MENA region after GFC (2008 to 2012) period

Dependent Variable	**Appropriate Panel Data Model Used**	**Findings**
Bank Capital	Two-Stage Least Square model	i. Credit risk **positively** affects bank capital. ii. Cost inefficiency significantly **positively** affects bank capital. iii. Profitability **positively** affects bank capital. iv. Loan growth **negatively** affects bank capital. v. Bank size significantly **negatively** affects bank capital.
Credit Risk	Fixed Effect model	i. Bank capital **negatively** affects credit risk. ii. Cost inefficiency significantly **negatively** affects credit risk. iii. Profitability significantly **negatively** affects credit risk. iv. Loan growth **negatively** affects credit risk. v. Bank size **negatively** affects credit risk. vi. Management efficiency significantly **negatively** affects credit risk.
Cost Inefficiency	Two-Stage Least Square model	i. Bank capital significantly **positively** affects cost inefficiency. ii. Credit risk **negatively** affects cost inefficiency. iii. Profitability **negatively** affects cost inefficiency. iv. Loan growth **positively** affects cost inefficiency. v. Bank size **positively** affects cost inefficiency. vi. Off-balance sheet items **negatively** affect cost inefficiency.
Profitability	Fixed Effect model	i. Bank capital significantly **positively** affects profitability. ii. Credit risk significantly **negatively** affects profitability. iii. Cost inefficiency **negatively** affects profitability. iv. Bank size significantly **positively** affects profitability. v. Asset utilization significantly **positively** affects profitability. vi. Overhead expenses significantly **negatively** affects profitability

4.8 Determining the Relationship between Bank Capital, Credit Risk, Cost Inefficiency, and Profitability on *Islamic banks in non-MENA region over 10 years*

In this section, the results of the analysis of the relationships between bank capital, credit risk, cost inefficiency and profitability of Islamic banks in non-MENA region for the period of 10 years are presented. The results of the pooled least square analysis, fixed effect analysis, random effect analysis and two-stage least square analysis based on

Equations 1 to 4 as listed out in chapter three are presented. Multicollinearity analysis was carried out by computing the Variance Inflation Factors (VIF) of the independent variables used in Equations 1 to 4. Based on the results as presented in Appendix 1, all the VIF values are less than 10, indicating that the independent variables used in Equations 1 to 4 are not highly correlated with each other. Therefore, none of the independent variables are excluded from Equations 1 to 4.

4.8.1 Pooled Least Square (PLS) Analysis on Islamic banks in non-MENA region for the overall period of 10 years (2003 to 2012)

Table 4.15a presents the result of pooled least square technique on Equations 1 to 4 in determining the relationships between bank capital, credit risk, cost inefficiency and profitability in Islamic banks that operate in non – MENA region for the overall period of 10 years (2003 to 2012).

Bank Capital as dependent variable: From column one of Table 4.15a, it can be noted that credit risk, cost inefficiency and profitability are significantly negatively related to bank capital. However, loan growth and bank size are not significantly related to bank capital.

Credit Risk as dependent variable: The results reported in column two of Table 4.15a indicate that bank capital, cost inefficiency and profitability are significantly negatively related to credit risk. Loan growth is found to be significantly positively related to credit risk at 10% significance level. On the other hand, bank size and management efficiency are not significantly related to credit risk.

Table 4.15a: Results of the Pooled Least Square (PLS) analysis on Islamic banks in non-MENA region for the overall period of 10 years (2003 to 2012)

Pooled OLS, using 255 bank year observations
Robust (HAC) standard errors

	Bank Capital *as dependent variable (1)*	***Credit Risk*** *as dependent variable (2)*	***Cost Inefficiency*** *as dependent variable (3)*	***Profitability*** *as dependent variable (4)*
Const.	62.820*** (19.543)	15.799** (7.831)	1.546*** (0.134)	-0.342 (0.918)
BC		-0.110* (0.060)	-0.005*** (0.001)	-0.024*** (0.007)
CR	-2.334*** (0.602)		-0.015* (0.008)	-0.298*** (0.031)
CInE	-19.782** (8.993)	-4.934** (2.337)		-0.144 (0.651)
ROA	-2.200*** (0.711)	-0.748*** (0.254)	-0.042*** (0.011)	
NLTA	-0.129 (0.138)	0.052* (0.027)	-0.001 (0.002)	
SIZE	-1.022 (1.149)	-0.346 (0.369)	-0.001 (0.014)	0.071 (0.077)
MGT_EFF		-0.057 (0.037)		
OBSTA			-0.000 (0.000)	
ASSUTI				0.894*** (0.063)
OHEADTOTA				-0.818*** (0.071)
Adjusted R-squared	0.388	0.475	0.246	0.836
F-statistics	33.245***	39.278***	14.820***	216.658***

Note: BC = Bank Capital; CR = Credit Risk; CInE = Cost Inefficiency; ROA = Return on Asset; NLTA = Net Loan to Total Assets; SIZE = Bank Size; MGT_EFF = Management Efficiency; OBSTA = Off Balance Sheet Items; ASSUTI = Asset Utilization Ratio; OHEADTOTA = Overhead Expenses to Total Assets; ***, **, and * statistically significant at the 1%, 5%, and 10% levels, respectively. Standard errors are given in parentheses.

Cost Inefficiency as dependent variable: Column three of Table 4.15a indicates that at 1% significance level, bank capital and profitability are significantly negatively related to cost inefficiency. Credit risk is significantly negatively related to cost inefficiency at 10% significance level. However, loan growth, bank size and off-balance sheet items are not significantly related to cost inefficiency.

Profitability as dependent variable: From column four of Table 4.15a, it can be noted that bank capital, credit risk and overhead expenses are significantly negatively related to profitability at 1% significance level. It can also be noted from the result that asset utilization is significantly positively related to profitability at 1% significance level. On the other hand, cost inefficiency and bank size are not significantly related to profitability.

4.8.2 Fixed Effect (FE) Analysis on Islamic banks in non-MENA region for the overall period of 10 years (2003 to 2012)

Table 4.15b presents the result of fixed effect panel data analysis on Equation 1 to 4.

Table 4.15b: Results of the Fixed Effect (FE) Analysis on Islamic banks in non-MENA region for the overall period of 10 years (2003 to 2012)

Fixed-effects, using 255 bank year observations
Robust (HAC) standard errors

	Bank Capital *as dependent variable* *(1)*	***Credit Risk*** *as dependent variable* *(2)*	***Cost Inefficiency*** *as dependent variable* *(3)*	***Profitability*** *as dependent variable* *(4)*
Const.	66.171*** (15.734)	13.240** (5.391)	1.991*** (0.374)	0.393 (1.640)
BC		-0.122** (0.049)	-0.007*** (0.002)	-0.016 (0.019)
CR	-2.030*** (0.513)		-0.015* (0.009)	-0.306*** (0.084)
CInE	-9.984** (4.465)	-2.053* (1.196)		-0.303 (0.732)
ROA	-1.400*** (0.441)	-0.319*** (0.115)	-0.052*** (0.014)	
NLTA	-0.185* (0.096)	-0.001 (0.022)	-0.003 (0.003)	
SIZE	-3.116*** (1.152)	-0.431 (0.263)	0.038 (0.039)	0.030 (0.102)
MGT_EFF		-0.033 (0.022)		
OBSTA			-0.000 (0.000)	
ASSUTI				0.818*** (0.113)
OHEADTOTA				-0.809*** (0.079)
Adjusted R-squared	0.851	0.843	0.484	0.842
F-test statistic	22.540***	17.181***	4.170***	1.274

Note: BC = Bank Capital; CR = Credit Risk; CInE = Cost Inefficiency; ROA = Return on Asset; NLTA = Net Loan to Total Assets; SIZE = Bank Size; MGT_EFF = Management Efficiency; OBSTA = Off Balance Sheet Items; ASSUTI = Asset Utilization Ratio; OHEADTOTA = Overhead Expenses to Total Assets; ***, **, and * statistically significant at the 1%, 5%, and 10% levels, respectively. Standard errors are given in parentheses.

Bank Capital as dependent variable: F-test is used in order to identify whether a PLS or a fixed effect model should be used. Based on column one of Table 4.15b, the F test statistic is significant at 1% level. Therefore a fixed effect model would be appropriate to estimated Equation 1. The result indicates that all the independent variables used (credit risk, cost inefficiency, profitability, loan growth and bank size) are significantly negatively related to bank capital.

Credit Risk as dependent variable: Based on column two of Table 4.15b, the F test statistic is significant at 1% level. This shows that a fixed effect model would be appropriate to estimated Equation 2. The result shows that bank capital, cost inefficiency and profitability are significantly negatively related to credit risk. On the other hand, loan growth, bank size and management efficiency are not significantly related to credit risk.

Cost Inefficiency as dependent variable: Column three of Table 4.15b shows that the F test statistic is significant at 1% level. Therefore a fixed effect model would be appropriate to estimated Equation 3. It could be noted from the result that bank capital, credit risk and profitability are significantly negatively related to cost inefficiency. On the other hand, loan growth, bank size and off-balance sheet items are not significantly related to cost inefficiency.

Profitability as dependent variable: From column four of Table 4.15b, it can be noted that the F test statistic is not significant. This shows that a pooled least square model would be appropriate to estimated Equation 4.

4.8.3 Random Effect (RE) Analysis on Islamic banks in non-MENA region for the overall period of 10 years (2003 to 2012)

Table 4.15c presents the result of random effect panel data analysis on Equation 1 to 4.

Table 4.15c: Results of the Random Effect (RE) Analysis on Islamic banks in non-MENA region for the overall period of 10 years (2003 to 2012)

Random-effects (GLS), using 255 bank year observations

	Bank Capital *as dependent variable (1)*	***Credit Risk*** *as dependent variable (2)*	***Cost Inefficiency*** *as dependent variable (3)*	***Profitability*** *as dependent variable (4)*
Const.	66.008*** (6.546)	12.981*** (2.256)	1.755*** (0.116)	-0.322 (0.887)
BC		-0.117*** (0.013)	-0.005*** (0.001)	-0.024*** (0.006)
CR	-2.042*** (0.233)		-0.016*** (0.006)	-0.300*** (0.026)
CInE	-10.598*** (2.528)	-2.333*** (0.711)		-0.150 (0.433)
ROA	-1.461*** (0.228)	-0.370*** (0.057)	-0.049*** (0.005)	
NLTA	-0.173*** (0.053)	0.013 (0.013)	-0.002 (0.001)	
SIZE	-2.986*** (0.615)	-0.445*** (0.151)	-0.017 (0.014)	0.072 (0.071)
MGT_EFF		-0.034** (0.015)		
OBSTA			0.000 (0.000)	
ASSUTI				0.888*** (0.048)
OHEADTOTA				-0.815*** (0.046)
Breusch-Pagan test (Chi-square)	305.905***	285.517***	29.603***	1.912
Hausman test (Chi-square)	4.899	17.427***	13.135**	3.648

Note: BC = Bank Capital; CR = Credit Risk; CInE = Cost Inefficiency; ROA = Return on Asset; NLTA = Net Loan to Total Assets; SIZE = Bank Size; MGT_EFF = Management Efficiency; OBSTA = Off Balance Sheet Items; ASSUTI = Asset Utilization Ratio; OHEADTOTA = Overhead Expenses to Total Assets; ***, **, and * statistically significant at the 1%, 5%, and 10% levels, respectively. Standard errors are given in parentheses.

Bank Capital as dependent variable: Breusch-Pagan test is used to decide whether to use a PLS or a random effect model. Based on column one of Table 4.15c, the Breusch-Pagan test statistic is significant at 1% level. This shows that a random effect model is preferred over a PLS model in estimating Equation 1. Meanwhile, Hausman test is used in order to choose between a fixed effect and a random effect model. The Hausman test statistic is not significant indicating that random effect model would be the most appropriate model to estimate Equation 1. The random effect result shows that all the independent variables used (credit risk, cost inefficiency, profitability, loan growth and bank size) are significantly negatively related to bank capital.

Credit Risk as dependent variable: Based on column two of Table 4.15c, the Breusch-Pagan test statistic is significant at 1% level. Therefore, a random effect model is preferred over a pooled least square model in estimating Equation 2. Meanwhile, Hausman test statistic is significant at 1% level. Therefore, a fixed effect model would be the most appropriate model to estimated Equation 2.

Cost Inefficiency as dependent variable: Column three of Table 4.15c shows that the Breusch-Pagan test statistic is significant at 1% level. Therefore, a random effect model is preferred over a pooled least square model in estimating Equation 3. Meanwhile, Hausman test statistic is significant at 5% level. Therefore, a fixed effect model would be the most appropriate model to estimated Equation 3.

Profitability as dependent variable: Based on column four of Table 4.15c, the Breusch-Pagan test statistic is not significant. This shows that a PLS model is preferred over a random effect model in estimating Equation 4.

4.8.4 Two-Stage Least Square (2SLS) Analysis on Islamic banks in non-MENA region for the overall period of 10 years (2003 to 2012)

Table 4.15d presents the result of two-stage least square panel data analysis and the specification tests (weak instruments test, Hausman test, and Sargan test) for Equation 1 through 4 as listed out in chapter three. The results are interpreted based on the dependent variable that supports equations 1 to 4 in this regression analysis.

Table 4.15d: Results of the Two Stage Least Square Panel Data Analysis on Islamic banks in non-MENA region for the overall period of 10 years (2003 to 2012)

TSLS, using 255 bank year observations
Instruments: const., NLTA, SIZE, MGT_EFF, OBSTA, ASSUTI, OHEADTOTA
Robust (HAC) standard errors

	Bank Capital *as dependent variable (1)*	***Credit Risk*** *as dependent variable (2)*	***Cost Inefficiency*** *as dependent variable (3)*	***Profitability*** *as dependent variable (4)*
Const.	59.122** (30.135)	-18.835 (38.811)	0.663 (1.875)	-54.911 (316.838)
BC		-0.088 (0.144)	-0.008 (0.031)	0.923 (5.746)
CR	6.631 (14.438)		0.314 (0.284)	3.031 (20.683)
CInE	-36.171 (42.850)	11.803 (18.386)		12.689 (68.582)
ROA	-0.548 (1.894)	0.227 (0.780)	0.028 (0.063)	
NLTA	-0.751 (1.028)	0.014 (0.089)	-0.024 (0.017)	
SIZE	3.584 (8.907)	-0.551* (0.330)	0.168 (0.193)	2.284 (13.357)
MGT_EFF		0.118 (0.216)		
OBSTA			0.000 (0.000)	
ASSUTI				2.153 (7.462)
OHEADTOTA				-3.242 (14.330)
Instrumented	CR CInE ROA	BC CInE ROA	BC CR ROA	BC CR CInE
Hausman test (Chi-square)	3.787	46.093***	171.160***	11.675***
Sargan over-identification test statistic	0.830			
Weak instrument test - Cragg-Donald minimum eigenvalue	0.035**	0.097**	0.563**	0.003**

Note: BC = Bank Capital; CR = Credit Risk; CInE = Cost Inefficiency; ROA = Return on Asset; NLTA = Net Loan to Total Assets; SIZE = Bank Size; MGT_EFF = Management Efficiency; OBSTA = Off Balance Sheet Items; ASSUTI = Asset Utilization Ratio; OHEADTOTA = Overhead Expenses to Total Assets; ***, **, and * statistically significant at the 1%, 5%, and 10% levels, respectively. Standard errors are given in parentheses.

Bank Capital as dependent variable: Based on column one of Table 4.15d, Hausman test is not significant. Therefore, it is appropriate to use OLS. As mentioned in the earlier section, a random effect model is preferred over a fixed effect model.

Credit Risk as dependent variable: Based on column two of Table 4.15d, Hausman test is significant at 1% significance level. Therefore, it is appropriate to use TSLS. Sargan over-identification test result is not available. This is because Equation (2) is exactly identified as noted in Chapter 3 under the order condition analysis. The weak instrument test based on Cragg-Donald minimum eigenvalue is significant at 5% significance level. This indicates that the instruments used are neither weak nor invalid. Based on the result, it can be noted that bank size is negatively related to credit risk at 10% level of significance.

Cost Inefficiency as dependent variable: Based on column three of Table 4.15d, Hausman test is significant at 1% significance level. Therefore, it is appropriate to use TSLS. Sargan over-identification test result is not available. This is because Equation (3) is exactly identified as noted in Chapter 3 under the order condition analysis. The weak instrument test based on Cragg-Donald minimum eigenvalue is significant at 5% significance level. This indicates that the instruments used are neither weak nor invalid. Based on the result, none of the independent variables are significantly related to cost inefficiency.

Profitability as dependent variable: Based on column four of Table 4.15d, Hausman test is significant at 1% significance level. Therefore, it is appropriate to use TSLS. Sargan over-identification test result is not available. This is because Equation (4) is exactly identified as noted in Chapter 3 under the order condition analysis. The weak instrument test based on Cragg-Donald minimum eigenvalue is significant at 5% significance level. This indicates that the instruments used are neither weak nor invalid. Based on the result, none of the independent variables are significantly related to profitability.

4.8.5 The Summary on Panel Data Analysis finding for Islamic banks in non-MENA region over the 10 year period

Table 4.15e summarizes the results of the Panel Data Analysis as discussed in Sections 4.8.1 through 4.8.4.

Table 4.15e: Summary on Panel Data Analysis finding for Islamic banks in non-MENA region over the 10 year period (2003 to 2012)

Dependent Variable	**Appropriate Panel Data Model Used**	**Findings**
Bank Capital	Random Effect model	i. Credit risk significantly **negatively** affects bank capital. ii. Cost inefficiency significantly **negatively** affects bank capital. iii. Profitability significantly **negatively** affects bank capital. iv. Loan growth significantly **negatively** affects bank capital. v. Bank size significantly **negatively** affects bank capital.
Credit Risk	Two-Stage Least Square model	i. Bank capital **negatively** affects credit risk. ii. Cost inefficiency **positively** affects credit risk. iii. Profitability **positively** affects credit risk. iv. Loan growth **positively** affects credit risk. v. Bank size significantly **negatively** affects credit risk. vi. Management efficiency **positively** affects credit risk.
Cost Inefficiency	Two-Stage Least Square model	i. Bank capital **negatively** affects cost inefficiency. ii. Credit risk **positively** affects cost inefficiency. iii. Profitability **positively** affects cost inefficiency. iv. Loan growth **negatively** affects cost inefficiency. v. Bank size **positively** affects cost inefficiency. vi. Off-balance sheet items **positively** affect cost inefficiency.
Profitability	Two-Stage Least Square model	i. Bank capital **positively** affects profitability. ii. Credit risk **positively** affects profitability. iii. Cost inefficiency **positively** affects profitability. iv. Bank size **positively** affects profitability. v. Asset utilization **positively** affects profitability. vi. Overhead expenses **negatively** affects profitability

4.9 Determining the Relationships between Bank Capital, Credit Risk, Cost Inefficiency, and Profitability on *Islamic banks in non-MENA region before GFC (2003 to 2007) period*

In this section, the results of the analysis of the relationships between bank capital, credit risk, cost inefficiency and profitability of Islamic banks in non-MENA region for the period before GFC (2003 to 2007) are presented. The results of the pooled least square analysis, fixed effect analysis, random effect analysis and two-stage least square analysis based on Equations 1 to 4 as listed out in chapter three are presented. Multicollinearity analysis was carried out by computing the Variance Inflation Factors (VIF) of the independent variables used in Equations 1 to 4. Based on the results as presented in Appendix 1, all the VIF values are less than 10, indicating that the independent variables used in Equations 1 to 4 are not highly correlated with each other. Therefore, none of the independent variables are excluded from Equations 1 to 4.

