DETERMINING LIQUIDITY RISK, PROFITABILITY AND COST EFFICIENCY OF ISLAMIC BANKS IN SELECTED OIC COUNTRIES

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By

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ABSTRACT

Liquidity risk in banks is a major issue following the 2008 Global Financial Crisis and 2014 oil price fall. The absence of Shariah-compliant liquidity instruments also accentuate liquidity problems in Islamic banks. The banks also face cost efficiency issues in addition to liquidity risk that affect their profitability. The main objective of this study is to examine liquidity risk determinants of Islamic banks in ten countries from Organization of Islamic Co-operation comprising Bahrain, Indonesia, Iran, Kuwait, Malaysia, Pakistan, Saudi Arabia, Sudan, Turkey and United Arab Emirate. Profit and Loss Sharing (PLS) contract and profitability were studied as mediators to explain the process through which relationship between liquidity risk and cost efficiency is affected. The study uses data of banks operating in dual and fully Islamic banking regulatory environments. Generalized Method of Moments was employed on 85 Islamic banks over 2005 to 2016 study period. The results show that cost efficiency and profitability ratios, Capital Adequacy Ratio and PLS are significantly related to liquidity risk. Similarly, Gross Domestic Product, Money Supply and inflation have significant influence on liquidity risk. It further highlights that profitability does mediates but PLS contract does not mediates the relationship between liquidity risk and cost efficiency. The implications of the results are that bank management, government and regulatory bodies of Islamic banks to manage the significant factors influencing liquidity risk effectively because they have direct impact on the banks' cost efficiency and profitability. This study contributes new findings in terms of reaffirming the reluctance of Islamic banks to use PLS contract since it increases liquidity risk. It is therefore recommended that the practitioners and policy makers to examine closely that PLS contract should be backed by long term capital to mitigate liquidity risk. This will ensure greater profitability of Islamic banks in the dual banking environment.

Keywords: Liquidity Risk, Profitability, Cost Efficiency, Islamic Bank.

ABSTRAK

Risiko kecairan di bank merupakan isu utama berikutan Krisis Kewangan Global 2008 dan kejatuhan harga minyak pada tahun 2014. Ketiadaan instrumen kecairan yang patuh Syariah juga menimbulkan masalah kecairan di bank-bank Islam. Bank-bank ini juga menghadapi masalah kecekapan kos selain daripada risiko kecairan yang memberikan kesan kepada keuntungan. Objektif utama kajian ini adalah untuk menyelidik penentu risiko kecairan bagi bank-bank Islam di sepuluh buah negara dari Pertubuhan Kerjasama Islam yang terdiri daripada Bahrain, Indonesia, Iran, Malaysia, Pakistan, Arab Saudi, Sudan, Turki dan Emiriah Arab Bersatu. Kontrak Perkongsian Untung Rugi (PLS) dan keuntungan telah dikaji sebagai pengantara untuk menjelaskan proses melalui hubungan antara risiko kecairan dan kecekapan kos yang terjejas. Kajian ini menggunakan data panel bank yang beroperasi dalam persekitaran peraturan perbankan dwi dan perbankan Islam sepenuhnya. Kaedah Momen umum digunakan ke atas 85 buah bank Islam bagi tempoh 2005 hingga 2016. Keputusan menunjukkan bahawa nisbah kecekapan kos dan keuntungan, Nisbah Kecukupan Modal dan PLS berkait rapat dengan risiko kecairan. Begitu juga Keluaran Dalam Negera Kasar, Bekalan Wang dan inflasi mempunyai pengaruh yang signifikan terhadap risiko kecairan. Kajian turut menekankan bahawa keuntungan boleh menjadi pengantara tetapi kontrak PLS tidak mengantarakan hubungan antara risiko kecairan dan kecekapan kos. Implikasi keputusan ini adalah pengurusan bank, pemerintah dan pengawal selia bank Islam perlu menguruskan faktor-faktor penting yang mempengaruhi risiko kecairan dengan berkesan kerana hal ini mempunyai kesan langsung ke atas kecekapan kos dan keuntungan bank. Kajian ini menyumbang kepada penemuan baharu dari segi mengesahkan keengganan pihak bank untuk menggunakan kontrak PLS kerana kontrak ini meningkatkan risiko kecairan. Oleh itu, disyorkan agar pengamal dan pembuat dasar mengkaji dengan teliti bahawa kontrak PLS perlu disokong oleh modal jangka panjang untuk mengurangkan risiko kecairan. Hal ini akan memastikan keuntungan lebih besar bagi bank-bank Islam dalam persekitaran dwi perbankan.

Kata kunci: Risiko Kecairan, Keberuntungan, Kecekapan Kos, Bank Islam.

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AAOIFI	Accounting and Auditing Organization for Islamic Financial Institutions
AE	Allocative Efficiency
ALM	Asset and Liability Management
BIMB	Bank Islam Malaysia Berhad
BIS	Bank for International Settlement
BK	Baron and Kenny
BLUE	Best Linear Unbiased Estimator
CAGR	Compounded Annual Growth Rate
CAR	Capital Adequacy Ratio
CDs	Certificates of Deposits
CFP	Contingency Funding Plan
CIR	Cost-to-Income Ratio
CMT	Commodity *Murabahah* Transactions
COMCEC	Committee for Economic and Commercial Cooperation of the Organization of Islamic Cooperation
DEA	Data Envelopment Analysis
DR	Deployment Ratio
FE	Fixed Effect
GCC	Gulf Cooperation Council
GDP	Gross Domestic Products
GFC	Global Financial Crisis

GLS	Generalized Least Square
GMM	Generalized Methods of Moments
GNI	Gross National Income
HQLA	High-Quality Liquid Assets
IB	Islamic Banking
IBIS	Islamic Banks Information System
IDB	Islamic Development Bank
IFSB	International Financial Service Board
IIFI's	International Islamic Financial Institutions
IIFM	International Islamic Financial Markets
IILM	International Islamic Liquidity Management Corporation.
IMF	Islamic Mode of Finance
INF	Inflation
IRTI	Islamic Research and Training Institute
ISO	International Standard Organization
LATA	Liquid Assets to Total Assets
LCR	Liquidity Coverage Ratio
LG	Liquidity Gaps
LQ	Liquidity Risk
MDIC	Malaysian Deposit Insurance Corporation
MENA	Middle East and North Africa
MS	Money Supply
NDD	Non-Deposit Dependence
NIM	Net Interest Margin

NPL	Non-Performing Loans
NPR	Net Profit Ratio
NSFR	Net Stable Funding Ratio
OIC	Organization for Islamic Cooperation
OPR	Operating Profit Ratio
PBTZ	Profit Before Tax and Zakat
PLS	Profit and Loss Sharing
PSIA	Profit Sharing Investment Accounts
PTE	Pure Technical Efficiency
RBC	Risk Bearing Capacity
RE	Random Effect
REG	Regulation
RLA	Risky Liquidity Assets
ROA	Return on Assets
ROE	Return on Equity
SIFIs	Systematically Important Financial Institutions
SLOLR	Shari'ah-compliant Lender of Last Resort
SRR	Statutory Reserve Requirement
SUR	Seemingly Unrelated Regression
TA	Total Assets
TBTF	Too Big To Fail
TCF	Total Customers' Funds
TE	Technical Efficiency
TI	Total Investment

TMA	*Tahawwut* (hedging) Master Agreement
TRA	Tobit Regression Analysis
UAE	United Arab Emirate
UK	United Kingdom
US	United States
UUM	Universiti Utara Malaysia
VIF	Variance-Inflation Factor
WDI	World Development Indicator

CHAPTER ONE

INTRODUCTION

1.1 Background of Study

Banking institution play a crucial financial intermediation role in the economic system of any country. Thus, banks have responsibility of providing fundamental services that include, but not limited to, acceptance and collection, as well as safe keeping of customers' funds, which the banks usually transferred or exchanged for financial or economic benefits of the customers on their instruction (Askari, Iqbal, Krichene & Mirakhor, 2012). The bank's services facilitate economic activities as well as promote greater efficiency being intermediaries in meeting the investment and liquidity needs of the economic agents in the financial system

The Islamic banking evolution came into being prior to the independence of several Islamic countries from their political colonialists in the 1950s (Belouafi, 1993). Islamic banks started in different countries like Egypt, United Arab Emirate (UAE), Sudan, and Pakistan in 1970s but took international coverage with the establishment of Islamic Development Bank (IDB) in Saudi Arabia in 1975 after the ministerial meeting of the Organization for Islamic Cooperation (OIC)

Globally, Islamic banking has become a credible and viable arrangement in the financial system. A rapid growth of Islamic banking has facilitated the establishment and operation of not less than 435 banking institutions that operate within some 75 countries in the globe and such institutions operate in foremost financial hubs like the United Kingdom (UK),

Malaysia, New York, Luxemburg, Singapore and Hong Kong (Sanusi, 2013). The estimated value of Islamic banks' assets was around US$2 trillion by 2014 and this amount is expected to reach US$3.5 trillion by 2018(COMCEC, 2015). The assets recorded a compounded annual growth rate (CAGR) of 17 percent (World Islamic Bank Report, 2015) between 2007 and 2012. This is within the Banker's (2013) estimated growth rate between 15 percent and 20 percent. The tremendous growth in total assets of Islamic banks was from US$250 billion in 2007 to US$1166 billion in 2012 representing a 366.4 percent increase. The assets further increased to US$ 1.8 trillion by 2014 (Kammer et al. 2015).

Figure 1.1 shows that more than 80 percent of the global Islamic banking assets is in Gulf Cooperation Council (GCC) and Middle East and North Africa (MENA) regions. The market share for Asia is 14 percent while the balance is shared by other regions. Figure 1.2 shows the distribution by country.

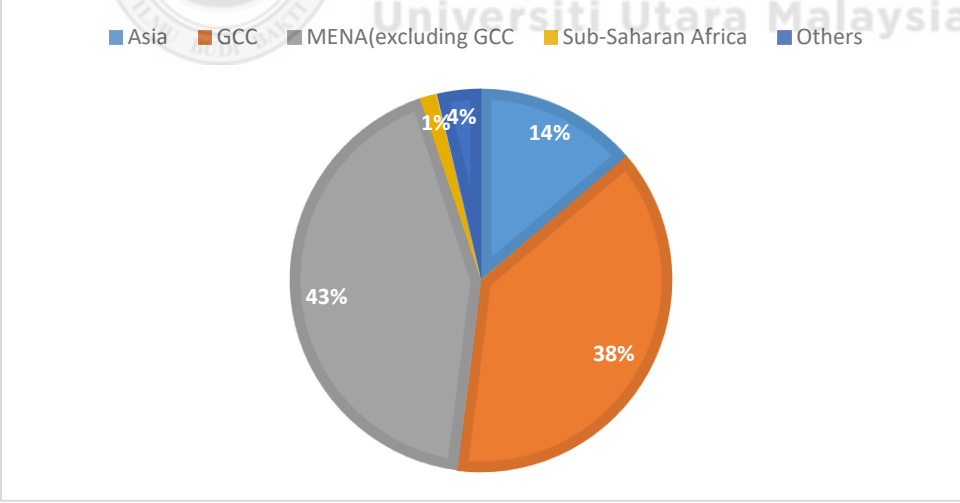


Figure 1.1
Islamic Banking Assets by Region (2016)
Source: Kammer et al.(2015)

Similarly, Figure 1.2 shows the share of Islamic banks' assets by country. It illustrates that the bulk of Islamic banking assets is located in sixteen countries from which ten countries were selected for this study. These countries are Iran, Saudi Arabia, Malaysia, United Arab Emirate (UAE), Kuwait, Turkey, Bahrain, Indonesia, Sudan and Pakistan.

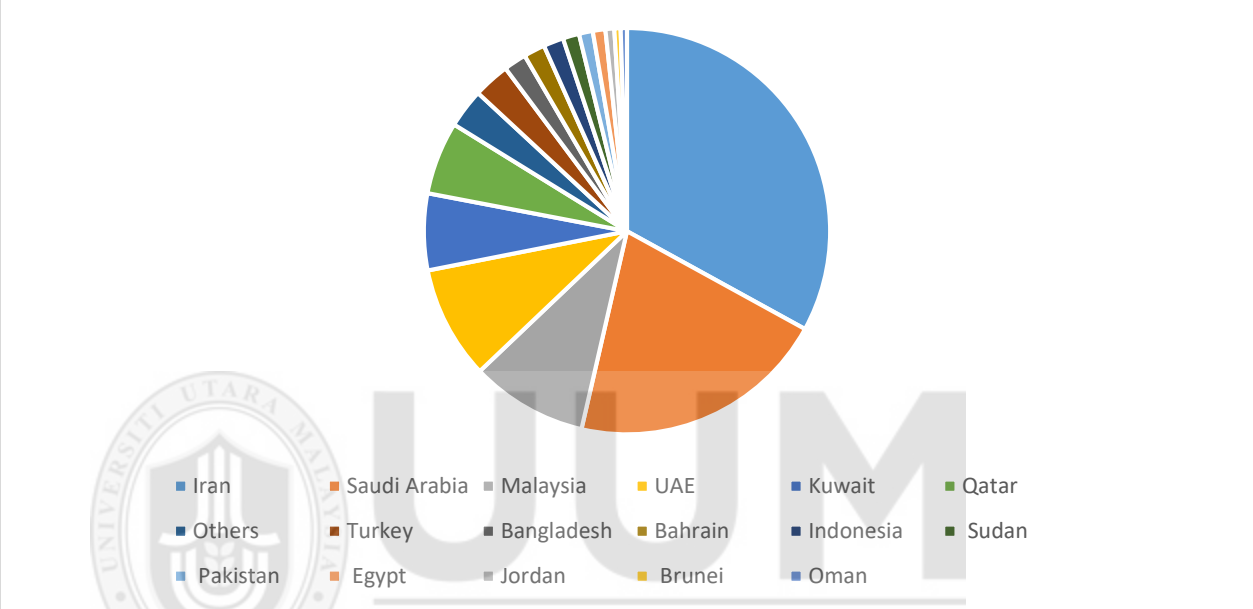


Figure 1. 2
Islamic Banking Share in Total Assets by Country (2016)
Source: IFSB

Preliminary analysis of the present study also shows the growth rates of key financial indicators including Islamic Mode of Finance (IMF), Total Investment (TI), Total Assets (TA), Total Customers' Funds and Total Liabilities. As shown in Figure 1.3, the growth rates oscillated in a largely decreasing pattern until 2014 when it reached its lowest negative level. The drop in 2014 is attributable to fall in oil prices. The impact of fall in oil prices of GCC countries banking system has been documented (Khandelwal, Miyajima and Santos, 2016; Lukonga and Souissi, 2015; Alodayni, 2016). Their reports gave empirical

evidence of the effect of oil price slump of 2014-2015 on macro economy, real sector and banking system in GCC and other oil-dependent countries. Similarly, Zu and Xie, 2015; Laksaci, 2016 also reported the influence of oil price fall on profitability of banks and stability of the economy.

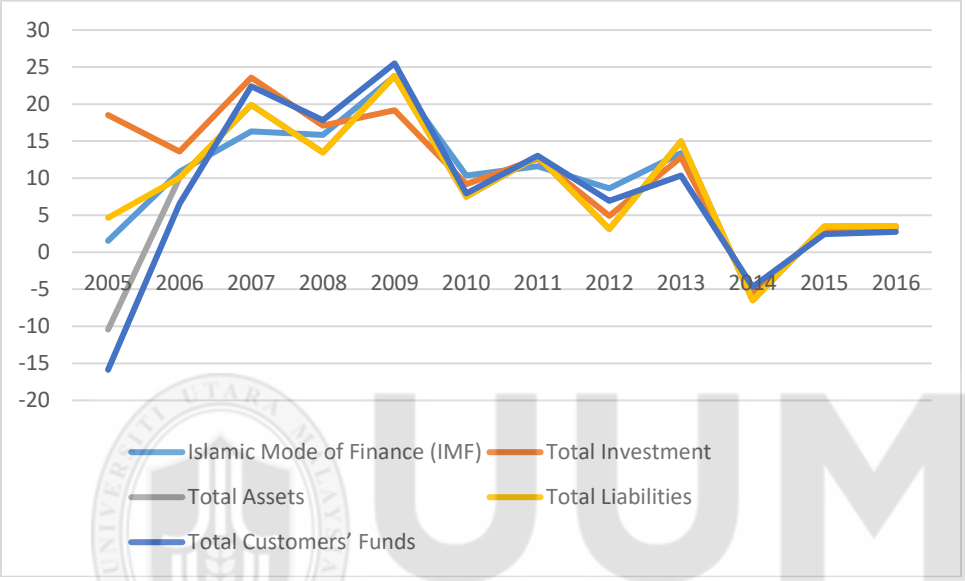


Figure 1.3:
Key Financial Indicators of selected OIC Countries 2005-2016 (percent Growth rate)

Similarly, Figure 1.4 also depicts the asset and liability profile of the Islamic banks between 2005 and 2015. They indicate a downward percentage of cash and balances with other banks. This is a potential liquidity risk as increased investments being financed by largely short term liabilities including customers' deposits that constitue over 85 percent of the liabilities.

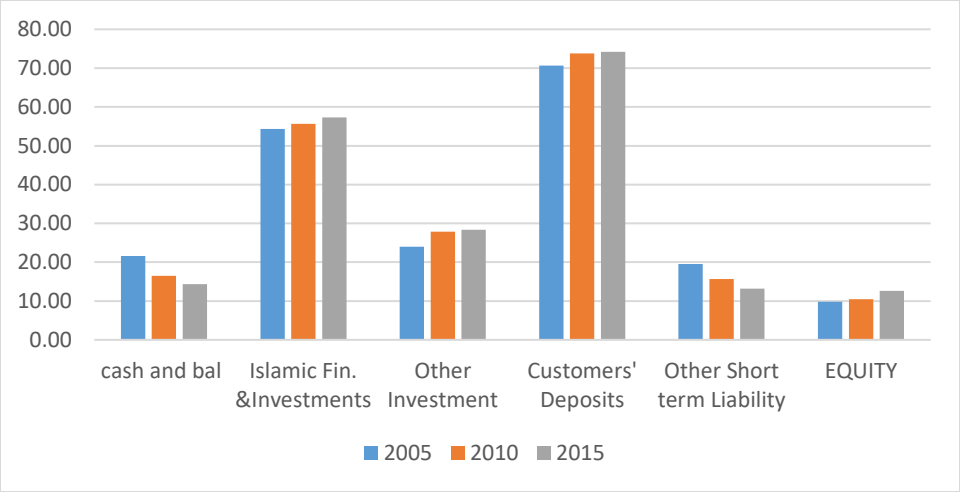


Figure 1. 4:
Assets and Liabilities of Banks in selected OIC Countries 2005-2015 (percent)

The significant increase in assets of the Islamic banks is due to the growing acceptance of the Islamic banking system by Muslim and non- Muslim nations. The increase is also attributable to the effect of global financial (GFC) of 2008.

There are several unfavorable conditions which contributed to the downfall of financial sector in 2008 resulting in the Global Financial Crisis (GFC). The growth of complex financial instruments aimed at spreading risks however increased instability due to market fluctuations and speculative activities. Analysts relied on quantitative mathematical models for value assessment and pricing and did not pay much attention to the qualitative aspects in their valuation. As such, moral hazard activities were not able to be detected earlier until the burst of the GFC mainly due to misconduct of the top bankers, high liquidity risk and credit risk.

Another area which prompted the building of risks was the eagerness of banks and financial institutions to increase risks in the search for greater profits. The core principles of Western

capitalism of profit maximization was witnessed in the US subprime mortgage crisis where subprime borrowers were given mortgages despite of their weak credit assessments. To compensate for the higher risks, the borrowers were charged higher lending rates. The borrowers faced tight liquidity and acute repayment problems when interest rates spiked sharply during recession in the US economy. In contrast, it increased the attention on Islamic banking due to its performance during the crisis (Hasan & Dridi, 2011; Beck, Demirguc-Kunt & Merrouche 2013). The crisis created reservations on the proper working of conventional banking. Miah & Shareem, (2015) also submit that this unparalleled worldwide financial meltdown not only brought the hegemony of traditional interest-based banking system into question but also raise doubt as to whether conventional banking practice works as a factor prompting financial mess. Farooq and Zaheer (2015) also provided empirical evidence that Islamic banks are less prone to deposit withdrawal than conventional banks during crisis.

The effect of global financial crisis is limited due to the nature of Islamic banking (Kolsi & Zehri, 2015; Kayed & Hassan, 2011). The Islamic banking system distances itself from market speculation taking place in Europe and US. Islamic banks diverged from debt trading and are not participating in buying and selling of debt unlike its European and American bank counterparts. In addition, the resistance of Islamic banks lies in its profit and loss sharing concept.

However, Islamic banks are not entirely spared from the crisis. According to Hassan and Dridi, 2011, the banks are affectedly differently. For instance, the risk management practices in some Islamic banks resulted to reduction in 2009 compared to conventional

banks. Thus, like conventional banks, Islamic banks also face financial and non-financial risks. Due to this situation, the Islamic banks need to focus on risk management.

Bank evolution revolves around risk taking and how the risks are managed. The management of risks determines the return from a transaction. For Islamic banks, risk management does not only involve risk transfer (Sulaiman, Muhammad, & Samsudin, 2013) but also risk sharing. Risk is shared between Islamic banks and their customers since as suppliers of funds, Islamic banks become capital provider rather than creditors and the customers assume the role of investors.

Financial transactions in Islamic banks are in the form of a symmetrical risk-return distribution. A risk sharing financial system according to Askari, et al. (2012) is based on equity finance (as against debt) and the return is shared based on pre-agreed determined ratio between the parties involved. In risk sharing arrangement, the real segment (asset or equity backed) and financial segment are seen and closely connected with each other and grow together. This makes it insusceptible considerably to the financial crunches that plaque the conventional banking system and is free from the sources of the crises including interest, too much debt creation, influence and speculation.

Athukorala and Warr (2002), submit that higher risk is associated with higher return but it can also lead to higher risk of failure. The history of bank failure is attributable to excessive risk taking by banks. This calls for regulatory bodies to control risk behaviors of banks. However, self-governance is vitally important in risk governance and internal control.

Every bank whether conventional or Islamic is facing liquidity risk. According to financial intermediation theory, financial institutions exist because of its role in real economy to create return to shareholders by taking calculated risk (Campbell & Kracaw, 1980; Diamond, 1984; Allen & Santomero, 1997). Risk management thus forms one of the activities of banks. There must be a risk management program with risk management framework made available. While some risks are common to both Islamic and conventional banks, others are specific to Islamic banks because of its unique nature which emphasizes on risk sharing (Askari, et al. 2012). While credit, liquidity, market and operational risks are common to both banking systems, displaced commercial risk, rate of return risk equity investment risk and Shari'ah-compliant risk are unique to Islamic banks (Zainol & Kassim, 2010; Zainol &.Kassim, 2012). Jeroen (2015), aptly describes this as follows:

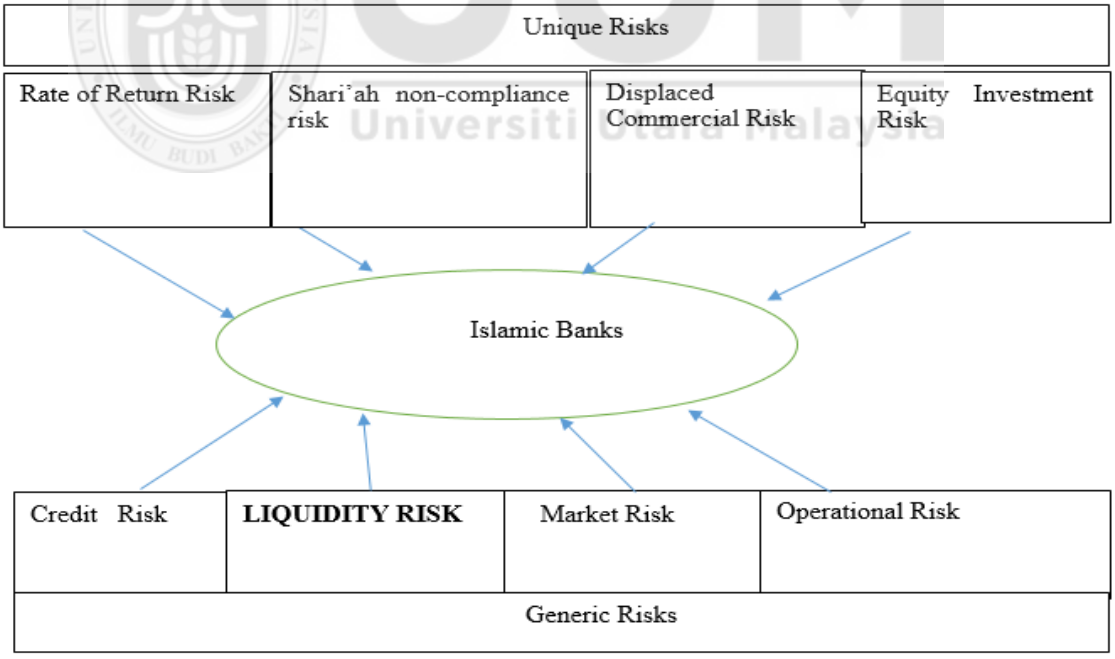


Figure 1.5
Risk Profile of Islamic Banks
Source: Jeroen (2015)

While non–financial organizations are concerned with cash flow in managing their working capital, financial institutions are concerned with maintaining a balanced liquidity profile for their operation. The liquidity of a company is denoted by the current ratio linked to the working capital, cash flow based ratios and the cash conversion cycle (Bolek, 2013). The concept of liquidity lies at the heart of commercial banks and the management of its funds. It represents one of the crucial risk in banking industry (Muharam & Kurnia, 2013). Liquidity to a bank is like blood in a human body (Talekar, 2005).

Liquidity is the ability of a bank to fund increases in current liabilities and meet obligations as they come due, without incurring undesirable losses. A bank is said to be illiquid if it cannot settle obligation on time (Drehmann & Nikolaou, 2013).

Liquidity management is a long–standing concern in the global Islamic Finance because there is a general lack of tradeable Shari'ah – compliant instruments that can serve as high quality short-term liquid assets (IFSB, 2015). The report by IFSB also estimates that the Islamic Finance industry currently requires almost US$400 billion for capital management of credible short-term liquid securities. It further states that most Islamic banks now are involved in bilateral investment based (*Mudarabah*) deposit placements with each other to resolve liquidity surplus and deficit conditions.

Other risks like credit, market and operational risks directly or indirectly have impact on liquidity risk. Thus, the significance of liquidity risk cannot be over emphasized. While the collapse of big banks like Citibank Group, Barclays and Chase Manhattan Bank have been attributed to credit risk (Waemustafa, 2014), the immediate signal of bank customers'

default is the inability of the banks to provide adequate liquidity to meet instant obligation because of non-payment by the customers.

Today, the stability of Islamic banks could be hampered if the liquidity issues are not addressed. In practice, some Islamic banks have shown signs of financial distress and few have been forced to close their operations. The banking and financial crisis of 2000- 2001 in Turkey provides evidence of liquidity problems which affected the stability of Islamic banks in that country (Ali, 2007). Likewise, the collapse of Islamic bank Limited of South Africa was attributed to impairment of loans and receivables which seriously affected the liquidity of the bank as well (Nathie, 2015).

Hence, a more comprehensive study on liquidity risk is justified to be conducted on Islamic banks. This will help to address the problems associated with liquidity risk management in the banks.

This study also focus on the efficiency and profitability of Islamic banks. The banks have been described as profit based institutions with incentives to make greater profit to increase customer bases (Alam, 2012). Different positions have been submitted by previous researchers. Some posit that Islamic banks are less efficient in terms of cost and profitability than conventional banks (Srairi, 2010; Wasiuzzaman and Gunasegavan, 2013). Others contend that conventional banks are less efficient than Islamic banks in terms of cost and profitability. This is the position of Alam, (2012); Abdul Nafea and Jasim, (2014). The resilence of Islamic banks during the last global financial crisis has been cited

as the evidence of better performance of Islamic banks over conventional banks (Hasan and Dridi, 2011; Beck, et al. 2013; Cihak & Hesse, 2010; Farooq & Zaheer, 2015).

Thus, this study endeavors to find the link among liquidity risk, cost efficiency and profitability. Liquidity risk being a major cost in banks will affect the profitability and hence performance of the banks. However, theory does not provide a clear picture of the relationship and empirical evidence also remains inconclusive (Deelchand and Padgett, 2009). Following recurrent global financial crises, there are growing interest among researchers and regulators to understand the relationship between risk, capital and efficiency of financial institutions worldwide as these are still existing unresolved issues.

Another issue of interest in this study is the current practice of profit and loss sharing (PLS) contract in Islamic banks. The percentage of usage of this contract to total financing is less than 20 percent. This is against the theoretical postulation that the liquidity position of Islamic banks will be different if PLS is practiced on a larger scale (Dar & Presley, 2001; Alman & Oehler, 2010). Hence, the study attempts to find explanation to the role of PLS in the relationship between liquidity risk and cost efficiency of Islamic banks.

1.2 Problem Statement

Liquidity risk is one of the foremost risks faced by Islamic banks. It is the heart of a financial institution's operations. When banks face liquidity problem, they cannot perform the intermediation role effectively. It is apparent from the GCF 2008 experience that liquidity risk poses major issues on the survival, profitability and efficiency of Islamic banks especially in OIC countries, whose member states are mostly poor (COMEC,2015).

