CROSS-COUNTRY PANEL DATA EVIDENCE OF THE DETERMINANTS OF LIQUIDITY RISK IN ISLAMIC BANKS: A CONTINGENCY THEORY APPROACH

Mamunur Rashid*

University of Nottingham Malaysia Campus

Jayalakshmy Ramachandran

University of Nottingham Malaysia Campus

Tunku Suleiman Bin Tunku Mahmood Fawzy

University of Nottingham Malaysia Campus

ABSTRACT

The objective of this study is to examine the determinants of liquidity in Islamic banks in Malaysia and the Gulf Corporation Council (GCC) countries. The study also aims at examining the dynamic nature of the liquidity position of the selected banks. We have used panel data fixed effect models to test the determinants of liquidity risk for 39 Islamic Banks in Malaysia and GCC countries, excluding Oman, over a six-year period from 2009 to 2014. The study employed 'cash-to-asset' and 'total investment to total assets ratio' as the two proxies for the liquidity position of the Islamic banks against several macro-economic and bank-specific independent variables. The macroeconomics independent variables include inflation rate, growth rate of gross domestic product and the growth rate of broad money. The bank specific independent variables include bank size, loan loss provision ratio and return on asset. These are the most robust set of determinants with respect to the most recent array of literature. The findings reveal that liquidity risk management in Islamic banks is primarily contingent upon three bank specific variables - past liquidity condition, size of the bank and loan loss provision, and two industry specific variables – growth of broad money and growth of GDP. In the presence of auto-regressive terms in investment-to-asset model, almost all the independent variables turnout to be important determinants of liquidity, lending some leads on the dynamic effect of these variables on liquidity risk of the Islamic banks. The results indicate that there must be an integration between the role played by the bank management and the policymakers to reduce the liquidity risk. The study has considered the starting time range for the sample to be from 2008 to limit the effect of global financial crisis, which has reduced the sample frame. Since the study provides insights on the key determinants of liquidity risk in Islamic banks, the results may be useful in improvement of overall enterprise risk management of the Islamic banks. We have redrawn the contingency theory framework in the context of risk management in Islamic banks.

Keywords: Contingency theory; Liquidity risk; Islamic banks; Malaysia; GCC.

^{*}Corresponding author: University of Nottingham Malaysia Campus, Jalan Broga, Semenyih, Selangor 47500, Malaysia. Email: mamunur.rashid@nottingham.edu.my

1. INTRODUCTION

Banks, globally, have experienced tremendous liquidity problem during and after the financial crisis of 2007-2008. During the pre-crisis (2004-2006) bubble formation periods, several major drawbacks such as the collapse of Bear Sterns, the mismatch of assets and liabilities, partially due to excessive leverage, trading on derivatives markets, and banks' inability to renew their short -term debt, had caused severe liquidity problems for many financial institutions. The recent Asian and global financial crises provided evidence that the liquidity problem experienced in one financial institution can cause a detrimental systematic effect on other financial institutions around the world (Ali, 2013). Hence, prudential regulation should be in place to avoid and manage liquidity crisis of the financial institutions (Nikolaou, 2009).

Islamic finance industry is growing at a very fast pace, such that regulators and practitioners are now increasingly concerned about liquidity risk management, especially with hindsight of the 2008-2009 financial crisis as a backdrop. The Islamic finance industry was largely protected from the global financial crisis due to the prohibition of excessive leverage and *riba* based instruments, and the increasing domestic participation of banks in Islamic finance and their limited connectivity across border. In recent times, however, the regulators are increasingly concerned about the need for an appropriate liquidity risk management as the Islamic banks are relying more on cost-plus contracts (e.g. *Murabahah*) and investing more in developing cross-border cooperation with internationally active banks (IFSB, 2015).