4.9.1 Pooled Least Square (PLS) analysis on Islamic banks in non-MENA region for the period before GFC (2003 to 2007)

Table 4.16a presents the result of pooled least square technique on Equation 1 to 4.

Bank Capital as dependent variable: From column one of Table 4.16a, it can be noted that credit risk, cost inefficiency, profitability and loan growth are significantly negatively related to bank capital. However, bank size is not significantly related to bank capital.

Credit Risk as dependent variable: The results reported in column two of Table 4.16a indicate that bank capital and profitability significantly negatively related to credit risk at 5% significance level. On the other hand, cost inefficiency, loan growth, bank size and management efficiency are not significantly related to credit risk.

Cost Inefficiency as dependent variable: Column three of Table 4.16a indicates that at 1% significance level, bank capital and profitability are significantly negatively related to cost inefficiency. Credit risk is significantly negatively related to cost inefficiency at 10% significance level. However, loan growth, bank size and off-balance sheet items are not significantly related to cost inefficiency.

Table 4.16a: Results of the Pooled Least Square (PLS) analysis on Islamic banks in non-MENA region before GFC (2003 to 2007) period

Pooled OLS, using 102 bank year observations
Robust (HAC) standard errors

	Bank Capital *as dependent variable* *(1)*	***Credit Risk*** *as dependent variable* *(2)*	***Cost Inefficiency*** *as dependent variable* *(3)*	***Profitability*** *as dependent variable* *(4)*
Const.	59.989*** (13.859)	7.016 (6.977)	1.666*** (0.205)	0.499 (1.255)
BC		-0.110** (0.052)	-0.008*** (0.003)	-0.012 (0.010)
CR	-2.531*** (0.354)		-0.018* (0.010)	-0.070 (0.081)
CInE	-17.522*** (5.330)	-2.351 (1.936)		-0.428 (0.866)
ROA	-1.991*** (0.492)	-0.442** (0.188)	-0.058*** (0.012)	
NLTA	-0.202* (0.110)	0.033 (0.022)	-0.001 (0.003)	
SIZE	-0.337 (1.100)	0.087 (0.358)	-0.001 (0.022)	-0.102 (0.113)
MGT_EFF		-0.020 (0.033)		
OBSTA			-0.000 (0.000)	
ASSUTI				0.966*** (0.080)
OHEADTOTA				-0.865*** (0.074)
Adjusted R-squared	0.514	0.434	0.412	0.894
F-statistics	22.351***	13.931***	12.786***	143.529***

Note: BC = Bank Capital; CR = Credit Risk; CInE = Cost Inefficiency; ROA = Return on Asset; NLTA = Net Loan to Total Assets; SIZE = Bank Size; MGT_EFF = Management Efficiency; OBSTA = Off Balance Sheet Items; ASSUTI = Asset Utilization Ratio; OHEADTOTA = Overhead Expenses to Total Assets; ***, **, and * statistically significant at the 1%, 5%, and 10% levels, respectively. Standard errors are given in parentheses.

Profitability as dependent variable: . It can be noted from column four of Table 4.16a that asset utilization is significantly positively related to profitability at 1% significance level. Meanwhile, overhead expenses are significantly negatively related to profitability at 1% significance level. On the other hand, bank capital, credit risk, cost inefficiency and bank size are not significantly related to profitability.

4.9.2 Fixed Effect (FE) Analysis on Islamic banks in non-MENA region before GFC (2003 to 2007) period

Table 4.16b presents the result of fixed effect panel data analysis on Equation 1 to 4.

Table 4.16b: Results of the Fixed Effect (FE) Analysis on Islamic banks in non-MENA region before GFC (2003 to 2007) period

Fixed-effects, using 102 bank year observations
Robust (HAC) standard errors

	Bank Capital *as dependent variable* *(1)*	***Credit Risk*** *as dependent variable* *(2)*	***Cost Inefficiency*** *as dependent variable* *(3)*	***Profitability*** *as dependent variable* *(4)*
Const.	72.911*** (12.039)	13.179** (5.924)	1.998*** (0.565)	2.097 (2.293)
BC		-0.104** (0.042)	-0.011** (0.005)	-0.025 (0.027)
CR	-1.896*** (0.646)		-0.024 (0.022)	-0.301 (0.249)
CInE	-12.305** (4.740)	-2.283* (1.303)		-1.656 (1.401)
ROA	-1.272*** (0.394)	-0.350** (0.143)	-0.076*** (0.011)	
NLTA	-0.554*** (0.120)	0.004 (0.027)	-0.007 (0.005)	
SIZE	-0.888 (1.172)	-0.208 (0.269)	0.009 (0.060)	-0.025 (0.177)
MGT_EFF		-0.055* (0.033)		
OBSTA			0.000 (0.000)	
ASSUTI				0.911*** (0.170)
OHEADTOTA				-0.681*** (0.136)
Adjusted R-squared	0.900	0.879	0.747	0.916
F-test statistic	12.938***	12.229***	5.052***	1.790**

Note: BC = Bank Capital; CR = Credit Risk; CInE = Cost Inefficiency; ROA = Return on Asset; NLTA = Net Loan to Total Assets; SIZE = Bank Size; MGT_EFF = Management Efficiency; OBSTA = Off Balance Sheet Items; ASSUTI = Asset Utilization Ratio; OHEADTOTA = Overhead Expenses to Total Assets; ***, **, and * statistically significant at the 1%, 5%, and 10% levels, respectively. Standard errors are given in parentheses.

Bank Capital as dependent variable: F-test is used in order to identify whether a PLS or a fixed effect model should be used. Based on column one of Table 4.16b, the F test statistic is significant at 1% level. Therefore a fixed effect model would be appropriate to estimated Equation 1. The result indicates that credit risk, cost inefficiency, profitability and loan growth are significantly negatively related to bank capital. On the other hand, bank size is not significantly related to bank capital.

Credit Risk as dependent variable: Based on column two of Table 4.16b, the F test statistic is significant at 1% level. This shows that a fixed effect model would be appropriate to estimated Equation 2. The result shows that bank capital, cost inefficiency, profitability and management efficiency are significantly negatively related to credit risk. On the other hand, loan growth and bank size are not significantly related to credit risk.

Cost Inefficiency as dependent variable: Column three of Table 4.16b shows that the F test statistic is significant at 1% level. Therefore a fixed effect model would be appropriate to estimated Equation 3. It could be noted from the result that bank capital and profitability are significantly negatively related to cost inefficiency. On the other hand, credit risk, loan growth, bank size and off-balance sheet items are not significantly related to cost inefficiency.

Profitability as dependent variable: Column four of Table 4.16b shows that the F test statistic is significant at 5% level. Therefore a fixed effect model would be appropriate to estimated Equation 4. The result shows that asset utilization is significantly positively related to profitability at 1% significance level. Meanwhile, overhead expenses are significantly negatively related to profitability at 1% significance level. On the other hand, bank capital, credit risk, cost inefficiency and bank size are not significantly related to profitability.

4.9.3 Random Effect (RE) Analysis on Islamic banks in non-MENA region for the period before GFC (2003 to 2007)

Table 4.16c presents the result of random effect panel data analysis on Equations 1 to 4.

Bank Capital as dependent variable: Breusch-Pagan test is used to decide whether to use a PLS or a random effect model. Based on column one of Table 4.16c, the Breusch-Pagan test statistic is significant at 1% level. This shows that a random effect model is preferred over a PLS model in estimating Equation 1. Meanwhile, Hausman test is used in order to choose between a fixed effect and a random effect model. The Hausman test statistic is not significant indicating that random effect model would be the most appropriate model to estimate Equation 1. The random effect result shows that credit risk, cost inefficiency, profitability and loan growth are significantly negatively related to bank capital at 1% significance level. However, bank size is not significantly related to bank capital.

Table 4.16c: Results of the Random Effect (RE) Analysis on Islamic banks in non-MENA region before GFC (2003 to 2007) period

Random-effects (GLS), using 102 bank year observations

	Bank Capital *as dependent variable (1)*	***Credit Risk*** *as dependent variable (2)*	***Cost Inefficiency*** *as dependent variable (3)*	***Profitability*** *as dependent variable (4)*
Const.	73.903*** (8.593)	9.606*** (3.051)	1.778*** (0.219)	0.435 (1.266)
BC		-0.090*** (0.018)	-0.009*** (0.002)	-0.012 (0.011)
CR	-2.089*** (0.459)		-0.018 (0.013)	-0.078 (0.056)
CInE	-13.260*** (3.546)	-1.898** (0.870)		-0.394 (0.563)
ROA	-1.441*** (0.344)	-0.334*** (0.077)	-0.071*** (0.007)	
NLTA	-0.437*** (0.087)	0.026 (0.019)	-0.004* (0.002)	
SIZE	-1.255 (0.980)	-0.167 (0.200)	0.010 (0.026)	-0.092 (0.116)
MGT_EFF		-0.036* (0.021)		
OBSTA			0.000 (0.000)	
ASSUTI				0.962*** (0.078)
OHEADTOTA				-0.865*** (0.057)
Breusch-Pagan test (Chi-square)	14.941***	36.878***	5.676**	4.760**
Hausman test (Chi-square)	6.038	5.889	8.308	9.745

Note: BC = Bank Capital; CR = Credit Risk; CInE = Cost Inefficiency; ROA = Return on Asset; NLTA = Net Loan to Total Assets; SIZE = Bank Size; MGT_EFF = Management Efficiency; OBSTA = Off Balance Sheet Items; ASSUTI = Asset Utilization Ratio; OHEADTOTA = Overhead Expenses to Total Assets; ***, **, and * statistically significant at the 1%, 5%, and 10% levels, respectively. Standard errors are given in parentheses.

Credit Risk as dependent variable: Based on column two of Table 4.16c, the Breusch-Pagan test statistic is significant at 1% level. Therefore, a random effect model is preferred over a pooled least square model in estimating Equation 2. Meanwhile, Hausman test statistic is not significant indicating that random effect model would be the most appropriate model to estimate Equation 2. The random effect result shows that bank capital, cost inefficiency, profitability and management efficiency are significantly negatively related to credit risk. However, loan growth and bank size are not significantly related to credit risk.

Cost Inefficiency as dependent variable: Column three of Table 4.16c shows that the Breusch-Pagan test statistic is significant at 5% level. Therefore, a random effect model is preferred over a pooled least square model in estimating Equation 3. Meanwhile, Hausman test statistic is not significant indicating that random effect model would be the most appropriate model to estimate Equation 3. The random effect result shows that bank capital, profitability and loan growth are significantly negatively related to cost inefficiency. However, credit risk, bank size and off-balance sheet items are not significantly related to cost inefficiency.

Profitability as dependent variable: Based on column four of Table 4.16c, the Breusch-Pagan test statistic is significant at 5% level. Therefore, a random effect model is preferred over a pooled least square model in estimating Equation 4. Meanwhile, Hausman test statistic is not significant indicating that random effect model would be the most appropriate model to estimate Equation 4. The random effect result shows that asset utilization is significantly positively related to profitability at 1% significance level. Overhead expenses are significantly negatively related to profitability at 1% significance level. On the other hand, bank capital, credit risk, cost inefficiency and bank size not significantly related to profitability.

4.9.4 Two-Stage Least Square (2SLS) Analysis on Islamic banks in non-MENA region for the period before GFC (2003 to 2007)

Table 4.16d presents the result of two-stage least square panel data analysis and the specification tests (weak instruments test, Hausman test, and Sargan test) for Equation 1 through 4 as listed out in chapter three. The results are interpreted based on the dependent variable that supports equations 1 to 4 in this regression analysis.

Bank Capital as dependent variable: Based on column one of Table 4.16d, Hausman test is not significant. Therefore, it is appropriate to use OLS. As mentioned in the earlier section, a random effect model is preferred over a fixed effect model and pooled OLS.

Credit Risk as dependent variable: Based on column two of Table 4.16d, Hausman test is not significant. Therefore, it is appropriate to use OLS. As mentioned in the earlier section, a random effect model is preferred over a fixed effect model and pooled OLS.

Cost Inefficiency as dependent variable: Based on column three of Table 4.16d, Hausman test is significant at 1% significance level. Therefore, it is appropriate to use TSLS. Sargan over-identification test result is not available. This is because Equation (3) is exactly identified as noted in Chapter 3 under the order condition analysis. The weak instrument test based on Cragg-Donald minimum eigenvalue is significant at 5% significance level. This indicates that the instruments used are neither weak nor invalid. Based on the result, none of the independent variables are significantly related to cost inefficiency.

Table 4.16d: Results of the Two Stage Least Square Panel Data Analysis on Islamic banks in non-MENA region for the period before GFC (2003 to 2007)

TSLS, using 102 bank year observations
Instruments: const., NLTA, SIZE, MGT_EFF, OBSTA, ASSUTI, OHEADTOTA
Robust (HAC) standard errors

	Bank Capital *as dependent variable (1)*	***Credit Risk*** *as dependent variable (2)*	***Cost Inefficiency*** *as dependent variable (3)*	***Profitability*** *as dependent variable (4)*
Const.	35.223 (31.007)	-28.212 (283.886)	5.380 (6.336)	8.455 (9.902)
BC		-0.121 (0.183)	-0.145 (0.268)	-0.252 (0.285)
CR	-6.363 (4.934)		-0.830 (2.155)	-1.443 (1.491)
CInE	-6.785 (12.881)	13.184 (122.937)		-1.222 (3.420)
ROA	-2.691* (1.396)	0.297 (6.135)	-0.363 (0.768)	
NLTA	0.058 (0.347)	-0.026 (0.371)	0.002 (0.069)	
SIZE	0.470 (1.931)	0.188 (0.619)	0.043 (0.360)	0.042 (0.430)
MGT_EFF		0.169 (1.477)		
OBSTA			0.000 (0.009)	
ASSUTI				0.423 (0.584)
OHEADTOTA				-0.359 (0.661)
Instrumented	CR CInE ROA	BC CInE ROA	BC CR ROA	BC CR CInE
Hausman test (Chi-square)	4.276	1.745	59.078***	8.582**
Sargan over-identification test statistic	0.028			
Weak instrument test - Cragg-Donald minimum eigenvalue	0.244**	0.006**	0.096**	0.098**

Note: BC = Bank Capital; CR = Credit Risk; CInE = Cost Inefficiency; ROA = Return on Asset; NLTA = Net Loan to Total Assets; SIZE = Bank Size; MGT_EFF = Management Efficiency; OBSTA = Off Balance Sheet Items; ASSUTI = Asset Utilization Ratio; OHEADTOTA = Overhead Expenses to Total Assets; ***, **, and * statistically significant at the 1%, 5%, and 10% levels, respectively. Standard errors are given in parentheses.

Profitability as dependent variable: Based on column four of Table 4.16d, Hausman test is significant at 5% significance level. Therefore, it is appropriate to use TSLS. Sargan over-identification test result is not available. This is because Equation (4) is exactly identified as noted in Chapter 3 under the order condition analysis. The weak instrument test based on Cragg-Donald minimum eigenvalue is significant at 5% significance level.

This indicates that the instruments used are neither weak nor invalid. Based on the result, none of the independent variables are significantly related to profitability.

4.9.5 The Summary of Panel Data Analysis finding for Islamic banks in non-MENA region before GFC (2003 to 2007) period

Table 4.16e summarizes the results of the Panel Data Analysis as discussed in Sections 4.9.1 through 4.9.4.

Table 4.16e: Summary of Panel Data Analysis for Islamic banks in non-MENA region before GFC (2003 to 2007) period

Dependent Variable	**Appropriate Panel Data Model Used**	**Findings**
Bank Capital	Random Effect model	i. Credit risk significantly **negatively** affects bank capital. ii. Cost inefficiency significantly **negatively** affects bank capital. iii. Profitability significantly **negatively** affects bank capital. iv. Loan growth significantly **negatively** affects bank capital. v. Bank size **negatively** affects bank capital.
Credit Risk	Random Effect model	i. Bank capital significantly **negatively** affects credit risk. ii. Cost inefficiency significantly **negatively** affects credit risk. iii. Profitability significantly **negatively** affects credit risk. iv. Loan growth **positively** affects credit risk. v. Bank size **negatively** affects credit risk. vi. Management efficiency significantly **negatively** affects credit risk.
Cost Inefficiency	Two-Stage Least Square model	i. Bank capital **negatively** affects cost inefficiency. ii. Credit risk **negatively** affects cost inefficiency. iii. Profitability **negatively** affects cost inefficiency. iv. Loan growth **positively** affects cost inefficiency. v. Bank size **positively** affects cost inefficiency. vi. Off-balance sheet items **positively** affect cost inefficiency.
Profitability	Two-Stage Least Square model	i. Bank capital **negatively** affects profitability. ii. Credit risk **negatively** affects profitability. iii. Cost inefficiency **negatively** affects profitability. iv. Bank size **positively** affects profitability. v. Asset utilization **positively** affects profitability. vi. Overhead expenses **negatively** affects profitability

4.10 Determining the Relationships between Bank Capital, Credit Risk, Cost Inefficiency, and Profitability on *Islamic banks in non-MENA region after GFC (2008 to 2012) period*

In this section, the results of the analysis of the relationships between bank capital, credit risk, cost inefficiency and profitability of Islamic banks in non-MENA region for the period after GFC (2008 to 2012) are presented. The results of the pooled least square analysis, fixed effect analysis, random effect analysis and two-stage least square analysis based on Equations 1 to 4 as listed out in chapter three are presented. Multicollinearity analysis was carried out by computing the Variance Inflation Factors (VIF) of the independent variables used in Equations 1 to 4. Based on the results as presented in Appendix 1, all the VIF values are less than 10, indicating that the independent variables used in Equations 1 to 4 are not highly correlated with each other. Therefore, none of the independent variables are excluded from Equations 1 to 4.

4.10.1 Pooled Least Square (PLS) analysis on Islamic banks in non-MENA region for the period after GFC (2008 to 2012)

Table 4.17a presents the result of pooled least square technique on Equation 1 to 4.

Bank Capital as dependent variable: From column one of Table 4.17a, it can be noted that credit risk is significantly negatively related to bank capital at 1% significance level. However, cost inefficiency, profitability, loan growth and bank size is not significantly related to bank capital.

Credit Risk as dependent variable: The results reported in column two of Table 4.17a indicate that bank capital, cost inefficiency, profitability and management efficiency are significantly negatively related to credit risk. Loan growth is significantly positively related to credit risk at 5% significance level. On the other hand, bank size is not significantly related to credit risk.

Table 4.17a: Results of the Pooled Least Square (PLS) analysis on Islamic banks in non-MENA region for the period after GFC (2008 to 2012)

Pooled OLS, using 153 bank year observations
Robust (HAC) standard errors

	Bank Capital *as dependent variable (1)*	***Credit Risk*** *as dependent variable (2)*	***Cost Inefficiency*** *as dependent variable (3)*	***Profitability*** *as dependent variable (4)*
Const.	65.197** (30.733)	15.548*** (5.650)	1.518*** (0.099)	-2.460 (1.574)
BC		-0.091* (0.048)	-0.002** (0.001)	-0.022*** (0.008)
CR	-2.309*** (0.800)		0.000 (0.005)	-0.355*** (0.030)
CInE	-22.014 (15.933)	-3.611** (1.587)		0.970 (0.785)
ROA	-2.349 (1.550)	-1.097*** (0.298)	0.004 (0.010)	
NLTA	-0.067 (0.178)	0.065** (0.029)	-0.000 (0.001)	
SIZE	-1.430 (1.903)	-0.457 (0.386)	-0.006 (0.012)	0.138 (0.086)
MGT_EFF		-0.077* (0.046)		
OBSTA			-0.002** (0.001)	
ASSUTI				0.886*** (0.070)
OHEADTOTA				-0.783*** (0.117)
Adjusted R-squared	0.297	0.578	0.092	0.790
F-statistics	13.873***	35.681***	3.570***	96.045***

Note: BC = Bank Capital; CR = Credit Risk; CInE = Cost Inefficiency; ROA = Return on Asset; NLTA = Net Loan to Total Assets; SIZE = Bank Size; MGT_EFF = Management Efficiency; OBSTA = Off Balance Sheet Items; ASSUTI = Asset Utilization Ratio; OHEADTOTA = Overhead Expenses to Total Assets; ***, **, and * statistically significant at the 1%, 5%, and 10% levels, respectively. Standard errors are given in parentheses.