The inappropriate liquidity instruments (non-Shari'ah compliant), difficulty in debt transfer except on face value and insufficient tools for supervisory authorities to support liquidity requirements of Islamic financial institutions are some of the issues and difficulties relating to liquidity management in Islamic banks.

Moreover, the global growth of Islamic banks can only be sustained with a robust risk management practice. However, this is not yet effective even in countries with more years of experience as managing risks such as credit risk and liquidity risk poses continuous challenges to banks. The critical issue on liquidity management in Islamic banks arises because of the banks' orientation towards short-term borrowing as against long-term financing (Ismal, 2010). This represents a liquidity gap or a funding mismatch.

The absence of many Shari'ah compliant securities also accentuates the liquidity risk as there is less instruments to trade to raise liquidity. Islamic liquidity market and Islamic capital markets are significant for a resilient and workable Islamic finance system. However, except in Malaysia, these two markets are not fully developed in many countries which operate Islamic banking.

Liquidity instruments such as inter-bank money market, debt instruments, and certificates of deposits (CDs), different forms of bonds are some of the tools existing in conventional banks to manage their liquidity. However, many of these instruments are not Shari'ah compliant and therefore could not be applied in Islamic liquidity market (Sobol, 2013). In addition, Islamic banks do not have easy access to these tools to enable them adequately

manage liquidity problems. This is a problem faced by fund managers to manage their liquidity since a small number of Shariah compliant instruments limit trading and liquidity.

Besides these instruments, the conventional banks also have access to central banks as lender of last resort in case of emergency. The central banks provide liquidity support to conventional banks again on interest basis which is not acceptable to Islamic banks. The absence of this support from central banks to Islamic banks is another factor militating against adequate liquidity position of many of the Islamic banks. This poses operational problems to manage their liquidity. For instance, Ali (2007) reports that one of the factors that led to the collapse of one of the Islamic banks in Turkey, Ihsan Finans was that deposits of the bank were not protected by the central bank's insurance system. However, Islamic banks' deposits in Malaysia are protected by Malaysian Deposit Insurance Corporation (MDIC). MDIC is to promote confidence in the banking system and to avert runs on individual banking institutions especially during crisis (Sabri, 2013). Nonetheless, there is need to be more careful in raising funds as well as prudent in investing them to safeguard the liquidity of the banks.

A major gap on liquidity research is that there is inconsistency in the determinants of liquidity risk. This has resulted in different researchers giving conflicting views on the significance of various factors that influence liquidity risk. For instance, on bank specific variables, while Muharam and Kurna (2013), and Mehmed (2014) suggest a negative and significant relationship between Return on Equity (ROE) and liquidity risk, Siaw (2013) and Anam, Hassan, Huda, Uddin and Hossain (2012) reports a positive correlation between the two variables.

Similarly, bank size measured in terms of total assets produced more contradictory results. For Siaw (2013), Sabri (2014), Ramzan and Zafar (2014), it is a positive correlation between bank size and liquidity risk while Sulaiman et al (2013) reveals a negative association between the variables. Yet, Ahmed, Ahmed and Naqvi (2011) report that variable size and profitability are not powerful explanatory variables to define the liquidity risk of Islamic banks in Pakistan. Again, these differences challenge the theory of 'too big to fail' (TBTF) (Kaufman, 2013) which suggests a negative connection between bank's size and liquidity risk.

Hence, the inconsistencies in the result of return on assets (ROA), total assets and capital adequacy on liquidity is a research gap which warrants further investigation to confirm the results. This gap is going to be addressed in this study by examining the case of Islamic banks in Malaysia and other selected OIC countries.

Another major issue of Islamic banks on liquidity management is asset and liability mismatch. Liability items represent sources of fund like deposits, while assets indicate the utilization and uses of such funds as financing. Based on their annual reports, Islamic banks tend to have short term liabilities to finance long term assets (Greuning & Iqbal, 2008). This is maturity mismatch which means borrowing short to lend long (Bourakba, 2015). The theoretical business model for Islamic banks as a special type of intermediary is that maturities of assets and liabilities should be matched. This is due to asset-backed principle which ties financing to the various activities of the real economy. However, due to domination of fixed income financing, there is always a mismatch between assets and liabilities which result in liquidity issues.

This asset and liability mismatch problem leads to another challenge in Asset and Liability Management (ALM). ALM is an important tool for risk management for any financial institution. It involves matching the maturity outline of assets and liabilities (Othman, Aris & Shahadan, 2007). It is also a process through which assets and liabilities of banks are managed. However, ALM in most Islamic banks is not satisfactory and this raises the issue of management efficiency of Islamic banks. For instance, Othman et al. (2007) reports that in Bank Islam Malaysia Berhad (BIMB), the core item of assets financing customers accounted for only 49.5 percent of total assets of BIMB. On the other hand, 95.31 percent of total deposits is short-term and used to finance long-term assets.

If the management of Islamic banks is not efficient, it will be difficult to monitor their funding cost relative to financing rate charged to customers. This means that the balance sheet structure will affect the cost efficiency of Islamic banks. Where the banks rely on short term funding which is relatively costlier, the financing rate charged by the bank will be high.

Paldi (2014a) points out liquidity issue in his report that the existing assets of Islamic Banks assets are not liquid in comparison with conventional banks. Also, due to absence of a well-developed financial instruments, secondary markets are not able to provide immediate funds required by Islamic banks. Thus, Islamic banks are less liquid and more expensive in terms of their funding costs. This managerial issue requires them to keep higher levels of capital requirement compared to conventional banks (Srairi, 2010; Miah & Sharmeen, 2015). Hence, capital requirements is one of the variables to be tested in relation to liquidity risk to assess its influence on Islamic banks performance. This has not been done before.

The mismatch issue in ALM of Islamic banks has been highlighted and accepted in past literature as a serious concern since it affects Islamic banks' cost structure and profitability. Despite this fact, there is hardly an empirical research testing profitability ratio and the balance sheet items affecting liquidity in the ALM of Islamic banks specifically finance to deposit ratio, term structure and capital adequacy ratio and bank size. The lack of such empirical study in this aspect currently presents a knowledge gap. The findings from a fresh study could contribute new knowledge for Islamic banks in OIC countries to manage their ALM and liquidity position better. This represents the second gap to be addressed in this study.

The effects of macro-economic variables in terms of Gross Domestic Products (GDP) and inflation effects on liquidity risk is also not settled. Mehmed (2014) reports that the choice of dependent variable determines which factors influence liquidity risk in the banking sector. Using liquid assets to customer deposits and short term funding as a measure of liquidity risk shows higher explanatory power than using liquid assets to total assets. Sabri (2014) observes an insignificant positive association and Vodova (2013) asserts an uncertain relationship between GDP and liquidity risk. Almost all studies used GDP to measure economic performance and the results were not conclusive. GDP is an aggregate that only measures flows but not stock of wealth of an economy. It also excludes many household activities that are productive in an economic sense (Stigliz, Sen, & Fitoussi, 2009).

Additionally, the focus on liquidity risk was not pronounced until after the 2008 global financial crisis. Previously, credit risk has been the priority of banking industry. Now,

attention is on liquidity risk as against managing interest rates and credit risk due to drying up of liquidity at the time of crisis (Peeble & Shah, 2015). This increasing concern explains why liquidity is featured prominently in Basel III following the financial crisis. Inadequate research on Islamic banks in OIC countries regarding liquidity risk and cost efficiency is another concern addressed in this study.

Also, related to this is the impact of type of regulation governing the banks on the liquidity of banks. This refers to dual banking or wholly Islamic banking regulated systems. Klomp and Haan (2012) find regulation has significant impact on high-risk taking banks. However, it does not have significant effect on low-risk taking banks. The authors used factor analysis to measure both multi-faceted concepts of banking risk and banking regulation. On the other hand, Sabri (2014) shows that liquidity risk is significantly determined by stringent officially supervisory power on capital regulation and banking activity restrictions. Although regulations have been studied in those past researches, but it is not in the context of liquidity risk. Furthermore, given the fact that liquidity risk is an important component of Basel III capital regulation and scarcity of such investigation, there is therefore a strong need to fill this gap. This study endeavors to determine the influence of regulation on the liquidity risk of Islamic banks. The study used dummy variable 0 for Islamic banks under dual regulated system and 1 for fully Islamic banking regulated system.

What is also lacking is that many specialized standard-setting bodies have developed specific standards, but these regulatory frameworks do not provide for the risks that are unique to Islamic banks in many countries (Kammer, et al. 2015). Consequently, the way

Islamic banking is being practiced in some countries has brought about intricate financial transactions. Operations across borders have also been stretched without proper regulatory coordination. This represents a research gap to assess the impact of regulation on liquidity risk of Islamic banks in the two regulated systems. It is postulated that the findings could lead to increased regulatory clarity and synchronization, and further improvement of regulatory tools for effective supervision.

Profit and loss sharing (PLS) paradigm is another distinctive feature of Islamic banking. It determines how successful an Islamic bank is seen in the distribution of wealth among investors and entrepreneurs in the society (Wiyono & Raymayuni, 2012). Islamic banks are in theory thought to be more stable, due to the PLS nature of contracts on both the asset and liability side of the banks' balance sheet. Unfortunately, less than 20 percent of the assets of Islamic banks are based on PLS (Dar & Presley, 2001). Though not adequately adopted by Islamic banks, PLS remains a core objective of Islamic financing that aims at welfare of the population. In practice, however, the assets of Islamic banks are mostly in *Murabahah* contract and its variations (Ali, 2007). Othman, et al. (2007) reports that in Bank Islam Malaysia Berhad (BIMB), *Musharakah* and *Mudarabah* remain the lowest Islamic financing at 0.94 percent and 0.66 percent of total asset financing respectively. As at December 2014, the BIMB's financing contract constitute zero percent for both *Musharakah* and *Mudarabah*.

According to Beck, et al. (2013), PLS is capable of guaranteeing equity and risk sharing that can mitigate risk exposure of Islamic banks. However, in practical banking operation, application of PLS is low. Why is it so? Empirical study to verify this statement is also

few except the one done by Wiyono and Raymayuni (2012) who earlier used PLS as a moderating variable between bank risk (credit and liquidity) and profitability. This study, however is different from Wiyono and Raymayuni (2012) since it requires further validation of PLS application in other countries whereas the earlier study was carried out only in three Islamic banks in Indonesia. In this study, the gap will be addressed by including a bigger sample of 85 banks from 10 OIC countries. A basic requirement for mediation is that two variables to be mediated have strong relationship. In this study, liquidity as a component of banks' cost has direct effect on cost efficiency. The need to test mediating effects of PLS is to find explanation to the process by which PLS affect liquidity risk and cost efficiency of Islamic banks. This may offer possible reasons why it is not being adopted by many Islamic banks. This is a new investigation whereby PLS and profitability are used as mediators to explain the relationship between liquidity risk and cost efficiency.

This brings to another phase of the study. It is argued that while Islamic banks are profit efficient, they are found to be cost inefficient due to high costs associated with newly setup Islamic banks (Abdul-Majid, Saal, and Guiliana, 2010). Some authors like Siraj and Pillai (2012), Srairi (2010) and Sufian (2007) claim significant differences in the efficiency of Islamic banks and conventional banks. In contrast, Yahya, Junaina, and AbdulRazak, (2012) assert that there is no significant difference in their efficiencies. Liquidity risk as a component of banks' cost profile will affect the cost efficiency of the banks. Hence, it is imperative to research into the link concerning liquidity risk and efficiency of Islamic banks. This is also to confirm if the argument is tenable. In addition, the mediating effects

of PLS on the relationship between the determinants of liquidity risk and cost efficiency has not been tested and published before in the previous studies.

In summary, this research will focus attention on resolving the inconsistency in previous studies by identifying the significant balance sheet and profitability items that determine liquidity risk. The problem connected with empirical research testing of the effects of profitability ratios on liquidity risk was addressed and attempt was made to resolve the conflicting reports on the impact of macro-economic variables on liquidity risk. Likewise, the unresolved impact of two regulatory banking system (dual or full-fledged Islamic based regulation) on liquidity risk was tested. Finally, the problem associated with the low application of Profit and Loss Sharing (PLS) contract by many Islamic banks is also addressed in this study by uncovering the mediating effect of PLS contract and profitability between liquidity risk and cost efficiency.

1.3 Research Objectives

The main objective of this study is to examine key bank specific and macro-economic determinants affecting liquidity risk of Islamic banks. An empirical study of factors affecting liquidity will assist in better management of the risk. As liquidity risk is a major cost in banks, a study of its determinants will also improve the cost efficiency of the banks. The study is also set to establish the mediating effects of PLS contract and profitability on the liquidity and cost efficiency of the banks. This will provide explanation on low application of PLS on the one hand and a link between liquidity risk, profitability and cost efficiency on the other.

The following specific objectives are then identified to be achieved from this research:

i. To determine banks specific factors affecting liquidity risk among Islamic banks.
ii. To investigate the external (macro) factors that affect liquidity risk in Islamic banks.
iii. To examine the effect of different banking regulations (dual or fully Islamic banking) on the liquidity risk of Islamic banks.
iv. To evaluate the effect of liquidity risk on cost efficiency of Islamic banks in selected OIC countries.
v. To investigate whether Profit and Loss Sharing (PLS) contract and Profitability mediate the relationship between liquidity risk and cost efficiency of Islamic banks.

1.3 Research Questions

Based on the above objectives, the research seeks to answer the following questions:

i. What are the bank specific factors which influence liquidity risk of Islamic banks?
ii. To what extent do macroeconomic factors (GDP, Inflation and Money Supply) affect liquidity risk of Islamic banks?
iii. What is the effect of different banking regulations (dual or fully Islamic) on the liquidity of Islamic banks?
iv. What are effects of liquidity risk on cost efficiency of Islamic banks?

v. To what extent do Profit and Loss Sharing (PLS) contract and Profitability (ROA) mediate the relationship between liquidity risk and cost efficiency of Islamic banks?

1.5 Justification of Study

The choice of Organization of Islamic Cooperation (OIC) for study on liquidity of Islamic banks is because OIC has a collective share of 98 percent of Islamic banks assets (IFSB Report 2015). Despite the acceptance and growth of Islamic Finance, many Muslim countries still display lower level of financial presence than the rest of the world. While the whole world average 12 accounts per 1000 adults, in the OIC countries, the average is lower than 9 accounts per 1000 adult (Harzi, 2011). Similarly, the percentage of global firms that have access to loans and credit facility is up to 35 percent whereas, the OIC records below 21 percent. These statistics indicate liquidity problems faced by banks and customers in OIC countries.

Furthermore, most of the member countries of OIC are categorized under low income states. 34 of the 57 members representing 66 percent are in this category (COMCEC, 2015). The Muslim countries especially in the GCC region is also facing dwindling income following the fall in price of oil which is the main source of their revenue. Thus, it becomes imperative to engage in research into areas of Islamic Banking that will sustain the liquidity and growth of the Industry. Islamic banking will also provide opportunities for Muslims who are financially excluded to participate both as depositors and borrowers of funds. One of the areas Islamic banks face challenges is the management of risks and liquidity risk is key in risk profile of Islamic banks.

The study was carried out for a period of twelve years from 2005 to 2016 for 85 Islamic banks in the selected OIC countries. This period is critical for an evaluation of liquidity risk due to the changing pattern of key financial indicators shown by the results of this study. This is in addition to the global financial crisis (GFC) and regulatory reforms across the countries. The selected countries represent over 90 percent of Islamic banks' assets. The countries also cut across different regions including GCC, MENA, Asia and Africa.

1.6 Significance of Study

Several studies have been carried out on risk management in Islamic banks in many countries. However, the extent of the research is very limited to some selected countries. Moreover, there is a general dearth of literature on liquidity risk compared to other risks (such as credit risk). Hence, this research is significant in filling the gap and lay the foundation for extended study on management of risk in general and liquidity risk in particular for Islamic banks. The present study identifies relevant factors affecting liquidity and thus contribute to better liquidity risk management. In this aspect, the fund managers are made aware of risk management techniques to manage the factors influencing liquidity risk of their banks.

Another significant output from this study is in terms of policies inputs for policy formulation. Policy will be in a better position to formulate liquidity management policies and guidelines especially for Islamic banks in OIC in which many of the countries are at the initial stage of Islamic banking and money market operations.

Additional significance of this study is that the analysis on the balance sheet structure will assist Islamic banks managers to focus their attention on how to attach every long- term financing with similar borrowing term structure to investments on the liability side. This will help to solve issues relating to the mismatch in the maturity structures of Islamic banks' balance sheets and ease the liquidity issues.

On the same note, the study highlights new findings on the cost efficiency of Islamic banks in selected OIC countries by using deployment ratio and cost income ratio. The findings will be useful to practitioners as they will clarify the conflicting findings that the Islamic banks are profit efficient but cost inefficient (Alam, 2012; Yahya, et al. 2012; Ismail, Abd.Majid, & Abd.Rahim 2013; Beck, et al. 2013) produced in past studies.

Also, the government and regulatory authorities in various countries will find useful information on the effects of macroeconomic variables on liquidity and liquidity risk of Islamic banks. The information expected from this study will provide necessary support for policy makers to formulate policies that accentuate the significance of liquidity risk in Islamic bank management and enhance the supervisory roles on Islamic banks.

Another significant output from the study is expected to come from the inclusion of Profit and Loss Sharing (PLS) as a mediator between the determinants of liquidity risk and cost efficiency of Islamic banks. The result would highlight a new empirical finding and theoretical implications useful for academicians to undertake future research in this area.

1.7 Scope of the Study

The scope of the present research is on the identification of determinants of liquidity risk in Islamic banks in selected OIC member countries. It is also to establish the relationship between liquidity risk and cost efficiency and the mediating effects of PLS contract and profitability on this relationship. The significance of mediating factors is to explain the process through which relationship between liquidity risk and cost efficiency of Islamic banks is affected by PLS and profitability.

For the study, liquidity risk is the dependent variable (Ahmed, et al. 2011). The following factors were examined as the bank specific independent variables: Deployment Ratio (DR), Cost Income Ratio (CIR), Return on Equity (ROE), Capital Adequacy Ratio (CAR), Profit and lost sharing (PLS), bank size, and profit before tax and zakat (PBTZ). The macro or country related variables will include inflation, Gross Domestic Products (GDP), Money Supply (MS) and regulation.

The data for this study is secondary data which was derived from the balance sheet and profit and loss statements of the Islamic banks available from Islamic Bank Information System (IBIS) database. All data except for regulatory type is in the form of financial ratios. Additional data was sourced from official documents and other secondary publications. Hence, this study's data is limited to secondary data. No primary data was used in the analysis.

The scope of this study is the selected OIC countries which include Bahrain, Indonesia, Iran, Kuwait, Malaysia, Pakistan, Saudi Arabia, Sudan, Turkey and United Arab Emirate (UAE).

1.9 Organization of the Study

This chapter describes the background of the research topic on the management of liquidity risk in Islamic banks in selected OIC countries. As an introduction, different types of financial and non-financial risks are explained before focusing on liquidity and liquidity risk of Islamic banks. The chapter discusses the problems of liquidity risk faced by Islamic banks and identify the gaps from academic researches done in the past on this topic. Subsequently, five research objectives were formulated followed by a set of questions on how the problems could be solved. The chapter also highlights the significance and scope of the study.

The next chapter which is Chapter Two reviews relevant literature on liquidity, liquidity risk and efficiency of Islamic banks. It also identifies the methodologies adopted by previous studies and the fact that the focus of these researches is in specific region and sometimes inconsistent results. These represent the gap that the present study hopes to fill.

Chapter Three identifies the theoretical framework, justifications of variables used, research hypotheses, data sources and method of analysis. The analysis of the data is carried in Chapter Four using panel analysis techniques, General Moments Method (GMM) and mediation approaches. Chapter Five concludes the study and makes recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviews previous literature on risk and liquidity risk management. It discusses the theoretical and empirical literature on liquidity risk, its determinants and effects on cost efficiency of Islamic banks. The chapter identifies key determinants of liquidity including Return on Equity (ROE), bank size, Capital Adequacy Ratio (CAR), profitability and microeconomic variables like Gross Domestic Products (GDP) and inflation. Conflicting results and inadequate coverage of these determinants were noted as gap that necessitated the present study. Finally, it explains the intermediation and Islamic participation theories as the foundation (underpinning theories) upon which this study is based.

2.2 Origin of Risk

A report by Skjong (2005) indicates that the English word 'risk' is borrowed from different languages. English borrowed it from Spanish, German from Italian and both were confirmed by French *risqué* of the 18th century. The Latin word *resicum* (*risicum*) came from a Greek navigation term *rhizikon* (*rhiza*) which connotes 'a root, stone, cut of the land' and it was a metaphor for 'difficulty to avoid in the sea'.

Greek derivative of the word, '*risque*' was used in the 12th century and it appears to relate to chance of outcomes in general and have either positive or negative implication. It is interesting to note that the lexical borrowings took place at the end of middle-ages. Later,

in the 16th century, the term risk got the meaning 'to dare, to undertake, enterprise, hope for economic success' (Skjong, 2005).

However, the French word, *'risque'* has main negative but occasionally positive meaning. In Latin, '*risqum*' originally referred to the challenge that a barrier present to a sailor and clearly has connotation of an equally fortuitous meaning (Epic, 2016).

On the other hand, since the 18th century, the English usage of the word, risk has very definite negative meanings. It means the chance of something going wrong, the danger that injury, damage, or loss will occur. When the word is used in Finance, it means the possibility of loss in investment or speculation.

Besides these definitions, there are other words connected to risk. These include:

a) **Perils** which means exposure to risk.

b) Hazards-these are acts or conditions which increase the likelihood of risks. It could be physical hazard, moral hazard, morale hazard or legal hazard.

There are many classifications of risk (Kuriakose, 2013). Three of these categories are significant:

a) Speculative or Pure Risk – speculative risk involves the chance of loss or gain while pure risks involve chance of loss or no loss. Pure risks are a family of risks in which all possible outcomes are harmful while speculative risks are a family of risks in which there are possible outcomes with benefit (Entsgo,2016). Generally, pure risks are insurable while speculative risk is usually not.

b) Financial or non-financial Risks- financial risks are those that involve financial transactions and include liquidity risk, credit risk and market risk. Among non-financial risks are legal risk and operational risk etc.

c) Static and Dynamic Risk - Dynamic risks are those resulting from changes in the economy that is changes in price levels, consumer tastes and technology. Static risk involves those that would occur even if there are no changes in the economy, for example peril of nature, dishonesty of individual.

2.3 Islamic Perspective on Risk

The broad perspectives of Islam on risk and its management are embodied in the overall goals of Islamic Law which defines *Maqasid Shari'ah* as promotion of 'well-being of the people which lies in safeguarding: faith, self, intellect, dignity and wealth. The general concept of risk in Islam is in the dictum: *Al-Ghunm bil Ghurm.* This is a Shari'ah maxim which says the legitimacy of earning profit is based on the condition of risk-sharing and engaging in economic activities which contributes to the entire economy (Rosly & Mohammad Zaini, 2008).

Risk and human behavior are related. While some people are risk averse, others are risk takers. In the context of Islamic banks, bankers are controlled by Shari'ah. In conventional banks, the risk behavior is guided by risk bearing capacity, risk appetite and risk tolerance (Blyth, 2013; Michel, 2014).

Thus, Islam differentiates between two types of risk, namely commercial risk and gambling (Al-Suwailem, 2011; Helmy, 2012). While Islam recognizes the inevitability of commercial risk in every transaction, it forbids gambling. In commercial risk, an entity will

be bought for gaining a profit after selling it. The buyer reckons on Allah for a profit. In this case, there may be a loss but this is necessary for a merchant because it is the nature of trade. In gambling, wealth is made for no effort and completely at the expense of the other party. Islam forbids gambling because in it there is a definite loss. The loss is intrinsic. This is related to the economic concept of added value. Gambling is about pure chance; no value is added. On the other hand, loss is possible in business but not definite. If someone buys goods for resale, he may lose part or the entire value and he may not. There is no intrinsic loss.

Islam also prohibits gambling or *Qimar or Maysir* which includes every game in which the winner receives something (money, commodity) from the loser. *Maysir* comes from Arabic word *yisir* which means ease. It is so called because it is associated with attempt to easily acquire wealth through games of chance. This zero-sum constitutes wagering on every uncertain or risky outcome which Islam forbids (Paldi, 2014b). It is a definite cost in exchange for possible gain. On commercial risk, Islam places restriction on risk taking. It forbids excessive uncertainty otherwise known as *Gharar*.

Allah (the Exalted) encourages precautionary measure against anticipated risks in several verses in the Qur'an. Allah relates to us the story of Prophet Yusuf (peace be upon him) with many lessons to learn on risk management.

إِذْ قَالَ يُوسُفُ لِأَبِيهِ يَا أَبَتِ إِنِّي رَأَيْتُ أَحَدَ عَشَرَ كَوْكَبًا وَالشَّمْسَ وَالْقَمَرَ رَأَيْتُهُمْ لِي سَاجِدِينَقَالَ يَا بُنَيَّ لَا تَقْصُصْ رُؤْيَاكَ عَلَىٰ إِخْوَتِكَ فَيَكِيدُوا لَكَ كَيْدًاۖ إِنَّ الشَّيْطَانَ لِلْإِنسَانِ عَدُوٌّ مُّبِينٌ

> *'Remember when Yusuf said to his father 'O my father! Verily, I saw (in a dream) eleven stars and the sun and the moon, I saw them prostrating themselves to me!'*

'He (the father) said.' O my son! Relate not your vision to your brothers, lest they arrange a plot against you. Verily! Shaitan is to man an open enemy! (Al-Qur'an, Surah Yusuf 12: 4 and 5).'

The lesson here is how to manage information. And information asymmetry is an important function of risk management. Furthermore, in subsequent verses, the king of Egypt sought the interpretation of his dream from Prophet Yusuf, he said:

قَالَ تَزْرَعُونَ سَبْعَ سِنِينَ دَأَبًا فَمَا حَصَدتُّمْ فَذَرُوهُ فِي سُنبُلِهِ إِلَّا قَلِيلًا مِّمَّا تَأْكُلُونَثُمَّ يَأْتِي مِن بَعْدِ ذَٰلِكَ سَبْعٌ شِدَادٌ يَأْكُلْنَ مَا قَدَّمْتُمْ لَهُنَّ إِلَّا قَلِيلًا مِّمَّا تُحْصِنُونَثُمَّ يَأْتِي مِن بَعْدِ ذَٰلِكَ عَامٌ فِيهِ يُغَاثُ النَّاسُ وَفِيهِ يَعْصِرُونَ

'For seven consecutive years, you shall sow as usual and that (the harvest) which you reap you shall leave in ears, (all)-except a little of it which you may eat. Then will come after that seven hard (years), which will devour what you have laid by in advance for them(all) except a little of that which you have guarded (stored). Then thereafter will come a year in which people will have abundant rain and in which they will press (wine)' (Al Qur'an, Surah Yusuf verses 47-49)

قَالَ اجْعَلْنِي عَلَىٰ خَزَائِنِ الْأَرْضِ ۖ إِنِّي حَفِيظٌ عَلِيمٌ

Yusuf said: Set me over the storehouses of the lad, I will indeed guard them with full knowledge (verse 55).

In this portion of his story, Prophet Yusuf identified the impending risk of famine in Egypt, suggested methods to mitigate or manage the risk and offered to monitor the effectiveness of the risk management process (AbdulGaniyy, Ogunbado & Ahmad, 2016a).

Allah also says:

وَقَالَ يَا بَنِيَّ لَا تَدْخُلُوا مِن بَابٍ وَاحِدٍ وَادْخُلُوا مِنْ أَبْوَابٍ مُّتَفَرِّقَةٍ ۖ وَمَا أُغْنِي عَنكُم مِّنَ اللَّهِ مِن شَيْءٍ ۖ إِنِ الْحُكْمُ إِلَّا لِلَّهِ ۖ عَلَيْهِ تَوَكَّلْتُ ۖ وَعَلَيْهِ فَلْيَتَوَكَّلِ الْمُتَوَكِّلُونَ

And he said: "O my sons! Do not enter by one gate, but enter by different gates, and I cannot avail you against Allah at all. Verily! The decision rests only with Allah. In him, I put my trust and let all those that trust, put their trust in Him."(AL Qur'an, Surah Yusuf verse 67).

Here, Prophet Ya'qub (Prophet Yusuf's father, peace be upon them) admonishes his children going to meet Yusuf in Egypt to take precaution when entering Egypt. (Al-Mubarakpuri, 2000). Similarly, Al-Maududi explains that Ya'qub advised them to be on their guard against the dangerous political situation and to enter the capital by different gates so as not to give cause for alarm and suspicion. In short, as far as it was possible, he took all the precautionary measures to avoid every possible risk (Maududi, 1990).

A lesson learnt from this is diversification as a risk management technique. It is argued that while risk may not be eliminated, diversification lessen the extent of the risk (Gurrib & Ashahrani, 2012).