Banks operate as a financial intermediary whereby it accepts deposit from customers and lend out to borrowers. Conventional banks, as well as Islamic banks, pioneer the concept of maturity transformation whereby banks accept short-term deposits and investments accounts and provide financing on long-term, which causes maturity mismatch between assets and liabilities (Ali, 2013; IFSB, 2015). Hence, a number of bank-specific variables determine an appropriate level of liquidity. Islamic banks are essentially operating in conventional setting in many countries. Due to the presence of the dual banking system, macroeconomic factors, such as, the interest rate, inflation rate, bank rate and current account balance, also help determine the 'excess' or 'shortfall' of liquidity in Islamic banks.

This study aims to contribute to the contingency theory of enterprise risk management (Mikes and Kaplan, 2014). There are a number of firm-specific and industry-specific contingency variables in this study that help understand the risk management in a better way. These variables indicate that the liquidity management policies of the banks must be aligned with the policies of the Central Banks and the government. The objective of this study is to enrich our knowledge on liquidity management by contributing in three major areas. Firstly, we have combined macroeconomic and bank-specific indicators of liquidity scenario in Islamic banks using two robust proxies for liquidity risk, 'the cash to total asset ratio' and 'the investment to total asset' ratio. With these two proxies, we would be able to observe liquidity scenario of Islamic banks for short- as well as long-term liquidity needs. Secondly, we have considered two major markets for Islamic finance, Malaysia and the Gulf Cooperation Council (GCC) countries, using the most recent set of data that ranges from 2009 to 2014. These two markets cover around 65% of the total Islamic asset

market development globally (E&Y, 2016). Our results and conclusions, therefore, provide implications for the bankers, consumers and the regulators of the respective markets in liquidity risk management. Thirdly, we have incorporated the findings into the contingency theory of enterprise risk management to understand the drivers of risk management in Islamic banks.

2. REVIEW OF THE PAST STUDIES

2.1. Liquidity risk in banks

Liquidity management is the ability to assess and manage the demand and supply of liquid funds, which is one of the core functions of any bank (Ismal, 2010a; Majid, 2003). Liquidity management is the ability of the bank to fund increases in assets and meet its obligations when they fall without incurring significant loss in value (BIS, 2008). Banks deal with three types of liqudity – market liquidity, funding liqudity, and central bank liquidity (Nikolaou, 2009). '*Market liquidity*' refers to the ability to trade an asset at short notice, at low cost and with little impact on its price. '*Funding liquidity*' refers to the ability of banks to meet their liabilities, unwind or settle their positions should they come due. Central bank liquidity refers to the ability of the central bank to supply liquidity when the financial system is in need of funds. Rochet (2008) highlights three potential causes of liquidity risk. On the liability side, there could be large uncertainty with deposit withdrawals. On the asset side, there is an uncertainty on the volume of new requests for loans, or renewal of old loans that the bank will receive in the future. Thirdly, the uncertainty of '*off-balance sheet*' transactions, may affect the liquidity of the bank.

Figure 1: Liquidity risk management infrastructure and superstructure for Islamic finance.



Islamic banks as an alternative financial platform face additional risks in addition to the conventional risks, such as adhering to the *shari'ah* regulations in the presence of conventional banking (Majid, 2003; Mohd Ariffin, 2012). As the Islamic industry is still emerging in many countries, the *shari'ah* compliant risk management market system is yet to take its initial shape. For instance, practices of *shari'ah*-compliant hedging techniques, such as the futures, options, or swaps, are still in embryonic stages (Makiyan, 2008). Figure 1 illustrates the evolution of Islamic finance in selected countries. Over the last fifteen years, researchers have concentrated on types of risks facing Islamic finance i.e. liqudity, credit and operational risks (How, Karim and Verhoeven, 2005), connection between liquidity risk and financial performance (Mohd Ariffin, 2012), and determinants of risks in various banks (Ali, 2013).