Cost Inefficiency as dependent variable: Column three of Table 4.17a indicates that at 5% significance level, bank capital and off-balance sheet items are significantly negatively related to cost inefficiency. However, credit risk, profitability, loan growth and bank size are not significantly related to cost inefficiency.

Profitability as dependent variable: It can be noted from column four of Table 4.17a that bank capital, credit risk and overhead expenses are significantly negatively related to profitability at 1% significance level. Asset utilization is significantly positively related to profitability at 1% significance level. On the other hand, cost inefficiency and bank size are not significantly related to profitability.

4.10.2 Fixed Effect (FE) analysis on Islamic banks in non-MENA region for the period after GFC (2008 to 2012)

Table 4.17b presents the result of fixed effect panel data analysis on Equation 1 to 4.

Bank Capital as dependent variable: F-test is used in order to identify whether a PLS or a fixed effect model should be used. Based on column one of Table 4.17b, the F test statistic is significant at 1% level. Therefore a fixed effect model would be appropriate to estimated Equation 1. The result indicates that credit risk, cost inefficiency and bank size are significantly negatively related to bank capital. Loan growth is significantly positively related to bank capital. On the other hand, profitability is not significantly related to bank capital.

Credit Risk as dependent variable: Based on column two of Table 4.17b, the F test statistic is significant at 1% level. This shows that a fixed effect model would be appropriate to estimated Equation 2. The result shows that bank capital and bank size, are significantly negatively related to credit risk at 5% significance level. On the other hand, cost inefficiency, profitability, loan growth and management efficiency are not significantly related to credit risk.

Table 4.17b: Results of the Fixed Effect (FE) Analysis on Islamic banks in non-MENA region after GFC (2008 to 2012) period

Fixed-effects, using 153 bank year observations
Robust (HAC) standard errors

	Bank Capital *as dependent variable* *(1)*	***Credit Risk*** *as dependent variable* *(2)*	***Cost Inefficiency*** *as dependent variable* *(3)*	***Profitability*** *as dependent variable* *(4)*
Const.	62.897*** (17.302)	10.740*** (3.914)	2.414*** (0.532)	-3.298** (1.421)
BC		-0.174** (0.086)	-0.004** (0.002)	0.039* (0.021)
CR	-1.331** (0.602)		0.003 (0.005)	-0.080 (0.052)
CInE	-8.771** (3.802)	1.539 (1.888)		0.111 (0.499)
ROA	0.271 (0.315)	-0.201 (0.166)	-0.004 (0.003)	
NLTA	0.102** (0.051)	0.007 (0.042)	-0.002 (0.002)	
SIZE	-5.140*** (1.642)	-1.272** (0.564)	0.112* (0.058)	0.249** (0.107)
MGT_EFF		0.020 (0.028)		
OBSTA			-0.001** (0.000)	
ASSUTI				0.765*** (0.153)
OHEADTOTA				-0.735*** (0.147)
Adjusted R-squared	0.927	0.853	0.577	0.817
F-test statistic	35.948***	8.554***	5.929***	1.615**

Note: BC = Bank Capital; CR = Credit Risk; CInE = Cost Inefficiency; ROA = Return on Asset; NLTA = Net Loan to Total Assets; SIZE = Bank Size; MGT_EFF = Management Efficiency; OBSTA = Off Balance Sheet Items; ASSUTI = Asset Utilization Ratio; OHEADTOTA = Overhead Expenses to Total Assets; ***, **, and * statistically significant at the 1%, 5%, and 10% levels, respectively. Standard errors are given in parentheses.

Cost Inefficiency as dependent variable: Column three of Table 4.17b shows that the F test statistic is significant at 1% level. Therefore a fixed effect model would be appropriate to estimated Equation 3. It could be noted from the result that bank capital, bank size and off-balance sheet items are significantly negatively related to cost inefficiency. On the other hand, credit risk, profitability and loan growth are not significantly related to cost inefficiency.

Profitability as dependent variable: Column four of Table 4.17b shows that the F test statistic is significant at 5% level. Therefore a fixed effect model would be appropriate to estimated Equation 4. The result shows that bank capital, bank size and asset utilization are significantly positively related to profitability. Meanwhile, overhead expenses are significantly negatively related to profitability at 1% significance level. On the other hand, credit risk and cost inefficiency are not significantly related to profitability.

4.10.3 Random Effect (RE) analysis on Islamic banks in non-MENA region for the period after GFC (2008 to 2012)

Table 4.17c presents the result of random effect panel data analysis on Equation 1 to 4.

Bank Capital as dependent variable: Breusch-Pagan test is used to decide whether to use a PLS or a random effect model. Based on column one of Table 4.17c, the Breusch-Pagan test statistic is significant at 1% level. This shows that a random effect model is preferred over a PLS model in estimating Equation 1. Meanwhile, Hausman test is used in order to choose between a fixed effect and a random effect model. The Hausman test statistic is significant at 5% level indicating that a fixed effect model would be the most appropriate model to estimated Equation 1.

Credit Risk as dependent variable: Based on column two of Table 4.17c, the Breusch-Pagan test statistic is significant at 1% level. Therefore, a random effect model is preferred over a pooled least square model in estimating Equation 2. Meanwhile, Hausman test statistic is significant at 1% level indicating that a fixed effect model would be the most appropriate model to estimated Equation 2.

Table 4.17c: Results of the Random Effect (RE) Analysis on Islamic banks in non-MENA region for the period after GFC (2008 to 2012)

Random-effects (GLS), using 153 bank year observations

	Bank Capital *as dependent variable (1)*	***Credit Risk*** *as dependent variable (2)*	***Cost Inefficiency*** *as dependent variable (3)*	***Profitability*** *as dependent variable (4)*
Const.	63.984*** (11.622)	7.867 (4.971)	1.760*** (0.120)	-2.460* (1.357)
BC		-0.115*** (0.020)	-0.003** (0.001)	-0.022*** (0.007)
CR	-1.394*** (0.222)		0.002 (0.004)	-0.355*** (0.025)
CInE	-9.837** (4.338)	0.767 (1.866)		0.970 (0.681)
ROA	0.109 (0.346)	-0.568*** (0.115)	0.003 (0.007)	
NLTA	0.067 (0.062)	0.032 (0.020)	-0.001 (0.001)	
SIZE	-4.838*** (1.018)	-0.791*** (0.298)	-0.035** (0.016)	0.138 (0.098)
MGT_EFF		-0.003 (0.028)		
OBSTA			-0.001 (0.001)	
ASSUTI				0.886*** (0.067)
OHEADTOTA				-0.783*** (0.099)
Breusch-Pagan test (Chi-square)	192.726***	58.605***	34.913***	0.004
Hausman test (Chi-square)	12.286**	45.595***	28.164***	26.765***

Note: BC = Bank Capital; CR = Credit Risk; CInE = Cost Inefficiency; ROA = Return on Asset; NLTA = Net Loan to Total Assets; SIZE = Bank Size; MGT_EFF = Management Efficiency; OBSTA = Off Balance Sheet Items; ASSUTI = Asset Utilization Ratio; OHEADTOTA = Overhead Expenses to Total Assets; ***, **, and * statistically significant at the 1%, 5%, and 10% levels, respectively. Standard errors are given in parentheses.

Cost Inefficiency as dependent variable: Column three of Table 4.17c shows that the Breusch-Pagan test statistic is significant at 1% level. Therefore, a random effect model is preferred over a pooled least square model in estimating Equation 3. Meanwhile, Hausman test statistic is significant at 1% level indicating that a fixed effect model would be the most appropriate model to estimated Equation 3.

Profitability as dependent variable: Based on column four of Table 4.17c, the Breusch-Pagan test statistic is not significant indicating that a PLS model is preferred over a random effect model in estimating Equation 4. However, as mentioned earlier, based on Table 4.17b, a fixed effect model would be appropriate to estimate Equation 4.

4.10.4 Two-Stage Least Square (2SLS) Analysis on Islamic banks in non-MENA region for the period after GFC (2008 to 2012)

Table 4.17d presents the result of two-stage least square panel data analysis and the specification tests (weak instruments test, Hausman test, and Sargan test) for Equation 1 through 4 as listed out in chapter three. The results are interpreted based on the dependent variable that supports equations 1 to 4 in this regression analysis.

Bank Capital as dependent variable: Based on column one of Table 4.17d, Hausman test is significant at 1% significance level. Therefore, it is appropriate to use TSLS. Sargan over-identification test indicates that Equation 1 is over-identified. The Sargan over-identification result is not significant indicating that all the instruments used in estimating Equation (1) are valid. The weak instrument test based on Cragg-Donald minimum eigenvalue is significant at 5% significance level. This indicates that the instruments used are neither weak nor invalid. Based on the result, none of the independent variables are significantly related to bank capital.

Credit Risk as dependent variable: Based on column two of Table 4.17d, Hausman test is significant at 1% significance level. Therefore, it is appropriate to use TSLS. Sargan over-identification test result is not available. This is because Equation (2) is exactly identified as noted in Chapter 3 under the order condition analysis. The weak instrument test based on Cragg-Donald minimum eigenvalue is significant at 5% significance level. This indicates that the instruments used are neither weak nor invalid. Based on the result, bank size is significantly negatively related to credit risk at 5% level of significance.

Table 4.17d: Results of the Two Stage Least Square Panel Data Analysis on Islamic banks in non-MENA region for the period after GFC (2008 to 2012)

TSLS, using 153 bank year observations

Instruments: const., NLTA, SIZE, MGT_EFF, OBSTA, ASSUTI, OHEADTOTA

Robust (HAC) standard errors

	Bank Capital *as dependent variable (1)*	***Credit Risk*** *as dependent variable (2)*	***Cost Inefficiency*** *as dependent variable (3)*	***Profitability*** *as dependent variable (4)*
Const.	105.325 (164.362)	-3.169 (15.583)	0.601 (0.794)	-4.518 (3.438)
BC		0.060 (0.165)	-0.006 (0.013)	-0.034 (0.066)
CR	20.766 (51.887)		0.116 (0.085)	-0.555*** (0.195)
CInE	-177.345 (412.695)	7.681 (7.875)		3.585* (2.027)
ROA	1.816 (7.751)	-0.095 (0.229)	0.011 (0.026)	
NLTA	-1.941 (4.619)	0.099 (0.090)	-0.011* (0.006)	
SIZE	25.776 (70.984)	-1.262** (1.165)	0.144 (0.104)	-0.002 (0.171)
MGT_EFF		-0.013 (0.102)		
OBSTA			-0.000 (0.001)	
ASSUTI				0.904*** (0.174)
OHEADTOTA				-0.745*** (0.329)
Instrumented	CR CInE ROA	BC CInE ROA	BC CR ROA	BC CR CInE
Hausman test (Chi-square)	13.752***	56.788***	128.161***	12.291***
Sargan over-identification test statistic	0.008			
Weak instrument test - Cragg-Donald minimum eigenvalue	0.053**	0.546**	1.596**	0.571**

Note: BC = Bank Capital; CR = Credit Risk; CInE = Cost Inefficiency; ROA = Return on Asset; NLTA = Net Loan to Total Assets; SIZE = Bank Size; MGT_EFF = Management Efficiency; OBSTA = Off Balance Sheet Items; ASSUTI = Asset Utilization Ratio; OHEADTOTA = Overhead Expenses to Total Assets; ***, **, and * statistically significant at the 1%, 5%, and 10% levels, respectively. Standard errors are given in parentheses.

Cost Inefficiency as dependent variable: Based on column three of Table 4.17d, Hausman test is significant at 1% significance level. Therefore, it is appropriate to use TSLS. Sargan over-identification test result is not available. This is because Equation (3) is exactly identified as noted in Chapter 3 under the order condition analysis. The weak instrument test based on Cragg-Donald minimum eigenvalue is significant at 5%

significance level. This indicates that the instruments used are neither weak nor invalid. Based on the result, loan growth is significantly negatively related to cost inefficiency at 10% level of significance.

Profitability as dependent variable: Based on column four of Table 4.17d, Hausman test is significant at 5% significance level. Therefore, it is appropriate to use TSLS. Sargan over-identification test result is not available. This is because Equation (4) is exactly identified as noted in Chapter 3 under the order condition analysis. The weak instrument test based on Cragg-Donald minimum eigenvalue is significant at 5% significance level. This indicates that the instruments used are neither weak nor invalid. Based on the result, credit risk and overhead expenses are significantly negatively related to profitability at 1% and 5% level of significance respectively. This table also shows that cost inefficiency and asset utilization are significantly positively related to profitability at 10% and 1% level of significance respectively.

4.10.5 The Summary of Panel Data Analysis finding for Islamic banks in non-MENA region after GFC (2008 to 2012)

Table 4.17e summarizes the results of the Panel Data Analysis as discussed in Sections 4.10.1 through 4.10.4.

Table 4.17e: Summary of Panel Data Analysis finding for Islamic banks in non-MENA region after GFC (2008 to 2012) period

Dependent Variable	**Appropriate Panel Data Model Used**	**Findings**
Bank Capital	Two-Stage Least Square model	i. Credit risk **positively** affects bank capital. ii. Cost inefficiency **negatively** affects bank capital. iii. Profitability **positively** affects bank capital. iv. Loan growth **negatively** affects bank capital. v. Bank size **positively** affects bank capital.
Credit Risk	Two-Stage Least Square model	i. Bank capital **positively** affects credit risk. ii. Cost inefficiency **positively** affects credit risk. iii. Profitability **negatively** affects credit risk. iv. Loan growth **positively** affects credit risk. v. Bank size significantly **negatively** affects credit risk. vi. Management efficiency **negatively** affects credit risk.
Cost Inefficiency	Two-Stage Least Square model	i. Bank capital **negatively** affects cost inefficiency. ii. Credit risk **positively** affects cost inefficiency. iii. Profitability **positively** affects cost inefficiency. iv. Loan growth significantly **negatively** affects cost inefficiency. v. Bank size **positively** affects cost inefficiency. vi. Off-balance sheet items **negatively** affect cost inefficiency.
Profitability	Two-Stage Least Square model	i. Bank capital **negatively** affects profitability. ii. Credit risk significantly **negatively** affects profitability. iii. Cost inefficiency significantly **positively** affects profitability. iv. Bank size **negatively** affects profitability. v. Asset utilization significantly **positively** affects profitability. vi. Overhead expenses significantly **negatively** affects profitability

4.11 Chapter summary

This chapter is divided into two sections. Firstly, this chapter provided the summary statistics on annual average bank capital, credit risk, cost inefficiency and profitability of the sample Islamic banks used in this study. The summary statistics were not only presented for the entire sample of Islamic banks over 10 year period but also subdivided into Islamic banks in MENA and non-MENA regions.

Secondly, the panel data regression analysis on bank capital, credit risk, cost inefficiency and profitability were presented in the following order:

(i) for all selected sample Islamic banks over the 10 year period;

(ii) for all the Islamic banks before the GFC (2003 to 2007);

(iii) for all the Islamic banks after the GFC (2008 to 2012);

(iv) for Islamic banks in the MENA region over the 10 year period;

(v) for Islamic banks in the MENA region before the GFC (2003 to 2007);

(vi) for Islamic banks in the MENA region after the GFC (2008 to 2012);

(vii) for Islamic banks in the non-MENA region over the 10 year period;

(viii) for Islamic banks in the non-MENA region before the GFC (2003 to 2007);

(ix) for Islamic banks in the non-MENA region after the GFC (2008 to 2012)

The panel data regression analysis presented covered pooled least square, fixed effect, random effect and two stage least square analysis.

CHAPTER 5

IMPLICATION OF FINDINGS, LIMITATIONS AND RECOMMENDATIONS

5.0 Introduction

This chapter presents the implications of the empirical findings of this study in relation to its objectives. The main objective of this study is to empirically determine the relationships between bank capital, credit risk, cost inefficiency and profitability in a selected sample of Islamic banks on a cross-country basis for the years between 2003 and 2012. Specifically the study aims to identify these relationships during the periods before and after the global financial crisis (GFC). The second objective is to determine the differences in these relationships in Islamic banks that operate in MENA and non-MENA regions for the period of 2003 to 2012 and also for sub-periods of before and after the GFC. The implications of the findings are presented in sections 5.1 to 5.4, the conclusions are highlighted in section 5.5, the contributions of the study is highlighted in section 5.6, and the possible limitations and suggestions for futures study are highlighted in section 5.7.

The findings of the panel data regression analyses as described in chapter four based on four dependent variables through equations 1 to 4 are presented in the following order:

(i) all sample Islamic banks, MENA and non-MENA region Islamic banks for the overall period of 10 years in Section 5.1,

(ii) all sample Islamic banks for periods before GFC and after GFC in Section 5.2,

(iii) sample Islamic banks that operates in MENA region for the period before GFC and period after GFC in Section 5.3 and

(iv) sample Islamic banks that operate in non-MENA region for the period before GFC and period after GFC in Section 5.4.

5.1 Implications of findings on all sample Islamic banks, MENA and non-MENA region Islamic banks for the overall period of 10 years

The first objective of this study is to determine the relationships between bank capital, credit risk, cost inefficiency and profitability in Islamic banks on a cross – country basis for the years between 2003 and 2012. The regression analysis used the bank capital, credit risk, cost inefficiency and profitability of Islamic banks as the dependent variable as described in the equations 1 to 4 that are presented in detail in chapters three and four. Table 5.1 presents the summarized outcome of these regression analyses for the overall 10 year period observation on the entire sample Islamic banks, MENA region and non-MENA region Islamic banks.

Table 5.1: Summary of findings – *Overall period of observation (2003 to 2012)*

Independent variables	DV = Bank capital			DV = Credit risk			DV = Cost inefficiency			DV = Profitability		
	All sample	MENA region	non-MENA region	All sample	MENA region	non-MENA region	All sample	MENA region	non-MENA region	All sample	MENA region	non-MENA region
Bank capital				(+)	(-) ***	(-)	(-)	(+)	(-)	(+)	(+)	(+)
Credit risk	(+)	(+)	(-)***				(+)	(+)	(+)	(-)***	(-) **	(+)
Cost inefficiency	(-)	(+)	(-)***	(-)	(-)	(+)				(+)	(+)	(+)
Profitability	(+)	(+) ***	(-)***	(-)	(-) ***	(+)	(+)	(+)	(+)			
Loan Growth	(-)	(-)	(-)***	(+)	(+)	(+)	(-)	(-)	(-)			
Bank size	(+)	(-) ***	(-)***	(+)	(-) *	(-)*	(+)	(+)	(+)	(-)	(-)	(+)
Management efficiency				(-)	(-) *	(+)						
Off-balance sheet items							(+)	(+)	(+)			
Asset utilization										(+)***	(+) ***	(+)
Overhead expenses										(-)***	(-) ***	(-)

= Not applicable; (-) refers to Negative relationship and (+) refers to Positive relationship. ***,** and * refers to 1%, 5% and 10% level of significance respectively.