Additionally, the Holy Prophet Muhammad ﷺ (peace be upon him) in his exhortation to a Bedouin Arab said:

عن أَنَسِ بْنِ مَالِكٍ قَالَ: قَالَ رَجُلٌ يَا رَسُولَ اللَّهِ: أَعْقِلُهَا وَأَتَوَكَّلُ أَوْ أُطْلِقُهَا وَأَتَوَكَّلُ قَال اعْقِلْهَا وَتَوَكَّلْ

Anas (radi Allahu anhu) reported that a person asked Rasul Allah ﷺ, "Should I tie my camel and have Tawakkul (trust in Allah for her protection) or should I leave her untied and have Tawakkul." Rasul Allah ﷺ replied, "Tie her and have Tawakkul." (Hasan) [Jami At-Tirmidhi]

Here, we are taught that our trust in Allah (the Exalted) should not prevent us from taking necessary precaution when managing our affairs. It means that one should try his best to prevent any calamity, but if it eventually happens, one should have faith in Allah. Therefore, we should manage risk as far as possible.

The Qur'an also speaks on management of properties and wealth. This is represented by cash or liquidity in financial terms.

وَلَا تَأْكُلُوا أَمْوَالَكُم بَيْنَكُم بِالْبَاطِلِ وَتُدْلُوا بِهَا إِلَى الْحُكَّامِ لِتَأْكُلُوا فَرِيقًا مِّنْ أَمْوَالِ النَّاسِ بِالْإِثْمِ وَأَنتُمْ تَعْلَمُون

And do not consume one another's wealth unjustly or send it [in bribery] to the rulers in order that [they might aid] you [to] consume a portion of the wealth of the people in sin, while you know [it is unlawful](Al-Qur'an, Surah Al-Baqara:188)

`Ali bin Abu Talhah reported that Ibn `Abbas said, "This verse (2:188) is about an indebted person when there is no evidence of the loan. So he denies taking the loan and the case goes to the authorities, even though he knows that it is not his money and that he is a sinner, consuming what is not allowed for him." This opinion was also reported from Mujahid, Sa`id bin Jubayr, `Ikrimah, Al-Hasan, Qatadah, As-Suddi, Muqatil bin Hayan and `Abdur-Rahman bin Zayd bin Aslam. They all stated, "Do not dispute when you know that you are being unjust." (Al-Mubarakpuri, 2000)

Also, Allah says:

وَلَا تُؤْتُوا السُّفَهَاءَ أَمْوَالَكُمُ الَّتِي جَعَلَ اللَّهُ لَكُمْ قِيَامًا وَارْزُقُوهُمْ فِيهَا وَاكْسُوهُمْ وَقُولُوا لَهُمْ قَوْلًا مَّعْرُوفًا

And do not give the weak-minded your property, which Allah has made a means of sustenance for you, but provide for them with it and clothe them and speak to them words of appropriate kindness (Al-Qur'an, Surah An-Nisa:4)

Here, Allah warned believers not to give their wealth to those are not wise enough to manage it properly. This applies to the young, insane people and those whose behavior are erratic. (Al-Mubarakpuri, 2000).

قَالُوا يَا شُعَيْبُ أَصَلَاتُكَ تَأْمُرُكَ أَن نَّتْرُكَ مَا يَعْبُدُ آبَاؤُنَا أَوْ أَن نَّفْعَلَ فِي أَمْوَالِنَا مَا نَشَاءُ ۖ إِنَّكَ لَأَنتَ الْحَلِيمُ الرَّشِيدُ

They said, "O Shu'ayb, does your prayer command you that we should leave what our fathers worship or not do with our wealth what we please? Indeed, you are the forbearing, the discerning!" (Al-Quran, Surah Hud verse 87). (or that we give up doing what we like with our property)

This means, the people of Hud were questioning Shu'ayb if he wanted to stop the act of lowering scales which has been the practice of their fore-fathers. They insisted that they have right to do whatever they like with their wealth. (Al-Mubarakpuri, 2000). Here, the people of Hud is challenging their Prophet over the right they should manage their wealth. Liquidity represents the wealth of depositors who are customers and owners of the bank. The banks hold the liquidity in trust for the customers and shareholders and thus have fiduciary duty to manage the liquidity appropriately.

Also, the hadith that the upper hand and is better than the lower hand (the giver is better than the receiver) indicate that a Muslim is better to be liquid and able to give especially for needy ones.

> حَدَّثَنَا أَبُو النُّعْمَانِ، قَالَ حَدَّثَنَا حَمَّادُ بْنُ زَيْدٍ، عَنْ أَيُّوبَ، عَنْ نَافِعٍ، عَنِ ابْنِ عُمَرَ ـ رضى الله عنهما ـ قَالَ سَمِعْتُ النَّبِيَّ صلى الله عليه وسلم. وَحَدَّثَنَا عَبْدُ اللَّهِ بْنُ مَسْلَمَةَ، عَنْ مَالِكٍ، عَنْ نَافِعٍ، عَنْ عَبْدِ اللَّهِ بْنِ عُمَرَ ـ رضى الله عنهما ـ أَنَّ رَسُولَ اللَّهِ صلى الله عليه وسلم قَالَ وَهُوَ عَلَى الْمِنْبَرِ، وَذَكَرَ الصَّدَقَةَ وَالتَّعَفُّفَ وَالْمَسْأَلَةَ " الْيَدُ الْعُلْيَا خَيْرٌ مِنَ الْيَدِ السُّفْلَى، فَالْيَدُ الْعُلْيَا هِيَ الْمُنْفِقَةُ، وَالسُّفْلَى هِيَ السَّائِلَةُ ".
>
> *Narrated By Ibn 'Umar: I heard Allah's Apostle while he was on the pulpit speaking about charity, to abstain from asking others for some financial help and about begging others, saying, "The upper hand is better than the lower hand. The upper hand is that of the giver and the lower (hand) is that of the beggar." [Sahih Bukhari, Vol 2, Book 24, Hadith #509]*

2.4 Risk Management in Islamic and Conventional Banks

The business of banking whether Islamic or conventional is to take calculated risk. Both Islamic and conventional banks are economic entities that specialize in risk management and maturity transformation (Howladar, 2011). Risk management is more of optimization

of risk reward equation rather than minimization of losses. Thus, a bank will be in a competitive advantage if it can manage its risk (Jeroen, 2015).

Risk management as a subject and professional discipline is gaining momentum (Ebrahim, 2011). It is now seen as distinct from corporate governance, Internal Audit or Control, Financial reporting and regulatory compliance to which it is closely linked. Risk management is a process that involves identifying, measuring, mitigating, reporting and monitoring risk (Ismal, 2010; Jeroen, 2015). It is a management process that deals with uncertainties an entity faces, threats to its resources and its consequences. It provides opportunities to increase the value of the entity based on its operating environment (Ebrahim, 2011). It is also seen as being concerned with both positive and negative aspects of risk. The practices of risk management, processes and tools which measure the risks and the techniques adopted to mitigate risk are similar in both Islamic and conventional banks (Al Ali & Naysary, 2014). In most cases, where Islamic banks are relatively new, the central banks apply the same rules to both Islamic and conventional banks.

2.5 Liquidity in Financial Institutions

The word liquidity has so many facets that is often counter-productive to use it without further and closer definition (Banque De France, 2008). It is a concept that is not only hard to define but also hard to ignore (Calvo, 2013b). Liquidity relates to the ability of an economic agent to exchange his or her existing wealth for goods and services or for other assets. Here, liquidity is regarded as a flow concept rather than stock (Nikolaou 2009). Thus, an asset is said to be liquid if it can be easily converted to cash or its equivalent (Ali, 2013).

Similarly, Bankscope defines liquid assets as loans with less than three months to run to maturity plus quoted or listed government bonds and cash (Alman & Oehler, 2010). Furthermore, liquidity is the lifeblood of any organization (Sekoni, 2015). This means that both banking and non-banking institutions require liquidity and management of cash and liquid assets is a fundamental management function in any organization.

In economics, liquidity refers to the ease and speed at which one asset can be converted into another (Sanghani, 2014; Vasigh, Fleming &, Kenneth, 2014). Based on this definition, a car for instance is less liquid an asset than gold, and treasury bills are more liquid than corporate bonds. Thus, money (cash) is the most liquid of wealth (Hasan, 2014).

There is always a tradeoff between profit (from lending or investment) and liquidity in bank's business. This is because while banks deal in cash or liquidity, they operate on a fractional reserve principle. The regulatory principle is to maintain balance between liquidity and profit. The structure of a bank's balance sheet depicts the importance of liquidity. On the asset side, the listing is from the most liquid asset (cash) to the most illiquid one (fixed assets like building). This is contrary to the reverse listing in other organizations where the fixed assets are first listed (Hasan, 2014). Moreover, the survival of a banking institution and the entire financial sector depends on the ability to provide liquidity and also understand the proper way to mitigate its risk. The main objectives of liquidity are to guarantee that banks are able to meet up with cash obligations without compromising their profitability.

In addition, liquidity is inherent in every market and it manifests itself in every transaction involving assets or portfolios trading. Sekoni (2015) also reports three situations in which

liquidity manifests itself. These include the need for daily business transactions, investment activities and in case of fire-sales when there is shortage of reserves. Shortage of liquidity always occur when there is financial crunch. During such crisis, there is often massive outflows of capital with no more or at least equal inflows.

2.5.1 Sources of Liquidity for Banks

Nikolaou (2009) enumerates four sources of liquidity. The first is short-term (liquid) deposit. This is money entrusted by depositors to the bank. It is considered as the major source of funding liquidity. The second is the market liquidity. This is when the banks engage in selling of assets in markets to generate liquidity. This can be through loan syndication, securitization and loans from secondary markets. The third liquidity is referred to as interbank market. Here, liquidity can be sourced by banks from other banks through interbank market. The last source is the central bank. Through its function as lender of last resort, central banks do directly provide liquidity to banks. The Central Banks act as an immediate but temporal buffer to liquidity shocks which allows time for supervision and regulation to confront the causes of liquidity risk (Nikolaou, 2009). Nikolaou (2009) also identifies monetary or macroeconomic liquidity which he refers to as the growth of money, credit and aggregate savings. Thus, it includes Central bank liquidity which he says is synonymous to supply of base money.

In addition, there is also funding liquidity which is the ability of banks to meet their liabilities and to settle their obligations as they come due (BIS, 2008). There are linkages among these sources of liquidity. In normal periods, the Central banks make available the amount of liquidity that will stabilize demand and supply through controlling of Statutory

Reserve Requirement (SRR), while market liquidity is managed through the interbank money market and short term asset markets re-distributes and maintain the liquidity and funding position. Liquidity management also safeguards an effective sharing of liquidity resources.

However, in an atmosphere of imperfect markets, and irregular information, the Central bank cannot differentiate between illiquid bank and the bank in debt. When there is a failure in coordination among depositors, banks, or traders which provide and are provided with information asymmetric and imperfect markets, the liquidity risk will result (Nikolaou, 2009).

2.5.2 Liquidity and Solvency

Liquidity and solvency are closely interrelated (Goodhart, 2008). These two terms refer to the financial wellbeing of an organization. However, there is difference. Solvency denotes the extent to which long-term obligations of an organization can be met. Liquidity on the other hand refers to the capability to settle short-term obligations. A solvent firm owns more than it owes. An illiquid bank can rapidly become insolvent, and an insolvent bank become illiquid. Davydenko (2013) defines solvency in terms of market value of assets relative to the debt of an organization while liquidity is cash reserves relative to current liabilities.

Banks fail because of insolvency. A combined shortage of liquidity can also render a bank insolvent. Banks' failure also cause liquidity and can lead to shrinkage in the collective pool of liquidity (Diamond & Rajan, 2002). Liquidity and solvency problems interact and

one can cause the other. The issue here is; illiquid assets are usually financed by banks with demandable claims.

A company is solvent if its assets are more than its debt. This means that its net worth is positive and able to manage its debt portfolio (Pappas, et al. 2013). It also means that when a company is solvent, it has more assets than liabilities. The company can settle its debt without losing its net worth.

Solvency risk occurs when a bank is not able to meet up maturing obligations due to its being in a negative net worth (Almarzoqi, Naceur, & Scopelliti, 2015). This means the bank has more liabilities than assets. This usually happens when a bank suffers losses on assets due to write-offs on securities and unsettled loans but the capital base is not sufficient to cover the losses. Two factors that influence solvency position are adequate capital and profitability. Liquidity risk on the other hand happens when a bank is not capable of meeting short-term obligations. This occurs when the bank does not have enough funding (funding liquidity) or if its investments and assets cannot be sold quickly for cash without incurring unnecessary losses (market liquidity) (Almarzoqi, et al. 2015).

Thus, liquidity ratios and solvency ratios are apparatuses investors use to make investment decisions. Liquidity ratios measure a company ability to change its assets to cash, while solvency ratios measure a company's ability to meet its financial obligations. Solvency ratios include financial obligations in both the long run and short term, whereas liquidity ratios focus more on a company's short-term debt obligations and current assets.

2.5.3 Liquidity during Global Financial Crisis

Peeble & Shah (2015) reports that these days, investors are spending a great deal of time on worrying about liquidity risk as against managing interest rates and credit risk. According to the authors, the reason is that liquidity is drying up at the time of financial crisis due to subprime borrowers' inability to pay the banks their mortgages.

Similarly, Bank for International Settlement (BIS) also states that liquidity in recent years has become a key focus of international policy debates. This reflects the view that global liquidity and its drivers are of major importance for international financial stability. According to the report, in a world of high capital mobility, global liquidity issue should be approached in a different way. Furthermore, Calvo (2013a) asserts that liquidity and credit shocks have been a central factor in recent crises. He says liquidity consideration explains why a credit boom always precede financial crisis and why capital inflows grow in the run-up of balance-of-payments crises.

In support of this argument, Asongu (2013) reveals that liquidity risk management has become increasingly vital in the banking industry especially following the recent financial melt-down and economic down-turn. The author posits that during the crisis, increasing credit concern and feeble market liquidity resulted in a cycle of deteriorating asset market value and deleveraging. The implication of this is that there is more focus on liquidity following the global financial crisis and that the concept of liquidity lies at the heart of commercial banks and the management of its funds. It represents one of the crucial risks in banking industry (Muharam & Kurna 2013).

2.5.4 Challenges of Liquidity in Islamic Finance

The Islamic Financial Service Board (IFSB, 2013) reveals that liquidity has been a major issue in Islamic finance due to the nature of Islamic finance instruments and contracts which tend to be short to medium term because of the absence of long term liquidity market.

The guideline by IFSB highlights the challenges to include:

i) Inappropriate (Shari'ah compliant) liquidity instruments

ii) Transfer of debts is limited to its face value in most of the jurisdiction due to Shari'ah compliance.

iii) Islamic finance relies on retail funding which limits it to domestic market. Hence, the capacity to transfer funds across borders is also limited.

iv) Supervisory authorities do not have sufficient tools to provide adequate liquidity support to International Islamic Financial Institutions (IIFI's) in normal and stressed market situation. For instance, there is no Shari'ah-compliant Lender of Last Resort (SLOLR).

v) The open market operation is also not Shari'ah compliant and cannot meet the monetary policy objectives of the supervisor. However, using of *sukuk* is expected to provide an acceptable Shari'ah compliant instrument.

vi) The level of cash and high-liquid assets is high among IIFI's compared to conventional banks. Thus, the performance of Islamic banks is limited.

vii) The existing interbank transactions such as commodity *Murabahah* transactions (CMT) are predominantly not collateralized. This increased counterparty risk

apprehension in bilateral transaction in stressed market situation thereby reducing the level of system-level liquidity available.

2.6 Liquidity Risk in Banks

Liquidity risk is complex to define. However, its causes and symptoms can be identified more easily (Sekoni, 2015). He defines liquidity in terms of capital and earnings of an organization not meeting its financial obligations without suffering undesirable losses. There are several definitions of liquidity risk. It arises when an asset cannot be disposed without suffering additional losses (Ali, 2013). The study also defines it in terms of likelihood of illiquid positions. Thus, according to him, liquidity is inversely related to liquidity risk. This means when liquidity risk is high, there is tendency for illiquidity. Similarly, Hasan (2014) defines liquidity as the possibility of loss due to a temporary inability to meet an obligation because of shortage of cash.

2.6.1 Causes and Sources of Liquidity Risk

Kumar (2008), identifies the following causes of liquidity risk to include sudden or unexpected large deposit withdrawals and credit disbursement. It also includes a situation when contingent obligations become due unexpectedly. According to the study, other events that cause counterparties to avoid trading or lending to the bank can also result into liquidity risk. Also, when the sectors which the banks depend on suffer loss of liquidity, this can lead to liquidity risk of the bank itself.

In addition, Mohammad and Shahwan (2013) also explain that limited accessibility of Shari'ah- compliant money and inter-bank markets are major sources of liquidity risk of Islamic banks. The financial instruments are not adequately developed to allow Islamic banks raise funds when required. The available financial instruments in conventional banks are interest based. The rule that available Islamic products like *Murabahah* and *Bay' al-Salam* can only be traded at par value is also responsible for lack of liquidity in Islamic banks. Another significant cause of liquidity risk identified by Mohammad and Shahwan (2013) is the conflicting interpretations of Shari'ah teachings on some of the Islamic products. For instance, while *bay'al-dayn* (sale of debt) is acceptable in Malaysia, it is not allowed in other regions.

Furthermore, Islamic banks are smaller in number in most of the countries and they depend mostly on demand deposits which can be withdrawn at any time. This again pose liquidity risk to the banks.

Thus, if liquidity risk is not maintained properly, there is a threat to banks of becoming insolvent or subjected to bad publicity and reputational damage. Liquidity risk has compound effect on other risks, hence it is more important to manage it effectively.

2.6.2 Studies on Determinants of Liquidity Risk

Many studies have been conducted on the determinants of liquidity risk in Islamic banks. For instance, Sulaiman, et al. (2013) report that macroeconomic variables influence the behavior of Islamic banks in managing liquidity risk. According to the authors, variable Gross Domestic Product (GDP) are significant and directly proportional to liquidity.

In addition, there are also bank specific factors influencing risk management. For instance, Ahmed, et al. (2011) while using liquidity risk as a dependent variable assert that leverages, tangibility and age are important determinants of liquidity risk in Islamic banks. The authors claim that variable size and profitability are not powerful explanatory variables to define the liquidity risk of Islamic banks in Pakistan. On the other hand, Htay, Adnan, AiRashid, and Meera (2011) examine the impact of corporate governance on the risk of banks and conclude that separate board leadership structure, higher proportion of independent directors, smaller board size, lower director ownership, higher institutional and block ownership seem to have lower impact on risk in Islamic banks.

Similarly, Muharam and Kurna (2013) investigate the influence of capital adequacy ratio (CAR), profitability ratios, return on assets(ROA), return on equity (ROE), Net Interest Margin (NIM), liquidity gaps (LG) and risky liquidity assets (RLA) on liquidity risk in banking industry. The authors point out that there is a negative and significant influence of CAR and ROE on conventional banks, while ROA and RLA have positive and insignificant effect. They also submit that while NIM, ROA and ROE have positive and significant effect on liquidity risk in Islamic banks, the LG and RLA have insignificant effect. Furthermore, they reveal that LG have positive and significant effect in conventional banks while the effect of NIM is negative and insignificant at 5percent. CAR is also negative and insignificant in Islamic banks. The study and result is like what was reported earlier by Kurna (2012).

In his study of determinants of liquidity of commercial banks in Hungary, Vodova (2013) submits that capital adequacy ratio and profitability are positively related to liquidity while

size of the bank and monetary policy on interest are negatively related. He says that the relationship between gross domestic products (GDP) and liquidity is ambiguous. According to him, bank liquidity decreases with the size of bank. This means that big banks rely on the interbank market or on the liquidity assistance of the Lender of Last Resort while small and medium sized banks hold buffer of liquid assets. This supports the hypothesis of ‘’too big to fail’’ (Kaufman, 2013).

The author maintains that during financial crisis, profitability of many banks declined substantially and liquidity remains almost unchanged or declined slightly. This is also in line with the submission of Bonfim & Kim (2012) that the regulation of Systematically Important Financial Institutions (SIFIs), the so called ‘too big, too systematic or too interconnected to fail’ may play an important role in mitigating the specific component of liquidity risk.

Furthermore, Bonfim and Kim (2012) while looking for evidence of herding behaviors among banks with emphasis on the period preceding the global financial crisis reveal that interbank ratio, measured as the ratio between interbank assets and interbank liabilities may also be an important input in assessing liquidity risk. They also suggest that the ratio between credit granted and deposits taken from customers provides a broad structural characterization of banks’ main funding risks.

Similarly, while analyzing the determinants of bank liquidity risk within the context of Euro area, Cucinelli (2013) posits that assets quality impacts only on the measure of short-

term liquidity risk. He says banks that specializes on lending activity are more vulnerable to funding structure.

Moreover, Siaw (2013) examines the determinants of liquidity risk of Ghana banks and how it affects their profitability. Using an unbalanced data set of 22 banks over a period of ten years (2002-2011), he employed random effects Generalized Least Square (GLS) regression based on Hausman test to estimate the determinants of bank liquidity risk. His result shows that bank size, Non-Deposit Dependence (NDD) and inflation have significant positive relationship with liquidity risk. He contends that while ownership structure does not affect liquidity risk significantly, ROA and ROE show significant correlation with liquidity risk.

Recently, Mehmed (2014) examines the extent to which banks in Bosnia and Herzegovina are exposed to liquidity risk. He argues that the most important determinants of liquidity in the banking sector vary, depends on the definition of liquidity risk. The author defines liquidity risk using two parameters. L1 Risk he defines as liquid assets to total assets while L2 Risk is liquid assets to customer deposits and short-term funding. Using GDP, Capital Adequacy and Return on Equity (ROE) as independent variables, he concludes that most of the determinants have influence on liquidity risk of banks in the country.

More recently, Jedidia and Hamza (2015) investigate the determinants of Islamic Banks liquidity using a panel of 60 Islamic banks in Middle East and North Africa (MENA) and Southeastern Asian countries. They observe that profitability of bank indicator (like ROA) positively affects the exposure to liquidity shortage. They also contend that CAR and the

ratio of bank's investment have statistically significant negative relationship with the liquidity risk measure. In line with previous researchers, they agree that bank size does not matter probably because small and large Islamic banks have difficulties in managing their liquidity risk. However, their position that GDP has negative but irrelevant association with liquidity risk is contentious.

The above discussion suggests that various authors have identified different determinants of liquidity risks. While some of these determinants like ROA and bank size have been commonly identified by many authors, other determinants have not been thoroughly discussed. Yet, there seems to be conflicting results in the relationship of some factors to liquidity risk. The conflict could be because of the period and country of study. Besides, many determinants including profitability, regulation and supervision, capitalization and inflation have not been adequately researched. This creates opportunity for further research in this area. The study will now discuss some of the determinants in more details.

2.6.2.1 Capital Adequacy Ratio (CAR)

This is also known as capital to risk (weighted) assets ratio. It is the ratio of a bank's capital to its risk. It is used to ensure that a bank can absorb a reasonable amount of loss and fulfills statutory capital requirements. The ratio is used to shield depositors and encourage stability and efficiency of financial systems around the world.

CAR is calculated thus:

$$\textbf{CAR} = \frac{\text{Tier1+Tier 2}}{\text{Risk Weighted Assets}}$$

Two types of capital are used to measure CAR.

Tier1 capital which absorb losses without a bank ceasing business. It is made up of:

> **(Paid capital + statutory reserves + disclosed reserves) – (equity investment in subsidiary + intangible assets + current and brought forward losses)**

Tier2 capital which can absorb losses in the event of a liquidation. Hence, it shields the depositors to a lesser degree. It includes:

> **Undisclosed Reserves + General Loss Reserves + Hybrid debt capital investments and subordinated debts**

The denominator can also be the respective national regulator's minimum total capital requirement (Harzi, 2011). Risk-weighted assets were defined as the sum of total on-balance sheet risk-weighted assets and total off-balance sheet risk-weighted items (Khan & Jabeen, 2011).

Kammer, et al. (2015) report that in spite of high capitalization of Islamic banks, there are challenges on the application of Basel III. For instance, further interpretation is required from respective regulatory bodies on the components of the capitals. Also, the dearth of liquid assets that are Shari'ah-compliant constitute another constraint. Hence, relevant

regulatory bodies of Islamic banks should explore the use of *Sukuk* as alternative source of liquidity.

2.6.2.2 Profit and Loss Sharing (PLS) Ratio

The concept of Islamic banking is based on prohibition of *riba* (usury or interest) and permission of trade (AL-Qur'an, Surah Al-Baqara (2): verse 282) and profit sharing arrangement. Profit sharing being one of the main objectives of Islamic banking is what distinguishes it from conventional banking. The PLS also determines how successful Islamic banking is in meeting the objectives of sharing wealth with investors (Wiyono & Raymayuni, 2012). Ghassan, Fachin, and Guendouz, (2012) report that the adoption of PLS in some Saudi Arabia banks positively contributed to the stability of the banks. Beck, et al. (2013) also contend that the advantages of Shari'ah compliant products lie in the equity and risk –sharing elements that mitigate the effects of mismatch of short- term, on-sight demandable deposit contracts with long- term and uncertain loan contracts.

There are two forms of profit and loss sharing modes of finance frequently mentioned in Islamic jurisprudence - *Musharakah* and *Mudarabah* (Febianto, 2012). *Musharakah* involves a partnership agreement for financing whereby the partners share in equity as well as management. The profits are shared based on agreed ratio while equity is used to distribute losses (Tariqullah & Habib, 2001). Thus, the bank share on the financing is equal to a certain percentage of the partner's profits. While the profit is distributed on the basis of an agreed ratio, the losses are allocated based on the proportion of each partner's contribution to the business. As soon as the principal amount financed by a partner is settled or withdrawn, the profit sharing with the partner terminates.

Moreover, *Mudarabah* is a venture capital funding whereby an agreement is reached between two or more persons in which one or more of them provide the capital and the others provide the entrepreneurship and management. The provider of capital is known as *rabbu-l maal* while the entrepreneur is known as *mudarib.* In this case, the bank usually serves as *rabbu-l-maal* and shares the profit with the *mudarib.* In case of loss, only the *rabbu-l-maal* loses the fund while the *mudarib* loses the effort put in except in case of negligence (Jedidia & Hamza, 2014). These participatory arrangements reflect the Islamic viewpoint that borrower should not bear the risk or cost of failure alone.

However, these PLS arrangement is not popular among Islamic banks. The assets of the banks depict low application of PLS. Dar and Presley (2001) report that the proportion of investment covered by PLS is not up to 20 percent. Febianto (2012) listed reasons for the reluctance of banks to engage in PLS arrangement. These include inherent riskiness of the products and bank's aversion to risk. PLS is usually a long-term investment and bank do not want to take risk over a long period. There is also high monitoring cost associated with PLS. Additional facilities will be required to adequately monitor the performance of the investment. Lastly, there is lack of transparency in the environment where Islamic banks operate today. The entrepreneurs may not disclose the true position of the business.

Similarly, Jedidia and Hamza (2014) examines whether the participative intermediation of PLS is responsible for high exposition to liquidity shortage or leads to less exposition to liquidity risk. The authors conclude that due to Islamic bank use of short-term deposits to fund long-term *Musharakah* and *Mudarabah,* the PLS arrangements are prone to higher exposition to liquidity risk. They also posit that in relation to risk transformation, PLS

instrument between the banks and its depositors on the one hand and bank and entrepreneurs on the other hand, offers less explanation to liquidity risk. Therefore, it is imperative to address these and other reasons militating against the adoption of PLS. This may be a subject of future further study.

2.6.2.3 Return on Equity (ROE)

Return on Equity (ROE) is a profitability ratio that measures the return generated by the shareholders' equity. It is measured by dividing annual net income by the equity capital. According to Ongore and Kusa (2013), ROE denotes the amount of profit which a company declare for the equity shareholders. It is the return on investment by shareholders. When the ROE is high in an organization, it is more likely to generate cash internally. Thus, it is a key determinant in liquidity position of a bank. Similarly, a higher ROE in a company is an indicator of a better profit performance. Khrawish (2011) also defines it as the ratio of Net Income after Taxes divided by Total Equity Capital. It represents the rate of return earned on the funds invested in the bank by its stockholders. ROE echoes how efficiently a bank management is using shareholders' resources. Akhtar, *et al.* (2011) also finds correlation between Return on Asset (ROA) and ROE in Islamic banks but independent in conventional banks. Thus, it can be assumed from the above report that ROE is not only an indicator of liquidity of a bank, it also indicates the effective management of the organization.

2.7 Liquidity Risk Management

Liquidity is the capability of a bank to finance upsurges in assets and meet commitments as they come due, without suffering undesirable losses (Archer, 2011). Conversion of

short-term deposit to long-term finance by banks makes them susceptible to liquidity risk. Liquidity risk is the risk connected with a bank's failure to meet its commitment (Arif & Anees, 2012).

According to Koch and MacDonald (2010), the scope of liquidity risk can be national or global such problems related with global economic breakdown and energy crunch. It can also be environmental in terms of deteriorating local or regional economic conditions. Risk can also be systematic, such as problems that arise from aggressive effect of one or several organizations.

Liquidity risk is divided into funding liquidity risk and market liquidity risk. Funding liquidity is the ability to settle obligations with immediacy. It is also known as Bank specific liquidity. Consequently, a bank is illiquid if it is unable to settle obligations in time. Thus, funding liquidity risk is driven by the possibility that the bank will become unable to settle obligations with immediacy over a specific period (Drehmann & Nikolaou, 2013).