2.2. Contingency theory

Past studies have reported both the supply and demand sides of liquidity risk management in banks. In the supply side while risk management is considered as a matter of 'organisational setup and preparedness', the demand side deals with the expectation of the stakeholders of the risk management practices of Islamic banks (Ismal, 2010a; 2010b; Hidayat, Al-Khalifa, and Aryasantana, 2012). This study uses the lenses of the contingency theory to explain the determinants of the liquidity risk in Islamic banks. The contingency theory is an emerging theory brodly in the context of enterprise risk management (ERM) where in private sector firms there exists no "one size fits all" system to management risk (Otley, 1980). Environment, technology, structure, size and strategy are the primitive contingency risk management variables. In the context of public sector, central government policies, information and communication technology. and organisational size are the contingency variables. Mikes and Kaplan (2014) identified three major contingency variables - risk types (preventable, strategy, and external), firm variables and industry vairables. As risk management principles and practices are widely different among organisations, this study aims to shed light on the industry-specific and firm-specific contingency vairables in the context on liqudity risk management of Islamic banks.

2.3. Determinants of liqudity risk in Muslim-majority economies

Bunda and Desquilbet (2008) have stated that higher capitalisation ratio and the presence of prudential regulation positively influence liquidity risk of the banks. Also, the study has reported that highly liquid commercial banks are well prepared in withstanding banking crisis than the less liquid banks (Moore, 2009). Deléchat, Henao, Muthoora, and Vtyurina (2012) have reported that the liquidity ratios are positively related to bank size and negatively related to loan loss provision, capitalisation and credit-to-GDP ratio. In the Middle East and Africa, political instability in Egypt has forced the banking sector to increase their liquidity reserve (Fielding and Shortland, 2005). In a more recent study on Islamic banks from the Middle East, North Africa and Southeast Asian countries, Jedidia and Hamza (2015) have reported that the profitability, investment and capital adequacy ratio are the major determinants of liquidity. Fadare (2011) has found that the monetary policy, interest rate and (lagged) loan-to-deposit ratio are significant determinants of liquidity risk in Nigerian banks. Chagwiza (2014) has explored the impact of micro and macroeconomic variables on the level of liquidity in commercial banks in Zimbabwe between the years 2010 and 2011 and has reported that the capital adequacy, total assets, growth rate of gross domestic product and bank rate have positively impacted the liquidity position of the banks. Inflation rate has also exhibited a negative impact on the banks' liquidity. Ben Moussa (2015) has found that liquidty in Tunisian banks is significantly impacted by the inflation rate and growth rate of GDP.

Mohamad, Mohamad, and Samsudin (2013) have investigated the liquidity behaviour of Malaysian Islamic banks using several macroeconomic variables for 17 Islamic banks from 1994 to 2009. Their study has found that the macroeconomic variables, total investment, and total asset (size) are inversely related to liquidity while profitability is positively related to the level of banks' liquidity. Chowdhury and Islam (2009) have compared the liquidity positions of a conventional bank and an Islamic bank in

Bangladesh from 2003 to 2006. The study has reported that the investment ratio, return on assets, earnings per share, price earnings ratio and net interest margin/profit margin are the important determinants of banks' liquidity gap. Islamic banks are found to be more efficient in liquidity management when compared to their conventional counterparts.

Ahmed, Ahmed, and Naqvi (2011) have considered six Islamic banks in Pakistan between 2004 and 2009, and reported that the leverage and age of the bank are significant variables in explaining the variation in liquidity. Akhtar, Ali, and Sadaqat (2011) have evaluated the liquidity risk in conventional and Islamic banks of Pakistan for 2006 to 2009. The study has reported a positive but statistically insignificant relationship between capital-to-net assets ratio with liquidity risk. Iqbal (2012) has undertaken a sample of 27 banks (22 conventional, 5 Islamic) from Pakistan between 2007 and 2010, and has concluded that the capital adequacy ratio, return on asset, return on equity, and bank size positively influence liquidity risk while non-performing loan ratio negatively influences liquidity risk. Ramzan and Zafar (2014) has found that the size of the bank has negatively impacted banks' liquidity.