5.1.1 Bank Capital as the dependent variable – Overall period of observation (2003 to 2012)

Applying equation 1 that prescribes the bank capital as the dependent variable on the overall 10 year observation period on all selected Islamic banks, MENA and non-MENA region Islamic banks, it can be noted from Table 5.1 that:

- The *credit risk* positively (not significantly) affects bank capital in all selected Islamic banks and also in Islamic banks that operate in the MENA region. The insignificance could be the result of the difference in the mode of operation in the Islamic banks compared to the conventional banks where the Islamic banks operates on the PLS mode. Though not significant, this finding shows that, higher the Islamic banks' credit risk, higher the level of capital required to sustain the risk. This is consistent with the fundamental capital adequacy requirement theory that is applicable to any bank and is in tandem with the findings in Islamic banks by Abedifar et al. (2011). Similar findings were also found by Fiordelisi et al. (2011) and Jokipii & Milne (2008) using data from European conventional banks. Said (2013), however, found that bank capital and credit risk to be negatively correlated in the MENA region's Islamic banks.

  However, the *credit risk* significantly negatively affects bank capital in Islamic banks that operate in the non-MENA region, during the 10 year observation period. This implies that non-MENA Islamic banks with higher credit risk hold smaller capital. Similar negative relationship between credit risk and bank capital was noted by Deelchand and Padgett (2009), Hussain (2007) and Kwan & Eisenbeis (1997) using conventional banks. This answers research question 1a pertaining to all sample Islamic bank, MENA region and non-MENA region Islamic banks during the 10 year observation period.

- The *cost inefficiency* negatively (not significantly) affects bank capital in all selected Islamic banks during the 10 year observation period. A significant negative relationship is noted between cost inefficiency and bank capital in non-MENA region Islamic banks. This finding generally indicates that cost inefficient (less cost efficient) Islamic banks and specifically the non-MENA Islamic banks hold less capital. In other words, cost efficient Islamic banks are better capitalized. Similar negative relationship between cost inefficiency and bank capital was also noted by Abedifar et al. (2011) in Islamic banks. Similar evidence was also documented by Berger & DeYoung (1997) and Fiordelisi et al. (2011) using conventional banks' data.

  However, *cost inefficiency* positively (not significantly) affects bank capital in Islamic banks that operate in MENA region during the 10 year observation period. This is opposite to the finding revealed in the observations for the entire sample of Islamic banks and for non-MENA Islamic banks for similar period of time. The result for MENA region Islamic banks implies that cost inefficient (less cost efficient) Islamic banks hold more capital during the entire period of 10 years. In other words, cost inefficient MENA region Islamic banks are under regulatory pressure to have more capital. Similar positive evidence was also found by Altunbas et al. (2007), Deelchand and Padgett (2009), Kwan & Eisenbeis (1997) and Soedarmono et al. (2010) using conventional banks' data. This finding answers research question 2a with regards to all sample Islamic bank, MENA region and non-MENA region Islamic banks during the 10 year observation period.

- The Islamic bank *profitability* positively (not significantly) affects bank capital during the 10 year period in all selected Islamic banks. Similar insignificant relationship was also found by Ahmad (2005) using Malaysian conventional banks' data. According to Ahmad (2005), this insignificant relationship between bank capital and profitability raises the possibility of lack of current self-regulatory incentives to have sufficient capital among domestic banks to protect their high charter value. This positive relationship between profitability and bank capital is significant (at 1% significance level) in Islamic banks that operate in the MENA region. Similar positive relationship was also found by Abedifar et al. (2011) in Islamic banks while Berger (1995), Deelchand and Padgett (2009), Jacques & Nigro (1997), Kwan & Eisenbeis (1997) and Rime (2001) documented similar findings using conventional banks' data and.

  However, the results for non- MENA region Islamic banks show that, profitability significantly (at 1% significance level) negatively affects bank capital. This implies that, higher profitability reduces bank capital holdings, or that Islamic banks do not increase retained earnings. This result answers research question 3a pertaining to all sample Islamic bank, MENA region and non-MENA region Islamic banks during the 10 year observation period.

- *Loan growth* negatively (not significantly) affects bank capital during the 10 year observation period in all selected Islamic banks and MENA region Islamic banks.

A significant (at 1% significance level) negative relationship is observed in non-MENA region Islamic banks. This negative relationship indicates that generally Islamic banks are holding lesser bank capital to cover the risk incurred by the increase in loan value. Similar evidence was also found by Foos et al. (2007), using U.S., Canada and European conventional banks and Altunbas et al. (2007) using European conventional banks data.

- *Bank size* positively (not significantly) affects bank capital during the 10 year observation period on all sample Islamic banks. However, in MENA and non-MENA region Islamic banks, bank size significantly (at 1% significance level) negatively affects bank capital. This negative relationship between bank size and bank capital is similar to the findings by Abedifar et al. (2011) and Bashir (1999) in Islamic banks while Kwan & Eisenbeis (1997) in U.S. conventional banks, Altunbas et al. (2007) in European conventional banks, Deelchand and Padgett (2009) in Japanese conventional banks, Soedarmono et al. (2010) and Suhartono (2011) using Indonesian conventional banks' data. This finding implies the generalization that larger banks hold less capital because from a safety net perspective (systemic risk), larger banks can be viewed as 'Too-Big-To-Fail' or 'Too-Big-To-Discipline-Adequately' (Kane 2000; Mishkin 2006). Thus, a significant negative relationship exists between bank size and bank capital in Islamic banks in MENA and non-MENA regions.

5.1.2 Credit Risk as the dependent variable - Overall period of observation (2003 to 2012)

Applying equation 2 that prescribes the credit risk as the dependent variable on the overall 10 year observation period for the entire sample Islamic banks, MENA region and non-MENA region Islamic banks, it can be noted from Table 5.1 that:

- *Bank capital* positively (not significantly) affects credit risk during the 10 year observation period supporting the regulatory hypothesis. However, a significant (at 1% significance level) negative relationship is noted in MENA region Islamic banks, while a similar negative (not significant) relationship prevails in non-MENA region Islamic banks. This is consistent with the moral hazard theory postulated by Berger & DeYoung (1997) where smaller capitalized banks assume higher risk. Evidence of moral hazard in conventional banks was also noted by Ahmad and Ariff (2007), Bahrini (2011), Chortareas et al. (2011), Deechand et al. (2009), Gambacorta & Mistrulli (2004), Guillen (2006), Hussain (2007), Konishi & Yasuda (2004), Lee & Hsieh (2013), Lindquist (2004), Staikouras et al. (2008), Suhartono (2012) and Van Roy (2005). Similar moral hazard evidence was also found in Islamic banks by Abedifar et al. (2011), Abedifar et al. (2012), Alam (2013), Gustina (2011) and Taktak et al. (2010). Weill (2011) too noted that Islamic banks have incentives to charge lower return rates than conventional banks and face higher exposure to moral hazard behavior of borrowers. Cihak & Hesse (2010) noted that, given Islamic banks' limitations on standardization in credit risk management, monitoring the various PLS arrangements becomes rapidly much more complex as the scale of the banking operation grows, resulting in problems relating to adverse selection and moral hazard becoming more prominent. This results answers research question 1b of this study with regards to all sample Islamic bank, MENA region and non-MENA region Islamic banks during the 10 year observation period.

- *Cost inefficiency* negatively (not significantly) affects credit risk during the 10 year observation period in all sample Islamic banks and MENA region Islamic banks. This finding supports the skimping behavior as described in chapter one of this study. Skimping hypothesis implies the costs connected with monitoring of lending activities affect the quality of a bank's loan portfolio. A negative impact of cost inefficiency on credit risk was also noted by Altunbas et al. (2007) using European conventional banks' data.

  However, a positive (not significant) relationship is noted between cost inefficiency and credit risk in the non-MENA region Islamic banks. This finding supports the bad management hypothesis. This implies that non-MENA Islamic banks which are cost inefficient (less cost efficient) take more credit risk. This also implies that cost inefficient non-MENA Islamic banks undertake excessive risk compared to MENA region Islamic banks. Berger & DeYoung (1997) found evidence supporting the bad management hypothesis using conventional banks' data. These authors concluded that efficiency in terms of cost may be an important indicator of future problem loans and problem banks. Kwan & Eisenbeis (1997) also found evidence that bank inefficiency positively affects risk-taking in U.S. conventional banks. Furthermore, according to these authors, this positive relationship could also be attributed to the moral hazard hypothesis noting that under the moral hazard hypothesis, inefficient banks run by entrenched management are postulated to be more prone to risk-taking due to the lower value of their capital. Evidence of bad management hypothesis was also noted by Chortareas et al. (2011), Das & Ghosh (2007), Deelchand and Padgett (2009), Fiordelisi et al. (2011), Louzis et al. (2012), Podpiera & Weill (2008), Suhartono (2012), Williams (2004) and Zago & Dongili (2006) in conventional banks. Evidence of bad management was also found in Islamic banks by Abedifar et al. (2011). Alam (2012)'s findings implied that bad management hypothesis is supported in the conventional banks, while skimping hypothesis is supported in the Islamic banks. However, the latter researcher did not break the sample into MENA and non-MENA region Islamic banks. By breaking the Islamic banks' data set into MENA and non-MENA region, this study found evidence of skimping hypothesis in MENA region Islamic banks and bad management behavior in non-MENA Islamic banks. This results answer research question 4a with regards to all sample Islamic bank, MENA region and non-MENA region Islamic banks during the 10 year observation period.

- *Profitability* negatively (not significantly) affects credit risk during the 10 year observation period for all selected Islamic banks. Significant (at 1% significance level) negative relationship is noted in MENA region Islamic banks. This indicates that Islamic banks with higher profitability take less credit risk. Similar evidence was noted in conventional banks by Fiordelisis et al. (2011) and Godlewski (2004). According to Fiordelisi et al. (2011), this negative relationship between profitability and credit risk implies that less cost efficient managers who are able to generate only a low profit per unit of capital invested, would also be responsible for a deterioration in credit quality. Gustina (2011) and Misman & Ahmad (2011) also noted an inverse relationship between credit risk and profitability in both conventional and Islamic banks.

However, in non-MENA Islamic banks, profitability positively (not significantly) affects credit risk. This indicates that non-MENA region Islamic banks with higher profitability take more credit risk. Similar positive evidence was also found by Cannata & Quagliariello (2006) and Suhartono (2012) using conventional banks' data. Suhartono (2012) interpreted this positive relationship in two different ways. First, profit oriented banks are willing to take on more risk to earn more profit (supporting moral hazard theory). Second, profitable banks allocate more loan loss reserves to shield against the tax (bad management theory). This author suggests that both moral hazard and bad management behavior might be intertwined in the result. Based on the result from Table 5.1, it can summarized that during the entire 10 year period, MENA region Islamic banks with higher profitability take less credit risk, while non-MENA region Islamic banks with higher profitability take more credit risk. This result answers research question 5a with regards to all sample Islamic bank, MENA region and non-MENA region Islamic banks during the 10 year observation period.

- *Loan growth* positively (not significantly) affects credit risk during the 10 year observation period on all sample Islamic banks, MENA region and non-MENA region Islamic banks. This positively relationship implies that generally Islamic banks with higher loan growth take on more credit risk. Similar result was also noted by Das & Ghosh (2007), Foos et al. (2010) and Suhartono (2012) using conventional banks' data.

- *Bank size* positively (not significantly) affects credit risk during the 10 year observation period on all sample Islamic banks. Bushman & Williams (2007), Deelchand and Padgett (2009), Marcucci & Quagliariello (2009) and Suhartono (2012) also noted positive relationship between bank size and credit risk in conventional banks. However, in MENA region and non-MENA region Islamic banks, bank size significantly (at 10% significance level) negatively affects credit risk. This implies that as the size of the MENA and non-MENA region Islamic banks increases, the credit risk decreases. This negative relationship was also generally found in Islamic banks by Abedifar et al. (2011), Abedifar et al. (2012) and Alam (2013). Using conventional banks' data, Suhartono (2011) also found that bank size has a negative relationship with credit risk taking. According to Suhartono (2011), bigger banks have more opportunity to generate income (from off- balance sheet items, other income from payment service and other fee based income) rather than from credit activities. Alam (2012) found that bank size positively affects credit risk in conventional banks, while a negative relationship was noted in Islamic banks.

- *Management efficiency* (earning assets to total assets ratio) negatively (not significantly) affects credit risk during the 10 years period on all sample Islamic banks. A significant (at 10% significance level) negative relationship is observed in MENA region Islamic banks. This shows that MENA region Islamic banks with low earning assets take more credit risk. Similar evidence was also noted by Ahmad (2003), Ahmad & Ahmad (2004), Ahmad & Ariff (2007), Gustina (2011) and Rahman et al. (2009) using conventional banks' data.

However, in non-MENA region Islamic banks, management efficiency positively (not significantly) affects credit risk. This implies that a higher proportion of earning assets to total assets, if not properly managed, would result in higher credit risk in non-MENA region Islamic banks. Using Islamic banks' data, Ahmad & Ahmad (2004) also noted a positive relationship between management efficiency and credit risk. Based on the result from Table 5.1, it can summarized that MENA region Islamic banks with low earning assets have high credit risk, while non-MENA region Islamic banks with high earning assets have high credit risk.

5.1.3 Cost Inefficiency as the dependent variable– Overall period of observation (2003 to 2012)

Applying equation 3 that prescribes the cost inefficiency as the dependent variable on the overall 10 year observation period on the entire sample Islamic banks, MENA region and non-MENA region Islamic banks, it can be noted from Table 5.1 that:

- *Bank capital* negatively (not significantly) affects cost inefficiency during the 10 year observation period on all selected Islamic banks and also the Islamic banks that operate in non-MENA region. This negative relationship implies that Islamic banks in general and specifically non-MENA region Islamic banks with higher capital are less cost inefficient (efficient in terms of their cost). Similar result was also found by Chan et al. (2013), Chortareas et al. (2011), Fiordelisi et al. (2011), Kablan (2007), Rossi et al. (2005), Srairi (2009) and Yildirim & Philippatos (2007) using conventional banks' data. According to Berger & Bonaccorsi di Patti (2006) and Casu & Molyneux (2000), the negative relationship between bank capital and cost inefficiency could be explained by the fact that high levels of equity capital reduces the probability of financial distress, which reduces costs by lowering risk premium on substitutes for other potentially more costly risk management activities. Similar finding was also noted in Islamic banks by Abedifar et al. (2011) who found that bank capital negatively affects cost inefficiency.

However, the result in Table 5.1 reveals that for MENA region Islamic banks, bank capital positively (not significantly) affect cost inefficiency. This implies that MENA region Islamic banks with higher capital are more cost inefficient (less efficient in terms of their cost). This result answers research question 2b of this study with regards to all sample Islamic bank, MENA region and non-MENA region Islamic banks during the 10 year observation period.

- *Credit risk* positively (not significantly) affects cost inefficiency during the 10 years period on all sample Islamic banks, MENA and non-MENA region Islamic banks. These findings imply that generally Islamic banks in all regions in observation which take on less risk are less cost inefficient (more efficient in terms of cost). The result could also imply that Islamic banks that take more risk are less cost efficient. This supports the bad luck hypothesis described by Berger & DeYoung (1997). Similar evidence was found by Chiu et al. (2009), Deelchand and Padgett (2009), Fiordelisi et al. (2011), Guillen (2006) and Rossi et al. (2005) using conventional banks' data. Alam (2012) found that credit risk positively affects cost inefficiency in conventional banks, while an inverse relationship was noted in Islamic banks. Evidence of bad luck hypothesis was noted in Islamic banks by Abedifar et al. (2011). This result answers research question 4b with regards to all sample Islamic bank, MENA region and non-MENA region Islamic banks during the 10 year observation period.

- *Profitability* positively (not significantly) affects cost inefficiency during the 10 years period on all sample Islamic banks, MENA and non-MENA region Islamic banks. Even though the result is insignificant, the finding implies that generally Islamic banks in all regions in observation are more cost inefficient (less cost efficient) when they generate more profits with relation to their total assets. This finding is contrary to the evidence found by Chan (2008) and Kalluru & Bhat (2009) using conventional banks' data. This result answers research question 6a with regards to all sample Islamic bank, MENA region and non-MENA region Islamic banks during the 10 year observation period.

- *Loan growth* negatively (not significantly) affects cost inefficiency during the 10 year observation period on all sample Islamic banks, MENA and non-MENA region Islamic banks. This implies that generally Islamic banks in all regions in observation which have higher loan growth tend to be less cost inefficient (more efficient in terms of cost). These findings also imply that Islamic banks that are more successful in expanding their loans tend to be more efficient in terms of cost. Similar finding was also noted by Altunbas et al. (2007), Chan (2008), Fiordelisi et al. (2011), Kwan (2006), and Rossi et al. (2005) using conventional banks' data.

- *Bank size* positively (not significantly) affects cost inefficiency during the 10 years period on all selected Islamic banks, MENA and non-MENA region Islamic banks. This implies that generally larger Islamic banks are more cost inefficient (less cost efficient). Similar evidence was noted by Deelchand and Padgett (2009) and Kwan (2006) using conventional banks' data. Hussein (2003) noted similar evidence using Islamic banks' data.

- *Off-balance sheet items* positively (not significantly) affects cost inefficiency during the 10 years period on all sample Islamic banks, MENA and non-MENA region Islamic banks. This implies that generally Islamic banks' cost inefficiency decreases with the decrease in off-balance sheet activities. Similar evidence was found by Chan et al. (2013) and Kwan (2006) using conventional banks' data.

5.1.4 Profitability as the dependent variable – Overall period of observation (2003 to 2012)

Applying equation 4 that prescribes the profitability as the dependent variable on the overall 10 year observation period on the entire sample Islamic banks, MENA and non-MENA region Islamic banks, it can be noted from Table 5.1 that:

- *Bank capital* positively (not significantly) affects profitability during the 10 year period on all sample Islamic banks, MENA and non-MENA region Islamic banks. The findings indicate that generally Islamic banks that hold more capital tend to be more profitable. This implies that well-capitalized banks face lower risks of going bankrupt, which reduces their costs of funding, thus leading to higher profit. Well-capitalized banks face lower costs of funding and financial distress and hence higher profits (Berger, 1995). Similar finding was also noted in Islamic banks by Ahmad & Noor (2011), Akhtar et al. (2011), Bashir (2003) and Noor & Ahmad (2011) while Athanasoglou et al. (2008), Athanasoglou et al. (2006), Goddard et al. (2004), Havrylchyk & Jurzyk (2006), Iannotta et al. (2007), Kosmidou (2008), Lee & Hsieh (2013) , Naceur (2003), Ramlall (2009), Shim (2010), Sufian & Habibullah (2009), Sufian & Noor (2012) and Uzhegova (2010) using conventional banks' data. Ansari & Kalil-ur-Rehman (2011) documented that bank capital positively affects profitability in both conventional and Islamic banks. This result implies that higher bank capital supports Islamic banks profitability. This results answer research question 3b with regards to all sample Islamic bank, MENA region and non-MENA region Islamic banks during the 10 year observation period.

- *Credit risk* significantly (at 1% and 5% significance level respectively) negatively affects profitability during the 10 year observation period on all sample Islamic banks and MENA region Islamic banks. This indicates that Islamic banks in general and specifically MENA region Islamic banks with high credit risk are less profitable during the 10 year observation period. This is reasonable since loan loss reserves changes according to the amount of new loan provisions added every year. Loan loss provisions would reduce the profit after tax which is the numerator of ROA. Similar evidence was noted by Akhtar et al. (2011) and Noor & Ahmad (2011) in Islamic banks while Athanasoglou et al. (2008), Athanasoglou et al. (2006), Kolapo, Ayeni & Oke (2012), Kosmidou (2008), Ramlall (2009), Riaz & Mehar (2013), Schiniotakis (2012), Sufian (2011), Sufian & Habibullah (2009) and Vong (2005) using conventional banks' data. Ali et al. (2011) noted similar evidence in both conventional and Islamic banks.