Market liquidity risk on the other hand is the risk that the bank will not be able to trade or unwind its assets situation without unpleasantly affecting market prices because of insufficient market penetration or market interruption.

Bank explicit liquidity or funding liquidity is very important in the setting of maturity conversion in the banking record, which consists typically of illiquid assets while market liquidity risk is more commanding in the transaction record of the bank that has frequently saleable assets (Yoram & Jacob, 2011).

Therefore, effective liquidity risk management supports banks to understand the requirements for cash flow. Such requirements are influenced by external factors. Liquidity risk management is very vital because a liquidity short fall in a financial institution can have a multiplier consequence on the whole economy.

The Basel committee on banking supervision emphasized that many banks refused to take account of several basic policies when there was surplus liquidity. There was an inadequate framework that reasonably accounted for the liquidity risk posed by individual products and business lines (Basel, 2008).

2.7.1 Liquidity Risk Management in Islamic Banks

The Islamic banks face similar risks like the conventional banks. However, due to the unique nature of Islamic banks, the intensity and magnitude of the risks differ (Shafique, Faheem, & Abdullah 2012; Shafique, Hussain, & Hassan, 2012).

According to Tariqullah and Habib (2001), there is a difference between the theoretical formulation and actual practice in respect of liquidity risk management in Islamic banks. Theoretically it is expected that Islamic banks should have investment deposits and this on the liability side. This should be utilized on asset side through profit sharing. The nature of risk in such a system will be like that of a mutual fund.

However, this theoretical ambition is different from current practice in Islamic bank. The asset side takes the form of investment in profit and loss sharing modes like *Musharakah* and *Mudarabah*. It can also take fixed cost mode of *Murabahah*, installmental sales as in *Ijaarah* (leasing), *Ististina* or *Salaam* or deferred sales or pre-paid sales. The deposits in

liability side could either be current accounts in form of *Qard hasan* (or interest-free loan) or investment accounts *Amaanah* (trust). While investment account holders are rewarded with profit and loss sharing (PLS), depositors can make withdrawal at demand. Thus, these modes of contract change the nature of risks in Islamic banks.

2.7.2 Liquidity Risk in Islamic Financing Instruments

In Islamic finance, risks and returns show strong correlation. The products of Islamic finance are unique and these attract different risks in the process of their implementation. The specific nature of the contracts also makes the risks to shift and change over the time of the contract (Akkizidis & Khandelwal, 2008). All Islamic finance instruments are exposed to liquidity risk although at varying degree.

In *Mudarabah* and *Musharakah,* due to the element of profit and loss sharing, does not pose asset-liability mismatch especially if each project is financed by specific deposit. Thus, the liquidity risk is eliminated for the bank. However, in the event of depositor demand to recall their investment, the liquidity risk will surface if the market price of the asset is less than the book value. Again, since the loss is shared the liquidity risk suffered by the bank is reduced (Ali, 2013).

In *Murabahah* contract, the Islamic bank acts as an intermediary by buying a commodity and selling it to the customer at a markup. The liquidity risk arises due to other risks especially when the customer default (which is a credit risk) or when he fails to accept the products. In the latter case, which is a cancellation risk, the bank's capital is tied down until another buyer surfaces. In that case, the bank may not be able to fulfill other obligations.

Also, the fact that *Murabahah* receivables are debt payables in the future, they cannot be traded in secondary market except at par value. This is another source of liquidity to the bank (Ali, 2013). This happens especially if the average maturities of deposits are shorter than average maturities of *Murabahah* contract or if the deposits are sensitive to market returns. However, *Murabahah* has a low liquidity risk. This perhaps explains why it is the most popular financing products among Islamic banks.

Moreover, in *salaam* payment for sale is made now while delivery is delayed to future time, the bank assumes liquidity risk on payment until delivery date. This is because if the bank needs cash, it cannot sell the *salaam* contract until due date because of Shari'ah restriction of not selling what is not in possession. One way of mitigating this risk is by entering a parallel *salaam* contract but with a condition that it should be another party not linked with the party on first *salaam*. Instead of being mitigated, liquidity risk may remain if there is credit and dispute risks even with parallel *salaam*.

Also, in *Ististina* contract, a product is paid for in advance by the buyer while it is delivered at a future date. One of the characteristics of *Ististina* is that the dates of sales and delivery can change. This can affect the liquidity of the bank. However, this could be reduced compared with *salaam* contract because in *Ististina*, the bank can pay in installment or the entire payment deferred. In this case, the bank can still maintain the liquidity of its assets. On the other hand, *salaam* contract requires payment in full (Ali, 2013). Nonetheless, banks engaged in *Ististina* need to understand the nature of its risk and make sufficient capital reserve provision for possible liquidations.

As for *Ijaarah* contract, it is a finance lease that involves use of an asset upon installmental payment of its rent. It generally refers to the lease or rental of a tangible asset such as property or merchandise, but it can also be designed for the hiring of professional services for a fee (Akkizidis & Khandelwal, 2008). The liquidity risk comes to play if the bank must pay for the asset before being made available for the lease. The lease rental can also not commence until the asset is delivered by the lessor (*mu jir*) and in use by the lessee (*musta jir)*. The liquidity risk also depends on whether the asset is resalable in the market in case of default by the lessee. The liquidity risk is less than in *Murabahah* because there is restriction on re-sale or re-pricing in *Murabahah*. The liquidity risk is still much lower in hire- purchase (*Ijaarah muntahi bi tamleek)* because sale price is built into rental instalment (Ali, 2013).

2.8 Risk, Efficiency and Performance

Studies have also been conducted on risk as a factor of efficiency. Alam (2012), while analyzing the relationship between risk and efficiency within two banking systems, measures banking risk as loan loss reserves as a fraction to total assets. The author also defines the efficiency in terms of cost efficiency using variables such as net loans to total assets, liquid assets to short term deposit, operating expenses to total assets etc. He concludes that cost efficiency scores for the conventional banks is higher than Islamic banks while the latter's profit efficiency scores have outperformed the conventional banks. He posits that Islamic banks are profit based institutions and there are incentives to generate higher profit to expand customer bases in the sampled dual banking economies. The Islamic banks also tends to be more liquid and less risky compared to conventional banks

in the dual banking system. The author only discusses mostly cost efficiency. Other efficiencies like technical, scale and operational efficiency were not measured.

Previously, Srairi (2010) examines profit and cost of banks. The result shows that the profit efficiency of banks in GCC are better than their cost efficiency. He also reports that the profit and cost efficiency of the banks show positive relationship with productivity and capitalization of the banks. The profit efficiency of banks is increased with higher loan activity but has negative effect on cost efficiency. He concludes that conventional banks are more efficient than Islamic banks in cost and profit efficiency.

Furthermore, Noor and Ahmad (2012) introduce country income level in their study to investigate the efficiency of 78 Islamic banks in 25 countries during the period 1997-2009. Their findings indicate that Islamic banks in low and high income countries are inefficient compared to medium income countries. The study also uses DEA and Tobit model for its analysis. It further states that there is positive relationship between bank efficiency and loan intensity, size, capitalization and profitability.

Also, Yahya, et al. (2012) study the difference (or lack of difference) in the efficiency level of Islamic banks and conventional banks using DEA to measure efficiency. The study which involved only two banks and for a period of just three years finds no significance difference in the efficiency of Islamic banks and conventional banks.

Similarly, Siraj and Pillai (2012) investigate the presence, if any, of similarity in growth of certain performance indicators of Islamic banks and conventional banks with respect to operating profit ratio (OPR), net profit ratio (NPR), ROA, ROE, operating expense and

income, deposits and total equity. They discover that Islamic banks performance is better and they are more equity financed than conventional banks. Although the conventional banks recorded growth in revenue, this could not translate to better profitability due to higher provisions on credit losses and impairment losses.

Wiyono and Raymayuni (2012) introduce the effect of Shari'ah conformity proxies by Islamic income and profit sharing ratio as moderating variables to the relationship between bank risk (credit and liquidity) and profitability of Islamic banking in Indonesia. The result shows that the Islamic income and profit sharing ratio only moderate on profit margin but not on ROA and ROE.

However, study on conventional investment banks for the G7 countries (Canada, France, Germany, Italy, Japan, UK and US) and Switzerland before the recent financial crisis was carried out by Radic, Fiordelisi, and Girardone (2012). The study states that bank risk-taking factors (liquidity and capital exposures) are important to accurately assess profit efficiency. They argue that failing to account for environmental factors can considerably influence the efficiency scores for investment banks. It is also their position that investment banks' core functions subject them to a wide range of risks. This confirms the fact that because Islamic banks also function as investment banks, they are exposed to a wide array of risks.

In another study, Alam (2013) examines whether bank regulation, supervision and monitoring enhance or impede technical efficiency and risk taking behavior of Islamic banks across the globe. He uses Data Envelopment Analysis (DEA) to measure technical

efficiency and Seemingly Unrelated Regression (SUR) to measure the effect of banks' supervision and regulation on risk. He employs a panel dataset of 320 observations from 70 Islamic banks operating in 11 countries for the period 2006 -2010. He summarizes that efficiency in Islamic banks was positively influenced by regulations related to 2nd and 3rd pillars of Basel II. He also submits that strict supervision relating to 1st pillar (capital requirements) have a positive impact on technical efficiency of Islamic banks.

Equally, examining cost efficiencies of selected Islamic banks and conventional banks in Malaysia was the objective of Ismail, et al. (2013). They also used DEA followed by Tobit Regression Analysis (TRA) to define factors prompting the efficiency of Islamic and conventional banks. The findings show that technical efficiency (TE) is the core cause of cost efficiency for conventional banks whereas allocative efficiency (AE) is the main cause of cost efficiency of Islamic banks. The study suggests that conventional banks are efficient in utilizing IT and electronic while Islamic banks are efficient in allocating and utilizing their resources. Scale efficiency is the key source of technical efficiency for both conventional banks and Islamic banks. Tobit regression also reveals that capitalization and bank size are positively and significantly associated to efficiency. It also says that loan quality is negatively and significantly associated with efficiency.

The authors recommend future studies to use different input / output specifications on a larger sample or for a longer period as the study was for a period of 2006- 2009. They further suggest that comparison of conventional banks and Islamic banks should also be done across country borders.

Similarly, Bader, et al. (2008) measured and compared the cost, revenue and profit efficiency of Islamic and conventional banks over a period of 1990 – 2005 using DEA. The study concluded that there were no significant differences between overall efficiency results of Islamic and conventional banks. The study measured efficiency using:

Efficiency of unit$_{j}$ =

$$\frac{U_1 y_{1j} + U_2 y_{2j} \quad + \cdots)}{V_1 x_{1j} + V_2 x_{2j} + ..)}$$

Where:

U_1 = weight given to output 1

y_{1j} = amount of output 1 from unit j

V_1 = weight given to input 1

x_{1j} = amount of input 1to unit j.

Also, Eljelly and Elobeed (2013) describe the common performance traits of banks operating under a full Islamic banking system in Sudan. They use nine large and active banks and apply factor analysis to a set of financial ratios. The result states that liquidity risk, coverage, efficiency (utilization), profitability, capital adequacy and control are factors that most explain variation of the financial ratios.

Beck, et al. (2013) further ratifies that Islamic banks have a lesser amount of cost-efficiency, but have a greater intermediation ratio, developed asset quality and are well capitalized. They also contend that due to their better capitalization and higher asset

quality, the listed Islamic banks during the recent crisis had a better stock performance. This is contrary to Miah and Sharmeen (2015) findings that Islamic banks are less efficient than conventional banks.

Equally, Al-Tamimi, et al. (2015) examine the relationship between financial risk and performance of GCC Islamic banks and the relative importance of the most common types of risk. They use two alternative parameters to measure performance – Return on Asset (ROA) and Return on Equity (ROE). Four types of risks were also included in the study – credit, liquidity, operational and capital risks. They report that a regression analysis indicates a significant negative relationship between bank's performance, capital risk and operational risk in Islamic banks in GCC region. They posit that the most important risk is capital risk followed by operational risk. Positive relationship between risk and performance of the banks was not confirmed.

Lately, Daly and Frikha (2015) confirm previous studies that increase in size of Islamic banks and rapid growth in the customers' deposits are critical factors in performance measurement. They argue that government intervention has a negative effect on the banking performance in the conventional model. Also, Paleckova (2015) suggests that liquidity risk and riskiness of portfolio had positive impact on efficiency in Czech Republic banking sector.

Thus, there seems to be divergent views with respect to influence of liquidity risk on banks' efficiency scores. This also creates opportunity for further studies in this area.

2.8.1 Relationship between Risk and Efficiency

Several studies have been conducted on the relationship between risk and efficiency. However, theory does not provide a clear picture of the relationship and empirical evidence also remains inconclusive (Deelchand and Padgett, 2009). Following recurrent global financial crises, there are growing interest among researchers and regulators to understand the relationship between risk, capital and efficiency of financial institutions worldwide. Knowledge about risk, capital and efficiency of banks is still very limited and fixed. For instance, Laeven and Majnoni (2002), submits that risk should be included in the studies on efficiency through the insertion of loan loss provision. This is also in line with the position of Drake and Hall (2003) that with exclusion of risks, there is possibility of overstatement of potential economies of scale.

Also, examining the effects of risk and efficiency on the performance of Islamic banks, Sutrisno (2016) concludes that inclusion of risk factors has mixed effect on Islamic banks efficiency. When risk factors are excluded, the potential economies of scale may be overestimated and technical efficiency is also sensitive to the exclusion of risk factors.

Furthermore, Deelchand and Padgett (2009) established an adverse relationship between risk and capital efficiency when all deposits are indemnified with a level premium rate that is, when there is no 'market discipline'. The authors findings tend to confirm the 'too big to fail' in which big banks rely on public bailout in case of financial complications because they are aware of their prominence in the financial system. This is contrary to findings of Altunbas et al (2007) whose empirical outcomes indicate positive connection between

capital risk and liquidity which confirms regulators' inclination for capital as a means of containing risk-taking activities.

Similarly, Said (2013a) examines the correlation between risks and efficiency within Islamic banks in MENA countries. He uses three stages of analyses. First, measuring efficiency with Data Envelopment Analysis (DEA). The next stage is to analyze the risks by using financial ratios. The last stage involves using Pearson Correlation coefficients to examine the correlation between credit risk, liquidity risk, operation risk and efficiency. The result of the study shows that both credit risk and operational risk are negatively related to efficiency. Incidentally, liquidity risk shows insignificant correlation to efficiency. The author, nonetheless submits that bank inefficiency and risks are positively correlated for conventional banks and inversely correlated for Islamic banks. In another study, Said (2013b) measures the overall technical efficiency of Islamic banks in MENA and concludes that Islamic banks are relatively technically less efficient. He submits that pure technical and scale efficiencies show problems of allocation of resources between inputs and output mix for MENA compared with GCC. This again highlights the inherent differences between risk-efficiency relationships between the two types of banking system (Alam, 2012).

Thus, most of the propositions between risk and efficiency are non-conclusive and yield inconsistent results. It is only an empirical analysis that can resolve the differing estimates.

2.8.2 Liquidity Risk and Performance

There are also studies relating liquidity risk to financial performance of banks. For instance, Sohaimi (2013) analyses the liquidity risk and disclosure and draw the relationship between liquidity risk and financial performance measures using deposits, cash liquidity gap and non-performing loans (NPL) as independent variables and the effect on banks' capital and reserves. He observes that liquidity risk affects banks' capital and reserves significantly. He regards NPL as the exacerbating factor of liquidity risk. He also submits that there is a negative relationship with deposit, cash and liquidity gap. This is like the findings of Arif and Anees (2012) who also included liquidity gap as the second factor exacerbating liquidity risk. Both studies agree with Alshatti (2014) who says that there is negative effect of the capital ratio and the liquid assets ratio on profitability. But he states that there is positive effect of the increase in the quick ratio and the investment ratio of available funds on the profitability. Similarly, Njeri (2014) and Jacob (2014) reveal that liquidity is the most critical factor that influence financial performance of microfinance, savings and credit cooperative societies in Kenya.

However, Al-Tamimi, et al. (2015) insist that there is only negative relationship between the performance of Islamic banks in GCC, capital and operational risks. They contend that the two most important risks are capital and operational risks. Saeed (2015) also supports the argument that liquidity risk has insignificant relationship to conventional bank performance in Malaysia.

2.9 Regulations and Supervision on Islamic Banks

Sabri, 2014 argues that official supervisory power, stringency on capital regulations and banking activity restrictions negatively and significantly determine liquidity creation. He also asserts while there is positive and significant impact of restrictions on the banking entry standards on liquidity creations in Islamic banks.

Kammer et al (2015) also report different frameworks for Islamic banks' regulation. For instance, countries like Saudi Arabia and United Arab Emirate (UAE) indicate a single integrated regulatory framework. Banks in Turkey also have a single unified framework (provision is made for recognizing Islamic banks). Bahrain and Kuwait have two separate independent regulatory frameworks (one for conventional and Islamic banks each). Malaysia and Indonesia have mixed approach in which similar regulatory framework is applied to areas that are related to both Islamic and conventional banks while separate guidelines and regulations are applied to areas specific to Islamic banks.

Kammer, et al. (2015) survey of 31 Islamic banks suggests that only three of the banks work under separate regulatory framework for Islamic banks. Seven of the banks have mixed approach in which there is a distinct regulatory framework with different rules and regulations for Islamic banks. The remaining 21 banks are under single regulatory framework with half of them having references applicable to Islamic banks.

Due to Islamic banks being exposed to liquidity risk more than conventional banks, there are official international regulations and supervisions of Islamic banks.

2.9.1 Basel Committee

Basel Committee regulates and supervises banks globally. The committee is the primary standard setting body authorized to strengthen the regulation and supervision of banks worldwide. It is in the Bank for International Settlement (BIS) in Basel, Switzerland (BIS, 2015). Basel has issued three guidelines. The first was in 1988 with Capital Accord (Basel I). This is a regulation which sets the requirement to calculate capital charge, that is, the amount of capital to be set aside to absorb potential loss across banks and through countries. Next in 1996, there was Basel I (Amendments). This incorporates market risk into Basel I. In 2004, it issued International Convergence of Capital Measurement and Capital Standards (Basel II). The objective of this is to make capital requirements more sensitive to risks including Operational risk. In 2010, there was Basel III (Response to Financial Crisis). This includes enhanced capital ratios, liquidity ratios and leverage ratio.

Basel III classifies Tier 1 capital as what is mandatory to absorb losses while enduring a going concern while Tier2 is a 'going concern' reserve to shield creditors in the event of an insolvency. Basel III abolishes Tier3 entirely. It states that Tier1 should include common equity and retained earnings. Since most of the Islamic banks' capital already encompasses of common equity, this requirement will have restricted effect on them (IFSB-2015).

Basel III identifies two liquidity ratios – Liquidity Coverage Ratio (LCR) and Net Stable Funding Ratio (NSFR). LCR is a quantitative requirement which seeks to ensure that banking institutions hold sufficient high-quality liquid assets (HQLA) to withstand an acute liquidity stress scenario over a 30-day period. It is measured as:

$$\textbf{LCR} = \frac{\textbf{Stock of HQLA}}{\textbf{Total Net Cash Outflow over the next 30 calendar days}}$$

Phased implementation of LCR commenced on 1st June 2015 as follows:

Table 2.1:
Liquidity Coverage Ratio (LCR)

Year	1 June 2015	January, 2016	2017	2018	2019
Minimum LCR (percent)	60	70	80	90	100

NSFR is a long-term liquidity constraint. It aims at strengthening banks' medium to long-term liquidity profile. The ratio considers a stress scenario with one-year period. It is measured as:

$$\textbf{NSFR} \quad \frac{\textit{Available Amount of Stable Funding}}{\textit{Require Amount of Stable Funding}}$$

The implementation of NSFR is to commence on 1st January 2018.

Apart from Basel committee, other Institutions charged with the responsibility to regulate and supervise Islamic banks include:

1) International Islamic Liquidity Management Corporation (IILM).
2) International Islamic Financial Markets (IIFM).
3) Islamic Finance Service Board (IFSB).
4) Accounting and Auditing Organization for Islamic Finance Institutions (AAOIFI).

2.9.2 International Islamic Liquidity Management Corporation (IILM)

IILM is a global multilateral body established on 25 October 2010 by a group of Central banks from Malaysia, Indonesia, Nigeria, Kuwait, Luxembourg, Mauritius, Qatar, UAE and Islamic Development Bank (IDB) (IFSB report, 2015). It's headquarter is based in Kuala Lumpur, Malaysia. The objective of IILM is to facilitate cross-border liquidity management among institutions that offer Islamic financial services. It is to make available several different Shari'ah –compliant instruments on commercial transactions that satisfies the liquidity needs of member organizations (Waemustafa, 2014). The IILM has issued a total of 11 tranches amounting to US $6.7 billion to date (IFSB, 2015).

2.9.3 International Islamic Financial Markets (IIFM)

IIFM is a neutral and non-profit standard setting organization of the Islamic Financial Service Industry. It was set up in 2002 by IDB and the central banks of Brunei, Indonesia, Bahrain, Sudan and Malaysia. It is based in Manama, Bahrain. Its focus is on the standardization of Islamic finance products and contracts.

The organization has released many important standard agreements. These include IIFM Master Collateralized *Murabahah* Agreement and its Operation Guidance Memorandum. Another publication is the agreement on *Tahawwut* (hedging) Master Agreement (TMA). TMA was designed to simplify risk management function and legal framework of Islamic finance institution.

2.9.4 Islamic Finance Service Board (IFSB)

This is an international standard-setting organization that encourages and enriches the accuracy and firmness of the IFSI by issuing global prudential, standard and guiding principles for the industry. IFSB was established in 2002 and is based in Malaysia. The organization enjoys the immunities and privileges of an international organizations and diplomatic missions from the host country. The IFSB consists of 188 members including 61 regulatory authorities, 8 inter-governmental organizations, and 119 market players. It is regarded as the Basel committee for Islamic financial institutions (Bitara, et al. 2016). The first IFSB standard relates to guiding principles of risk management (Jeroen, 2015). It has issued fourteen other guidelines on capital adequacy, corporate governance, Shari'ah compliance and liquidity risk.

In view of the challenges on liquidity risk the Islamic banks face, the IFSB set out principles on liquidity risk. The first principle deals with types of fund providers. These include:

a) Current account holders. These holders do not participate in the profits of the IIFI's business. They should be provided with full cash withdrawal requests.
b) Unrestricted Investment Account Holders. These participate in the IIFI's business and share in profit and loss. Reasons for withdrawal by these holders may be due to:

    i) Rate of return is lower than expected.

ii) The financial conditions of IIFI has raised some concern.

iii) IIFI fails to comply with Shari'ah rules in many contracts and activities.

The liquidity management framework should consider the liquidity exposures in respect of each category of current accounts and unrestricted investment accounts holders. The guidelines also require IIFI's not to undertake liquidity risk that cannot be covered by Shari'ah-compliant funds. This is to lessen the effect of such risk. In order comply with this principle, the IIFI's are also obliged to provide committed funds for *Musharakah* transactions. They are also to make available cash flows for expenses or profit payments.

2.9.5 Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI)

AAOIFI is a non-profit organization based in Bahrain. It prepares accounting, auditing, governance, ethics and Shari'ah standards for Islamic Financial Institutions. Its objectives include developing, disseminating, and interpreting accounting and auditing standards for IFI's. The organization is being supported by 200 institutional members from 40 countries including Saudi Arabia, Bahrain, Malaysia, Sudan, UAE, Qatar etc. These and other countries have adopted standards issued by AAOIFI. The standards have harmonized Islamic finance practices across the globe (AAOIFI, 2008-2014).

2.10 Development of Islamic Finance in OIC

The Organization of Islamic Cooperation (OIC) is a non-governmental organization of 57 countries which put efforts and resources together to protect the wellbeing and interest of Muslims throughout the world (Othman et al. (2007). According to Ada and Dalkilic

(2014), the history of interest free banking is traced back to Hammurabi who ruled in Babylon 2123 -2081 B.C. Also, Wahyudi, Rosmanita, Prasetyo and Putri (2015) report on informal banking practices during the caliphate of Umar Bin Khattab.

However, modern Islamic Finance is traced back to 1950s when most of the Islamic countries gained independence (Belouafi, 1993). According to the author, the first Islamic financial institution was established in in late 1950s by landowners as supporters (promoters) of the institution in a rural area in Pakistan. Deposits and credits were made without charging interest. The bank could not survive due to its inability to meet the depositors' requirements and pay staff salaries. This was because of limited resources as the bank relied on small fixed administrative fee when loan is disbursed as source of income to cover operating and other expenses.

Another effort was made in Egypt in the 1960s by Professor Ahmad EL-Najjar, known as 'The Founder of Islamic Banks'. He was the first Muslim economist to introduce the concept of 'interest-free banking' (Bourakba, 2015). His effort resulted to the establishment of Mt-Ghamr in Egypt. The people had confidence in the bank because it adhered to the teachings of Islam. Depositors reached 60 thousand within 3 years. However, lack of government support and non-sharing of return led to the collapse of the bank.

Subsequently, other Islamic banks were established in different countries including Dubai Islamic bank (1975), Islamic Commercial Bank of Abu Dhabi (1977) and Faisal Islamic Bank of Sudan (1977). A group of Faisal Islamic Banks were also established in many

other Muslim countries. It was in 1970s that Egypt and Pakistan proposed the establishment of Islamic Banking during the OIC ministerial meeting. This culminated in the establishment of Islamic Development Bank (IDB). This is an organization based in Jeddah, Saudi Arabia. The aim is to foster economic development among members. Invariably all OIC member states became members of IDB (Bourakba, 2015).

Thus, Islamic Banks finally appeared in the 1970s, spent its early stages in the 1980s, progressed in the 1990s into a rapidly developing system (Ada and Dalkilic, 2014). Today it is regarded as one of the fastest growing industries in the world. Although it still has less than 2percent of the global financial assets, it can no longer be ignored as a player in the international financial market. While conventional banks are more like spectator's game in which few expert players are on ground and a big crowd is watching from outside, the Islamic banks are participatory sports where everyone is playing and no one is mere watching (Al-Jarbi,2004).

2.11 Theoretical Framework

This subsection discusses the underpinning theories related to the study. Several theories have been postulated which relate to the functions of banks and liquidity management. These include financial intermediation, Islamic banking (participation), anticipated income, Shiftability, liability management, commercial loan, liquidity preference risk premium and portfolio theories. However, only two (financial intermediation and Islamic participation) are the underpinning theories of this study.

2.11.1 Financial Intermediation Theory

The theory of financial intermediation identifies four areas relating to the functions of banks as financial intermediaries. These include rendering of financial services, information dissemination, and delegation of monitoring services and payment as well as provision of finance (Campbell and Kracaw, 1980; Diamond, 1984; Allen and Santomero, 1997, Freixas and Rochet, 2008; Andries, 2009). Under this theory, the banks functions as intermediaries between the lender of fund and the borrower. Funds are taken from depositors and given as loan to borrowers for economic activities. In return, the banks make profit from the interest spread. According to Pagano (2001), the banks' function as intermediaries helps to resolve the issue of information asymmetries and reduce transaction costs between the lenders and the borrowers. This function becomes more important with the increased complexity of financial products and modernization of the banking systems.

However, Ciancanelli and Gonzalez (2000) states that in carrying out the intermediary roles, banks do behave in a self-interest manner by giving out loans to risky borrowers to benefit from high returns. The problem gets more pronounced when managers of banks try to achieve their own goals, while the large number of shareholders are involved in riskier activities to maximize their return at the expense of the creditors and depositors (Pinteris, 2002).

As an information specialist, Beston and Smith (1996) suggest that banks can obtain confidential information and access privileged information about their clients (borrowers and lenders). The pool of information about banks' customers enable banks to become information specialists and producers. However, according to Campbell and Kracaw

(1980), banks also play a role of as delegated monitor for banks creditors. Banks act as agents who are delegated the authority to invest in financial assets on behalf of the creditors. Diamond (1984) discusses the financial intermediary role of banks based on minimizing information monitoring cost which he says are beneficial to determining incentives between borrowers and lenders.

Based on Delegated Monitoring Theory which he propounded, Diamond (1984) describes banks as delegated monitors on behalf of their creditors and adds that banks act on behalf of the creditors to overcome problems of asymmetric information. Banks play a role in investigating and monitoring the activities of their existing and potential borrowers to ensure that their creditors interest are protected and the banking activities are conducted suitably. Hence, in achieving this objective, banks must conduct their business efficiently and with diligence by allocating creditors fund to profitable and productive investment with reasonable risk. By doing this, banks will ensure high liquidity and safety to borrowers always (Ahmad, 2003). Similarly, if banks do not monitor their activities as delegated, agency problems will arise. For instance, if banks invest customers' deposits in high risk projects or assets, agency problem will result. If banks do not constantly monitor the investment, there is also a sign of risk.

With respect to payment and financial services, banks have been given a dominant role in most financial markets especially in developing countries (Macey and O'Hara, 2003; Nam, 2004). The payment system functions enable banks to transfer money in the form of cash or cash equivalents such as electronic transfer, cheques, draft and letter of credit from one party to another. Similarly, as a financial service provider, banks provide services such as

receiving deposits, extend loans, transfer money, currency exchange and any other activities related to finance as prescribed by the central bank. Hence, banks are playing a crucial role in the financial market, it is important for banks to have good management. Good management enhances efficiency while bad management creates banking crisis which have effects on the economic, political and social condition of a nation.