2.4. Determinants of liquidity risk in Muslim-minority economies

Islamic banks operate in mixed and Muslim mintory economies. Hence, understanding the determinants of liqudity in non-Islamic economies is often warranted. Lucchetta (2007), using a large sample of 5066 european banks over a period of 1998-2004, has reported a mix of macroeconomic and bank specific variables as important determinants of banks' liqudity. It is observed that liquidity is negatively impacted by the interest rate, loan loss provision and loans to total assets ratio while liquidity is positively affected by the interbank market rate and bank size. Cucinelli (2013) has investigated 1080 listed and non-listed banks from the Eurozone using Liquidity Coverage Ratio (LCR) and Net Stable Funding Ratio (NSFR), and has found that the smaller banks and the banks with smaller capitalisation had liquidity problems.

Vodova (2013 and 2011) have conducted two extensive researches on the banking sector liquidity in Hungary and Czech. The studies have reported that the liquid asset ratio has increased with the capital adequacy, interest rate on loans, and bank profitability while the bank size, interest margin, market interest rate, and the interest rate on interbank transactions have negatively influenced bank liquidity. Roman and Sargu (2014) have investigated the determinants of the bank's liquidity in Bulgaria and Romania between 2003 and 2011. Their research have stated that the capital adequacy ratio and the ratio of impaired loans to gross loans have significant impact on liquidity of banks. Mehmed (2014) has found that the non-performing loans, return on equity, loan loss reserve, bank size, reserve ratio and loan to deposit ratio are significant determinants of bank's liquidity. The diversity of the above determinants, however, clearly establish the presence of a group of contingency variables that can explain the liquidity risk in banks. These variables can be further dividend into industry and firm specific contingency variables (Mikes and Kaplan, 2014), which, upon empirical testing, can be an additional contribution in the context of Islamic banks.

3. EMPIRICAL DESIGN

3.1. Sample and measurements

The study considers a sample of 39 Islamic banks for a period of six years from 2009 to 2014. We wanted to avoid the impact of the financial crisis, hence started the data from 2009. A summary of the sample composition is provided in Table 1. To avoid the financial crisis of 2007-08, we have taken 2009 as the cut off period. The data were obtained from the annual reports of the respective Islamic banks, the Bankscope database, and the World Bank's database. Two major contributions of this study are, firstly, the combination of the bank-specific and macroeconomic data, and secondly, the inclusion of two major Islamic markets – Malaysia and the GCC.

Country	Number of banks	Overall % in the total sample
Malaysia	17	44%
Kingdom of Bahrain	6	15%
United Arab Emirates	5	13%
Kingdom of Saudi Arabia	4	10%
State of Kuwait	4	10%
State of Qatar	3	8%
Total	39	100%

T 1 1 1

Note: The Sultanate of Oman is omitted from the list due to insufficient financial information available on its existing Islamic banks.

Liquidity can be measured either using the 'liquidity stock' or 'liquidity flow' approach (Moore, 2009). The 'stock approach' uses various balance sheet ratios to identify liquidity trends. The two most important stock ratios are loan-to-deposit ratio and the liquid asset ratio. The 'flow approach' assesses the liquidity risk by comparing the inflows and outflows of bank's cash flow and identifies the amount needed during the period. This is also described as a maturity gap analysis. However, as the flow approach requires more data, and with limited historical data for many Islamic banks we have relied on the stock of liquidity approach. To obtain robustness, we have employed two proxies for the liquidity of the banks: the cash to total asset ratio (L1) and the investment to total asset ratio (L2).