However, the credit risk positively (not significantly) affects profitability in non-MENA Islamic banks. Similar positive relationship between credit risk and profitability was found by Sufian (2012) and Sufian & Habibullah (2009) in conventional banks. Ben Naceur & Omran (2008) also found similar evidence in MENA region conventional banks. According to Sufian & Habibullah (2009), this positive relationship between credit risk and profitability is in consonance with Berger & De Young's (1997) skimping hypothesis. Under the skimping hypothesis, Berger & De Young (1997) suggest that a bank maximizing the long run profits may rationally choose to have lower costs in the short run by skimping on the resources devoted to underwriting and monitoring loans, but bear the consequences of greater loan performance problems. This result answers research question 5b with regards to all sample Islamic bank, MENA region and non-MENA region Islamic banks during the 10 year observation period.

- *Cost inefficiency* positively (not significantly) affects profitability during the 10 year observation period on all selected Islamic banks, MENA and non-MENA region Islamic banks. This implies that generally Islamic banks that are more cost inefficient (less efficient in terms of cost) are more profitable. Contrary evidence was noted in conventional banks by Athanassoglou et al. (2006), Bodla and Verma (2006), Kosmidou (2008), Alexiou and Sofoklis (2009). This results answer research question 6b with regards to all sample Islamic bank, MENA region and non-MENA region Islamic banks during the 10 year observation period.

- *Bank size* negatively (not significantly) affects profitability during the 10 year observation period on all selected Islamic banks and MENA region Islamic banks. Several studies have also documented a negative relationship between bank size and profitability such as Ali et al. (2011), Kosmidou (2008), Naceur (2003), Sufian & Habibullah (2009) in conventional banks. Ansari & Kalil-ur-Rehman (2011) noted a negative relationship between bank size and profitability in both conventional and Islamic banks. Akhtar et al. (2011), Hassan & Bashir (2005) and Mirzaei (2011) also noted similar evidence in Islamic banks. Cihak & Hesse (2008) found that small Islamic banks tend to be financially stronger than large Islamic banks.

However, a positive (not significant) relationship between bank size and profitability was noted in Islamic banks that operate in non-MENA region. Although the relationship is insignificant, the result implies that larger size non-MENA region Islamic banks tend to be more profitable compared to MENA region Islamic banks. If there are significant economies of scale, bank size would positively affect profitability (see Akhavein et al., 1997; Bikker & Hu, 2002; Bourke, 1989; Goddard et al., 2004; Molyneux & Thornton, 1992). Similar evidence was found by Akhtar et al. (2011), Alper & Anbar (2011), Athanasoglou et al. (2006), Azzam (2009), Hauner (2005), Kosmidou (2008), Ramlall (2009), Sufian (2009) and Sufian & Noor (2012) using conventional banks. Ali et al. (2011) noted a positive relationship between bank size and profitability in both conventional and Islamic banks. Positive relationship between bank size and profitability was also noted in Islamic banks by Azzam (2009), Bashir (1999), Masood & Ashraf (2012), Noor & Ahmad (2011) and Zouari & Taktak (2012).

- *Asset utilization* significantly (at 1% significance level) positively affects profitability during the 10 year observation period on all selected Islamic banks and the MENA region Islamic banks. A similar positive (not significant) relationship is also noted in non-MENA region Islamic banks. This implies that generally Islamic banks that utilize their assets effectively tend to be more profitable. Similar result was also found by Sufian & Habibullah (2009) in conventional banks. Similar evidence was also noted in Islamic banks by Ali et al. (2011).

- *Overhead expenses* significantly (at 1% significance level) negatively affect profitability during the 10 year observation period on all selected Islamic banks and the MENA region Islamic banks. In non-MENA region Islamic banks, a similar negative relationship is also noted but it is not significant. This indicates that generally Islamic banks with high overhead expenses are less profitable. Demirguc-Kunt & Huizinga (2010), Guru, Staunton & Balashanmugam (2002), Hidayat & Abduh (2012), Kosmidou (2008), Pasiouras & Kosmidou (2007) and Sufian & Habibullah (2009) also found similar result in conventional banks. Similar evidence was also found by Sufian (2011) in both conventional and Islamic banks. Ahmad & Isa (2007) and Rosly & Bakar (2003) and noted similar inverse relationship between overhead expenses and profitability in Islamic banks.

Table 5.2 provides a summary based on the research question using all sample of Islamic banks, MENA region and non-MENA region Islamic banks on the overall 10 year observation period.

Table 5.2: Summary findings based on Research Questions - All years

Research question	Sub questions	All sample	MENA region	Non-MENA region
1. Is there a positive or negative relationship between the level of bank capital and credit risk in Islamic banks?	a. *Does credit risk positively or negatively affects bank capital in Islamic banks?*	Positive	Positive	Negative
	b. *Does bank capital positively or negatively affects credit risk in Islamic banks?*	Positive (supports regulatory hypothesis)	Negative (supports moral hazard hypothesis)	Negative (supports moral hazard hypothesis)
2. Is there a positive or negative relationship between the level of capital and cost inefficiency in Islamic banks	a. *Does cost inefficiency positively or negatively affects bank capital in Islamic banks?*	Negative	Positive	Negative
	b. *Does bank capital positively or negatively affects cost inefficiency in Islamic banks?*	Negative	Positive	Negative

Table 5.2 (cont.): Summary findings based on Research Questions - All years

Research question	Sub questions	All sample	MENA region	Non-MENA region
3. *Is there a positive or negative relationship between the level of capital and profitability in Islamic banks?*	a. *Does profitability positively or negatively affects bank capital in Islamic banks?*	Positive	Positive	Negative
	b. *Does bank capital positively or negatively affects profitability in Islamic banks?*	Positive (supports expected bankruptcy hypothesis and signaling hypothesis)	Positive (supports expected bankruptcy hypothesis and signaling hypothesis)	Positive (supports expected bankruptcy hypothesis and signaling hypothesis)
4. *Is there a positive or negative relationship between credit risk and cost inefficiency in Islamic banks?*	a. *Does cost inefficiency positively or negatively affects credit risk in Islamic banks?*	Negative (supports skimping behavior)	Negative (supports skimping behavior)	Positive (supports bad management hypothesis)
	b. *Does credit risk positively or negatively affects cost inefficiency in Islamic banks?*	Positive (supports bad luck hypothesis)	Positive (supports bad luck hypothesis)	Positive (supports bad luck hypothesis)
5. *Is there a positive or negative relationship between the credit risk and profitability in Islamic banks?*	a. *Does profitability positively or negatively affects credit risk in Islamic banks?*	Negative	Negative	Positive (supports moral hazard and bad management behavior)
	b. *Does credit risk positively or negatively affects profitability in Islamic banks?*	Negative	Negative	Positive
6. *Is there a positive or negative relationship between the cost inefficiency and profitability in Islamic banks?*	a. *Does profitability positively or negatively affects cost inefficiency in Islamic banks?*	Positive	Positive	Positive
	b. *Does cost inefficiency positively or negatively affects profitability in Islamic banks?*	Positive	Positive	Positive

5.2 Implications of findings on all sample Islamic banks for the periods before GFC and after GFC

Table 5.3 summarizes the results on all sample Islamic banks for the period before and after GFC for each of the explanatory variables based on the analysis done in sections 4.2 to 4.19 in chapter 4.

Table 5.3: Regression Summary – All Islamic banks

Independent variables	DV = Bank capital		DV = Credit risk		DV = Cost inefficiency		DV = Profitability	
	Before GFC	After GFC	Before GFC	After GFC	Before GFC	After GFC	Before GFC	After GFC
Bank capital			**(-)*** **	(-)	(-)	(-)	**(+)****	**(+)***
Credit risk	(+)	(+)			(+)	(+)	(-)	(-)
Cost inefficiency	(-)	(-)	**(+)***	(+)			(+)	(+)
Profitability	(+)	(-)	(-)	(+)	(+)	(+)		
Loan Growth	(-)	(-)	**(+)*****	(-)	(-)	(-)		
Bank size	(-)	(-)	(-)	(-)	(-)	(+)	(+)	(+)*
Management efficiency			(-)	(+)				
Off-balance sheet items					(+)	(+)		
Asset utilization							**(+)*****	**(+)*****
Overhead expenses							**(-)*****	**(-)*****

= Not applicable; (-) refers to Negative relationship and (+) refers to Positive relationship. ***, ** and * refers to 1%, 5% and 10% level of significance respectively.

5.2.1 Bank Capital as the dependent variable on all sample Islamic banks

Applying equation 1 that prescribes the bank capital as the dependent variable on all selected sample Islamic banks, it can be noted from Table 5.3 that:

- The *credit risk* positively (not significantly) affects bank capital during the periods before and after the GFC in all sample Islamic banks. Though the relationship is not significant, this finding shows that, higher the Islamic banks' credit risk, higher the level of capital required to sustain the risk and this relationship has not changed by the effects of the GFC in Islamic banks. This is consistent with the findings in Islamic banks by Abedifar et al. (2011) which observed sample Islamic banks between 2001 and 2008. However these authors did not differentiate the before and after GFC periods. This finding answers research question 1a pertaining to all sample Islamic bank observation before and after GFC.

- The *cost inefficiency* negatively (not significantly) affects bank capital during the periods before and after GFC on all selected Islamic banks. Though the relationship is not significant, these findings indicate that less cost inefficient (highly cost efficient) Islamic banks hold more capital and this relationship is not altered by the effects of the GFC in Islamic banks. In Islamic banks, similar negative relationship between cost inefficiency and bank capital was noted by Abedifar et al. (2011). However this author did not differentiate the before and after GFC periods. This finding answers research question 2a pertaining to all sample Islamic bank observation before and after GFC.

- The Islamic bank *profitability* affects bank capital positively during the period before GFC and negatively during the period after GFC. Both relationship although not significant, implies that an increase in Islamic bank profitability, increases Islamic bank capital before GFC but the higher profitability decreases bank capital in Islamic banks after GFC. Generally a positive relationship between bank profitability and bank capital was also found by Abedifar et al. (2011) in Islamic banks. This results answer research question 3a pertaining to all sample Islamic observation as to before and after GFC.

- *Loan growth* negatively (not significantly) affects bank capital during the periods before and after GFC in all selected Islamic banks. Though the relationship is not significant, this indicates that Islamic banks are holding lesser bank capital to cover the risk incurred by the increase in loan growth and this condition is not altered by the effects of the GFC.

- *Bank size* negatively (not significantly) affects bank capital during the periods before and after GFC in all selected Islamic banks. The finding generally implies that larger banks hold less capital because from a safety net perspective (systemic risk), larger banks can be viewed as 'Too-Big-To-Fail' or 'Too-Big-To-Discipline-Adequately' (Kane 2000; Mishkin 2006). Thus, a negative relationship exists between bank size and the bank capital during both before and after GFC using all sample Islamic banks.

5.2.2 Credit Risk as the dependent variable on all sample Islamic banks

Applying equation 2 that prescribes the credit risk as the dependent variable on all selected sample Islamic banks, it can be noted from Table 5.3 that:

- *Bank capital* negatively affects credit risk of all sample Islamic banks during the periods of before and after GFC. The result before GFC is significant at 1% significant level, while it is not significant after GFC. This negative relationship between bank capital and credit risk is consistent with the moral hazard theory postulated by Berger and DeYoung (1997) where smaller capitalized banks assume higher risk. Similar moral hazard evidence was also found in Islamic banks by Abedifar et al. (2011), Abedifar et al. (2012), Alam (2013), Gustina (2011) and Taktak et al. (2010). Weill (2011) too noted that Islamic banks have incentives to charge lower return rates than conventional banks and face higher exposure to moral hazard behavior of borrowers. However, these authors did not differentiate the before and after GFC periods. This results answer research question 1b pertaining to all sample Islamic observation before and after GFC.

- *Cost inefficiency* positively affects credit risk of all sample Islamic banks before and after GFC. The result before GFC is significant at 10% significant level, while it is not significant after GFC. This positive relationship between cost inefficiency and credit risk implies bad management hypothesis in Islamic banks during both before and after GFC. This indicates that Islamic banks which are cost inefficient (less efficient in terms of cost) take more credit risk implying that inefficient Islamic banks undertake excessive risk before and after the global financial crisis. By breaking the Islamic banks' data set into before and after GFC periods, this study found evidence of bad management behavior in Islamic banks during these periods. The results reported above answers research question 4a pertaining to all sample Islamic observation before and after GFC.

- *Profitability* negatively (not significantly) affects credit risk during the period before GFC and positively (not significantly) affects credit risk after the GFC in all selected Islamic banks. This indicates that Islamic banks with higher profitability take less credit risk before GFC and this condition is reversed after GFC. According to Fiordelisi et al. (2011), this negative relationship between profitability and credit risk implies that less efficient managers who are able to generate only a low profit per unit of capital invested, would also be responsible for a deterioration in credit quality. The positive relationship between profitability and credit risk as found during after GFC period is also documented by Suhartono (2012) using conventional banks' data. However these authors did not differentiate the before and after GFC periods. Based on the result from Table 5.3, it can summarized that before the GFC, Islamic banks with higher profitability take less credit risk, while after the GFC, Islamic banks with higher profitability take more credit risk. This results answer research question 5a pertaining to all sample Islamic as observed before and after GFC.

- *Loan growth* significantly (at 1% significance level) positively affects credit risk on all sample Islamic banks during the period before GFC. This positive relationship indicates that Islamic banks with higher loan growth take on more credit risk before GFC. However, during the period after GFC, loan growth negatively (not significantly) affects credit risk on all sample Islamic banks. This indicates that

Islamic banks with higher loan growth take on less credit risk after GFC. Similar evidence was also found in Islamic banks by Abedifar et al. (2011), Abedifar et al. (2012) and Alam (2013). Based on the result from Table 5.3, it can summarized that, Islamic banks with higher loan growth take more credit risk before the GFC, while after the GFC, Islamic banks with higher loan growth take less credit risk.

- *Bank size* negatively (not significantly) affects credit risk on all sample Islamic banks during the periods of before and after GFC. This implies that, as the size of the Islamic banks increases, the credit risk decreases and this condition is not altered by the effects of the GFC in Islamic banks. In Islamic banks a negative relationship between bank size and credit risk was noted by Abedifar et al. (2011), Abedifar et al. (2012) and Alam (2013).

- *Management efficiency* (earning assets to total assets ratio) negatively (not significantly) affects credit risk on all sample Islamic banks during the period before GFC. This shows that Islamic banks with low earning assets take more credit risk before GFC.

  However, during the period after GFC, management efficiency positively (not significantly) affects credit risk in all sample Islamic banks. This implies that a higher proportion of earning assets to total assets, if not properly managed, would result in higher credit risk. Based on the result from Table 5.3, it can summarized that before the GFC, Islamic banks with low earning assets have high credit risk, while after the GFC, Islamic banks with high earning assets have high credit risk.

5.2.3 Cost Inefficiency as the dependent variable on all sample Islamic banks

Applying equation 3 that prescribes the cost inefficiency as the dependent variable on all selected sample Islamic banks, it can be noted from Table 5.3 that:

- *Bank capital* negatively (not significantly) affects cost inefficiency on all sample Islamic banks during the periods before and after GFC. Even though the negative relationship is not significant, it indicates that Islamic banks with higher capital are less cost inefficient (more efficient in terms of their cost) during both before and after GFC. According to Berger & Bonaccorsi di Patti (2006) and Casu & Molyneux (2000), the negative relationship between bank capital and cost inefficiency could be explained by the fact that high levels of equity capital reduces the probability of financial distress, which reduces costs by lowering risk premium on substitutes for other potentially more costly risk management activities. Similar finding was also noted in Islamic banks by Abedifar et al. (2011) who found that bank capital negatively affects cost inefficiency. The results answer research question 2b pertaining to all sample Islamic observation before and after GFC.

- *Credit risk* positively (not significantly) affects cost inefficiency during the periods before GFC and after GFC. The finding implies that Islamic banks that take less risk are less cost inefficient (more efficient in terms of cost) during both before and after GFC periods. This supports the bad luck hypothesis described by Berger and DeYoung (1997). Alam (2012) found that credit risk positively affects cost inefficiency in conventional banks, while an inverse relationship was noted in Islamic banks. Evidence of bad luck hypothesis was noted in Islamic banks by

Abedifar et al. (2011). This results answer research question 4b pertaining to all sample Islamic observation before and after GFC.

- *Profitability* positively (not significantly) affects cost inefficiency during the periods before GFC and after GFC. This finding implies that Islamic banks will become less cost inefficient (more cost efficient) when they generate less profits with relation to their total assets during both before and after GFC. This finding answers research question 6a pertaining to all sample Islamic observation before and after GFC.

- *Loan growth* negatively (not significantly) affects cost inefficiency during the period before GFC and after GFC in all selected Islamic banks. This implies that Islamic banks which have higher loan growth tend to be less cost inefficient (more efficient in terms of cost) during both before and after GFC. This finding implies that Islamic banks that are more successful in expanding their loans tend to be more efficient in terms of cost during both before and after GFC.

- *Bank size* negatively (not significantly) affects cost inefficiency on all sample Islamic banks during the period before GFC. This implies that Islamic banks which are larger in size are less cost inefficient (more efficient in terms of their costs) before GFC. Using both conventional and Islamic banks data, Srairi (2009) noted similar inverse relationship between bank size and cost inefficiency. Abedifar et al. (2011) found similar evidence using Islamic banks' data.

However during the period after GFC, bank size positively (not significantly) affects cost inefficiency on all sample Islamic banks. This implies larger sized Islamic banks are more cost inefficient (less cost efficient) after GFC. Based on the result from Table 5.3, it can summarized that before the GFC, larger sized Islamic banks are less cost inefficient (more cost efficient), while after the GFC, larger sized Islamic banks are more cost inefficient (less cost efficient).

- *Off-balance sheet items* positively (not significantly) affects cost inefficiency during the periods before and after GFC. The result implies that Islamic banks' cost inefficiency decreases with the decrease in off-balance sheet activities during both before and after GFC. The effects of the GFC did not alter this condition in Islamic banks.

5.2.4 Profitability as the dependent variable on all sample Islamic banks

Applying equation 4 that prescribes the profitability as the dependent variable on all selected sample Islamic banks, it can be noted from Table 5.3 that:

- *Bank capital* significantly positively affects profitability on all sample Islamic banks during the periods before GFC and after GFC. The findings indicate that Islamic banks that hold more capital tend to be more profitable during both before and after the global financial crisis. This implies that well-capitalized Islamic banks face lower risks of going bankrupt, which reduces their costs of funding, thus leading to higher profit during both before and after GFC. Ansari & Kalil-ur-Rehman (2011) also found that bank capital positively affects profitability in both conventional and Islamic banks. This result indicates that higher bank capital supports stronger Islamic banks profitability. This finding answers research question 3b pertaining to all sample Islamic observation before and after GFC.

- *Credit risk* negatively (not significantly) affects profitability during the period before GFC and after GFC in all selected Islamic banks. This indicates that Islamic banks with high credit risk are less profitable during both before and after the global financial crisis. This is reasonable since loan loss reserves changes according to the amount of new loan provisions added every year. Ali et al. (2011) noted similar evidence in both conventional and Islamic banks. Similar evidence was also noted by Akhtar et al. (2011) and Noor & Ahmad (2011) in Islamic banks. However these authors did not differentiate the before and after GFC periods. The results answer research question 5b pertaining to all sample Islamic observation before and after GFC.