Financial intermediation theory is concerned with the functions of banks. Liquidity is one of the key elements of banking functions. Thus, the theory is relevant to the study on liquidity of banks. In terms of flow of funds, the banks as intermediaries allow depositors to trade-off between liquidity and returns (Andries, 2009). Since the depositors do not know ahead the liquidity problem they may face in the future, the banks as liquidity providers allow them to hold their wealth in form of bank deposits. The banks are thus able to transform the deposit needs of lenders to the credit requirements of borrowers.

2.11.2 Islamic Banking (Participation) Theory

The theory of intermediation in conventional banks entails that the banks make profit by spreading the interest received from loan and the interest given to depositors (Bader et al, 2008). The same intermediation function is performed by the Islamic banks. However, these banks do not receive interest from borrowers neither do they give a predetermined interest to depositors. Rather, there is profit and loss sharing between the depositors and borrowers of fund. The Islamic banks also derive profit from fee- based banking services. The prohibition of pre-determined interest and prescription of profit sharing is based on

the interpretation of Qur'anic verses (Ariff, 2006). This is the basis of Islamic Banking (Participation) theory. In participation theory, the needs of the bank customers are matched with that of the depositors of funds. When Islamic bank becomes efficient, it leads to adequate liquidity that satisfies the demands of both the customers and funds providers.

Mohammad and Shahwan (2013) states that Islamic banks should in theory comply with the purpose of Islamic law or *Maqasid Al-Shari'ah*. This is derived from the holy Al-Qur'an and Hadith of the Prophet ﷺ it states five elements of necessities that constitute the human nature (*al-fitrah*). These include: Life al-*hayah*, intellect or mind *al-aql*, wealth *al-maal*, dignity *al-maru'ah* and human interaction *Muamalat*. The Islamic banking principle is based on the last element – *Muamalat.* The Islamic banks should operate on the principle of permissible trade and should do away with usury or interest *Riba,* uncertainty *Gharar,* gambling *Maisir*, coercion *Ikrah*, fraud *Ghabn* and lack of knowledge *Jahala*. Ismal (2010) further says that the aims of *Maqasid Al-Shari'ah* are to create a fair and equitable distribution of economic resources such as wealth and income, full- employment and maximum rate of economic return that enhance socio-economic justice. The essence of *Maqasid Al-Shari'ah* is to ensure that everybody has access to participate in the wealth distribution and sharing.

In achieving these objectives, Islamic banking system replaces interest or usury with profit and loss sharing which systematically transforms intermediation roles into participatory role by providing capital and sharing profit and loss with business owners (Siddiqi, 2006). It should be noted that the success of this participatory and profit sharing requires a restructuring in the financial system to accommodate this unique contractual relationship

between borrowers and lenders. Islamic banking contributes to the economic development through just and equitable distribution of wealth by eliminating inefficiency in the economy that arises from speculation by replacing interest with profit and loss sharing mechanism. This contributes to higher productivity which comes from real economic activities and minimize risk through profit and loss sharing mechanism between capital providers and banks. According to Galadari, (2011), beyond being an agent of lending and handling money (intermediation), Islamic banks encourages participation of investors and depositors through the adoption of Profit and Loss Sharing (PLS).

2.12 Research Gap

The preceding sections have reviewed empirical literature of liquidity risk determinants, performance and efficiency of Islamic banks. Apart from differences in the reports of researchers on what constitute significant variables that determines liquidity risk, the scope and coverage of these researches are also limited. There are also more studies conducted on conventional banks than Islamic banks. The studies on Islamic banks are also concentrated on few countries. Thus, a wider coverage on liquidity risk in Islamic banks in selected countries from OIC will provide a better understanding. This is due to the fact that the selected countries host over 90 percent of global Islamic bank assets. Previous studies have also not included profit and loss sharing (PLS) sharing contract as a variable in liquidity risk management of Islamic banks. The fact that PLS is usually long-term investment with consequent implication on liquidity of Islamic banks can provide explanation on why it constitute less than 20 percent of Islamic banks investment.

Similarly, the literatures on efficiency of banks concentrate on non-parametric method of Data Envelopment Analysis (DEA) to breakdown technical efficiency into pure technical efficiency and scale efficiency. Few studies compare cost efficiency performance of Islamic banks with conventional banks. It seems that no attempt has been made to link liquidity risk as a major cost of banks to the cost efficiency of banks. This also constitute a gap that is being filled by the present study.

2.13 Summary of Chapter

This chapter attempts to review empirical and theoretical literatures on liquidity risk, profitability and cost efficiency of Islamic banks. It presents the Islamic perspectives on risks and liquidity risk management. Empirical reviews indicate inadequate coverage and contradicting results as the gaps being filled in the present study. The review also establish link between liquidity risk performance and cost efficiency of Islamic banks. The theoretical underpinning of this study has also been identified as financial intermediation and Islamic banking (participation) theories.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

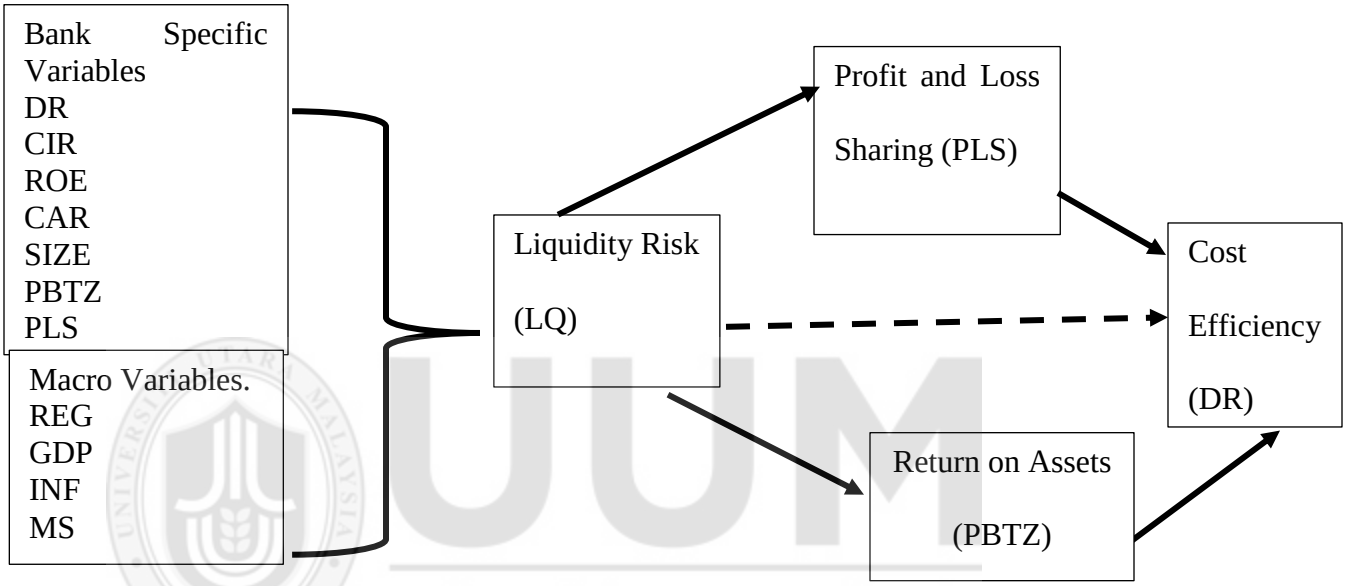
This chapter highlights the methodology adopted in this research. It starts with the conceptual framework and presents the model specification of the study. It also discusses the research design, which includes explanation on the panel data used for the study. It highlights the differences between the use of fixed effects and random in panel data analysis. It presents the features and application of Generalized Methods of Moments (GMM). The chapter also includes sections on measurements and justification of variables of the study, hypothesis development, data sources and method of data analysis.

3.2 Conceptual Framework

In order to establish the relationship between the dependent and independent variables, the following framework was conceptualized. The first model identifies the determinants of liquidity risks. The determinants are classified into two: bank specific (micro) and macroeconomic variables. The bank specific variables include Cost income ratio (CIR), deployment ratio (DR), return on equity (ROE), capital adequacy ratio (CAR), bank size, profit before tax and zakat (PBTZ) and profit and loss sharing (PLS). The macroeconomic variables affecting liquidity risk include regulation of the banks (REG). The banks regulation is categorized into dual and fully Islamic banking systems. Other macro - economic variables tested for their effect on liquidity risk include gross domestic product (GDP), inflation (INF) and money supply (MS).

The second part of the model depicts the multi-mediating variables using PLS and PBTZ as mediating variables in the relation between liquidity risk and cost efficiency. In this case, the cost efficiency proxy by cost income ratio (CIR) becomes the dependent variable while liquidity risk (LQ) is the independent variable.

CONCEPTUAL FRAMEWORK



Note: CIR = Cost Income Ratio, DR= Deployment Ratio, ROE=Return on Equity, CAR= Capital Adequacy Ratio, SIZE= Bank's Size, PLS= Profit and Loss Sharing, REG= Regulation dummy, PBTZ= Profit before Tax and Zakat, GDP= Gross Domestic Product, INF= Inflation, MS= Money Supply.

Figure 3.1

Conceptual Framework of the Study

Based on the above conceptual framework, the following models were developed:

$$LQ_{it} = \beta_0 + \beta_1 CIR_{it} + \beta_2 DR_{it} + \beta_3 ROE_{it} + \beta_4 CAR_{it} + \beta_5 \text{SIZE}_{it} + \beta_6 \text{PBTZ}_{it} + \beta_7 \text{PLS}_{it} + \beta_8 \text{REG}_{it} + \beta_9 \text{GDP}_{it} + \beta_{10} \text{INF}_{it} + \beta_{11} \text{MS}_{it} + \varepsilon_{it} \quad \text{3.1}$$

$$CIR_{it} = \beta_0 + \beta_1 \text{LQ}_{it} + \beta_2 \text{PLS}_{it} + \varepsilon_{it} \quad \text{3.2a}$$

$$CIR_{it} = \beta_0 + \beta_1 \text{LQ}_{it} + \beta_3 \text{PBTZ}_{it} + \varepsilon_{it} \quad \text{3.2b}$$

While equation 3.1 demonstrate the liquidity risk determinants, 3.2a and 3.2b respectively demonstrate the mediation of PLS and PBTZ on liquidity risk and cost efficiency.

Note: CIR=Cost Income Ratio, DR= Deployment Ratio, ROE=Return on Equity, CAR= Capital Adequacy Ratio, SIZE= Bank's Size, PLS= Profit and Loss Sharing, REG= Regulation dummy, PBTZ= Profit before Tax and Zakat, GDP= Gross Domestic Product, INF= Inflation, MS= Money Supply.

Where:

LQ_{it} = Liquidity for bank *i*, year *t*

CIR_{it} = Cost Income Ratio for bank *i*, year *t*

β_0 = intercept

β_1-β_{12} = Coefficients of parameters

ε_{it} = Error term of bank i

3.3 Measurement of Variables

This section discusses measurement of liquidity ratios and cost efficiency ratios

3.3.1 Measures of Liquidity Risk Ratio

Ali (2013) identifies five measures of liquidity risk ratio as follows:

1) Liquid Assets to Total Assets (LATA): Liquid assets include cash and other cash counterparts plus deposits with other banks.
2) Financing to Deposit Ratio: this articulates the varying nature of financing burdens and the ability of bank to collect deposits.

3) Maturity Mismatch of Assets and Liabilities. This measures short-term funds that are not up to 3 month but are used to finance long-term assets.
4) Ratio of Stable Deposits to Total Deposits
5) Profit Sharing Investment Accounts (PSIA) to total deposits.

3.3.2 Measurement of Cost Efficiency

There are two widely used measures of cost efficiency. These include deployment ratio and cost-to-volume ratio.

Deployment ratio measures the proportion of resources deployed in liquid assets. Deployment ratio makes the balance sheet of a bank more noteworthy (Shodhganga, 2016). The ratio is measured by Khan (2004); Shodhganga (2016); Chakraborty, Salam & Rabbany; 2015; Ongore & Kusa, 2013) using:

1) Investment to assets.
2) Other assets to total assets
3) Credit –deposit ratio.
4) Fixed asset to total assets.
5) Investment-deposit ratio.

The deployment ratio is used as a systematic tool by Islamic banks to represent ratio of total financing and investment to total deposit. The ratio ranges from 0 and 100 (Khan, 2004).

Cost-to-income ratio (CIR) is also known as efficiency ratio or expenses to income ratio. It is a measure of bank's performance (Tripe, 1988). It is defined as non-interest expense

divided by the sum of net interest income and non-interest income. Non-interest expense usually excludes bad debt and tax expense (Hess and Graham, 2004). It is used to benchmark the operational efficiency of banks (Reserve Bank Australia, 2014). CIR is a key and popular financial measure of bank productivity and efficiency. The lower the cost, the more efficient the bank (Research Note, 2015; Burger and Moormann, 2008). CIR is negatively correlated with ROA (Almazari, 2013).

3.4 Variables and Hypotheses Development

This section of the study provides justification for the variables used as determinants of liquidity risk. Based on the research questions of the study, hypotheses were also developed. The justifications for the variables are first presented is table 3.1 below:

Table 3.1:
Variable Justifications

Variable	Literature cited
Liquidity Asset to Total Assets (LATA).	Vodova (2013); Mehmed (2014)
Deployment Ratio	Khan (2004); Shodhganga (2016); Chakraborty, Salam & Rabbany; 2015; Ongore & Kusa, 2013)
Cost-to-volume Ratio	Tripe (1988); Hess & Francis (2004); Burger & Moormann (2008) Vodova (2013); Mehmed (2014); Mathuva, M (2009)
Return on Equity(ROE)	Muharam and Kurna (2013) Mehmed (2014)
Size	Ahmed, *et al.* (2011); Sulaiman, *et al.* (2013); Cucinelli (2013); Mehmed (2014).
Regulation	Sabri, (2014); Klomp and Haan (2012); Kammer et al (2015)
Profitability.	Ahmed, *et al.* (2011) Ariffin, 2012, Anam, *et al.* 2012, Fayed, 2013; Sulaiman, *et al.* 2013, Jawadi and Louhichi (2014)
Inflation.	Sulaiman, *et al.* (2013) ; Daniel (2014) ; Cucinelli (2013) ; Mehmed (2014)
Money Supply	Srairi, (2009) and Chowdhury and Schabert, (2015); Shostak, 2000
Gross Domestic Product (GDP).	Sulaiman, *et al.* (2013) ; Daniel (2014) ; Cucinelli (2013) ; Mehmed (2014) ; Wójcik-Mazur and Szajt, 2015

3.4.1 Dependent Variable – Liquidity Risk (LQ)

Liquidity risk is defined as the ratio of total investment to total assets. The ratio has been used by Genetay, Lin and Molyneux (2015). Using this definition, Nikolaou (2009) suggests that if the ratio reaches 100 percent, a maximum level of liquidity risk is gotten and illiquidity will materialize. Similarly, Hanmanth and Shivaji (2014) submits that measuring liquidity risk in this way assesses the extent to which assets of banks cover their investment. The ratio is also defined and calculated in the Islamic Bank Information System (IBIS) database.

3.4.2 Cost Income Ratio (CIR)

Cost income ratio (CIR) defined as total expenses to income ratio (Tripe, 1988). The ratio has been used to represents banks' efficiency and productivity (Hess & Graham, 2004; Burger &Moormann, 2008 and Almazari, 2013). As a popular measurement of cost efficiency in banks (Mathuva, 2009), CIR is included as one of the determinants of liquidity risk in Islamic banks. It is expected that an increase in CIR will also increase liquidity risk (LQ).

Therefore it is hypothesized as follow:

H_{O1}: There is no significant positive relationship between the cost income ratio (CIR) and liquidity risk of Islamic banks.

H_{A1}: There is a significant positive relationship between the cost income ratio (CIR) and liquidity risk of Islamic banks.

3.4.3 Deployment Ratio and Liquidity Risk

The study also attempts to test the relationship between cost efficiency, measured by deployment ratio (DR) and liquidity risk (LQ). Previous studies have used DR only as a measure of efficiency (Khan (2004); Shodhganga (2016); Chakraborty, Salam & Rabbany; 2015; Ongore & Kusa, 2013) but not relating it to liquidity risk. The first attempt to link these two variables was the study carried out by AbdulGaniyy, Zainol and Ahmad (2016b) on comparative study of liquidity determinants of Islamic banks in full-fledged Islamic banking and dual banking system. The study which was carried on Islamic banks in Sudan

and Malaysia established a positive relationship between DR and LQ in both banking environments.

The present study extends the coverage of that study by examining the relationship within the selected OIC countries. As a measure of the ratio of total investment to deposits, DR indicates what proportion of deposit is invested. Thus, an increase in this ratio is expected to increase the liquidity risk of the banks. It is therefore, hypothesized that:

H_{O2}: There is no significant positive relationship between the deployment ratio (DR) and liquidity risk of Islamic banks.

H_{A2}: There is a significant positive relationship between the deployment ratio (DR) and liquidity risk of Islamic banks.

3.4.4 Return on Equity (ROE) and Liquidity Risk

The next hypotheses tested involve the conflicting results on the bank specific determinants which calls for further study on each of the determinants. First, we hypothesize on the Return on Equity (ROE).While Anam, et al. (2012) submit that a positive relationship exists between ROE and liquidity risk, Muharam and Kurna (2013) and more recently, Mehmed (2014) says the relationship is negative.

Thus, it is hypothesized that:

H_{O3}: ROE does not have significant negative relationship with liquidity risk in Islamic banks.

H_{A3}: ROE has significant negative relationship with liquidity risk in Islamic banks.

3.4.5 Capital Adequacy Ratio and Liquidity Risk

Similarly, the relationship between Capital Adequacy Ratio (CAR) and liquidity risk has been reported differently. While Vodova (2013) reports a positive relationship, Jedidia and Hamzah (2015) and Muharam and Kurna (2013) report a negative relationship.

It is therefore hypothesized that:

H_{O4}: CAR does not have significant negative relationship with liquidity risk in Islamic banks.

H_{A4}: CAR has significant negative relationship with liquidity risk in Islamic banks.

3.4.6 Bank Size and Liquidity Risk

The relationship between banks size and liquidity risk exhibit a more diverse result. Cihák and Hesse (2010), using data from 18 countries with significant existence of Islamic banking, suggest that Islamic banks are financially resilient when they are small, however, they lose their comparative strong point as they grow larger in size which reveals challenges of risk management in large Islamic banks.

While Ahmed, et al. (2011) posit an insignificant relationship, Sulaiman, et al. (2013), Vodova (2013) and Bonfirm and Kim (2012) suggest negative relationship. However, Siaw (2013), Anam, et al. (2012), Sabri, (2014) and Ramzan and Zafar (2014) predict a positive

relationship. The theory of 'too big to fail' also suggests a negative relationship between size of a bank and the liquidity risk (Kaufman, 2013). Like previous studies, the present study also used logarithm of assets to measure the size of banks. This study therefore hypothesizes that:

H_{O5}: There is no significant positive relationship between the size and liquidity risk of Islamic banks.

H_{A5}: There is a significant positive relationship between the size and liquidity risk of Islamic banks.

3.4.7 Profitability and Liquidity Risk

Similarly, the relationship between profitability and liquidity risk is varied. Many researchers have pointed out that there is a tradeoff between profit and holding liquid assets. When liquid assets are increased, the risk associated with liquidity is reduced. The position is that while it is required to hold adequate liquid asset to avoid liquidity risk, such liquidity holding limit the profit potential of the bank. Vodova (2013) predicts a positive relationship between profit and liquidity risk. This corresponds with Ayaydin and Karaaslan (2014) findings that there is a negative relationship between bank liquidity and profitability on the one hand and positive relationship between liquidity risk and profitability. This establishes a negative relationship between liquidity and liquidity risk. It also suggests that a bank will make more profit by being exposed to high liquidity risk. The position will be reversed when the risk finally occurs. This is also the position of Hassan (2014) and Lartey, Antwi and Boadi (2013). The latter report weak positive relationship. Bordeleau and Graham (2010)

moderates the position by suggesting that the relationship varies depending on the bank's business model and state of the economy.

However, Ahmed, *et al*. (2011) suggests insignificant relationship between profit and liquidity risk. While using Profit before tax and Zakat (PBTZ) as a measure of profitability, this study hypothesizes thus:

H_{O6}: Profitability does not have significant negative relationship with liquidity risk in Islamic banks.

H_{A6}: Profitability has significant negative relationship with liquidity risk in Islamic banks.

3.4.8 Profit and Loss Sharing (PLS) and Liquidity Risk

Theoretically, Islamic banking involves profit and loss sharing (PLS). In practice, however, less than 20 percent of the Islamic banks products is based on PLS. The low usage of PLS contract on the asset side of Islamic banks is a major drawback on the practice of banking system where it is presumed that the risk sharing facility of PLS can adjust the liquidity risk profile of Islamic banks. The liquidity position of Islamic banks will be different if PLS is practiced on a larger scale (Dar & Presley, 2001; Alman & Oehler, 2010).

The present study also confirmed that only 7 percent of Islamic banks adopt PLS. Jedidia and Hamza (2014) in their study concluded on a positive relationship between PLS and liquidity risk. The argument was that since PLS is often financed by short term funds, it is

exposed to high liquidity risk. In an attempt to further establish this position, this study hypothesizes that:

H_{O7}: PLS does not have significant positive relationship with liquidity risk in Islamic banks.

H_{A7}: PLS has significant positive relationship with liquidity risk in Islamic banks.

3.4.9 Bank Regulation and Liquidity Risk

The impact of regulation and supervision on liquidity has not been adequately studied. For instance, Sabri, (2014) while doing a comparative exploration between Islamic, conventional and hybrid banks in GCC reports that officially supervisory power stringency, capital regulations and banking activity restrictions negatively and significantly determine liquidity creation and liquidity risk. Earlier Klomp and Haan (2012) reports that banking regulation and supervision influence the risks of high-risk banks. However, most measures for bank regulation and supervision do not have a significant effect on low-risk banks.

Nonetheless, the need for regulation and supervision of liquidity position of banks became a focus following the last global financial crisis. This necessitated the Basel III regulation on liquidity ratios.

For this study, a dummy variable on bank regulation was used. Islamic banks were categorized into two:

1- Banks in countries with only Islamic banks. At the moments, only Iran and Sudan have this status where the banks are fully regulated on Shari'ah rules.

0- Banks in countries with dual banking systems of both conventional and Islamic banking system. This is the category of the remaining selected countries namely, Bahrain, Kuwait, Indonesia, Malaysia, Pakistan, Saudi Arabia, Turkey and UAE (Kammer et al. 2015). The study used 1(one) for the first category and 0 (zero) for the second category. This is to ascertain the impact of banking system, whether dual or fully Islamic banking, on the liquidity risk of the banks. Similar categorization of Islamic banks have been done by Mohamad, *et al*., 2015; Ibrahim, Muneeza and Hassan, 2012; IFSB, 2017.

In view of the above, the study hereby hypothesize as follows:

H_{O8}: Regulation does not have significant impact on liquidity risk in Islamic banks.

H_{A8}: Regulation has significant impact on liquidity risk in Islamic banks.

3.4.10 Inflation and Liquidity Risk

Inflation is one of the macroeconomic variables that has been shown to affect liquidity of Islamic banks. Current inflation and past inflation play key roles in the provision of liquidity by the Islamic banking. Its negative coefficient indicates that banks had to reduce liquidity due to the rise in cost incurred (Sulaiman, *et al.* 2013). Similarly, Malik and Rafique (2013) report a negative impact of inflation on liquidity. However, Siaw (2013) predicts a positive and statistically significant relationship between inflation and liquidity risk. Essentially, both were reporting the same result differently. While Sulaiman, *et al.* (2013) reports on liquidity, Siaw (2013) focuses on the lack of liquidity (i.e. liquidity risk).

This study hence hypothesizes that:

H_{O9}: Inflation does not have significant positive relationship with liquidity risk in Islamic banks.

H_{A9}: Inflation has significant positive relationship with liquidity risk in Islamic banks.

3.4.11 Gross Domestic Product (GDP) and Liquidity Risk

Another widely used macroeconomic variable is the growth in Gross Domestic Product (GDP). The report on GDP has also been varied. Wójcik-Mazur and Szajt, 2015 argued that GDP growth negatively affect liquidity risk. The negative relationship suggests that during economic growth, there is a decrease in liquid asset in favor of financing. However, Vodova (2013) indicates an ambiguous relationship, Mehmed, (2014) suggests both positive and negative connection depending on the measure of liquidity employed. Yet, Sabri, (2014), reports positive but insignificant association. Based on this argument, the present study therefore hypothesizes that:

H_{O10}: GDP does not have significant positive relationship with liquidity risk in Islamic banks.

H_{A10}: GDP has significant positive relationship with liquidity risk in Islamic banks.

3.4.12 Money Supply (MS) and Liquidity Risk

Money Supply (MS) is regarded as the amount of money in the economy. Srairi, (2010) and Chowdhury and Schabert, (2015) used it as a proxy for macroeconomic variable. It is defined to include the stock of money with the public, coins, currency and time deposits with commercial banks, thrift institutions and government deposits with banks and the central bank (Shostak, 2000). This means that money supply has direct impact on the liquidity position of banks. Previous studies have not used it as a macroeconomic variable affecting liquidity risk in banks. The first attempt seems to be that of AbdulGaniyy, *et al.* (2016b) which compares its effect on liquidity risk of Islamic banks in fully- Islamic and dual banking systems. The authors concluded that while MS has a significant positive effect on liquidity risk in Sudan, it is positive but insignificant in Malaysia.

In order to extend these findings, the present study therefore hypothesize that:

H_{O11}: MS does not have significant positive relationship with liquidity risk in Islamic banks.

H_{A11}: MS has significant positive relationship with liquidity risk in Islamic banks.

3.4.13 Profit and Loss Sharing (PLS) as a Mediating Variable

Profit and Loss Sharing (PLS) remains one of the basic characteristics that makes Islamic banks different from conventional banks (Shaukat & Mirakhor, 2017). However, PLS still suffer low adoption among Islamic banks. One of the arguments is that PLS increases the liquidity risk of Islamic banks (Jedidia &Hamzah, 2015; Ernawati, 2016). This is due to the fact PLS usually has a long term duration whereas it is often financed by short term

liabilities in form of customers' deposits. Wiyono and Raymayuni (2012) used PLS as moderator between Islamic banks' profitability and income. A moderator presumes weak relationship between a predictor and outcome variables. A moderator strenghens or weaken the relationship between a dependent (outcome) and independent (predictor) variables (Baron & Kenny, 1986). On the other hand, mediating variable explains the relationship between between dependent and independent variable.

The application of mediation is not limited to areas of psychology as in Baron and Kenny (1986), Zhao, X., Lynch, J., & & Chen, Q. (2010) and Wu (2011). Mediating variables have also been used by Ramada and Chen (2012), Wahba and Khaled (2015) and Ramli and Gilbert (2016) relating to finance performances. Ramadan and Chen (2012) studied the mediating role of debt level on the relationship between determinants of capital structure and firm's financial performance. The study used three methods of pooled Ordinary Least Squares (OLS), Fixed Effects (FE) and Random Effect (RE). It concludes that the mediating role of debt level is partial and very small.

Similarly, Wahba and Khaled (2015) used panel data regression to test the mediating effect of financial performance on the relationship between social responsibility and ownership structure. The study conducted on a sample of firms listed in the Egyptian social respobsibility index for the period 2007 to 2010 conclude that financial performance and not social responsibility helps institutional investors in making investement decisions.

More recently, Ramli and Gilbert (2016) using Patial Least Squares- Structural Equation Modeling (PLS-SEM) investigated the mediating effects of firm leverage in Malaysia. The

question was whether or not firm's leverage has a mediating role between the firms'and macro-economic variables from capital structure theory perspective. The study concluded that both factors of the capital structure choice have partial mediating effects.

The present study used Profit and Loss Sharing (PLS) and profitability measured by profit before tax and zakat (PBTZ) as mediating varibles between liquidity risk and cost efficiency. Therefore, in order to test whether PLS as a determinant of liquidity risk, also affects the cost efficiency of Islamic banks, the study used PLS as a mediating variable.

Hence, it is hypothesized that:

H_{O12}: The PLS does not have mediating effect on liquidity risk and efficiency of Islamic banks.

H_{A12}: The PLS have mediating effect on liquidity risk and efficiency of Islamic banks.

3.4.14 Profitability (PBTZ) as a Mediating Variable

Lastly, the study also tested mediating effect of profitability measured by profit before tax and zakat (PBTZ) between liquidity risk and efficiency. Profitability has been linked to cost efficiency of banks (AbdulGaniyy, Zainol & Ahmad, 2017; Aliyu & Yusof, 2016; Stavárek & Polouček, 2004; Khalil, Mehmood & Ahmad, 2015). Thus, having proposed a link between profitability and liquidity risk, it is also hypothesized that:

H_{O13}: The PBTZ does not have mediating effect on liquidity risk and efficiency of Islamic banks.

H_{A13}: The PBTZ have mediating effect on liquidity risk and efficiency of Islamic banks.

3.5 Research Design

A research design is a plan for the collection, measurement, and analysis of data, based on the research questions of the study (Sekaran and Bougie, 2013). Research design helps researcher to find solution to the problems of the study. It also ensures the accuracy, generalization and application of the research result (Bhatti & Sundram, 2015). It involves recognizing the need for study, nature and unit of investigation, and time covered.