(a) Measurements of liquidity in banks - cash to asset (L1) and investment to asset (L2) ratio

Despite several controversies with the cash ratio as an "inefficient" determinant of bank's liquidity (Aspachs, Nier, and Tiesset, 2005; Chagwiza, 2014; Roman and Sargu, 2014; Vodova, 2011), the balance of cash, excluding the balance with the Central Bank, is still considered as the simplest measure of liquidity, which is used to calculate the cash-toasset ratio (Mohd Ariffin, 2012; Ali, 2013; Iqbal, 2012; Bunda and Desquilbet, 2008). A higher cash ratio indicates a higher reserve of liquidity. The second proxy is the investment to total asset ratio. It measures the proportion of asset, which is tied up in financing the corporate sector. The higher the investment to asset ratio, the lesser the amount of available liquid assets. Nevertheless, higher levels of investment provide higher potential profitability for the banks as more of the available funds are channelled into higher earning assets compared to liquid assets. In the event of liquidity shortage, Islamic bank may have insufficient funds to service its liabilities. Therefore, a reasonable mix between liquid assets and investment is needed to ensure that profitability is not hindered and sufficient liquid assets are available (Chagwiza, 2014). Appendix A summarises a list of literature that have employed similar measurements as dependent variables.

(b) Macroeconomic determinants of liquidity: Growth of GDP, inflation rate and growth of broad money

Appendix B summarises a list of independent variables that are tested in existing studies as the determinants of liquidity in banks. This study has considered a mixture of macroeconomic and bank-specific independent variables. The growth rate of gross domestic product (GDP) is the rate at which the economy grows and is the measure of the macroeconomic development (Mohamad et al., 2013). Since a better growth rate experienced by a country would indicate a potential increase in demand for investment, we hypothesise a negative relationship between the growth of GDP and cash-to-asset ratio. Banks are more willing to lend than hold back cash. Thus more profitable loan would be lent out reducing bank's asset liquidity (Bunda and Desquilbet, 2008). However, a mixed relationship is expected between the investment-to-total assets ratio to growth of GDP. A positive relationship is expected when businesses and entrepreneurs need extra funds, during economy boom. Therefore, these investments facilitate growth within the economy. Secondly, banks are more willing to lend out money because they know that business and entrepreneurs are able to repay their loans. However, it is also possible for the relationship to be negative. As Corporations and households see an increase in the level of income during an economic boom and would rely upon internal sources of funds and reduce the amount of external debt (Vodova, 2013). This can be seen as a decrease in investment in the balance sheet of the Islamic bank.

Inflation rate is the annualized percentage change of the general price index over a period of time. Inflation rate carries significant influence on the liquidity of the Islamic bank (Mohamad et al., 2013). We hypothesise that the relationship between the inflation rate and cash-to-assets ratio will be negative as the increase in inflation rate raises bank's operating costs and reduces the amount of cash available to Islamic bank. Similarly, we expect that the relationship between inflation and the investment-to-assets ratio would be negative. As explained by Vodova (2013), inflation rate increases the bank's vulnerability of loans to customers. As the growth rate of broad money (creation of money in the economy) is positively connected to banking operation, we hypothesise that the growth rate of broad money will have a postive impact on both cash-to-assets and investment-to-total assets ratios.

(c) Bank-specific determinants: Loan loss provision, total assets, and return on assets

Loan loss provision is the provision set aside for doubtful loans. The ratio is calculated as the provision expense over the gross amount of investment (Cucinelli, 2013; Mehmed, 2014). Choong, Thim, and Kyzy (2012) took loan loss provision as a proxy for credit risk. We hypothesise that there exists a negative relationship between the loan loss provision and the two proxies of liquidity – cash-to-assets ratio and investment-to-assets ratio.

The total assets of the banks are considered as the proxy for the size of the bank (in natural log) (Iqbal, 2012). If the 'too big to fail' fallacy is true, big banks will hold less liquid assets. We hypothesise that there will be a negative relationship between the bank size (total assets) and the cash-to-total assets ratio. However, as the size of the bank and investment should have a positive relationship, it is expected that investment-to-assets ratio would be positively connected to size of the banks.