- *Cost inefficiency* positively (not significantly) affects profitability during the periods before GFC and after GFC in all selected Islamic banks. This implies that Islamic banks that are more cost inefficient (less efficient in terms of cost) are more profitable during both before and after GFC. Earlier studies in conventional banks noted an inverse relationship between cost inefficiency and profitability (Alexiou & Sofoklis, 2009; Athanassoglou et al., 2006; Bodla & Verma, 2006; Bourke, 1989; Kosmidou, 2008; Molyneaux & Tornton, 1992; Vander Vennet, 2002). This results answer research question 6b pertaining to all sample Islamic observation before and after GFC.

- *Bank size* positively (not significantly) affects profitability during the periods before and after GFC. The result before GFC is not significant, while it is significant at 10% significant level for the result after GFC. This positive relationship between bank size and profitability implies that larger size Islamic banks tend to be more profitable during both before and after the GFC. If there are significant economies of scale, bank size would positively affect profitability (see Akhavein et al., 1997; Bikker & Hu, 2002; Bourke, 1989; Goddard et al., 2004; Molyneux and Thornton, 1992). Ali et al. (2011) noted a positive relationship between bank size and profitability in both conventional and Islamic banks. Positive relationship between bank size and profitability was also noted in Islamic banks by Azzam (2009), Bashir (1999), Masood & Ashraf (2012), Noor & Ahmad (2011) and Zouari & Taktak (2012). However these authors did not differentiate the before and after GFC periods.

- *Asset utilization* significantly (at 1% significance level) positively affects profitability during the periods before GFC and after GFC. This implies that Islamic banks that utilize their assets effectively tend to be more profitable and this condition is not altered by the effects of the GFC. Similar evidence was also noted in Islamic banks by Ali et al. (2011).

- *Overhead expenses* significantly (at 1% significance level) negatively affect profitability during the period before GFC and after GFC. This indicates that Islamic banks with high overhead expenses are less profitable during both before and after GFC. Rosly & Bakar (2003) and Ahmad and Isa (2007) noted similar inverse relationship between overhead expenses and profitability in Islamic banks. However these authors did not differentiate the before and after GFC periods.

Table 5.4 provides a summary based on the research question using all sample of Islamic banks during the periods before and after GFC.

Table 5.4: Summary findings based on Research Questions - All Islamic banks

Research question	Sub questions	Before GFC	After GFC	Effects of GFC
1. *Is there a positive or negative relationship between the level of bank capital and credit risk in Islamic banks?*	a. *Does credit risk positively or negatively affects bank capital in Islamic banks?*	Positive	Positive	Not altered
	b. *Does bank capital positively or negatively affects credit risk in Islamic banks?*	Negative (supports moral hazard hypothesis)	Negative (supports moral hazard hypothesis)	Not altered
2. *Is there a positive or negative relationship between the level of capital and cost inefficiency in Islamic banks*	a. *Does cost inefficiency positively or negatively affects bank capital in Islamic banks?*	Negative	Negative	Not altered
	b. *Does bank capital positively or negatively affects cost inefficiency in Islamic banks?*	Negative	Negative	Not altered
3. *Is there a positive or negative relationship between the level of capital and profitability in Islamic banks?*	a. *Does profitability positively or negatively affects bank capital in Islamic banks?*	Positive	Negative	Altered
	b. *Does bank capital positively or negatively affects profitability in Islamic banks?*	Positive (supports expected bankruptcy hypothesis and signaling hypothesis)	Positive (supports expected bankruptcy hypothesis and signaling hypothesis)	Not altered
4. *Is there a positive or negative relationship between credit risk and cost inefficiency in Islamic banks?*	a. *Does cost inefficiency positively or negatively affects credit risk in Islamic banks?*	Positive (supports bad management hypothesis)	Positive (supports bad management hypothesis)	Not altered
	b. *Does credit risk positively or negatively affects cost inefficiency in Islamic banks?*	Positive (supports bad luck hypothesis)	Positive (supports bad luck hypothesis)	Not altered
5. *Is there a positive or negative relationship between the credit risk and profitability in Islamic banks?*	a. *Does profitability positively or negatively affects credit risk in Islamic banks?*	Negative	Positive (supports moral hazard and bad management behavior)	Altered
	b. *Does credit risk positively or negatively affects profitability in Islamic banks?*	Negative	Negative	Not altered

Table 5.4 (cont.): Summary findings based on Research Questions - All Islamic banks

Research question	Sub questions	Before GFC	After GFC	Effects of GFC
6. Is there a positive or negative relationship between the cost inefficiency and profitability in Islamic banks?	a. *Does profitability positively or negatively affects cost inefficiency in Islamic banks?*	Positive	Positive	Not altered
	b. *Does cost inefficiency positively or negatively affects profitability in Islamic banks?*	Positive	Positive	Not altered

5.3 Implications of findings on MENA region Islamic banks for the period before GFC and period after GFC

Table 5.5 summarizes the results on MENA region Islamic banks for the period before and after GFC for each of the explanatory variables based on the analysis done in section 4.2 to 4.19 in chapter 4.

Table 5.5: Regression Summary – Islamic banks in MENA region

Independent variables	DV = Bank capital		DV = Credit risk		DV = Cost inefficiency		DV = Profitability	
	Before GFC	After GFC	Before GFC	After GFC	Before GFC	After GFC	Before GFC	After GFC
Bank capital			(+)	(-)	(+)	**(+) ***	**(+) ****	**(+) *****
Credit risk	(+)	(+)			(+)	(-)	(-)	**(-) ***
Cost inefficiency	(+)	(+) *	**(+) *****	**(-) *****			**(+) ***	(-)
Profitability	**(+) *****	(+)	(-)	**(-) *****	(-)	(-)		
Loan Growth	(+)	(-)	**(+) *****	(-)	(-)	(+)		
Bank size	**(-) *****	(-) **	(-)	(-)	(+)	(+)	(+)	(+) **
Management efficiency			**(-) ***	**(-) *****				
Off-balance sheet items					(+)	(-)		
Asset utilization							**(+) *****	**(+) *****
Overhead expenses							**(-) *****	**(-) *****

= Not applicable. (-) refers to negative relationship and (+) refers to positive relationship. ***, ** and * refers to 1%, 5% and 10% level of significance respectively.

5.3.1 Bank Capital as the dependent variable on sample Islamic banks in MENA region

Applying equation 1 that prescribes the bank capital as the dependent variable on MENA region Islamic banks, it can be noted from Table 5.5 that:

- In Islamic banks that operate in the MENA region, *credit risk* positively (not significantly) affects bank capital during both periods of before and after GFC. Even though the relationship is not significant, this finding shows that greater the Islamic banks' credit risk, higher the level of equity required and this condition is not altered by the effects of the GFC in MENA region Islamic banks. However, Said (2013) generally found that bank capital and credit risk to be negatively correlated in the MENA region's Islamic banks. Nonetheless, Said (2013) did not break the sample into before and after GFC periods. This results answer research question 1a pertaining to MENA region Islamic banks before and after GFC.

- *Cost inefficiency* positively affects bank capital of MENA region Islamic banks during the periods before and after GFC. The relationship is significant (at 10% significance level) in the period after GFC and is not significant in the before GFC period. The result indicates that MENA region Islamic banks that are cost inefficient (less cost efficient) hold more capital during both before and after the global financial crisis. In other words, inefficient Islamic banks are under regulatory pressure to have more capital both before and after GFC. This results answer research question 2a with regards to MENA region Islamic banks during both before and after GFC.

- *Profitability* affects bank capital positively during the periods before and after GFC in the MENA region Islamic banks. The positive relationship is significant (at 1% significance level) during the period before GFC and is not significant in the after GFC period. In contrary, Said (2013) found that profitability and bank capital to be negatively correlated in the MENA region's Islamic banks using Pearson correlation analysis (without any regression analysis) for years from 2006 to 2009. However, this author did not account for any structural break of the GFC effects. This results answer research question 3a with regards to MENA region Islamic banks during the periods before and after GFC.

- *Loan growth* positively (not significantly) affects bank capital of the MENA region Islamic banks during the period before GFC. This implies that as MENA region Islamic banks assume higher levels of loan growth, managers tend to augment capital stock before the GFC. However, during the period after GFC, loan growth negatively (not significantly) affects bank capital of MENA region Islamic banks. This indicates that MENA region Islamic banks are holding lesser bank capital to cover the risk incurred by the increase in loan growth after the GFC.

- *Bank size* significantly (at 1% and 5% significance level respectively) negatively affects bank capital of MENA region Islamic banks during the periods before and after GFC. This implies that larger sized Islamic banks in the MENA region generally hold lesser capital both before and after the global financial crisis. Generally similar evidence was also noted in Islamic banks by Abedifar et al. (2011) and Bashir (1999). Thus, a negative relationship exists between bank size and the bank capital in MENA region Islamic banks during both the period before and after GFC.

5.3.2 Credit Risk as the dependent variable on sample Islamic banks in MENA region

Applying equation 2 that prescribes the credit risk as the dependent variable on MENA region Islamic banks, it can be noted from Table 5.5 that:

- *Bank capital* positively (not significantly) affects credit risk during the period before GFC in MENA region Islamic banks supporting the regulatory hypothesis. Boudriga et al. (2010) also noted that generally bank capital affects credit risk positively in the MENA region. However, during the period after GFC, a negative (not significant) relationship between bank capital and credit risk was noted in the MENA region Islamic banks. This is consistent with the moral hazard theory postulated by Berger & DeYoung (1997) where smaller capitalized banks assume higher credit risk. Said (2013) found that bank capital and credit risk to be negatively correlated (evidence of moral hazard) in the MENA region's Islamic banks. However, this author did not account for any structural break of the GFC effects. Thus, this study documents evidence that supports regulatory hypothesis before the GFC, and moral hazard behavior is observed after the GFC in the MENA region Islamic banks. This result answers research question 1b with regards to Islamic banks in the MENA region during the period before and after GFC.

- *Cost inefficiency* significantly (at 1% significance level) positively affects credit risk in MENA region Islamic banks during the period before GFC. This supports the bad management hypothesis. This indicates that MENA region's Islamic banks which are more cost inefficient (less cost efficient), take more credit risk before GFC. However, cost inefficiency significantly (at 1% significance level) negatively affects credit risk during the period after the GFC. This finding supports the skimping behavior in MENA region Islamic banks after GFC. Skimping hypothesis implies the costs connected with monitoring of lending activities affect the quality of a bank's loan portfolio. Alam (2012)'s findings generally implied that bad management hypothesis is supported in the conventional banks, while skimping hypothesis is supported in the Islamic banks. However, this author did not break the study period into before and after crisis. By breaking the MENA region Islamic banks' data set into before and after GFC period, this study found evidence of bad management behavior before the GFC and skimping behavior after the GFC in MENA regions' Islamic banks. These results answer research question 4a with regards to MENA region Islamic banks during the period before and after GFC.

- *Profitability* negatively affects credit risk during the period before GFC and after GFC in the MENA region Islamic banks. The result is significant (at 1% significance level) after GFC. This negative relationship indicates that MENA region Islamic banks with high profitability take less credit risk before and after GFC. Gustina (2011) and Misman & Ahmad (2011) also generally noted an inverse relationship between credit risk and profitability in both conventional and Islamic banks. Similar evidence was also noted by Boudriga et al. (2010), who found that generally profitability negatively affects credit risk in the MENA region. However these authors did not differentiate the before and after GFC periods. These results answer research question 5a for the MENA region Islamic banks during the period before and after GFC.

- *Loan growth* significantly (at 1% significance level) positively affects credit risk during the period before GFC in the MENA region Islamic banks. This indicates that MENA region Islamic banks with higher loan growth take more credit risk before GFC. However, during the period after GFC, loan growth negatively (not significantly) affects credit risk of the MENA region Islamic banks. This indicates that MENA region Islamic banks are holding lesser bank capital to cover the risk incurred by the increase in loan growth during the period after GFC. Alam (2012) also noted that generally loan growth negatively affects credit risk in both conventional and Islamic banks. Boudriga et al. (2010) documented similar inverse relationship between loan growth and credit risk in the MENA region Islamic banks. However, these authors did not account for any structural break of the GFC effects. Based on this result, it can be noted that the MENA region Islamic banks with higher loan growth take more credit risk before the global financial crisis. However, after the global financial crisis, MENA region Islamic banks with higher loan growth take lesser credit risk.

- *Bank size* negatively (not significantly) affects credit risk during the periods before GFC and after GFC in the MENA region Islamic banks. These findings indicate that smaller sized MENA region Islamic banks take more credit risk during the periods before and after GFC. According to Suhartono (2011), bigger banks have more opportunity to generate income (from off- balance sheet items, other income from payment service and other fee based income) rather than from credit activities. Alam (2012) found that bank size positively affects credit risk in conventional banks, while a negative relationship was noted in Islamic banks.

However, this author did not account for the differences in MENA and non-MENA region Islamic banks and also the effects of GFC.

- *Management efficiency* (earning assets to total assets ratio) significantly (at 10% and 1% significance level respectively) negatively affects credit risk during the periods before and after GFC in the MENA region Islamic banks. This shows that MENA region Islamic banks with low earning assets take more credit risk before and after GFC.

5.3.3 Cost Inefficiency as the dependent variable on sample Islamic banks in MENA region

Applying equation 3 that prescribes the cost inefficiency as the dependent variable on MENA region Islamic banks, it can be noted from Table 5.5 that:

- *Bank capital* affects cost inefficiency positively during the periods before and after GFC. The result is significant (at 10% significance level) after GFC. These results indicate that MENA region Islamic banks with higher capital are more cost inefficient (less efficient in terms of their cost) before and after the GFC. This result contradicts the findings of Ben Naceur & Omran (2008) and Ben Naceur, Ben-Khedhiri & Barbara (2009). An inverse relationship between bank capital and cost inefficiency was noted by Ben Naceur & Omran (2008) in MENA region conventional banks and by Ben Naceur et al. (2009) in the MENA region Islamic banks. However, these authors did not observe their sample into before and after GFC periods. The results reported here answers research question 2b with regards to MENA region Islamic banks during the periods before and after GFC.

- *Credit risk* affects cost inefficiency positively in MENA region Islamic banks during the period before GFC. Although the result is not significant, the evidence implies that MENA region Islamic banks that take more risk are more cost inefficient (less cost efficient) before the GFC. This supports the bad luck hypothesis as described by Berger & DeYoung (1997) in conventional banks. Evidence of bad luck hypothesis was noted in Islamic banks by Abedifar et al. (2011). Using MENA region Islamic banks, Ben Naceur et al. (2009) also found that credit risk positively affects cost inefficiency. However, these authors did not break the sample into before and after GFC periods.

  However, credit risk affects cost inefficiency negatively (not significantly), during after GFC. Therefore, the result after GFC implies that MENA region Islamic banks that take less risk are more cost inefficient (less efficient in terms of cost). Ben Naceur & Omran (2008) found that credit risk negatively affects cost inefficiency in the conventional banks of MENA countries. Similar evidence was also found by Alam (2012) generally in Islamic banks. However, these authors did not break the sample into before and after GFC periods. Based on this finding, bad luck hypothesis is supported in the MENA region Islamic banks during before global financial crisis but not after. The results reported here answers research question 4b with regards to MENA region Islamic banks during the periods before and after GFC.

- *Profitability* affects cost inefficiency negatively (not significantly), during the periods before and after GFC. This finding implies that MENA region Islamic banks will become less cost inefficient (more cost efficient) when they generate more profits with relation to their total assets during both before and after GFC. The results reported here answers research question 6a with regards to MENA region Islamic banks during the periods before and after GFC.

- *Loan growth* affects cost inefficiency negatively during before GFC. Although not significant, the result implies that MENA region Islamic banks which have higher loan growth tend to be less cost inefficient (more efficient in terms of cost) before the GFC. This finding implies that MENA region Islamic banks that are more successful in expanding their loans business are more efficient in terms of cost during the period before GFC.

  However, loan growth affects cost inefficiency positively (not significantly) during after GFC. Similar positive relationship between loan growth and cost inefficiency was also noted by Ben Naceur et al. (2009) using MENA region Islamic banks. However, these authors did not account for any structural break of the GFC effects. The discussion here implies that, before GFC, MENA region Islamic banks which have higher loan growth tend to be more efficient in terms of cost but after the GFC, MENA region Islamic banks which have higher loan growth tend to be less efficient in terms of cost.

- *Bank size* affects cost inefficiency positively (not significantly) during the periods before and after GFC in the MENA region Islamic banks. These results imply that larger sized MENA region Islamic banks are more cost inefficient (less efficient in terms of cost) during both periods before and after GFC. Similar positive relationship between bank size and cost inefficiency was noted by Hussein (2003) using Islamic banks' data. However, this author did not account for any structural break of the GFC effects.

- *Off-balance sheet items* positively (not significantly) affect cost inefficiency of MENA region Islamic banks during the period before GFC. This implies MENA region Islamic banks' cost inefficiency decreases with the decrease in off-balance sheet activities. However, *off-balance sheet items* negatively (not significantly) affect cost inefficiency of MENA region Islamic banks during the period after GFC. This suggests that MENA region Islamic banks that are more actively involved in OBS activities operate less cost inefficiently (more cost efficiently) after the global financial crisis.

5.3.4 Profitability as the dependent variable on sample Islamic banks in MENA region

Applying equation 4 that prescribes the profitability as the dependent variable on MENA region Islamic banks, it can be noted from Table 5.5 that:

- *Bank capital* significantly (at 5% and 1% significance level respectively) positively affects profitability during the periods before GFC and after GFC. This finding indicates that, MENA region Islamic banks that hold more capital are more profitable both before and after GFC. This implies that well-capitalized MENA region Islamic banks face lower risks of going bankrupt, which reduces their costs of funding, thus leading to higher profit during both before and after GFC. Generally, well-capitalized banks face lower costs of funding and financial distress and hence higher profits (Berger, 1995). This positive relationship between bank capital and profitability is similar to the finding by Ahmad & Noor (2011), Akhtar et al. (2011), Bashir (2003) and Noor & Ahmad (2011) generally in Islamic banks. Similar evidence was also found by Bashir (2003) in Middle Eastern Islamic banks, by Ben Khediri & Ben-Khedhiri (2009) and Karim et al. (2010) in MENA region Islamic banks. However, these authors did not account for any structural break of the GFC effects. This result indicates that higher bank capital supports MENA region Islamic banks' profitability and this relationship is not altered by the effects of the GFC. The results reported here answers research question 3b with regards to MENA region Islamic banks during the periods before and after GFC.

- *Credit risk* affects profitability negatively during the periods before GFC and after GFC. The result was significant (at 10% significance level) after GFC. These findings indicate that MENA region Islamic banks with high credit risk are less profitable during both before and after GFC. This is reasonable since loan loss reserves changes according to the amount of new loan provisions added every year. Loan provisions would reduce the profit after tax which is the numerator of ROA. Similar negative relationship between credit risk and profitability was also found by Akhtar et al. (2011) and Noor & Ahmad (2011) in Islamic banks. Similar evidence was also noted by Karim et al. (2010) in African Islamic banks. However, these authors did not account for any structural break of the GFC effects. The results reported here answers research question 5b for the MENA region Islamic banks during both before and after GFC.