This study adopted a hypothesis testing approach. Hypothesis testing refers to a process whereby the researcher explains the relationship between variables and test statistical hypothesis.

This study is also quantitative and correlational. A correlational study highlights important variables associated with the problems of the study. With respect to this study, the determinants of liquidity risk were established first and the relationship between liquidity and efficiency was empirically tested using PLS contract and profitability as mediating variables.

3.5.1 Panel Data

The study used panel data. A panel data refers to data that follows a cross section over a period. Panel data gives more explanatory data, more changeability, less collinearity

among variables, more degrees of freedom and more efficacy. By studying the repeated cross section of observations, panel data are better suited to study the dynamic forces of change. Since this panel data relate to firms (banks) over time, there is bound to be heterogeneity in these units. The techniques of panel data estimation can also take the inevitable heterogeneity relating to the study of banks over time explicitly into account by allowing for individual-specific variables. Panel data can better detect and measure effects that simply cannot be observed in pure cross-section or pure time series data and thus enrich empirical analysis in ways that may not be possible if only cross-section or time series data is used.

In addition, Baltagi (2008) also highlighted other advantages of panel data analysis over cross-sectional and time series data analyses. This include the fact that panel data can identify and measure effects that may not be easily detected in cross-sectional and time series data. Panel data also allows for construction and testing of models that are complicated.

Also with panel data which gathers information on micro units, including individuals, firms and household, it is more accurate to measure many variables. This eliminates biases that may result in aggregation of firms and individuals. The panel data model is analyzed using fixed effect (FE) or random effect (RE). The techniques have been used for research relating to banks operation by Asbeig and Kassim, 2015; Siaw, 2013; Cucinelli, 2013; Jedidia and Hamzah, 2015; Abdelaziz, Mouldi and Helmi, 2011; Khasawneh, Khrawish and Khrisat, 2012.

3.5.1.1 Fixed Effect Model

Fixed effects is used to explain variables that are not random. It is used to control for time-invariant variables that have not been measured but that affect *Y*. However, while the effects of time-invariant variables (measured or unmeasured) can be controlled for, their effects cannot be estimated (William, 2000). Fixed effects permit common coefficients of cross-sectional units. It also allows intercepts to different among the unit of analysis. (Siaw, 2013). This model presumes that specific individual effect and independent variables are correlated. Slope coefficients and intercept are assumed to constant over time Gujarati (2004).

Fixed Effect (FE) model is specified as follows:

$$Y_{it} = \beta_1 \sum X_{it} + \alpha_i + \mu_{it} \quad \ldots\ldots 3.3$$

Where Y_{it} is the dependent variable for Bank (or Firm) i in time t, X_{it} represents the independent or explanatory variables, β_1 is the coefficient of $X_{it,}$ αi is the unobserved, time-constant factor that affects Yit. α_i is also referred to as the unknown intercept for each entity and takes the values (r = 1, 2,3……. n) while μ_{it} is the unobserved error term that affects Y_{it}

3.5.1.2 Random Effect Model

Random effect on the other hand assumes that mean value is common and that error term reflects the differences among the cross-sectional units. The assumption in random effects is that independent variables and individual specific effects are not correlated.

Random Effect (RE) Model is specified as follows:

$$Y_{it} = \beta_1 \sum X_{it} + \alpha_i + \mu_{it} + \varepsilon_{it} \quad \ldots\ldots 3.4$$

Where μ_{it} is between-entity error while ε_{it} is within-entity error

Hence, the assumption regarding whether individual units have correlation with error components and independent variables will affect the choice of FE and RE. If they are correlated, it is more appropriate to use FE. Otherwise, it is better to use RE if they are not correlated. According to Gujarati (2004), if T (representing number of years) is greater than N (the cross-sections) is small, the possibility of difference between RE and FE estimates is low. In this case, it is preferable to use FE. However, if T is small and N is huge, the two estimators will produce different results.

However, if the cross-sectional units in the sample are regarded as random drawings, then RE is appropriate, for in that case statistical inference is unconditional. Again, if the individual error component ε_i and one or more regressors are correlated, then the RE estimators are biased, whereas those obtained from FE are unbiased.

Therefore, Hausman tests was used in this study to decide on whether to use random effects or fixed effects. (Siaw, 2013). The Hausman test regulates whether the estimates of the coefficients, taken as a group, are significantly different from the two regressions (fixed effects and random effects). In simple terms, the null hypothesis in the Hausman tests is that the favored model is random effects as opposed to the alternative which says the favored model is the fixed effect.

The panel data techniques (fixed effect and random effect) were carried out with *xtreg* command in *stata* using the following format:

xtreg depvar indepvars, fe…… (Fixed effect)

xtreg depvar indepvars, re……. (random effect)

Where:

depvar is the dependent variable

indepvars are the independent variables

This means that in the regression, the dependent variable is first indicated followed by a list of independent variables and then a comma (,). The options fe and re are also indicated and these are recognized in stata for fixed effect and random effect options respectively.

To perform the Hausman test, the command is:

hausman fe re

The Hausman test is performed after fixed effect and random effect regressions and the result stored as FE and RE respectively. Thus, the choice of FE or RE in panel data analysis depends on the nature of the data.

In addition to panel data, the study also explored the consistency of the result with Generalized Method of Moments (GMM).

3.5.2 Generalized Methods of Moments (GMM)

In order to further confirm the consistency of the panel data analysis, this study also used the GMM. GMM is a framework to derive estimators (Drukker, 2010). GMM in econometric theory, is a common method to estimate the parameters of the econometric and statistical model using an alternative technique instead of normal least square or maximum likelihood. Use of GMM for banks' panel data is justified due to endogeneity problems in banks data. The estimator has been used by Islam and Nishiyama, 2015; Trinugroho, Agusman and Tarazi, 2014; Abid, Ouertani and Zouari-Ghorbel, 2014; Iftikha, 2015 and Jedidia and Hamzah, 2015.

GMM was first projected by Arellano and Bond (1991) and advanced by Arellano and Bover (1995) and Blundell and Bond (1998). This was to solve the endogeneity problem in the independent variables by using a series of instrumental variables produced by lagged variables (simultaneity bias problem of reverse causality and possible omitted variables).

It is theorized for semiparametric models with a finite-dimensional parameter. GMM does not have specific known distributional features that are commonly assumed in other econometric models or statistical techniques. GMM provides more robust results that handles endogeneity that is common to banks data. It is also to correct the problem of heteroscedasticity and auto-correlation.

3.5.2.1 Conditions for GMM

Roodman (2009) and Baum (2013) highlighted the conditions that must be satisfied before GMM can be used as follows:

i) There should be a small T and large N panel. That is, the time should be few but with many individuals. In this study, T = 12, and N = 85. That is, 85 banks were studied for a period of twelve years.

ii) A linear functional relationship

iii) A single left-hand-side variable that is dynamic, depending on its own past Figures.

iv) Individual variables that are not exogenous, that is, correlated with past and possibly with realizations of the errors.

v) Fixed individual effects.

vi) Heteroscedasticity and autocorrelation within individual but not across them.

The basic features of GMM model include that it:

i) eliminates serial correlation

ii) eliminates heteroscedasticity

iii) covers endogeneity problem

iv) is used for time series and cross sectional data

v) is more efficient with less time periods and more cross sections.

vi) GMM is more efficient in the presence of heteroscedasticity and if there is no heteroscedasticity, it no worse than instrumental variable estimator.

3.5.2.2 Types of GMM

There are basically two types of GMM. These are difference GMM and system GMM. Difference GMM involves transforming all the regressors by first differencing. System GMM on the other hand involves an additional assumption that first differences of instrumental variables are uncorrelated with the fixed effects. It builds two equations- the original equation and the transformed one.

The present study used *xtdpdsys* which implements both difference and system GMM. The *xtdpdsys*, though not an official *Stata* command, it is a free contribution to research community used in *Stata* (Roodman, 2009; Baum, 2013). It is designed to fit closely related dynamic panel data models with 'small T and large N' panel. T represents the number of years and N is the number of observation. In this study, there are 85 banks representing N and twelve years representing T. *xtdpdsys* also reports the Arellano-Bond for autocorrelation (Windmeijer, 2005).

3.5.2.3 Sargan Test

This is a test developed by Sargan (1958) for overidentifying restriction. It is used to test the validity of instrumental variables. In Sargan test, the null hypothesis is that instrumental variables are not correlated to a set of results and hence the instruments are healthy and acceptable (Hansen, 1982). If Sargan test rejects the null hypothesis, it means the instrumental variables estimator is inconsistent and biased. A Sargan test with a p-value above 0.05 fails to reject the null hypothesis. This means that the overidentifying restriction is valid. This study used the test to confirm the validity of the instruments used.

3.5.3 Mediating Variable

A mediating variable is thought of as the carrier or transporter of information along the causal chain of effects (Little, *et al.* 2007)

There is a lengthy history of mediation (Kenny, 2014). It was made very popular by Baron and Kenny (1986). A mediator specifies how (or the mechanism by which) a given effect occurs. They describe a mediator variable in the following:

> *''The generative mechanism through which the focal independent variable is able to influence the dependent variable of interest. Mediation is best done in the case of a strong relation between the predictor and criterion variable.'' (Baron and Kenny, 1986; pp 1173,1178).*

A given variable is said to function as a mediator to the extent that it accounts for the relation between predictor and the criterion. Whereas moderator variables specify when certain effects hold. Mediators speak on how and why such effects occur (Baron and Kenny, 1986).

Kenny (2014) gave reasons for intense interest in the topic. According to him, one reason for testing mediation is demanding to understand the mechanism through which the causal variable affects the outcome. Mediation and moderation analyses are a vital part of what is known as process analysis. However, mediation analyses tend to be more powerful than moderation analyses.

Wu (2011), further explains the conditions and steps for testing mediation

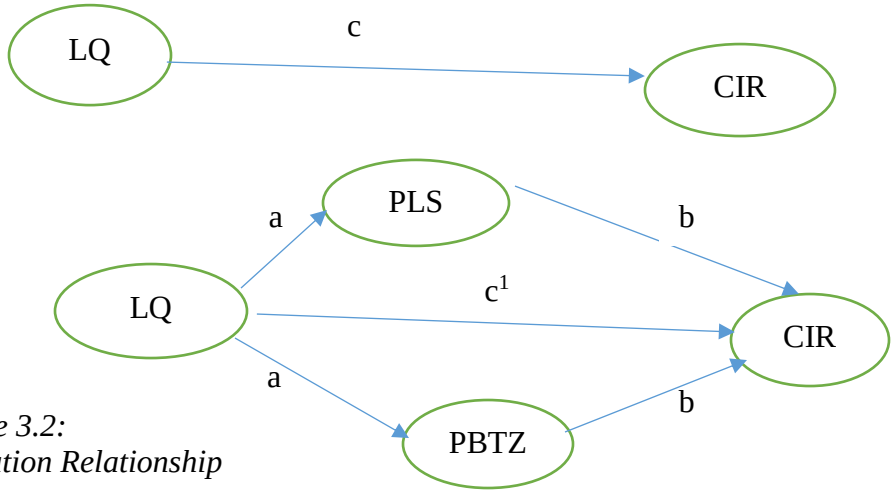


Figure 3.2:
Mediation Relationship

Using X to represent LQ i.e. liquidity risk, Y to represent CIR Cost Income Ratio (i.e. cost efficiency), Z^1 to represent PLS (i.e. Profit and Loss Sharing) and Z^2 to represent PBTZ (i.e. Profit before Tax and Zakat).

When X and Z (i.e. Z^1 and Z^2) predict Y

- Z coefficient (i.e. b)must be significant
- There should be difference in the two coefficients of X (i.e. c^1 should not be the same as c).

3.5.3.1 Steps for Testing Mediation

This sub-section discusses the steps to take in testing mediation effect in a relationship based on Baron and Kenny (BK) approach (Baron and Kenny, 1986).

From the above, X which represents liquidity risk is the predictor or independent variable, while Y representing cost income ratio is the predicted or dependent variable. Z^1 and Z^2 representing PLS and PBTZ respectively are the two mediating variables. The following models (3.5 to 3.8) demonstrate the steps in testing mediations.

1. Test if Y is predicted by X

   $Y=\beta_1+cX+\varepsilon_1$……..3.5

2. Test if Z is predicted by X

   $Z = \beta_2 + aX + \varepsilon_2$…….3.6

3. Test if with the inclusion of Z, Y is still predicted by X

   $Y = \beta_3 + c^1X + bZ^1 + \varepsilon_3$……..3.7

   $Y = \beta_3 + c^1X + bZ^2 + \varepsilon_3$……..3.8

Decision Rules

Based on the above steps, the decision rules are:

4 There is complete mediation between X and Y if all the following 3 conditions exist:

   i) Y is predicted by X

   ii) Z is predicted by X

   iii) Y is not predicted by X whereas Z does if both Z and X are included in the regression.

5 There is partial mediation by Z in the relationship between X and Y if the following conditions exist:

   i) Y is predicted by X

   ii) Z is predicted by X

iii) When Y is predicted by Z and X, coefficient of X is smaller than when only X is used to predict Y.

6 There is no mediation by Z on the relationship between X and Y if any the following conditions exist:

i) Z is not predicted by X

ii) Y is not predicted by Z

iii) The coefficient of X is not different before and after Y is predicted by Z.

3.5.3.2 Other Measurements of Mediation

The above approach adopted by Wu (2011) is in line with Baron and Kenny (1986). It is thus referred to as Baron and Kenny (BK) approach. One of the requirements of this approach is that the independent variable should significantly affect the dependent variable before mediation can occur. This requirement is criticized as not being necessary. It is argued that the existence of mediation does not require that the effect of independent variable (X) on dependent variable (Y) should be significant (Malhotra, *et al.* 2014). According to Hayes, 2009; MacKinnon, 2008; and Zhao, *et al.* 2010, this condition presumes a consistent mediation effect. When the mediation model is an inconsistent one, the BK approach may lead to misleading conclusion. Collins et al (1998), Shrout and Bolger (2002), James, *et al.* (2006) and Pardo and Roman (2013) have also criticized the need for statistically significant effect of the direct path before a mediation can be established.

This led to other approaches of measuring mediation including Sobel (1982) and Bootstrap method by Preacher and Hayes (2004; 2008), Hadi, Abdullah and Sentosa (2016).

Sobel (1982) developed a test to evaluate the significance of mediating effect. Figure 3.3 below (a Venn diagram) depicts the mediating effects on the relationship between independent variable and dependent variable. Portion c represents where all the circles overlap. The Sobel's test inspects the portion of c. If c is greater than d, and the p value of the test is significant, there is a mediation.

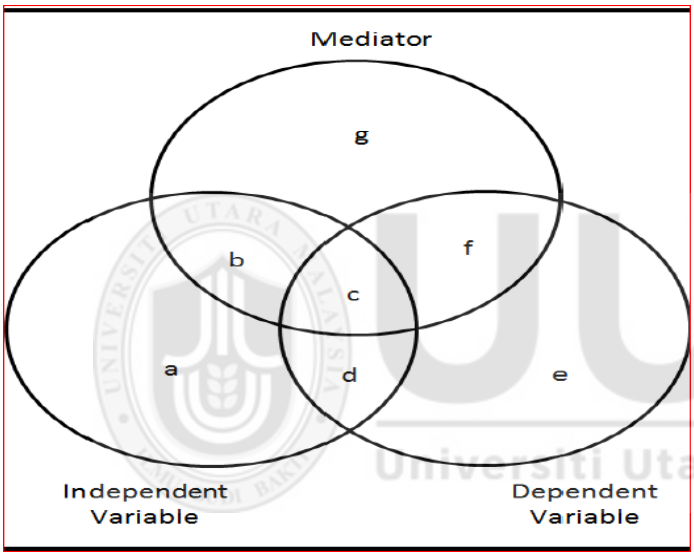


Figure 3.3:
Sobel Approach to Mediation
Source: Hadi, *et al.* (2016)

Sobel test has also been criticized as depending on distribution assumption (Hadi, *et al.* (2016). The distribution of indirect effect according to Bollen & Stine (1990) and Hair, *et al.* (2014) tends to be asymmetric in cases of small samples. Thus, unless there is a large sample, Sobel approach is not suitable for small samples. This is because the distribution of indirect effect is only normal in large samples (Stone & Sobel, 1990; MacKinnon, *et al.* 2002; MacKinnon, Lockwood & Williams, 2004).

The third approach to testing mediation is bootstrapping developed by Preacher and Hayes (2004; 2008). The method does not depend on an assumption of normality and thus is suitable even in cases of small samples (Pardo & Roman, 2013; Hair, *et al.* 2014). Its advantage over Sobel approach is that mediation can be determined with certainty using bootstrapping method. It is the preferred method of detecting indirect effect and compute confidence interval (Malhotra, *et al.* 2014). Mediation is confirmed if the confidence interval does not include zero. That is, if the lower and upper limits are both either negative or positive.

Bootstrapping also has the advantage of being more suitable for a multi-mediation model. A multi-mediation model is where there two or more mediators in a model. The present study has a multi-mediation model by using Profit and Loss Sharing (PLS) and Profit before Tax and Zakat (PBTZ) as mediators.

Bootstrapping is run by specifying the dependent variable(Y), the mediator (M) and the independent variable (X).The study employed the three approaches of mediation testing.

3.6 Population and Sampling

Sekaran and Bougie (2013) define population as the entire group of people, events, or things of interest to the researcher. It is the group of people, events or things of interest which the researcher wants to make conclusions.

The population of the study included all the Islamic banks in the selected countries. For this purpose, the countries selected was based on up to date data on Islamic banks. The selected countries contribute 90 percent of the global Islamic bank assets.

In Table 3.2, the distribution of banks' population and sample in the selected OIC countries is shown based on the Islamic Bank Information System (IBIS) database.

Table 3.2:
Distribution of Islamic Banks' Population and Sample in Selected Countries

Country	Population of Islamic Banks	Sampled Islamic Banks
Bahrain	24	18
Kuwait	7	6
Indonesia	3	2
Iran	16	13
Malaysia	18	15
Pakistan	7	6
Saudi Arabia	3	2
Sudan	16	13
Turkey	4	3
UAE	8	6
Total	106	85

Source: Researcher

Thus, the sample size satisfy Krejcie and Morgan (1970) requirement for sample size. The data is also not balanced as the number of banks sampled is prorated based on the population of banks in each country. The number of years covered for each bank is also vary but within the period 2005 and 2016. While some banks joined within the period, others exited before 2016. Data for 2015 and 2016 were collected from respective banks web sites as IBIS did not have data for these years.

3.7 Sources of Data

Secondary data source was used for this study. Data was collected from Islamic Banks and Financial Institution Information (IBIS) data base of Islamic Research and Training Institute (IRTI). The database has a compressive financial report of Islamic banks. This makes comparison among banks in the selected countries possible. A total of 85 banks

from ten member countries were used for the study. The data source was supplemented with information from the respective individual banks websites.

The analysis of countries and Islamic banks used for the study is provided in Appendix 1.

The study also used World Bank's World Development Indicator (WDI) for the macroeconomic variables – Inflation, Money Supply and GDP.

For this study, the measurement and sources of the variables are in Table 3.3.

Table 3.3:
Variable Measurement and Sources

Variables	Expected Relationship	Measurement	Source
LIQUIDITY RISK		Total Investments / Total Assets	Financial Statement
COST EFFICIENCY	Positive	Deployment Ratio= Total Investment/ Total Customers' Funds	Financial Statement
	Positive	Cost Income Ratio (CIR)= Total Expenses/ Total Income	
ROE	Negative	Profit /Total Shareholders' equity	Financial Statement
CAR	Positive	Total Shareholders' equity / Total Investments	Financial Statement
SIZE	Positive	Log of Total Assets	Financial Statement
PBTZ	Positive	Log of profit before tax and Zakat	Financial Statement
PLS	Positive	Ratio of *Musharakah* and *Mudarabah* over Total Financing	Financial Statement
REG.	Positive	Dummy variable: 1 = Full Islamic Banking System, 0= Dual Banking System	
INF	Positive	Log of Inflation (GDP Deflator %)	World Bank
MS	Positive	Log of Money Supply (% GDP)	World Bank
GDP	Positive	Log of Gross Domestic Product	World Bank

3.8 Data Analysis

The study employs *STATA14* to analyze the influence of the independent variables on liquidity in the first model. Liquidity itself was measured using liquid asset over total asset.

Efficiency as the dependent variable in the second model was measured using deployment ratio calculated from the data sources.

The mediating effects of PLS and PBTZ on liquidity risk and efficiency of Islamic banks were tested using the three approaches of Barron and Kenny (BK), Sobel and Bootstrapping.

3.8.1 Descriptive Statistics

As part of the descriptive statistics of the study, the analysis of the mean, standard deviation of liquidity variables of the Islamic banks were carried out. The liquidity trend confirms the assertion of Ali (2013) who in his study using three measures of liquidity posits that the liquidity and liquidity risk change over a period in Islamic banks.

3.8.2 Diagnostic Test

After analyzing and summarizing the data, a few tests were carried out prior to regression analysis. Such tests include normality, multicollinearity, homoscedasticity and auto-correlation tests. These tests are necessary to achieve BLUE (Best Linear Unbiased Estimator) if there is minimum variance and the expected value is a true value (Gujarati, 2004).

3.8.2.1 Auto-correlation Test

Auto-correlation refers to correlation between sequence of observations over time (that is, time series) or for a particular time (that is, cross-sectional data) (Gujarati, 2004). The test introduced by Wooldridge (2002) is used to detect the existence of auto-correlation in the model. It is important to mention that this test needs comparatively few assumptions and easy to implement (Drukker, 2003)

3.8.2.2 Linearity Test

The estimation between dependent and independent variables is only possible if the relationship between them is linear. If the relationship is nonlinear, then the result will be under estimated and may not reflect true position. The linearity of data is often obtained by plotting of the observations.

3.8.2.3 Normality Test

Normality test is a fundamental assumption in multi-variate analysis. The test calculates the degree of normal distribution of the sample data. Normality assumption also allows us to derive the probability or sampling distributions of the coefficients of the variables and their variances (Gujarati, 2004). As suggested by Hair, *et al.* (2006), residual (the difference between the observed and predicted values for dependent variable) plots and statistical tests are used to examine the normality of the data. The statistical test used to confirm the normality of the data in this study is *xtsktest* command in *STATA. Xtsktest* is considered as an estimation command of the skewness and kurtosis of each component of a panel data. It is an alternative to Jarque- Bera test in panel data models (Alejo, *et al.* 2015). Examining skewness and kurtosis in the error components shows significant role in analysis and estimation processes in linear panel data models.

3.8.2.4 Multicollinearity Test

This test primarily measures the correlation among several independent variables. In order to confirm the existence of multicollinearity in a model, collinearity statistics such as tolerance statistics and variance-inflation factor (VIF) were calculated. Tolerance value specifies the changeability of the stated independent variable that is not described by other

independent variables in the model. Tolerance value that is below 0.10 suggests multicollinearity problem (that is, multiple correlation with other variables is high). VIF value on the other hand is the inverse of the tolerance value. Where VIF value is above 10, it suggests multicollinearity problem (Pallant, 2007).

The correlation coefficient of variables is often used to test the multicollinearity problem. When the correlation coefficient is large, it indicates presence of multicollinearity. However, there seems to be no agreement on how large the coefficient should be to indicate multicollinearity. For instance, Asterious and Hall (2007) and Tabachnic and Fidell (2007) contend that variance inflation factor (vif) which is used to measure multicollinearity should not exceed 9. Stine (1995), also says vif is a measure of how much multicollinearity has increased the variance of slope of the estimate. O'Brien (2007) argues against rule of thumb for vif but agrees that 10 is the most commonly used rule of thumb.

Wu (2011) suggests that problem of collinearity should be expected when the mediating variable is included in the model. However, the effect can be reduced by increasing the sample size.

3.8.2.5 Homoscedasticity Test

Data is said to be homoscedastic if the variance of error terms (ε) appears constant over a range of independent variables (Hair, *et al.* 2006). A fundamental regression model requires that the error term in the regression function is homoscedastic or equal variance over all periods and locations. There is homoscedastic problem if the variance is not equal or constant. The present study used Wald test to assess the true value of parameters based

on the sample estimates. It is used to test the joint significance of a subset of coefficients.

If the result of the test is significant, null hypothesis of homoscedasticity will be rejected, and the problem of heteroscedasticity will be identified.

3.8.3 Regression Analysis for Hypotheses Testing

Regression Analysis is used to test the hypotheses. It is used to test the significance of the relationship between two or more independent variables and the dependent variable (Hair, *et al.* 2006). The authors further posit that sample size has a direct impact on the power of multiple regression. Hence there is no hard and fast rule on the determination of number of observation for independent variable. In order to ensure reliable and valid results, 15 to 20 observations have been suggested (Hair, *et al.* 2006).

In Figure 3.4, the flowchart of panel data analysis is depicted.

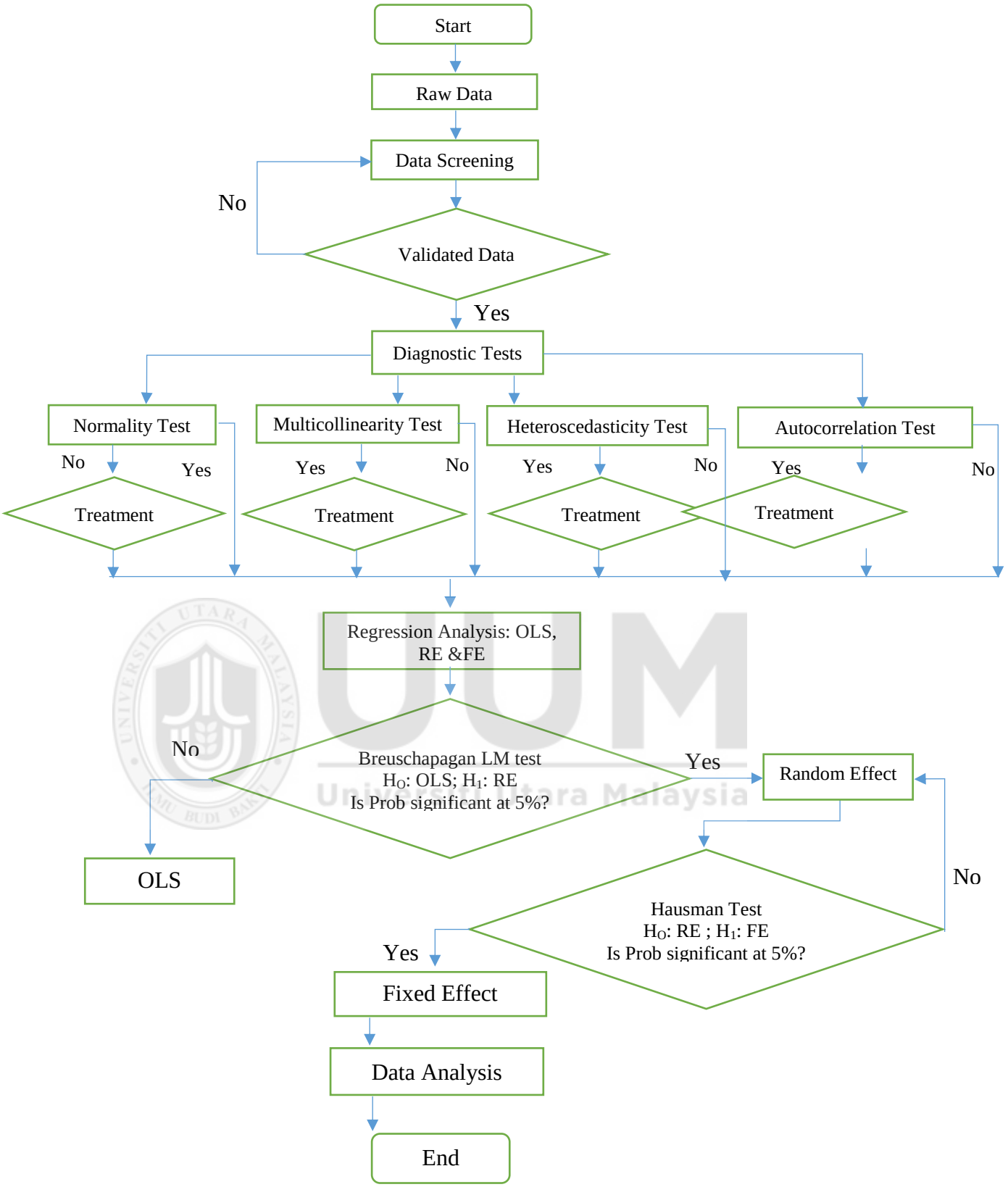


Figure 3.4
Panel Data Analysis Flowchart

The flowchart shows that after screening and validation of the data, four diagnostic tests were carried out. Apart from normality test that requires a 'yes' answer before proceeding to regression analysis, the other tests require a 'no' answer. Thereafter, regression analysis is carried out using ordinary least square (OLS), random effect (RE) and fixed effect (FE). The Breuscha Pagan LM test is conducted to test whether OLS or RE is suitable. If RE is chosen, then Hausman test follows. This tests whether RE or FE is suitable. In this study, RE was preferred and the analysis was further corrected for heteroscedasticity and autocorrelation with vce (robust) option.