The return on assets, which is the percentage of net income to total assets, is used as an indicator of profitability, and often as the proxy for overall performance (Mohd Ariffin, 2012). As the bank holds more liquid assets, this would reduce the profitability of the bank as more assets are channelled to low yield investments (Ali, 2013; Chagwiza, 2014). Whereas, to increase the profitability of the bank, more funds are needed to be placed in higher yield assets that are illiquid in nature, such as investment. Thus, it is hypothesised that there is a negative relationship between cash-to-assets ratio and the return on assets. However, as net income and overall investment may be positively connected, we expect to get a positive relationship between investment-to-assets ratio and the return of assets.

3.2. Choice of panel data models - fixed versus random effects

We have tested whether a fixed effect or a random effect model would be the most reliable. The null hypothesis of the Hausman test is that the random effect is efficient (Hausman, 1978). Table 2 provides the details of descriptive stastics and Table 3 offers the details of the Hausman test. We have conducted two panels of anlaysis. In the first panel, we have considered cash to asset ratio (L1) in three equations. The first equation is a static model that includes L1 and other determinants. The second and third equations include the autoregressive term of L1, and L2 alongside other determinants. Similar apporach is followed for the second panel where investment to asset ratio (L2) is the dependent variable. The auto-regressive terms of the L1 and L2 are considered to understand the dynamic nature of the relationship between the dependent and the independent variables. The static model that is being tested is shown in equation 1 below. The auto-regressive components are shown in equation 2.

$$Lr_{it} = \alpha + \beta_1 INF_{it} + \beta_2 GDP_{it} + \beta_3 GBM_{it} + \beta_4 LTA_{it} + \beta_5 LLP_{it} + \beta_1 ROA_{it} + e_{it}$$
(1)

$$Lr_{it} = \alpha + \beta_1 INF_{it} + \beta_2 GDP_{it} + \beta_3 GBM_{it} + \beta_4 LTA_{it} + \beta_5 LLP_{it} + \beta_1 ROA_{it} + \beta_1 Lr_{it-1} + e_{it} (2)$$

In equation (1) and (2), Lr presents the liquidity ratio that can take either L1 (cash to asset ratio) or L2 (investment to asset ratio). GDP is the growth of gross domestic products, GBM is the growth of broad money, LTA is the natural log of total assets, LLP is the loan loss provision, ROA is the return on assets. Lr_{t-1} presents the regressive term (one lag) of the liquidity ratio, either L1 and L2, which is taken as the dependent vairable. We have considered up to one lag for the regressive term for simplicity of the models.

Table 3 shows that average cash-to-total asset is 11% whereas the percentage of investment-to-total asset is 59%. Average GDP growth rate is 4% while growth rate of the broad money is below 10% on the average. Loan loss provision is 3.5% and the banks on the average earned ROA of little less than 1%.

Tuble 2. Descriptive statis	Juie 5		
Variables	Mean	St. Dev.	Obs.
Cash/Total Assets (L1)	0.113	0.104	234
Investment/Total Assets (L2)	0.589	0.127	234
Inflation Rate (INF)	0.022	0.016	234
Growth rate of GDP (GDP)	0.043	0.038	234
Growth rate of Broad Money (GBM)	0.092	0.047	234
Total Assets of Bank (LTA)	7.086	0.743	234
Loan Loss Provision (LLP)	0.035	0.037	234
Return on Assets (ROA)	0.009	0.013	234

Table 2: Descriptive statistics

Note: St. Dev. = Standard Deviation, Obs. = Observation. L1 and L2 are the two dependent variables. INF, GDP and GBM are the three macroeconomic determinants of liquidity, whereas LTA, LLP and ROA are the three bank-specific determinants of liquidity.

	Table 3: Hausman test	
	Cash/Total Assets (L1)	Investment/Total Assets (L2)
Prob.	0.004	0.010
Chi-Sq. Statistic	17.283	15.060
Chi-Sq. d.f.	5	5

Notes: H₀: Random effects are efficient. Decision: Reject Null; meaning that the fixed models are more efficient.