- *Cost inefficiency* significantly (at 10% significance level) positively affects profitability during the period before GFC. This implies that MENA region Islamic banks that are more cost inefficient (less efficient in terms of cost) are more profitable before the global financial crisis. However, *cost inefficiency* negatively (not significantly) affects profitability during the period after GFC. This implies that MENA region Islamic banks that are less cost inefficient (more efficient in terms of cost) are more profitable after the global financial crisis. Based on these discussions, the study found that MENA region Islamic banks that are more cost inefficient (less efficient in terms of cost) are more profitable before the global financial crisis. However, this relationship is altered after the global financial crisis whereby MENA region Islamic banks that are less cost inefficient (more efficient in terms of cost) are found to be more profitable. These results answer research question 6b with regards to MENA region Islamic banks during the periods before and after GFC.

- *Bank size* positively affects profitability of MENA region Islamic banks during the period before and after GFC. The result is significant (at 5% significance level) after GFC. These results imply that larger sized MENA region Islamic banks tend to be more profitable during both before and after GFC. If there are significant economies of scale, bank size would positively affect profitability (see Akhavein et al., 1997; Bikker & Hu, 2002; Bourke, 1989; Goddard et al., 2004; Molyneux & Thornton, 1992). Positive relationship between bank size and profitability was also noted by Karim et al. (2010) in the African Islamic banks and by Hidayat & Abduh (2012) in Bahrain's Islamic banks. However, these authors did not account for any structural break of the GFC effects.

- *Asset utilization* significantly (at 1% significance level) positively affects profitability during the period before and after GFC. This implies that MENA region Islamic banks that utilize their assets effectively tend to be more profitable during both before and after GFC. Similar positive relationship between asset utilization and profitability was also found by Ali et al. (2011). However, this author did not account for any structural break of the GFC effects.

- *Overhead expenses* significantly (at 1% significance level) negatively affect profitability during the period before and after GFC. This indicates that MENA region Islamic banks with high overhead expenses are less profitable both before and after GFC. Ahmad & Isa (2007) and Rosly & Bakar (2003) noted similar inverse relationship between overhead expenses and profitability in Islamic banks but they did not break the study period into before and after crisis.

Table 5.6 provides a summary based on the research question using the sample of MENA region Islamic banks during the periods before and after GFC.

Table 5.6: Summary findings based on Research Question – MENA region Islamic banks

Research question	Sub questions	Before GFC	After GFC	Effects of GFC
1: Is there a positive or negative relationship between the level of capital and credit risk in Islamic banks?	*a. Does credit risk positively or negatively affects bank capital in Islamic banks?*	Positive	Positive	Not altered
	b. Does bank capital positively or negatively affects credit risk in Islamic banks?	Positive (supports regulatory hypothesis)	Negative (supports moral hazard hypothesis)	Altered
2. Is there a positive or negative relationship between the level of capital and cost inefficiency in Islamic banks	*a. Does cost inefficiency positively or negatively affects bank capital in Islamic banks?*	Positive	Positive	Not altered
	b. Does bank capital positively or negatively affects cost inefficiency in Islamic banks?	Positive	Positive	Not altered

Table 5.6 (cont.): Summary findings based on Research Question – MENA region Islamic banks

Research question	Sub questions	Before GFC	After GFC	Effects of GFC
3. Is there a positive or negative relationship between the level of capital and profitability in Islamic banks?	a. *Does profitability positively or negatively affects bank capital in Islamic banks?*	Positive	Positive	Not altered
	b. Does bank capital positively or negatively affects profitability in Islamic banks?	Positive (supports expected bankruptcy hypothesis and signaling hypothesis)	Positive (supports expected bankruptcy hypothesis and signaling hypothesis)	Not altered
4. Is there a positive or negative relationship between credit risk and cost inefficiency in Islamic banks?	a. *Does cost inefficiency positively or negatively affects credit risk in Islamic banks?*	Positive (supports bad management hypothesis)	Negative (supports skimping behavior)	Altered
	b. Does credit risk positively or negatively affects cost inefficiency in Islamic banks?	Positive (supports bad luck hypothesis)	Negative	Altered
5. Is there a positive or negative relationship between the credit risk and profitability in Islamic banks?	*a. Does profitability positively or negatively affects credit risk in Islamic banks?*	Negative	Negative	Not altered
	b. Does credit risk positively or negatively affects profitability in Islamic banks?	Negative	Negative	Not altered
6. Is there a positive or negative relationship between the cost inefficiency and profitability in Islamic banks?	a. *Does profitability positively or negatively affects cost inefficiency in Islamic banks?*	Negative	Negative	Not altered
	b. *Does cost inefficiency positively or negatively affects profitability in Islamic banks?*	Positive	Negative	Altered

5.4 Implications of findings on sample Islamic banks in the non-MENA region for the period before GFC and period after GFC

Table 5.7 summarizes the results on non-MENA region Islamic banks for the period before and after GFC for each of the explanatory variables based on the analysis done in sections 4.2 to 4.19 in Chapter 4.

Table 5.7: Regression Summary – Islamic banks in non-MENA region

Independent variables	DV = Bank capital		DV = Credit risk		DV = Cost inefficiency		DV = Profitability	
	Before GFC	After GFC	Before GFC	After GFC	Before GFC	After GFC	Before GFC	After GFC
Bank capital			**(-)*****	(+)	(-)	(-)	(-)	(-)
Credit risk	**(-)*****	(+)			(-)	(+)	(-)	**(-)*****
Cost inefficiency	**(-)*****	(-)	**(-)****	(+)			(-)	**(+)***
Profitability	**(-)*****	(+)	**(-)*****	(-)	(-)	(+)		
Loan Growth	**(-)*****	(-)	(+)	(+)	(+)	**(-)***		
Bank size	(-)	(+)	(-)	**(-)****	(+)	(+)	(+)	(-)
Management efficiency			**(-)***	(-)				
Off-balance sheet items					(+)	(-)		
Asset utilization							(+)	**(+)*****
Overhead expenses							(-)	**(-)****

= Not applicable. (-) refers to negative relationship and (+) refers to positive relationship. ***,** and * refers to 1%, 5% and 10% level of significance respectively.

5.4.1 Bank Capital as the dependent variable on sample Islamic banks in non-MENA region

Applying equation 1 that prescribes the bank capital as the dependent variable on non - MENA region Islamic banks, it can be noted from Table 5.7 that:

- *Credit risk* significantly (at 1% significance level) negatively affects bank capital of non-MENA region Islamic banks during before GFC. This implies that non-MENA Islamic banks with higher credit risk hold a smaller capital before the GFC. However, *credit risk* positively (not significantly) affects bank capital during the period after GFC. This implies that after GFC, the greater the credit risk, higher the level of equity required by Islamic banks' of non-MENA region. This reveals that the finding is altered by the effects of the GFC in non-MENA region Islamic banks. The results reported here answer research question 1a in the non-MENA region Islamic banks during the periods before and after GFC.

- The summary result in Table 5.5 indicates that *cost inefficiency* negatively affects bank capital during the periods before GFC and after GFC in Islamic banks that operate in non-MENA region. The result before GFC is significant (at 1% significance level). These results indicate that less cost inefficient (highly cost efficient) non-MENA region Islamic banks hold more capital during both periods before and after GFC. This result also implies that an improvement in cost efficiency strengthens non-MENA region Islamic banks' capital. This discussion reveals that the finding is not altered by the effects of the GFC in non-MENA region Islamic banks. The results reported here answers research question 2a with regards to non-MENA region Islamic banks before and after GFC.

- *Profitability* significantly (at 1% significance level) negatively affects bank capital during the period before GFC in the non-MENA region Islamic banks. On the other hand, *profitability* positively (not significantly) affects bank capital during the period after GFC in the non-MENA region Islamic banks. This discussion reveals that the finding is altered by the effects of the GFC in non-MENA region Islamic banks. The discussion here answers research question 3a with regards to non-MENA Islamic banks before and after GFC.

- *Loan growth* negatively affects bank capital during the period before and after GFC in the non-MENA region Islamic banks. The result before GFC is significant (at 1% significance level). The evidence indicates that non-MENA region Islamic banks are holding lesser bank capital to cover the risk incurred by the increase in loan growth during both before and after GFC.

- *Bank size* negatively (not significantly) affects bank capital during the period before GFC in the non-MENA region Islamic banks. This implies that the larger sized non-MENA region Islamic banks are highly levered. Larger banks hold less capital because from a safety net perspective (systemic risk), larger banks can be viewed as 'Too-Big-To-Fail' or 'Too-Big-To-Discipline-Adequately' (Kane 2000; Mishkin 2006). However, bank size positively (not significantly) affects bank capital during the period after GFC in the non-MENA region Islamic banks. Thus, a negative relationship exists between bank size and the bank capital in non-MENA region Islamic banks before the GFC and this is altered after the GFC.

5.4.2 Credit Risk as the dependent variable on sample Islamic banks in non-MENA region

Applying equation 2 that prescribes the credit risk as the dependent variable on NON-MENA region Islamic banks, it can be noted from Table 5.7 that:

- *Bank capital* significantly (at 1% significance level) negatively affects credit risk of non-MENA region Islamic banks during the period before GFC. This negative relationship between bank capital and credit risk is consistent with the moral hazard theory postulated by Berger & DeYoung (1997) where smaller capitalized banks assume higher risk. Weill (2011) noted that Islamic banks have incentives to charge lower return rates than conventional banks and face higher exposure to moral hazard behavior of borrowers. Cihak & Hesse (2010) noted that, given Islamic banks' limitations on standardization in credit risk management, monitoring the various PLS arrangements becomes rapidly much more complex as the scale of the banking operation grows, resulting in problems relating to adverse selection and moral hazard becoming more prominent. However, *bank capital* positively (not significantly) affects credit risk during the period after the GFC supporting the regulatory hypothesis in non-MENA region Islamic banks. Based on this discussion, it can be noted that moral hazard behavior is observed before the global financial crisis, and regulatory hypothesis is supported after the global financial crisis in the non-MENA region Islamic banks. The opposite was found for MENA region Islamic banks. The results reported here answers research question 1b with regards to Islamic banks in the non-MENA region during the periods before and after GFC.

- *Cost inefficiency* significantly (at 5% significance level) negatively affects credit risk of non-MENA region Islamic banks before GFC. This supports the existence of skimping behavior in non-MENA region Islamic banks before GFC. Skimping hypothesis implies the costs connected with monitoring of lending activities affect the quality of a bank's loan portfolio. On the other hand, the result after GFC indicates that cost inefficiency positively (not significantly) affects credit risk of non-MENA region Islamic banks. This supports the bad management hypothesis. This indicates that non-MENA region's Islamic banks which are more cost inefficient (less efficient in terms of cost) take more credit risk after GFC. This implies that inefficient non-MENA region Islamic banks undertake excessive risk after the global financial crisis. According to Kwan & Eisenbeis (1997), this positive relationship could also be attributed to the moral hazard hypothesis noting that under the moral hazard hypothesis, inefficient banks run by entrenched management are postulated to be more prone to risk-taking due to the lower value of their capital. By breaking the non-MENA region Islamic banks' data set into before and after GFC period, this study found evidence of skimping behavior before the GFC and bad management behavior after the GFC in non-MENA regions' Islamic banks. This is opposite to the findings based on MENA region Islamic banks where bad management behavior was noted before the GFC and skimping behavior was noted after the GFC. These results answer research question 4a with regards to non-MENA region Islamic banks during the periods before and after crisis.

- *Profitability* negatively affects credit risk in the non-MENA region Islamic banks during the period before and after GFC. The result before GFC is significant (at 1%

significance level) while the result after GFC is not significant. This negative relationship indicates that non-MENA region Islamic banks with high profitability take less credit risk during both periods before and after GFC. The relationship between profitability and credit risk before and after GFC for non-MENA Islamic banks are similar to the findings based on MENA region Islamic banks. According to Fiordelisi et al. (2011), this negative relationship between profitability and credit risk implies that less efficient managers who are able to generate only a low profit per unit of capital invested, would also be responsible for a deterioration in credit quality. The results reported here answers research question 5a for the non-MENA region Islamic banks during periods before and after GFC.

- *Loan growth* positively (not significantly) affects credit risk during the period before and after GFC in the non-MENA region Islamic banks. This indicates that non-MENA region Islamic banks with higher loan growth take more credit risk during periods before and after GFC.

- *Bank size* negatively affects credit risk during the period before and after GFC in the non-MENA region Islamic banks. The result before GFC is not significant but the result after GFC is significant (at 5% significance level). Similar negative relationship was also noted using MENA region Islamic banks for both periods. According to Suhartono (2011), bigger banks have more opportunity to generate income (from off- balance sheet items, other income from payment service and other fee based income) rather than from credit activities.

- *Management efficiency* (earning assets to total assets ratio) negatively affects credit risk during the period before and after GFC in the non-MENA region Islamic banks. The result before GFC is significant (at 10% significance level) and the result after GFC is not significant. This shows that non-MENA region Islamic banks with low earning assets take more credit risk before and after the global financial crisis. Similar negative relationship was also noted using the MENA region Islamic banks for both periods.

5.4.3 Cost Inefficiency as the dependent variable on sample Islamic banks in non-MENA region

Applying equation 3 that prescribes the cost inefficiency as the dependent variable on NON-MENA region Islamic banks, it can be noted from Table 5.7 that:

- *Bank capital* negatively (not significantly) affects cost inefficiency during the periods of before and after GFC. This implies that non-MENA region Islamic banks with higher capital level are less cost inefficient (more efficient in terms of their cost) before and after the global financial crisis. According to Berger & Bonaccorsi di Patti (2006) and Casu & Molyneux (2000), the negative relationship between bank capital and cost inefficiency could be explained by the fact that high levels of equity capital reduces the probability of financial distress, which reduces costs by lowering risk premium on substitutes for other potentially more costly risk management activities. This result is opposite to the findings based on the MENA region Islamic banks during both periods. The results reported here answers research question 2b with regards to non-MENA region Islamic banks during periods before and after GFC.

- *Credit risk* negatively (not significantly) affects cost inefficiency of non-MENA region Islamic banks during the period before GFC. This result implies that non-MENA Islamic banks which take less risk are more cost inefficient (less efficient in terms of cost) before GFC. On the other hand, credit risk positively (not significant) affects cost inefficiency during the period after GFC. This result implies that non-MENA region Islamic banks that take less risk are less cost inefficient (more efficient in terms of cost) after the global financial crisis. This positive relationship between credit risk and cost inefficiency supports the bad luck hypothesis described by Berger & DeYoung (1997). These results are opposite to the findings based on the MENA region Islamic banks during both periods. The results reported here answers research question 4b with regards to non-MENA region Islamic banks during periods before and after GFC.

- *Profitability* negatively (not significantly) affects cost inefficiency of non-MENA region Islamic banks during the period before GFC. This finding implies that non-MENA region Islamic banks become less cost inefficient (more cost efficient) when they generate more profits with relation to their total assets before the global financial crisis. On the other hand, profitability positively (not significantly) affects cost inefficiency during the period after GFC. This implies that non-MENA region Islamic banks become less cost inefficient (more cost efficient) when they generate less profits with relation to their total assets after GFC. This discussion reveals that the finding is altered by the effects of the GFC in non-MENA region Islamic banks. The results reported here answers research question 6a with regards to non-MENA region Islamic banks during periods before and after GFC.

- *Loan growth* positively (not significantly) affects cost inefficiency during the period before GFC. This implies that non-MENA region Islamic banks which have higher loan growth tend to be more cost inefficient (less efficient in terms of cost) before the GFC. However, loan growth significantly (at 10% significance level) negatively affects cost inefficiency during the period after GFC. This implies that non-MENA region Islamic banks which have higher loan growth tend to be less cost inefficient (more efficient in terms of cost) after the GFC. This finding implies that non-MENA region Islamic banks that are more successful in expanding their loans business tend to be more efficient in terms of cost after GFC. The finding discussed here implies that, before the GFC, non-MENA region Islamic banks which have higher loan growth tend to be less efficient in terms of cost. However, after the global financial crisis, non-MENA region Islamic banks which have higher loan growth tend to be more efficient in terms of cost.

- *Bank size* positively (not significantly) affects cost inefficiency during the period before GFC and after GFC in the non-MENA region Islamic banks. This result implies larger sized non-MENA region Islamic banks are more cost inefficient (less cost efficient) during both periods. This discussion reveals that the finding is not altered by the effects of the GFC in non-MENA region Islamic banks

- *Off-balance sheet items* positively (not significantly) affects cost inefficiency during the period before GFC. This result implies that the cost inefficiency of Islamic banks in the non-MENA region decreases with the decrease in off-balance sheet activities before GFC. However, *off-balance sheet items* negatively (not significantly) affect cost inefficiency during the period after GFC. This suggests that non-MENA region Islamic banks who are more actively involved in OBS activities operate less cost inefficiently (more cost efficiently) after the global financial crisis. The relationship between off-balance sheet items and cost inefficiency before and after GFC result for non-MENA region Islamic banks is similar to the result noted during both periods in the MENA region Islamic banks.

5.4.4 Profitability as the dependent variable on sample Islamic banks in non-MENA region

Applying equation 4 that prescribes the profitability as the dependent variable on NON-MENA region Islamic banks, it can be noted from Table 5.7 that:

- *Bank capital* negatively (not significantly) affects profitability of non-MENA region Islamic banks during the period before and after GFC. This indicates that non-MENA region Islamic banks which hold less capital are more profitability during both the periods before and after GFC. This is opposite to the finding based on MENA region Islamic banks for both the periods. The results reported here answers research question 3b with regards to non-MENA region Islamic banks during periods before and after GFC.

- *Credit risk* negatively affects profitability of non-MENA region Islamic banks during the period before and after GFC. The result is not significant before GFC but is it significant (at 1% significance level) after GFC. This negative relationship indicates that non-MENA region Islamic banks with high credit risk are less profitable. This is reasonable since loan loss reserves changes according to the amount of new loan provisions added every year. Loan provisions would reduce the profit after tax which is the numerator of ROA. The results reported answer research question 5b for the non-MENA region Islamic banks during periods before and after GFC.

- *Cost inefficiency* negatively (not significantly) affects profitability of non-MENA region Islamic banks during the period before GFC. This result implies that non-MENA region Islamic banks that are less cost inefficient (more efficient in terms of cost) are more profitable before the global financial crisis. However, after GFC, cost inefficiency significantly (at 10% significance level) positively affects profitability during the period after GFC. This implies that non-MENA region Islamic banks that are more cost inefficient (less efficient in terms of cost) are more profitable after the global financial crisis. This discussion reveals that the finding is altered by the effects of the GFC in non-MENA region Islamic banks. The results reported here answers research question 6b for the non-MENA region Islamic banks during periods before and after GFC.

- *Bank size* positively (not significantly) affects profitability on non-MENA region Islamic banks during period before GFC. This result implies that larger size non-MENA region Islamic banks tend to be more profitable before GFC. If there are significant economies of scale, bank size would positively affect profitability (see Akhavein et al., 1997; Bikker & Hu, 2002; Bourke, 1989; Goddard et al., 2004; Molyneux & Thornton, 1992). However, during the period after GFC, bank size negatively (not significantly) affects profitability of non-MENA region Islamic banks. This indicates that smaller sized non-MENEA region Islamic banks tend to be financially stronger than the larger one.

- *Asset utilization* positively affects profitability during the period before and after GFC. The result after GFC is significant (at 1% significance level). The result implies that non-MENA region Islamic banks that utilize their assets effectively tend to be more profitable before and after the global financial crisis.

- *Overhead expenses* negatively affect profitability during the period before and after GFC. The result is significant (at 5% significance level) after GFC. The result indicates that non-MENA region Islamic banks with high overhead expenses are less profitable before and after the global financial crisis.