Apart from panel data analysis, this study further used GMM for confirmation of consistency and robustness and also to correct the problems of heteroscedasticity and auto-correlation.

3.9 Summary of the Chapter

This chapter discusses an overview of the methodology of the study. It sets out the research design and develops the hypotheses to be tested in order to achieve the objectives of the study. It also describes the sources of data used and presents the use of *Stata SE 14* as the statistical tool to analyze the data.

A panel data on Islamic banks in selected countries in OIC collected from IBIS data base was used to estimate liquidity risk determinants. This study also estimates the effect of liquidity risk on cost efficiency of Islamic banks using PLS contract and profitability (PBTZ) as mediating variables. Fixed Effect (FE) was used based on the outcome of Hausman specification test. The study also used GMM to further ascertain the consistency

and robustness of the panel data technique. It tested the effects of PLS and PBTZ as mediating variables in the relationship between liquidity risk and cost efficiency using three approaches of BK, Sobel and Bootstrapping.

CHAPTER FOUR

RESULT AND DISCUSSION

4.0 Introduction

This chapter discusses the descriptive statistics of the determinants of liquidity risk. It includes the result of correlational and regression analyses of the first model on the determinants of liquidity risk. It also presents the results of mediating effects of Profit and Loss Sharing (PLS) and Profitability (PBTZ) on liquidity and efficiency of Islamic banks.

4.1 Descriptive Statistics

This section describes the variables of the study.

4.1.1 Banks Specific Liquidity Risk Variables

Table 4.3 below describes the statistics of the variables. All the variables show close variation around the mean. Only bank size and PBTZ exceed 2 and 1 respectively. This is attributable to variation in the asset base and profit of the Islamic banks under study.

Liquidity risk (LQ), which is the dependent variable shows that on average, 82 percent of total assets of the sampled Islamic banks are invested. Similarly, the deployment ratio(DR) which measures the ratio of total investment to total customers' fund indicates that on average 116 percent of customers' funds are invested. This implies that Islamic banks in addition to using customers' deposit, they also access other funds like equity for investment. Also, the cost income ratio (CIR) which measures the cost of running the banks in relation to their operation indicates 68 percent. Against the background that the higher

the ratio, the less efficient, this figure is better than the least efficient bank with 98 percent and below the most efficient bank with 28 percent (Bratton & Garrido, 2016). The Return on Equity (ROE) measured as Profit before Tax and Zakat (PBTZ) over total share equity of 0.103 also suggests that on average, investors gain 10 percent from their investment in Islamic banks.

Similarly, CAR shows that 24 percent of the shareholders' equity is invested. This is also in line with the result by Khan and Jabeen (2011) who reported 21.5 percent for Islamic banks in Pakistan. The result is above Basel and IFSB benchmark of 8 percent (Deelchand and Padgett, 2009). This shows that Islamic banks are adequately capitalized and insured against risk. This is supported by Beck *et al*.2013 that Islamic banks showed better performance during the last financial crisis due to higher capitalization and better asset quality.

The bank size measured as the natural logarithm of assets has an average of 6.415. The standard deviation of 2.16 shows the variation between the minimum score of -2 and maximum of 9. This also suggest that there is wide gap in the assets base of Islamic banks being studied. Profit before Tax and Zakat (PBTZ) shows average natural logarithm of 5.11 and standard deviation of 1.12 which suggests that the profit is widely dispersed around the mean. The minimum figure of -2 and maximum of 8 respectively suggest that while some of the banks make profits, others incur losses.

The Profit and Loss Sharing (PLS) was measured as the ratio of *Musharakah* and *Mudarabah* to total Islamic financing. The result shows that on average only 15 percent of Islamic financing assets is based on PLS. This corroborates previous studies that PLS constitutes less than 20 percent of Islamic finance assets (Dar and Presley 2001; Febianto 2012).

Table 4.1:
Descriptive Statistics

Variables	*Observations*	***Mean***	***Standard Deviation***	***Min.***	***Max.***
LQ	732	0.823	0.192	0	2.703
DR	732	1.161	0.231	0	2.914
CIR	679	0.681	0.383	0.301	3.669
ROE	629	0.103	0.405	0	1.949
CAR	733	0.239	0.434	0.301	4.602
SIZE	745	6.415	2.160	-2	9
PBTZ	745	5.110	1.120	-2	8
PLS	745	0.150	0.260	0	2
REG	745	0.301	0.457	0	1
GDP	745	3.942	0.578	2.7	4.7
INF	745	0.867	0.434	-0.7	1.6
MS	745	-	0.391	-1	0
		0.188			

Note: LQ= Liquidity Risk, DR= Deployment Ratio, CIR = Cost- to Income Ratio, ROE=Return on Equity, ROA =Return on Asset, CAR= Capital Adequacy Ratio, SIZE= Bank's Size, PLS= Profit and Loss Sharing, REG= Regulation dummy, PBTZ= Profit before Tax and Zakat GDP= Log of Gross Domestic Product, INF= Log of Inflation (GDP Deflator %), MS=Log of Money Supply (% GDP).

4.1.2 External and Macro-Economic Variables

The study used REG dummy variable to represents regulation of the Islamic banks. While number 1 was used to represent countries where full-fledged Islamic banking are being practiced, 0 (zero) represents countries with dual banking system. Only two of the ten

countries sampled- Sudan and Iran have full-fledged Islamic banking for their entire financial transactions.

For the macroeconomic variables, figures 3.942, 0.867 and -0.188 represent the natural logarithm of GDP, inflation and money supply respectively. Their standard deviations are less than 1. The wide variation in these macro-economic variables among the countries sampled has been reduced with the use logarithm.

4.2 Correlation Analysis

Correlation analysis measures the strength and direction of relationship between two variables. The measurement ranges between -1 and +1. A -1 correlation indicates perfect negative relationship while +1 connotes perfect positive relationship. A perfect correlation also suggests that one variable can be determined perfectly by knowing the other. That means when one variable increases or decreases, the other also does in the same direction. When the correlation is zero, it indicates there is no relationship between the two variables

While Anam, *et al.* (2012) reported that if correlation is above 0.705, it suggests that multicollinearity is present, Cohen (1988) suggested the guidelines on interpretation of correlation thus:

Small r = 0.10 to 0.29

Medium r = 0.30 to 0.49

Large r = 0.50 to 1.0

Table 4.2 below displays the correlation that exist among the variables of the study. Major correlations have been highlighted. The highest positive correlation of 0.8077 is between liquidity risk (LQ) and deployment ratio (DR). This large correlation suggests that both LQ and DR may be measuring the same thing. Thus, a more popular measurement of cost efficiency (CIR) was also included.

The figure also shows the significant correlation between two variables at 5% with asterisk (*). The liquidity risk (LQ) has positive and significant correlation with DR, SIZE, PBTZ, GDP and MS while the correlation with CIR, ROE, CAR, REG and INF are negative. Only one of the correlation is above 0.7. This suggests no presence of multicollinearity.

	LQ	DR	CIR	ROE	CAR	SIZE	PBTZ	PLS	REG	GDP	INF	MS
LQ	1											
DR	0.8077*	1										
CIR	-0.0238	-0.0309	1									
ROE	-0.0361	-0.0685	-0.2939*	1								
CAR	-0.4321*	-0.3030*	0.2225*	-0.2248*	1							
SIZE	0.1874*	0.1019*	-0.2205*	0.1834*	-0.5948	1						
PBTZ	0.0823*	0.0269	-0.0513	0.4401*	-0.2875	0.5546*	1					
PLS	0.0007	-0.0393	-0.0914*	0.0772	0.0558	0.0704	0.0889*	1				
REG	-0.0613	-0.0325	-0.0393	0.1874*	-0.189	0.3670*	0.4737*	0.2753*	1			
GDP	0.1048*	0.1445*	0.0980*	-0.1839*	0.0594	-0.2263*	-0.2433*	-0.2669*	-0.3484*	1		
INF	-0.0085	-0.012	-0.1218*	0.1494*	0.047	0.0493	0.1534*	0.1248*	0.3016*	-0.2031*	1	
MS	0.1031*	0.0877*	0.0706	-0.1504*	-0.0375	-0.2769*	-0.4194*	-0.3069*	-0.5861*	0.6081*	-0.2592*	1

Table 4.2:
Correlation Analysis

Note: CIR=Cost income ratio, DR= Deployment Ratio, ROE=Return on Equity, CAR= Capital Adequacy Ratio, SIZE= Bank's Size, PLS= Profit and Loss Sharing, REG= Regulation dummy, PBTZ= Profit before Tax and Zakat, GDP=Gross Domestic Product, INF= Inflation, MS= Money Supply. The asterisks (*) show significance at 5%

4.3 Diagnostic Tests Results

Four tests were conducted to ascertain the normality of the data and that the data is free from multicollinearity, heteroscedasticity and autocorrelation.

4.3.1 Normality Test

The normality test using *xtsktest* command (shown in Appendix 2) shows that the two error components *e* and *u* are negatively skewed with observed coefficient but positive with a bootstrap. The joint test rejects the normality of *e* but failed to reject normal distribution of *u* which relates to the banks components. Generally, non-normality is not a big concern but it only affects the inference.

4.3.2 Variance Inflation Factor (VIF)

The first diagnostic test conducted was Variance Inflation Factor (VIF).

Table 4.3 below shows that the average vif is 2.12. This again indicates that there is no multicollinearity in the variables of the study.

Table 4.3:
Variance Inflation Factor

Variable	***VIF***	***1/VIF***
MS	3.23	0.309873
CAR	3.1	0.322202
PBTZ	3	0.333135
SIZE	2.97	0.337028
GDP	2.28	0.438231
REG	2.12	0.471094
ROE	1.62	0.615841
CIR	1.62	0.616583
DR	1.3	0.76661
PLS	1.25	0.79908
INF	1.24	0.807937
Mean VIF	2.12	

4.3.3 Wald Test for Heteroscedasticity

Modified Wald test for group wise heteroscedasticity (xttest3) in fixed effect regression model was conducted. The result shows X^2 value of 9647.83 and probability X^2 value of 0.0000. This indicates the presence of heteroscedasticity among the variables.

4.3.4 Autocorrelation Test

Wooldridge test for autocorrelation in panel data (*xtserial*) was also carried out. The result shows F (1, 27) = 1.919 and Prob > F = 0.0018. This suggests there is autocorrelation of the variables.

To solve both heteroscedasticity and autocorrelation, an *xtgls* was conducted. The *xtgls* is a *stata* command for Feasible Generalized Least Square (FGLS) estimator. This command is used for estimation when there is autocorrelation and heteroscedasticity across panels. The result which is included in appendix 4 as model 5, still shows the presence of autocorrelation and heteroscedasticity. Thus, a more robust and dynamic technique to correct these problems is Generalized Methods of Moment (GMM).

4.4 Panel Regression Analysis

Prior to conducting panel data regression, two test were carried out to confirm the suitable model to employ. The first test carried out was Breusch and Pagan Lagrangian multiplier test for random effects. This was to confirm which of Ordinary Least Square (OLS) and

Random Effect Model (REM) is suitable. The result shows probability value of 0.000. This suggests that OLS is not suitable for the analysis. Rather, the preferred model is REM.

The second test conducted was Hausman test in order to ascertain whether Fixed Effect Model (FEM) or REM is the appropriate model. The result also gave a probability value of 0.0024. This indicates that FEM is the appropriate model.

In Appendix 4, the regression analysis using Liquidity Risk (LQ) as dependent variable is shown. It depicts the full panel data regression analysis including Ordinary Least Square (OLS), Two Stage Least Square (TSLS), Random Effect Model (REM) and Fixed Effect Model (FEM). It will be observed that both OLS and TSLS generated the same result. The *xtgls* command was also used to fit the panel data by using Feasible Generalized Least Square (FGLS). The command is used to allow for estimation in the presence of autocorrelation and heteroscedasticity.

Subsequently, the two tests conducted still show the presence of autocorrelation and heteroscedasticity. This justifies the need for a more robust technique of Generalized Methods of Moments (GMM) to correct these problems.

4.5 Generalized Methods of Moments (GMM) Analysis

Due to the problem of endogeneity which arises from the causal relationship between dependent and independent variables, the present study used GMM as a further test of the consistency and robustness of the traditional panel estimates of OLS, REM and FEM.

The result of the GMM estimation is shown in Table 4.4. The Table shows the result of two-step (system) GMM. The result gives the number of instrumental variables to be 72 as against number of groups (banks) of 77. This indicates that instruments are exogenous together. The lag of independent variable LQ is also significant. Thus, it satisfies the condition of a dynamic variable which depends on its past record. Similarly, the probabilities of Arellano & Bond test AR1 and AR (2) are greater than 5 percent for the System GMM, it shows there is no autocorrelation. This shows the consistency of GMM and a good specification of instruments without heteroscedasticity and autocorrelation problems.

4.5.1 Banks' Specific Variables

The study tested a total of eleven variables including REG and three macro-economic variables. All the variables show significant effects on liquidity risk at 5 percent significant level. Only two of the banks' specific variables, namely ROE and CAR are negative, the remaining seven are positive.

First, the result indicates that for cost-income ratio (CIR), a unit increase in it will increase liquidity risk by 3%. CIR as a measure of cost efficiency has been used by various authors (Tripe (1988); Hess & Francis (2004); Burger & Moormann (2008); Vodova (2013); Mehmed (2014) and Mathuva, (2009)). However, to the best knowledge of the researcher, this is the first time it is being used as a determinant of liquidity risk. The positive significant effect conforms to the expectation that liquidity risk is a key cost element of all banks including Islamic banks.

Another cost efficiency measurement tested in this study is Development Ratio. The result suggests a significant positive relationship between DR and LQ. This means a unit increase in DR will also increase liquidity risk by 0.799. This is highest effect of the variables on LQ. Thus, an increase in investment in relation to customers' fund will increase liquidity risk exposure of the banks. This gives empirical support to the Islamic dictum: *Al-Ghunm bil Ghurm* which links gains from investment to risk taking. It is important to reiterate that Deployment Ratio (DR) to the best knowledge of the researcher is being tested as a determinant of liquidity risk for the first time. It was previously used only as a cost efficiency measurement by Khan (2004); Shodhganga (2016); Chakraborty, et al. 2015 and Ongore and Kusa, 2013.

Previous studies on relationship between liquidity risk and ROE have indicated conflicting results. While Muharam & Kurna (2013) and Mehmed (2014) reported negative relationship in their studies, Siaw, 2013, Anam, *et al.* 2012 on the other hand indicated a positive association. The result of the present study indicates negative and significant relationship. Thus, it tends to support the result of Muharam and Kurna (2013) and Mehmed (2014). The implication of this is that as liquidity risk in banks increases, the return available to shareholders is reduced.

The model also suggests there is a statistically significant negative correlation between CAR and LQ. The result shows that a one-unit increase in CAR will reduce liquidity risk by 0.114. This means that a more capitalized Islamic will be less exposed to liquidity risk. This is in line with the position held by Moussa (2015), Jedidia & Hamzah (2015) and

Muharam and Kurna (2013). However, it defers from the result submitted by Vodova, 2013 which suggested a positive relationship.

Bank's size measured in terms of total assets depicts a statistically significant positive relationship with liquidity risk. The result indicates that a one-unit increase in SIZE will also increase the liquidity risk by 0.0177. This suggests that when the bank grows in terms of assets, it increases its investments which can expose it to higher liquidity risk. The result is supported by similar result submitted by Siaw, 2013; Anam, *et al.* (2012); Sabri, (2014); Ramzan and Zafar (2014). However, it is contrary to 'too big to fail' hypothesis which suggests that big banks are less exposed to liquidity risk (Kaufman, 2013). This hypothesis suggests a negative relationship. This negative relationship was also the position held by Sabri, (2014); Ramzan and Zafar (2014); Sulaiman et al (2013), Vodova, 2013 and Bonfirm & Kim (2012).

Furthermore, profitability measured by Profit before Tax and Zakat (PBTZ) shows a significant positive relationship with liquidity risk. This implies that when banks achieve higher profit, more fund is available for investment which then expose the banks to higher liquidity risk. Previous studies (Ahmed, *et al.* 2011; Ariffin, 2012, Anam, *et al.* 2012, Fayed, 2013; Sulaiman, *et al.* 2013, Jawadi, Jawadi, & Louhichi (2014) have mostly used ROA and ROE as measurement of profitability. The results of these studies are varied. The present study used the log of profit before tax and zakat (PBTZ) to measure profitability. This is like what Vodova, 2013 and Ahmed, *et al.* 2011 used in their studies. However, while the significant positive relationship of the present study agrees with that of Vodova, 2013; it is not in support of Ahmed, *et al.* 2011 who reported an insignificant relationship.

The Profit and Loss Sharing (PLS) is positively related to liquidity risk at 1 percent significant level. The result indicates that a one-unit increase in PLS will equally increase the liquidity risk by 0.8 percent. This perhaps explains why most of Islamic banks do not get involved with *Musharakah* and *Mudarabah* which are the two types of Islamic banks products on PLS. As earlier stated by Jedidia and Hamza (2014), Islamic banks reliance on short-term deposit to finance long term assets in PLS exposes them to higher liquidity risk.

Regulation (REG) which is a dummy to represent the regulatory environment under which Islamic banks operate also indicates a statistically significant positive relationship with liquidity risk. The coefficient of 0.116 shows that the liquidity risk of fully Islamic banks is more by 12 percent. A possible explanation on this is the higher usage of Profit and Loss Sharing (PLS) in full-fledged Islamic countries. For instance Sudan legislated on *Mudarabah* as against *Murabahah* in order to increase the percentage of the former. This result suggests that both banks operating under a full Islamic banking regulation or a dual system will be influenced by liquidity risk. Therefore, it implies that both types of banks need to adhere to banking regulations.

Table 4.4:
GMM Result Dependent Variable: Liquidity Risk (LQ)

VARIABLES	GMM two step
L.LQ	-0.0166***
	(0.000512)
CIR	0.0302***
	(0.00366)
ROE	-0.0259***
	(0.00211)
CAR	-0.114***
	(0.00341)
DR	0.799***
	(0.00203)
SIZE	0.0177***
	(0.000649)
PBTZ	0.00819***
	(0.000660)
PLS	0.00791***
	(0.00232)
REG	0.116***
	(0.00255)
GDP	0.0449***
	(0.00451)
INF	0.00391***
	(0.000583)
MS	0.0174***
	(0.00287)
Constant	0.608***
	(0.0292)
Observations	416
Number of Bank	77
Number of Instrument	72
Sargan test	59.77
P-value of Sargan test	0.3753
Arrellano & Bond test AR (1)	
P- value AR (1)	0.1151
Arrellano & Bond test AR (2)	
P- value AR (2)	0.5817

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: L.LQ=Lag of LQ (Liquidity Risk), CIR=Cost income ratio, DR= Deployment Ratio, ROE=Return on Equity, CAR= Capital Adequacy Ratio, SIZE= Bank's Size, PLS= Profit and Loss Sharing, REG= Regulation dummy, PBTZ= Profit before Tax and Zakat, GDP=Gross Domestic Product, INF= Inflation, MS= Money Supply.

4.5.2 Macroeconomic Variables

The Gross Domestic Product (GDP) shows a statistically positive significant effect on liquidity risk. With a coefficient of 0.0449, it indicates that one percent increase or decrease in GDP will lead to 0.04 percent increase or decrease in liquidity risk of Islamic banks. The implication of this is that as income increases, the banks also have more access to liquidity which increases the transactions of the banks and does expose them to greater liquidity risk. Previous studies have used GDP as one of the macroeconomic variables determining liquidity risk. The results of these studies suggest conflicting conclusion. While Mehmed, (2014) supported both positive and negative effects depending on the definition of liquidity risk ratio employed, Vodova, (2013) reported ambiguous result. Yet, Sabri, (2014) reported positive but insignificant effect.

The result of the present study also indicates a statistically positive significant effect of inflation (INF) on liquidity risk. With a coefficient of 0.00391, it means that when consumer price index increases by 1 percent, it will result in 0.4 percent increase in liquidity risk. This implies that during inflation, there is an increase in economic activities. This leads to higher investment demand by banks' customers with consequent exposure to higher liquidity risk. The result of this study is supported by Siaw, 2013; Singh and Sharma, (2016) and Tseganesh, (2012). However, the result contradicts those reported by Vodova, (2011); Bhati, *et al.* (2015), Moussa, (2015).

With respect to MS, few studies have reported its relationship with liquidity. For instance, Chung, Ariff and Shamsher (2012) and Chung and Ariff (2016) stated that MS is positively related to banking liquidity. They submitted that MS has impact on higher banking

liquidity. The present study suggests that if money supply (MS) increases by one unit, it will lead to liquidity risk by 0.2 percent. Just like inflation, an increase in money supply (MS) create more opportunities for investment and thus exposes banks higher liquidity risk. The significance of macro-economic variables suggests that stable economic policies influence liquidity risk and hence the sustainability of Islamic banks.

4.6 Test of Mediating Variables

Here, the results of mediation tests using Baron and Kenny (BK), Sobel and Bootstrapping approaches are reported.

Table 4.5 below shows the result of BK approach using PLS as mediator. It indicates that b coefficient with a p-value of 0.985 is not significant. This suggests that PLS does not significantly mediates the relationship between liquidity risk (LQ) and cost efficiency (CIR)

Table 4.5:
BK Approach with PLS as Mediator

	Coefficient	*Standard Error*	*t*	*P>/t/*
'a coefficient'	-0.0010	0.0498	-0.02	0.985
'b coefficient'	-0.1388	0.0576	-2.41	0.016
Direct effect(c')	-0.0463	0.0744	-0.62	0.534
Total effect(c)	1.7754	0.1362	13.03	0.000

Similarly, Table 4.6 below presents the Sobel test for PLS as a mediator. It also shows that with a p- value of 0.9847, PLS does not significantly mediates the relationship between liquidity risk (LQ) and cost efficiency (CIR). The proportion of total effect that is mediated is only -.0029 or -0.3 percent

Table 4.6:
Sobel-Goodman Mediation Tests- Model 2: PLS as Mediator

	Coefficient	Standard Error	z	P>/z/
Sobel	0.00013	0.0069	0.0192	0.9847
Goodman-1 (Aroian)	0.00013	0.0075	0.0177	0.9859
Goodman-2	0.00013	0.0063	0.0211	0.9832
a coefficient	-0.0010	0.4981	-0.0191	0.9847
b coefficient	-0.1388	0.0576	-2.4108	0.0159
Indirect effect	0.0001	0.0069	0.0192	0.9847
Direct effect	-0.0463	0.0744	-0.6222	0.5337
Total effect	-0.0462	0.0747	-0.6182	0.5364

Proportion of total effect that is mediated: -.0029
Ratio of indirect to direct effect: -.0029
Ratio of total to direct effect: 0.9971

Lastly, Table 4.7 presents the summary of bootstrapping approach using PLS as mediator. The Table indicates that the confidence intervals of the mediator (PLS) ranges between -**0.0072 and 0.0053.** This suggests that there is zero in the range. Thus, there is no mediation in the relationship using the three approaches.

Table 4.7:
Summary Bootstrapping Approach with PLS as Mediator

	Lower	Upper
Total	0.0693	0.2469
PLS	-0.0072	0.0053

Level of Confidence for Confidence Interval 95
Number of Bootstrap Resamples 1000

Next, result of the mediating effect of PBTZ on the relationship between LQ and CIR using the three approaches is represented.

Table 4.8 shows the BK approach using PBTZ as mediator. With a p-value of 0.0005 for the b coefficient, it suggests that there is statistical significant effect when PBTZ is included in the relationship between LQ and CIR. In compliance with BK approach, the direct effect c' is also significant with a p-value of 0.000. This signifies PBTZ is a mediator.

Table 4.8:
BK Approach with PBTZ as Mediator

	Coefficient	*Standard Error*	*T*	*P>/t/*
'a coefficient'	-0.4231	0.0727	-5.82	0.0000
'b coefficient'	-0.3482	0.0378	-9.21	0.0000
Direct effect(c')	-0.2385	0.0632	-3.77	0.0000
Total effect(c)	2.113	0.1187	17.81	0.000

Similarly, Table 4.9 presents the Sobel approach on the mediating effect of PBTZ. With a z-score of 4.92 and p- value of 0.00, it shows the statistical significance of indirect effect. Thus, it also established the mediating effect of PBTZ. The proportion of total effect that is mediated is put at 162 percent

Table 4.9:
Sobel-Goodman Mediation Tests- Model 2: PBTZ as Mediator

	Coefficient	Standard Error	Z	P>/z/
Sobel	0.1473	0.0299	4.92	0.0000
Goodman-1 (Aroian)	0.1473	0.0301	4.9	0.0000
Goodman-2	0.1473	0.0298	4.94	0.0000
a coefficient	-0.4231	0.0727	-5.8196	5.9e-09
b coefficient	-0.3482	0.0378	-9.2122	0000
Indirect effect	0.1473	0.0299	4.9201	0000
Direct effect	-0.2385	0.0632	-3.7738	0.0002
Total effect	-0.0912	0.0661	-1.3789	0.1679

Proportion of total effect that is mediated: -1.6160
Ratio of indirect to direct effect: -0.6177
Ratio of total to direct effect: 0.3823

Finally, Table 4.10 also confirms the mediating effect of PBTZ using bootstrapping approach. It shows confidence intervals of **0.0687** and **0.2468** for lower and upper limits respectively. The intervals do not include zero and thus establish the mediating effect.

Table 4.10:
Summary Bootstrapping Approach with PBTZ as Mediator

	Lower	Upper
Total	0.0693	0.2469
PBTZ	0.0687	0.2469

Level of Confidence for Confidence Interval 95
Number of Bootstrap Resamples 1000

The implication of these mediating tests is that all the tests tend to lead to the same result. The result also suggests that although profit and loss sharing (PLS) affects liquidity risk due to its long-term investment nature, the contract does not have affect the cost efficiency of Islamic bank. This is attributable to the sharing of risk. The mediating effect of profitability (PBTZ) implies that both liquidity risk and cost efficiency have causal relationship with profitability. In order to achieve a desired profitability, an acceptable level of liquidity risk and cost efficiency should be attained.

4.7 Hypotheses Testing

Thirteen hypotheses were developed in chapter three. Based on the results of above estimations, the following summarizes decision on the hypotheses

Table 4.11:
Summary of Hypotheses Testing

Hypotheses	Statement	Result	Decision
H_{A1}	***There is a significant positive relationship between the cost income ratio (CIR) and liquidity risk of Islamic banks.***	Significant and positive	Supported
H_{A2}	***There is a significant positive relationship between the deployment ratio (DR) and liquidity risk of Islamic banks.***	Significant and positive	Supported
H_{A3}	***There is a significant negative relationship between ROE and liquidity risk of Islamic banks.***	Significant and Negative	Supported
H_{A4}	***There is a significant negative relationship between CAR and liquidity risk of Islamic banks.***	Significant and negative	Supported
H_{A5}	***There is a positive relationship between the SIZE and liquidity risk of Islamic banks.***	Significant and positive	Supported
H_{A6}	***There is a significant positive relationship between profitability (PBTZ) and liquidity risk of Islamic bank.***	Positive and significant	Supported
H_{A7}	***There is a significant positive relationship between PLS and liquidity risk in Islamic banks.***	Significant and positive	Supported
H_{A8}	***There is an impact of regulation on the liquidity risk of Islamic banks.***	Significant and positive	Supported
H_{A9}	***There is a significant positive relationship between inflation and liquidity risk in Islamic banks.***	Significant and positive	Supported
H_{A10}	***There is a significant positive relationship between GDP and liquidity risk in Islamic banks.***	Significant and positive	Supported
H_{A11}	***There is a significant positive relationship between MS and liquidity risk in Islamic banks.***	Positive and significant	Supported
H_{A12}	***The PLS have mediating effect on liquidity risk and efficiency of Islamic banks.***	No Mediation	Not supported
H_{A13}	***The PBTZ have mediating effect on liquidity risk and efficiency of Islamic banks.***	Mediation	Supported

4.8 Conclusion

This chapter has discussed the result of the study. The discussion included the descriptive statistics of the variables and their correlation. Diagnostic tests were also carried out on the normality, multicollinearity, heteroscedasticity and autocorrelation of the variables. The study explored different techniques including ordinary least square (OLS), two stage least square (TSLS), random effect (RE), fixed effects (FE) and Feasible Generalized Least Square (FGLS) aimed at resolving the heteroscedasticity and autocorrelation effects. The use of Generalized Methods of Moment (GMM) finally resolved the problems.

The result of the regression analyses supported eleven of the thirteen hypotheses tested. The mediating effect of PLS on liquidity risk and cost efficiency of Islamic banks was not supported. However, the mediating effect of profitability (PBTZ) was established using three approaches of mediation tests of Baron and Kenny (BK), Sobel and Bootstrapping.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.1 Introduction

Liquidity risk in banks is now a major issue following the 2008 Global Financial Crisis (GFC) and 2014 oil price fall. Islamic banks are also facing cost efficiency issues that affects their profitability. The focus of this study is on liquidity and cost efficiency of Islamic banks in OIC member countries which contribute over ninety percent of global Islamic banking activities.

The focus of Basel 111 on liquidity risk management attest to the fact that prior to the crisis, attention has been on other risks to the near neglect of liquidity risk. Although, Islamic banks were not affected by the liquidity crunch due to the nature of its system that prohibits speculation and rely on asset based transactions. Yet, the absence of Shari'ah-compliant liquidity instruments in most of the countries where Islamic banks operate accentuate the downward trend on liquidity.