4. **RESULTS**

Table 5 tabulates the fixed effect regression outputs. Panel I presents the results for first proxy – cash to asset ratio (L1) and Panel II presents the results for the second proxy – investment to total asset ratio (L2). In brief, the models achieved highest level of statistical fitness (adjusted R-squared). However, only the dynamic models (Eq. 3 and Eq. 6) have achieved decent Durbin Watson.

Inflation rate negatively influences the cash liquidity of the bank. However, the influences are not statistically significant. On the other hand, similar to the existing studies, inflation rate positively influences investment to asset ratio, which means higher inflation will eventually reduce the liquidity of the banks. Higher GDP growth rate reduces short term (cash liquidity) but helps to increase the long-term (investment to asset ratio) liquidity of Islamic banks. Growth of broad money has mixed influence on bank's liquidity. In the short run, the bank's cash liquidity increases with the growth of money. This is essentially true as the banks have to increase the liquidity reserve if the deposit increases. However, in the long-run, bank investment decreases with the increase of broad money, which eventually translates into more liquidity for banks. Nonetheless, this is only true in the presence of the regressive terms.

The results show that the larger banks carry smaller cash liquidity while their long-term liquidity is also affected adversely as they invest a lot in loans. Larger amount of loan loss provisions reduces both short and long term liquidity. Thus, larger amount of loan losses negatively affects the profitability of the banks. Higher return on asset may not directly come into cash reserve since banks would like to reinvest their profits as new loans.

In the extended format of the results, Eq. 2 and 5 the study finds that the investment liquidity negatively affects the cash liquidity (Eq. 2). This relationship is significant even in the presence of the regressive term (L_{1-1} in Eq. 3). Similarly, cash liquidity negatively influences the investment liquidity with and without the regressive term. Both the past cash liquidity and investment liquidity positively influence the contemporaneous liquidity. The determinants present a better fit with the investment to asset ratio model. In summary, past liquidity, growth of GDP, growth of broad money, bank size, loan loss provisions, and profitability (ROA) are the important determinants of bank's liquidity. Overall, bank specific factors more influential in the cash liquidity model while the macroeconomic factors are more important in the investment liquidity model. Hence, the policy role of the government and the strategic direction for effective liquidity risk management of the Islamic banks are equally important to achieve a superior liquidity risk management performance. Stable economic condition also plays an important role in efficient liquidity risk management. In this respect, a vibrant domestic shari'ah compliant money market would be an important addition to the overall liquidity management atmosphere.

Determinente	Panel I: (Cash/Total As	ssets (L1)	Panel II: In	vestment/Tota	al Assets (L2)
Determinants	Eq1	Eq2	Eq3	Eq4	Eq5	Eq6
Inflation	-0.191	-0.001	-0.009	0.678**	0.393**	0.318
Growth of GDP	-0.152*	-0.196***	-0.083	-0.233***	-0.327***	0.022
Growth of Money	0.115***	0.102**	0.088^{***}	-0.147	-0.091**	-0.084**
Size of Bank	-0.044*	-0.024	-0.02**	0.113***	0.103***	0.03
Loan Loss Provision	-0.031	-0.006	-0.036**	-0.309***	-0.251***	-0.118
Return on Asset	0.114*	0.181	-0.07	0.86***	0.945***	0.764*
L1					-0.536***	-0.447***
L1 (-1)			0.316**			
L2		-0.236***	-0.112*			
L2 (-1)						0.384***
R squared	0.845	0.867	0.913	0.853	0.921	0.967
Adjusted R squared	0.810	0.839	0.888	0.819	0.902	0.956
Durbin Watson	1.494	1.616	2.102	1.648	1.918	2.167
F-Statistics	24.094	30.561	36.669	24.932	48.758	93.103
Prob. (F-Statistics)	0.000	0.000	0.000	0.000	0.000	0.000

Table 5: Regression estimates – determinants of Islamic banks' liquidity

Notes: *** significant at 1% level, ** significant at 5% level, * significant at 10% level. Equation 1 involves six determinants of bank's liquidity, Equation 2 presents L2 (investment-to-asset ratio) as the determinant in L1 (cash-to-total assets) model, and Equation 3 presents regressive term of the dependent variable and the second proxy of bank liquidity alongside other variable in one model. L1 = cash-to-total asset ratio, L2 = investment-to-total asset ratio.