Table 5.8 provides a summary based on the research question using the entire the non-MENA region Islamic banks.

Table 5.8: Summary findings based on Research Question – non-MENA region Islamic banks

Research question	Sub questions	Before GFC	After GFC	Effects of GFC
1: Is there a positive or negative relationship between the level of capital and credit risk in Islamic banks?	a. *Does credit risk positively or negatively affects bank capital in Islamic banks?*	Negative	Positive	Altered
	b. *Does bank capital positively or negatively affects credit risk in Islamic banks?*	Negative (supports moral hazard hypothesis)	Positive (supports regulatory hypothesis)	Altered
2. Is there a positive or negative relationship between the level of capital and cost inefficiency in Islamic banks	a. *Does cost inefficiency positively or negatively affects bank capital in Islamic banks?*	Negative	Negative	Not altered
	b. *Does bank capital positively or negatively affects cost inefficiency in Islamic banks?*	Negative	Negative	Not altered
3. Is there a positive or negative relationship between the level of capital and profitability in Islamic banks?	a. *Does profitability positively or negatively affects bank capital in Islamic banks?*	Negative	Positive	Altered
	b. *Does bank capital positively or negatively affects profitability in Islamic banks?*	Negative	Negative	Not altered

Table 5.8 (cont.): Summary findings based on Research Question – non-MENA region Islamic banks

Research question	Sub questions	Before GFC	After GFC	Effects of GFC
4. *Is there a positive or negative relationship between credit risk and cost inefficiency in Islamic banks?*	a. *Does cost inefficiency positively or negatively affects credit risk in Islamic banks?*	Negative (supports skimping behavior)	Positive (supports bad management hypothesis)	Altered
	b. *Does credit risk positively or negatively affects cost inefficiency in Islamic banks?*	Negative	Positive (supports bad luck hypothesis)	Altered
5. *Is there a positive or negative relationship between the credit risk and profitability in Islamic banks?*	a. *Does profitability positively or negatively affects credit risk in Islamic banks?*	Negative	Negative	Not altered
	b. *Does credit risk positively or negatively affects profitability in Islamic banks?*	Negative	Negative	Not altered
6. *Is there a positive or negative relationship between the cost inefficiency and profitability in Islamic banks?*	a. *Does profitability positively or negatively affects cost inefficiency in Islamic banks?*	Negative	Positive	Altered
	b. *Does cost inefficiency positively or negatively affects profitability in Islamic banks?*	Negative	Positive	Altered

5.5 Chapter summary

The main objective of this study is to empirically determine the relationships between bank capital, credit risk, cost inefficiency and profitability in a selected sample of Islamic banks on a cross-country basis for the years between 2003 and 2012. Specifically the study aims to identify these relationships during the periods before and after the global financial crisis (GFC). The second objective is to determine the differences in these relationships in Islamic banks that operate in MENA and non-MENA regions for the period of 2003 to 2012 and also for sub-periods of before and after the GFC.

The findings of this study reveal that low capitalized Islamic banks take on more credit risk during both the sub-periods of analysis i.e. before and after the GFC. This supports the moral hazard hypothesis introduced by Sinkey Jr. & Carter (1997). Evidence of moral hazard was not only found before and after the GFC, but also in Islamic banks that operate in MENA and non-MENA regions. Though Harris & Raviv (1991) noted that Islamic banks which act as business partners in their financing operations can mitigate moral hazard and adverse selection, the practice of profit and loss sharing (PLS) arrangements in Islamic banks could potentially shift the credit risk borne by banks to their investment account holders. As the Islamic banks transfer their credit risk to the depositors, their propensity to increase the risk of moral hazard is high (Pellegrina 2012). Besides that, the competitive conditions that exist specifically in jurisdictions with dual banking systems, aggravates the risk of moral hazard in Islamic banks.

This study also finds that cost inefficient Islamic banks take on more credit risk during both the sub-periods in analysis i.e. before and after GFC. This condition supports the bad management hypothesis proposed by Berger & DeYoung (1997). Evidence of bad management behavior was also observed in Islamic banks that operate in non-MENA region. Bad management hypothesis implies that, managers who do not adequately control for operating expenses, also poorly manage loan portfolio. The reverse condition is found in Islamic banks that operate in MENA region, where cost inefficiency is found to be negatively related to credit risk. This finding supports the skimping hypothesis developed by Berger & DeYoung (1997). Skimping behavior implies that higher the cost efficiency (lower the cost inefficiency), higher the credit risk taking. This reveals that, Islamic banks in MENA region that spends less on monitoring loan portfolio, records more bad loans.

Having said that, this study also notes that highly risky (in terms of credit risk) Islamic banks were more cost inefficient for the periods before and after GFC and also in MENA and non-MENA regions. This indicates that the problem loans, resulting from unexpected and external factors, induce the Islamic banks cost inefficiency level. This condition is commonly known as the "bad luck hypothesis" in the conventional banks.

Another finding of this study reveals that, highly profitable Islamic banks take on less credit risk during the period before the GFC. However, the inverse was observed after GFC, where highly profitable Islamic banks take on more credit risk. Region wise, it is noted that highly profitable MENA region Islamic banks take less credit risk, while highly profitable non-MENA region Islamic banks take on more credit risk. This implies that all Islamic banks engages in moral hazard behavior or allocates more profits into loan loss reserves to shield against tax (bad management) after the GFC period. This implication is also applicable to Islamic banks in non-MENA region during the overall period of observation.

The findings of this study also indicate that in Islamic banks, higher the bank capital, higher the profitability during both periods (before and after GFC) and also in Islamic banks that operate in MENA and non-MENA regions. This supports the expected bankruptcy hypothesis and the signaling hypothesis developed by Berger (1995).

Overall, this study found that the relationships between bank capital, credit risk, cost inefficiency and profitability in Islamic banks were generally similar during both the periods before and after the GFC. However, differences were noted in the directions of which cost inefficiency and profitability affects credit risk in MENA and non-MENA region. Cost inefficiency negatively affects credit risk of Islamic banks that operate in MENA region while the inverse is observed in Islamic banks that operate in non-MENA region. Profitability negatively affects credit risk of Islamic banks that operate in MENA region while the reverse condition is observed in Islamic banks that operate in non-MENA region. This generally indicates the presence of bad management behavior in non-MENA region Islamic banks as compared to MENA region Islamic banks. The bad management behavior in non-MENA region Islamic banks could be due to the influence of the presence of conventional banks operating in parallel with Islamic banks in this region.

5.6 Contributions of this study

This study contributes newer evidences on Islamic banking resilience and its managerial efficiency. As the Islamic banking system operates on an asset based intermediation, the underlying assets should provide profitable returns without much uncertainty. Besides adding to the existing literature on Islamic banking performance measures, the findings of this study contributes useful indicators in determining the tradeoff between the level of credit risk and capital that an efficient Islamic bank should take. This would enable the Islamic banking industry and its regulators, to make better decisions in terms of risk management practices on extreme economic events in the future. This study also contributes useful implications in determining the impact of financial crisis on the relationships among bank capital, credit risk, cost inefficiency and profitability in Islamic banks besides extending the linkages among these four factors on the overall performance of the banks.

Generally, the findings of this study contribute towards the management of the risk by Islamic banks in its financial intermediation. Specifically, the findings of this study, highlights the existence of moral hazard in Islamic banking system during both the sub-periods of analysis (i.e. before and after the GFC) and also in Islamic banks that operate in

MENA and non-MENA regions. Islamic banks that are cost inefficient were found to be taking on higher credit risk during both the sub-periods in the analysis which supports the bad management hypothesis proposed by Berger & DeYoung (1997). This finding suggests that Islamic banks need to be more prudent in their cost management practices while monitoring their credit risk appetite.

Besides that, this study also highlights that, highly profitable Islamic banks take on less credit risk before the GFC. However, the inverse was observed after GFC. This implies that all Islamic banks engages in moral hazard behavior or allocates more profits into loan loss reserves to shield against tax (bad management) after the GFC period. Region wise, it is noted that highly profitable MENA region Islamic banks take less credit risk, while highly profitable non-MENA region Islamic banks take on more credit risk.

Another important contribution of this study to the Islamic banking sector is that, well capitalized Islamic banks attained higher profits during both periods (before and after GFC) and also in Islamic banks that operate in MENA and non-MENA regions. This is consistent with the expected bankruptcy hypothesis and the signaling hypothesis developed by Berger (1995) in the conventional banks.

Overall, this study finds that the relationships between bank capital, credit risk, cost inefficiency and profitability in Islamic banks are generally similar during both the periods before and after the GFC. However, differences were noted in the directions of which cost inefficiency and profitability affects credit risk in Islamic banks that operate in MENA and non-MENA region. This generally indicates the presence of bad management behavior in non-MENA region Islamic banks as compared to MENA region Islamic banks. The bad management behavior in non-MENA region Islamic banks could be due to the influence of the presence of conventional banks operating in parallel with Islamic banks in this region. This suggests that the relationships among the four factors are different in Islamic banks that operate in different jurisdictions, specifically in MENA and non-MENA regions.

5.7 Possible limitations and suggestions for further research

This section highlights the possible limitations of this study and suggests on how to overcome them in the future studies. First, though there are 152 banks listed as Islamic banks by the Bankscope database, not all the banks listed provide a complete set of bank specific financial report over the 10 year observation period. The unbalanced availability of data and the sampling criteria that required financial reports for at least 40 per cent of the observation period scaled down the sampling size to 650 bank year observations. A second source of limitation is the period of analysis. The period of analysis in this study is limited to only 10 years due to the unavailability of complete data for years prior to 2003, which again reduced the sample size in certain Islamic banking jurisdictions. A fifteen to twenty year analysis would have provided larger sample size that could include many other Islamic banking jurisdictions. Particularly the future related studies should include more Islamic banks in Asia and European regions.

The third possible limitation is the dimensions of analysis that divided the period of observations into before and after global financial crisis without analyzing the period during the GFC itself. This limitation emerged due to the insufficient sample size which hampered any possible analysis to be conducted separately for a single year period i.e. between June 2007 and December 2008 that is considered to be the GFC period. Therefore, future related studies should be carried out for the periods before, during and after the GFC, with larger number of sample size.

Lastly, it is also suggested that the future related studies use additional measures to estimate bank efficiency and bank risks. This study specifically used cost inefficiency as a measure for bank efficiency and only credit risk for assessing bank risk.

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APPENDICES

Appendix 1: List of sample Islamic banks

Country	Bank
BAHRAIN	ABC Islamic Bank (E.C.)
	Albaraka Banking Group B.S.C.
	Albaraka Islamic Bank BSC
	Arcapita Bank B.S.C.
	Bahrain Islamic Bank B.S.C.
	Capivest
	Gulf Finance House BSC
	Khaleeji Commercial Bank
	Kuwait Finance House
	Shamil Bank of Bahrain B.S.C.
BANGLADESH	ICB Islamic Bank Limited
	Islami Bank Bangladesh Limited
	Shahjalal Islami Bank Ltd
BRUNEI DARUSSALAM	Bank Islam Brunei Darussalam Berhad
EGYPT	Egyptian Saudi Finance Bank
	Faisal Islamic Bank of Egypt
INDONESIA	Bank Syariah Mandiri
	PT Bank Muamalat Indonesia
IRAN	Bank Keshavarzi-Agricultural Bank Of Iran
	Bank Mellat
	Bank Of Industry and Mine
	Bank Saderat Iran
	Bank Sarmayeh
	Bank Sepah
	Bank Tejarat
	Karafarin Bank
JORDAN	Islamic International Arab Bank
	Jordan Islamic Bank
KUWAIT	A'Ayan Leasing & Investment Company
	Boubyan Bank KSC
	Investment Dar Co (The)
	Kuwait Finance House
	Kuwait International Bank

Appendix 1 (cont.): List of sample Islamic banks

Country	Bank
MALAYSIA	Affin Islamic Bank Berhad
	Al Rajhi Banking & Investment Corporation (Malaysia) Berhad
	Alliance Islamic Bank Berhad
	AmIslamic Bank Berhad
	Asian Finance Bank Berhad
	Bank Islam Malaysia Berhad
	Bank Muamalat Malaysia Berhad
	CIMB Islamic Bank Berhad
	Hong Leong Islamic Bank Berhad
	Maybank Islamic Berhad
	OCBC Al-Amin Bank Berhad
	RHB Islamic Bank Berhad
	Standard Chartered Saadiq Berhad
PAKISTAN	Albaraka Islamic Bank BSC (EC) - Pakistan Branches
	BankIslami Pakistan Limited
	Dawood Islamic Bank
	Dubai Islamic Bank Pakistan Limited
	Emirates Global Islamic Bank Limited
	Meezan Bank Limited
PALESTINIAN TERRITORY	Arab Islamic Bank
QATAR	Masraf Al Rayan (Q.S.C)
	Qatar International Islamic Bank
	Qatar Islamic Bank SAQ
SAUDI ARABIA	Al Rajhi Bank-Al Rajhi Banking & Investment Corporation
	Bank AlBilad
	Islamic Development Bank
SINGAPORE	Islamic Bank of Asia (The)
SUDAN	Al Shamal Islamic Bank
	Bank of Khartoum
	Faisal Islamic Bank (Sudan)
	Tadamon Islamic Bank
TUNISIA	Bank Ettamouil Saoudi Tounsi - B.E.S.T. Bank-BEST Bank- Bank Ettamwil Tounsi Saoudi Tounsi

Appendix 1 (cont.): List of sample Islamic banks

Country	Bank
TURKEY	Albaraka Türk Katilim Bankasi AS-Albaraka Turk Participation Bank
	Bank Asya-Asya Katilim Bankasi AS
	Kuwait Turkish Participation Bank Inc-Kuveyt Turk Katilim Bankasi A.S.
	Türkiye Finans Katilim Bankasi AS
UNITED ARAB EMIRATES	Abu Dhabi Islamic Bank - Public Joint Stock Co.
	Al Hilal Bank PJSC
	Amlak Finance PJSC
	Dubai Bank
	Dubai Islamic Bank plc
	Emirates Islamic Bank PJSC
	Noor Islamic Bank
	Sharjah Islamic Bank
	Tamweel PJSC
UNITED KINGDOM	BLME-Bank of London and The Middle East Plc
	European Islamic Investment Bank Plc
	Islamic Bank of Britain Plc
YEMEN	Islamic Bank of Yemen for Finance & Investment
	Saba Islamic Bank
	Shamil Bank of Yemen & Bahrain
	Tadhamon International Islamic Bank

Appendix 2: Variance Inflation Factors

Appendix 2.1: Variance Inflation Factors (All Islamic banks over 10 years)

Independent variables	DV = Bank capital	DV = Credit risk	DV = Cost inefficiency	DV = Profitability
BC		1.128	1.18	1.308
CR	1.12		1.21	1.13
CInE	1.182	1.539		1.631
ROA	1.302	1.226	1.145	
NLTA	1.112	1.146	1.106	
SIZE	1.114	1.165	1.175	1.136
MGT_EFF		1.342		
OBSTA			1.012	
ASSUTI				1.167
OHEADTOTA				1.764

Appendix 2.2: Variance Inflation Factors (All Islamic banks before GFC)

Independent variables	DV = Bank capital	DV = Credit risk	DV = Cost inefficiency	DV = Profitability
BC		1.182	1.18	1.26
CR	1.154		1.174	1.105
CInE	1.23	1.589		1.549
ROA	1.237	1.253	1.086	
NLTA	1.228	1.311	1.217	
SIZE	1.141	1.2	1.207	1.128
MGT_EFF		1.49		
OBSTA			1.02	
ASSUTI				1.287
OHEADTOTA				1.594

Appendix 2.3: Variance Inflation Factors (All Islamic banks after GFC)

Independent variables	DV = Bank capital	DV = Credit risk	DV = Cost inefficiency	DV = Profitability
BC		1.088	1.209	1.365
CR	1.224		1.397	1.193
CInE	1.176	1.539		1.798
ROA	1.505	1.305	1.361	
NLTA	1.112	1.127	1.105	
SIZE	1.187	1.222	1.236	1.205
MGT_EFF		1.322		
OBSTA			1.077	
ASSUTI				1.077
OHEADTOTA				2.043

Appendix 2.4: Variance Inflation Factors (Islamic Banks in the MENA region over 10 years)

Independent variables	DV = Bank capital	DV = Credit risk	DV = Cost inefficiency	DV = Profitability
BC		1.184	1.174	1.277
CR	1.052		1.053	1.023
CInE	1.172	1.42		1.946
ROA	1.158	1.146	1.09	
NLTA	1.072	1.088	1.045	
SIZE	1.069	1.176	1.17	1.153
MGT_EFF		1.257		
OBSTA			1.027	
ASSUTI				1.182
OHEADTOTA				2.039

Appendix 2.5: Variance Inflation Factors (Islamic Banks in the MENA region before GFC)

Independent variables	DV = Bank capital	DV = Credit risk	DV = Cost inefficiency	DV = Profitability
BC		1.422	1.278	1.342
CR	1.094		1.057	1.055
CInE	1.121	1.404		1.325
ROA	1.044	1.194	1.197	
NLTA	1.204	1.337	1.186	
SIZE	1.139	1.211	1.211	1.103
MGT_EFF		1.394		
OBSTA			1.07	
ASSUTI				2.056
OHEADTOTA				2.056

Appendix 2.6: Variance Inflation Factors (Islamic Banks in the MENA region after GFC)

Independent variables	DV = Bank capital	DV = Credit risk	DV = Cost inefficiency	DV = Profitability
BC		1.217	1.166	1.408
CR	1.167		1.167	1.062
CInE	1.295	1.618		2.505
ROA	1.528	1.329	1.255	
NLTA	1.07	1.079	1.059	
SIZE	1.135	1.249	1.233	1.223
MGT_EFF		1.311		
OBSTA			1.023	
ASSUTI				1.049
OHEADTOTA				2.688

Appendix 2.7: Variance Inflation Factors (Islamic Banks in the non-MENA region over 10 years)

Independent variables	DV = Bank capital	DV = Credit risk	DV = Cost inefficiency	DV = Profitability
BC		1.235	1.519	1.563
CR	1.392		1.792	1.354
CInE	1.234	1.89		1.492
ROA	1.747	1.564	1.598	
NLTA	1.423	1.667	1.466	
SIZE	1.418	1.444	1.443	1.225
MGT_EFF		1.707		
OBSTA			1.047	
ASSUTI				1.324
OHEADTOTA				1.606

Appendix 2.8: Variance Inflation Factors (Islamic Banks in the non-MENA region before GFC)

Independent variables	DV = Bank capital	DV = Credit risk	DV = Cost inefficiency	DV = Profitability
BC		1.605	1.885	2.003
CR	1.358		1.809	1.78
CInE	1.567	2.67		1.902
ROA	1.867	2.11	1.429	
NLTA	1.469	1.735	1.604	
SIZE	1.267	1.281	1.308	1.292
MGT_EFF		1.759		
OBSTA			1.075	
ASSUTI				1.711
OHEADTOTA				1.79

Appendix 2.9: Variance Inflation Factors (Islamic Banks in the non-MENA region after GFC)

Independent variables	DV = Bank capital	DV = Credit risk	DV = Cost inefficiency	DV = Profitability
BC		1.162	1.401	1.443
CR	1.825		2.351	1.332
CInE	1.023	1.664		1.087
ROA	2.07	1.393	2.349	
NLTA	1.521	1.755	1.541	
SIZE	1.803	1.874	1.903	1.732
MGT_EFF		1.888		
OBSTA			1.315	
ASSUTI				1.65
OHEADTOTA				2.312