This chapter summarizes the result of the entire study. It presents the summary of major findings and contributions of the study. It also identifies its contributions, managerial and policy implications as well as limitations. Lastly, it makes recommendation for future research.

5.2 Summary of Major Findings

The main objective of this study to examine key bank specific determinants as well as macro-economic variables affecting the liquidity risk of Islamic banks have been achieved. While it has not established the mediating effects of PLS contract, it confirms that profitability does mediates between the liquidity and cost efficiency of the banks.

5.2.1 Objective 1: Banks specific factors affecting liquidity risk

The analysis of liquidity determinants also depicts vital information. Despite the uniqueness in the trend of the key financial indicators among the countries, the determinants did not show major differences as the standard deviations were mostly less than one. This signifies that the values of the determinants were around their respective means.

The Cost Income Ratio (CIR) and Deployment Ratio (DR) which were used as proxies for cost efficiency have significant positive effect on the liquidity risk of the banks. The significance of the ratios was confirmed by both the panel data analysis technique and Generalized Methods of Moments (GMM). This means that an increase in investment in relation to customers' fund will increase liquidity risk exposure of the banks. In other words, the higher the liquidity risk exposure of the banks, the higher is the cost implication.

Similarly, the result of the analysis also shows that capital adequacy ratio (CAR) negatively affect liquidity risk. This means that Islamic banks with higher CAR tend to be less exposed to liquidity risk. Also, bank's size measured by total assets indicates a significant positive effect on liquidity risk. This implies that as the banks increase their asset base, they tend to

increase their investment and hence exposed to higher liquidity risk. This seems to contradict the theory of 'too big to fail' which suggests that big banks are less exposed to liquidity risk.

This study also used two variables to measure profitability. These are ROE and PBTZ. While ROE suggests a negative relationship of profitability to liquidity risk, PBTZ indicate positive relationship. The positive relationship of PBTZ suggests that as profit increases, bank managers tend to take more risk in attempt to earn more returns. The negative relationship of ROE on the other hand suggests that as banks engage in more liquidity risk investments, the amount available as returns to investors is reduced.

Furthermore, the study also indicates that Profit and Loss Sharing (PLS) has a significant positive effect on liquidity risk. This means that where the Islamic banks engage in PLS financing, they are more exposed to higher liquidity risk. This perhaps explains why the proportion of PLS financing is just 15 percent on average across the banks in OIC countries.

5.2.2 Objective 2: Effect of Macro-economic variables on Liquidity Risk

Three macro-economic variables were tested for their relationship with liquidity risk in this study. These variables – Gross Domestic Products (GDP) and Inflation (INF) and Money Supply (MS) display significantly positive effects on liquidity risk. These results signify that in the first instance, when the income of a country increases, the banks have more access to funds through deposits. This will in turn provide opportunities for more investments and thus expose the banks to higher liquidity risk. In the second instance, as consumer price index (inflation) increases, the liquidity risk of the banks will also increase.

The same explanation holds for money supply (MS). That is, an increased money supply in the economy provides opportunity for more investments by banks which consequently increased their exposure to higher liquidity risk.

5.2.3 Objective 3: Effect of different banking systems on Liquidity Risk

The study further establishes that regulation of Islamic banks in terms of either being under dual or full-fledged Islamic banking system has a significantly positive impact on their exposure to liquidity risk. This points out that Islamic banks operating under dual banking system requires a separate regulation such as Islamic Liquidity Framework and Islamic Capital Market that are available in Malaysia. Such regulatory body will focus mainly based on Islamic banking system.

5.2.4 Objective 4: Effects of Cost Efficiency on Liquidity Risk

The study also tested the effects of cost efficiency proxied by cost income ratio (CIR) and deployment ratio (DR) on liquidity risk. The result shows that these variables have significant positive effects on liquidity risk. The results of mediating variables also suggest that liquidity risk (LQ) has significant effects on cost efficiency. This means that liquidity risk is an important element of the cost structure of Islamic banks.

5.2.5 Objective 5: Mediating effects of PLS and Profitability on Liquidity Risk

Finally, the study also provides empirical evidence on non-mediating effect of PLS on the relationship between liquidity risk and cost efficiency. This means that although PLS has a significant effect on liquidity risk, it does not affect the cost efficiency of the banks. Thus, it does not mediate between liquidity risk and cost efficiency. It also means that if Islamic

banks decide to use PLS especially in their assets side, it will not have effect on their cost efficiency. This is possible if the PLS is being financed by equally long-term borrowing or equity finance. Hence, adopting PLS which may lead to higher liquidity risk because it involves long-term investment, it does not have negative effect on cost efficiency. This can be attributable to the risk sharing nature of the investment.

However, the result of this study offers proof of mediating impact of profitability proxy by PBTZ on the relationship between liquidity risk and cost efficiency. This implies that profitability has effect on both liquidity and cost efficiency. This means that an Islamic bank can be more profitable by being exposed to higher liquidity risk which may also leads to a better cost efficiency based on the management of the risk.

With an R-squared of 87 percent, the study provides evidence that the determinants studied explain large percentage of liquidity risks in Islamic banks. Such determinants like Cost Income Ratio (CIR), Deployment Ratio (DR), Profit and Loss Sharing (PLS) and Profitability (PBTZ) are new variables which have not been measured previously as determinants of liquidity risk.

Table 5.1:
Summary of Objectives and Result

Hypotheses	Research Objectives	Methodology	Result	Findings/Implications
HA1-HA7	To determine banks specific factors affecting liquidity risk among Islamic banks.	Panel data analysis Generalized Methods of Moments (GMM)	All bank specific variables have significant effects on liquidity risk	The higher the liquidity risk exposure of Islamic banks, the higher is the cost implication. An increase in asset base of the banks also exposes them to higher liquidity risk. As the banks are exposed to higher liquidity risk, the profit is higher but less return to shareholders due to higher investment drive.
H_{A8}	To examine the effect of different banking systems (dual or fully Islamic banking) on the liquidity risk of Islamic banks.	Using dummy variables of 1 and 0 for fully Islamic and dual banking respectively in panel data and GMM.	Significant result indicating the effect of banking system on liquidity risk of Islamic banks.	Higher exposure of Islamic banks under fully Islamic banking regulations requires separate regulation to address limited Shariah compliant liquidity instruments
$H_{A9} - H_{A11}$	To investigate the external (macro) factors that affect liquidity risk in Islamic banks.	Panel data analysis Generalized Methods of Moments (GMM).	GDP, Money Supply (MS) and Inflation significantly affect liquidity risk.	Liquidity risk respond to macroeconomic conditions of a country. This implies that instability in economy such as financial shocks, oil price slump affect liquidity of banks.
H_{A12}-H_{A13}	To assess the effect of liquidity risk on the cost efficiency of Islamic banks in selected OIC countries	Baron and Kenny (BK), Sobel and Bootstrapping approaches.	All approaches suggest significant direct effect.	Liquidity risk is an important element of the cost structure of Islamic banks.
H_{A12}-H_{A13}	To investigate mediating effects of PLS and PBTZ on the relationship between liquidity risk and cost efficiency of Islamic banks in selected OIC countries	Baron and Kenny (BK), Sobel and Bootstrapping approaches.	PBTZ mediates the relationship. PLS does not.	Even though PLS affect liquidity risk of Islamic bank, it does not have impact on the cost structure of the banks. This implies that the cost of risk in PLS is being shared.

5.3 Contribution of the Study

The present research has made unique empirical, theoretical, methodological and practical contributions to the study of liquidity risk and efficiency of Islamic banks.

Empirically, the study of bank specific and macro-economic variables provides for over 80% of the determinants of liquidity risk in Islamic banks. Such variables as deployment ratio (DR), cost income ratio (CIR), profit and loss sharing (PLS) contract and profitability (PBTZ) provides clear picture of factors that affect liquidity risk of Islamic banks. The effect of PLS particularly explains reasons why most Islamic banks do not adopt the contract. Preliminary analysis of the study also supports the findings of previous researches that there exits mismatch between assets and liabilities of the Islamic banks. It shows that over 70 percent of Islamic banks' assets which are long terms are being financed by over 85 percent of their liabilities that are short term.

Theoretically, the study provides evidence of the significance and relevance of cost efficiency to liquidity risk through the statistically positive significant effect of CIR and DR. This means that for Islamic banks to effectively manage its cost, it must address the issue of liquidity risk. Liquidity risk remains a key cost element in Islamic banks' profile.

The study also provide an integration of the theory of intermediation and Islamic (Participation) theory through the inclusion of profit and loss sharing (PLS) contract in liquidity risk variables.

Furthermore, while the research could not establish mediating effect of PLS on the relationship between liquidity risk and cost efficiency, it does make available supporting

evidence of profitability (PBTZ) as a mediator in the relationship. This means that although PLS affects liquidity risk because of its long-term nature, it does not affect the cost efficiency of Islamic banks. The liquidity risk of Islamic banks in OIC countries will be better managed if every long term investment in PLS contract is attached to long term savings. Also, the mediation of PBTZ provides a link between liquidity risk, cost efficiency and profitability. An appropriate management of these three variables will remove the misconception attached to Islamic banks as being profit efficient but cost inefficient.

In terms of methodology, the study provides evidence of advancement of generalized methods of moment (GMM) over simple panel data techniques in addressing problems of endogeneity, heteroscedasticity and autocorrelation that are often associated with banks' data. While panel data techniques could not address these problems, GMM was able to solve them.

5.4 Implications and Recommendation of the Study

Based on the above results and contributions, there are managerial and policy implications as well as recommendation of the study. The study is coming at a time when the attention of global finance is geared towards liquidity risk management. In terms of managerial implication, the phased implementation of Liquidity Coverage Ratio (LCR) of Basel III which requires minimum of 80 percent LCR by 2017, and 100 percent by 2019, makes it imperative for Islamic banks' managers and supervisory authorities to focus attention on meeting this global financial liquidity requirement. The declining growth rates of key financial indicators in recent years demand urgent actions.

Secondly, it is also important that an efficient Asset and Liability Management (ALM) is put in place to reduce risk and achieve an acceptable balance between profitability, risk and efficiency. This is in view of the imbalance between the structure of assets and liabilities of the Islamic banks. This is also reflected in the high level of liquidity risk recorded across the Islamic banks. In an environment that is competitive and deregulated, successful banking requires that assets match liabilities with respect to maturity and risk. This will ensure an optimum return on investment.

Thirdly, the mediating effect of Profitability (PBTZ) on liquidity risk and cost efficiency also suggest that managers of Islamic banks should fashion out strategies that will ensure a balance between risk taking and cost efficiency to provide adequate return to stakeholders.

Fourthly, with respect to liquidity risk determinants, an efficient management of the factors identified in this study will assist Islamic banks' managers and other stakeholders in addressing the downward trend of liquidity profile of the banks.

Fifthly, one of the key features of Islamic banking is Profit and Loss Sharing (PLS) paradigm. However, this study confirms the low proportion of PLS to the total Islamic Modes of Finance (IMF). Hence there is a need for policy adjustment to accentuate the benefit of PLS in Islamic banking. To achieve this successfully, a separate investment deposit account with long term structure should be created for PLS financing.

In terms of policy implication, first, the Central Banks could likewise implement a policy on contingency funding plan (CFP) for Islamic banks that obviously sets out the ways to

address liquidity shortages in crisis circumstances. A CFP is a liquidity crisis management instrument to provide framework and strategies to deal with stress situations, set up clear lines of duty, incorporate clear summon and heightening systems and be routinely tried and upgraded to guarantee that it is operationally powerful.

Secondly, the study has also provided an evidence that liquidity risk profile of Islamic banks is unique and different from conventional bank settings. Thus, management of the risk should be treated differently from the conventional practice. In view of this and to fashion out an appropriate liquidity risk management practice, Islamic banks requires a separate supervisory and regulatory authority.

The reality now is that Islamic banks should co-exist with conventional banks in most of the countries under dual banking system. Whether Islamic bank windows or subsidiaries of a conventional bank or fully Islamic banks, a separate Islamic banks regulatory body under the central banks of the respective countries can enforce a truly Islamic banking practices. The Islamic bank widows and subsidiaries will then not be a facade or front in which main functions are conducted in conventional practice.

Thirdly, to effectively manage liquidity in Islamic banks, countries where the banks operate should also set up Liquidity Framework as introduced in Malaysia in 1998. This will create awareness and cooperation among the Islamic banks and assist them to handle short and medium-term liquidity issues. This will provide a better assessment of the present and future liquidity position of Islamic banks and make available a more efficient and uninterrupted efficient liquidity measurement and management. This is also like Liquidity

Management Centre (LMC) introduced in Bahrain in 2002. The LMC was meant to sell Shari'ah-compliant securities which Islamic banks can hold as liquid assets.

Fourthly, government and regulatory authorities should legislate a benchmark for percentage of PLS in total Islamic Modes of Finance. This was successfully done in Sudan to increase the proportion of *Mudarabah* and consequently reduced that of *Murabahah*. A promotion of PLS by Islamic banks will encourage more customers who are opposed to interest based conventional banks. It will also promote small scale entrepreneurship who lack collateral usually imposed by conventional banks. However, even though PLS is encouraged in Islamic banking, its success will also depend on long term financial support in terms of equity based capital.

Fifthly, the significance of macroeconomic variables (GDP, Inflation and money supply) tested in this study implies that the economic environment of countries operating Islamic banking affects the liquidity risk of the banks. Hence, the government of OIC member countries should put in place policies that will ensure economic growth. This will in turn boost the investment capacity of Islamic banks in their jurisdictions. In addition, the central banks as lenders of last resort should provide Shariah- compliant instruments that mitigate the liquidity problems of Islamic banks. It is also important to develop Islamic money market and Islamic capital market to mitigate the liquidity risk of Islamic banks.

Lastly, membership of international organizations responsible for supervision and regulations of Islamic banks should be mandatory to the banks. Such organizations like International Islamic Liquidity Management Corporation (IILM), International Islamic

Financial Markets (IIFM) and Islamic Finance Service Board (IFSB) provide support on liquidity and related matters to members.

5.5 Limitations of the Study

The contributions of this study notwithstanding, the major limitation suffered during it relate to access to data on Islamic banks. The Islamic Banks Information System (IBIS) which provided the bulk of the financial data used in this study went offline for some period before it was concluded. The data was subsequently sourced from the respective banks' web sites to supplement what was gathered from IBIS. Reconciling the different format of these sources to the requirement of the study was tedious.

In view of this, it is recommended that international Islamic financial regulatory bodies like IFSB should institute a mandatory database for all Islamic banks. Such a database will further encourage and ease research on Islamic banks. The Islamic Research and Training Institute (IRTI) that hosted IBIS should also get it back on air for continuous and easy access to data on Islamic banks.

The research is also limited to ten countries of the 57- member countries of OIC. However, the selected countries constitute over 90 percent of the entire global Islamic finance assets. The study is also limited to the period covered (2005-2016). Nonetheless, a period of eleven years is sufficient to make reasonable estimation of the pattern and growth of liquidity risk of the banks.

5.6 Extension for Future Research

The following recommendations are made in view of the limitations of the study. Future research should supplement secondary data with primary data to fully appreciate the practical applications of liquidity risk management in Islamic banks. Future research will then not be limited to identification of determinants alone. Rather, other aspects of liquidity risk management can be explored.

It is also recommended that an in-depth study of different countries operating Islamic banks should be undertaken. This is in view of variation on the pattern and growth of key financial indicators and liquidity trend of the countries.

Furthermore, future research on liquidity risk management could also be enriched with comparison with conventional banks' operations. The fact that most of the Islamic banks operate under dual banking system makes such comparative study imperative.

It is also suggested that future study should focus on the impact of the growth of Islamic bank windows and subsidiaries on the full Islamic bank operations. This is important to access the extent and effect of co-mingling of funds among the Islamic bank windows and subsidiaries of conventional banks.

Similarly, future study can also include the impact of interest rate charged by conventional banks on the liquidity risk management of Islamic banks. Prohibition of interest rates in Shariah remains what makes most of the financial instruments inaccessible to Islamic banks. This limits the banks to sources of funds that are otherwise available to conventional banks.

In view of the significance of macro-economic variables tested in this study, it is also suggested that future research should highlight the impact of economic and financial crises on liquidity risk of Islamic banks. A study on the effects of 2007/2008 Global Financial Crisis (GFC) and 2014 Oil Price Slump will highlight the significance of these events on the liquidity risk, profitability and cost efficiency of Islamic banks.

In overall, the importance of liquidity risk management in Islamic banks can no longer be ignored. The emphasis being placed on it after the last financial crisis demonstrate its significance. This study contributes to the empirical evidence of the significance of liquidity risk in Islamic banks. It has also shown the evidence of link between liquidity risk, cost efficiency and profitability. The consistency and robustness of GMM approach over panel data techniques in addressing problems of endogeneity, heteroscedasticity and autocorrelation that usually affect bank data was also established for data that meets the dynamic requirements of GMM.

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Appendix 1: List of Sampled Islamic Banks.

COUNTRY	ISLAMIC BANKS
Bahrain	ABC Islamic Bank (E.C.)
Bahrain	Al Baraka Islamic Bank B.S.C. (E.C.)
Bahrain	Bahrain Islamic Bank B.S.C. Al -Salam Bank Arcapita Bank B.S.C. Bank Alkhair Capinnova Investment Bank Capivest B.S.C. Citi Islamic Investment Bank (E.C.) Elaf Bank First Energy Bank B.S.C. First Investment Bank Global Banking Corporation B.S.C Gulf Finance House International Investment Bank Kuwait Finance House Bahrain Liquidity Management Centre B.S.C. Seera Investment Bank
Indonesia	Bank Muamalat Indonesia
Indonesia	Bank Syariah Mandiri
Iran	Bank Saderat Iran
Iran	Parsian Bank
Iran	Saman Bank Bank Keshavarzi Bank Maskan Iran Bank Mellat Bank Melli Bank of Industry and Mine Bank Refah Bank Sepah Bank Tejarat

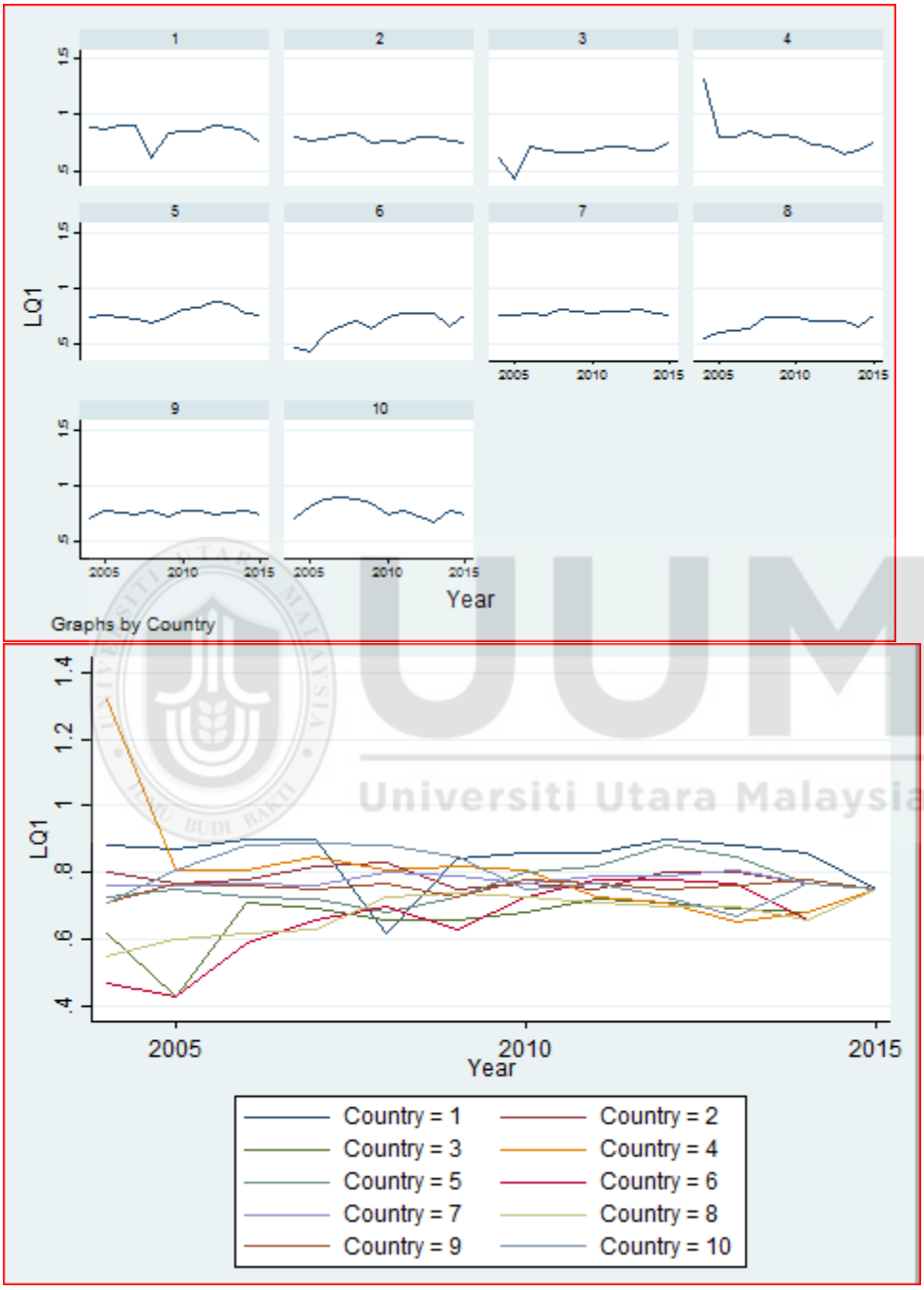
	EN Bank
	Pasargad Bank
Kuwait	Boubyan Bank
	Gulf Investment House
Kuwait	Kuwait Finance House
	Kuwait International Bank
	Kuwait Turk Participation Bank
	Warba Bank
Malaysia	Bank Islam Malaysia Berhad
Malaysia	Bank Muamalat
	Bank Rakyat
	Affin Islamic Bank Berhad
	Al Rajhi Banking & Invt. Corp.
	Alkhair International Islamic Bank
	Alliance Islamic Bank
	AmIslamic Bank Berhad
	Asian Finance Bank
	CIMB Islamic Bank Berhad
	EONCAP Islamic Bank Berhad
	Kuwait Finance House
	Maybank Islamic Berhad
	OCBC Al-Amin Bank Berhad
	Standard Chartered Saadiq Berhad
Pakistan	Al Baraka Bank (Pakistan) Limited
Pakistan	Bank Islami Pakistan Limited
	Faysal Bank (Pakistan)
	Burj Bank Limited
	Dubai Islamic Bank
	Emirates Global Islamic Bank Limited
Saudi Arabia	Al Rajhi Bank

Saudi Arabia	Bank Aljazira
Sudan	Al Salam Bank (Sudan Al Baraka Bank (Sudan)
Sudan	Al Shamal Islamic Bank Animal Resources Bank Bank of Khartoum Blue Nile Mashreq Bank Export Development Bank Financial Investment Bank Omdurman National Bank Saudi Sudanese Bank Savings and Social Development Bank Sudanese Islamic Bank Sudanese French Bank
Turkey	Albaraka Turk Participation Bank Bank Asya Kuwait Turk Participation Bank
UAE	Abu Dhabi Islamic Bank Dubai Islamic Bank Emirates Islamic Bank Sharjah Islamic Bank Ajman Bank Noor Islamic Bank

Appendix 2: Normality Test

```
. xtsktest
(running _xtsktest_calculations on estimation sample)

Bootstrap replications (50)
----+--- 1 ---+--- 2 ---+--- 3 ---+--- 4 ---+--- 5
..................................................    50

Tests for skewness and kurtosis                 Number of obs     =       478
                                                Replications      =        50

                                  (Replications based on 79 clusters in Bank)
------------------------------------------------------------------------------
             |   Observed   Bootstrap                         Normal-based
             |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  Skewness_e |  -.0002319     .00009    -2.58   0.010    -.0004083   -.0000556
  Kurtosis_e |   .0000927   .0000241     3.85   0.000     .0000455      .00014
  Skewness_u |  -.0000469   .0000696    -0.67   0.501    -.0001832    .0000895
  Kurtosis_u |   .0000418    .000017     2.45   0.014     8.43e-06    .0000752
------------------------------------------------------------------------------

Joint test for Normality on e:        chi2(2) =  21.45    Prob > chi2 = 0.0000
Joint test for Normality on u:        chi2(2) =   6.48    Prob > chi2 = 0.0392
```

Appendix 3: Liquidity Trend by Country



Appendix 4: Panel Data Results

VARIABLES	(1) OLS	(2) TSLS	(3) RE	(4) FE	(5) XTGLS
DR	0.683***	0.683***	0.722***	0.737***	0.683***
	(0.0194)	(0.0194)	(0.0186)	(0.0204)	(0.0191)
CIR	0.0186	0.0186	0.0533**	0.0735**	0.0186
	(0.0159)	(0.0159)	(0.0218)	(0.0307)	(0.0157)
ROE	-0.0525***	-0.0525***	-0.0625***	-0.0521***	-0.0525***
	(0.0134)	(0.0134)	(0.0123)	(0.0133)	(0.0132)
CAR	-0.143***	-0.143***	-0.139***	-0.132***	-0.143***
	(0.0161)	(0.0161)	(0.0159)	(0.0181)	(0.0159)
SIZE	0.00197	0.00197	0.00726**	0.00971***	0.00197
	(0.00328)	(0.00328)	(0.00285)	(0.00301)	(0.00323)
PBTZ	0.00809	0.00809	0.0121**	0.0109*	0.00809
	(0.00602)	(0.00602)	(0.00540)	(0.00582)	(0.00593)
PLS	0.0318**	0.0318**	0.0261**	0.0217*	0.0318**
	(0.0146)	(0.0146)	(0.0126)	(0.0130)	(0.0144)
REG	-0.0409***	-0.0409***	-0.0641***	-0.0957	-0.0409***
	(0.0113)	(0.0113)	(0.0190)	(0.0981)	(0.0111)
GDP	-0.00760	-0.00760	-0.00114	0.00766	-0.00760
	(0.00960)	(0.00960)	(0.0148)	(0.0260)	(0.00946)
INF	0.00154	0.00154	0.00939	0.0107	0.00154
	(0.00924)	(0.00924)	(0.00713)	(0.00724)	(0.00910)
MS	0.0114	0.0114	-0.0192	-0.0686*	0.0114
	(0.0155)	(0.0155)	(0.0243)	(0.0387)	(0.0153)
L.LQ					
Constant	1.040***	1.040***	0.806***	0.590**	1.040***
	(0.130)	(0.130)	(0.173)	(0.241)	(0.129)
Observations	477	477	477	477	477
R-squared	0.828	0.828		0.875	
Number of Bank			79	79	79

Appendix 5: GMM Results

```
xtdpdsys LQ DR CIR ROE  CIR CAR DR SIZE PBTZ PLS REG GDP INF MS ,
twostep
note: DR dropped from div() because of collinearity
note: CIR dropped from div() because of collinearity
note: DR dropped because of collinearity
note: CIR dropped because of collinearity

System dynamic panel-data estimation          Number of obs     =
416
Group variable: Bank                          Number of groups  =        77
Time variable: Year
Obs per group:
min =         1
avg =   5.402597
max =        10

Number of instruments =     72                Wald chi2(14)     =   4.87e+06
Prob > chi2       =     0.0000
Two-step results

LQ      Coef.   Std. Err.      z    P>z     [95% Conf. Interval]

LQ
L1.  -.0166236    .000512   -32.47   0.000    -.0176271   -.0156202

CIR    .0301559   .0036647     8.23   0.000     .0229732    .0373385
ROE   -.0258883   .0021132   -12.25   0.000    -.0300301   -.0217464
CAR   -.1135833   .0034134   -33.28   0.000    -.1202734   -.1068931
DR    .7991132   .0020294   393.77   0.000     .7951357    .8030908
SIZE    .0176566   .0006495    27.19   0.000     .0163837    .0189296
PBTZ    .0081873   .0006601    12.40   0.000     .0068935    .0094811
PLS    .0079126   .0023208     3.41   0.001     .0033639    .0124613
REG     .11588   .0025504    45.44   0.000     .1108813    .1208786
GDP    .044941   .0045116     9.96   0.000     .0360985    .0537835
INF    .0039093   .0005831     6.70   0.000     .0027664    .0050523
MS    .017364   .0028722     6.05   0.000     .0117346    .0229934
_cons    .6084649   .0292398    20.81   0.000     .5511559    .6657739

Warning: gmm two-step standard errors are biased; robust standard
```

errors are recommended.
Instruments for differenced equation
GMM-type: L(2/.).LQ
Standard: D.ROE D.CIR D.CAR D.DR D.SIZE D.PBTZ
D.PLS D.REG D.LGDP D.INF D.MS
Instruments for level equation
GMM-type: LD.LQ
Standard: _cons

. estat sargan
Sargan test of overidentifying restrictions
H0: overidentifying restrictions are valid

chi2(57) = 59.77253
Prob > chi2 = 0.3753

. estat abond

Arellano-Bond test for zero autocorrelation in first-differenced errors

Order	z	Prob > z
1	-1.5755	0.1151
2	.55096	0.5817

H0: no autocorrelation