5. CONCLUSION

Managing liquidity has been one of the major challenges to Islamic banks primarily because of two reasons: firstly, the Islamic banks have limited human capacity to understand, measure and manage liquidity risk, and secondly, Islamic banks are prohibited to source short-term capital from conventional markets. Many Islamic countries are yet to start their *shari'ah* compliant secondary money markets for Islamic

banks. This study investigates the determinants of Islamic banks' liquidity for banks in Malaysia and the GCC countries. We have examined a panel of 39 banks for the period of 2009-2014. We have employed two proxies of bank's liquidity – cash to asset ratio and investment to asset ratio. Overall, growth of GDP, growth of broad money, return on asset, size of the banks, loan loss provisions, and profitability are the important determinants of bank's liquidity. Our study suggests that bank-specific factors are more significant in cash liquidity model while both the bank-specific and macroeconomic factors are equally significant in investment liquidity model. Our results indicate that an efficient management of operating cost and loans is the proactive way to solve liquidity problem. Regulators of Islamic markets can play an important role by establishing a *shari'ah* compliant secondary market so that the banks can source short-term capital.

5.1. Implications for the bankers and regulators

Our findings support industry risk survey (See Rosman, 2009 and references therein) where the researchers have identified operating and credit risks as two most important risks for Islamic banks. Operating risk is the uncertainty due to failure of technology, operating procedure and inefficient human capital. Credit risk interacts with operating risk as in Islamic banks the credit risk can be efficiently managed by serving the partnership-contracts that requires greater human efficiency and superior operating procedure. Credit risk is the uncertainty that the borrowers may fail to pay the loan instalments. If the borrowers are chosen wrongly, Islamic banks will experience loss and liquidity shortage. Therefore, efficient management is the key to reduce liquidity risks in Islamic banks.

Larger banks with lower rate of return and higher loan loss provision will require more reserve funds to meet liquidity. Large banks provide large amount of loans to customers that earn them higher return on assets. If loan management is inefficient, it may result in larger loan loss provision, leading to lower profitability, and higher requirement of liquid funds to honour the cheques.

A stable economy with growth of GDP will experience larger loan disbursement. Bankers will have hard time balancing liquidity-profitability in this high growth period. Regulators' role is vitally important during this period to keep an eye on performance of loans. As a proactive tool, bankers rely on money market for short-term liquidity management. Central Bankers must ensure that the money markets are regulated properly. As many Islamic financial markets do not have a vibrant secondary market for liquidity, the banks primarily rely on funds supplied by the Central Bank. Malaysia and Bahrain have successfully introduced secondary markets for meeting excess liquidity needs by the Islamic banks. For others, Central Bank's liquidity window and the policies, particularly on money supply, are vitally important.

Cost of and access to new funds are two important determinants of banks' liquidity problem. If the interest rate drops, banks will find it difficult to maintain healthy deposit flow. On the other hand, conventional banks tend to rely on secondary markets to raise new funds, and the access to such markets is extremely limited and restricted for Islamic banks. Hence, Islamic bankers rely on funds reserved with other Islamic banks and the Central Bank to meet their excess liquidity needs. As the research on macroeconomic vulnerability of the Islamic financial institution is relatively in an emergent stage, more recent studies on risk and profitability of the Islamic banks globally (Grira, Hassan and Soumare, 2016) establish that Islamic banks are not cost efficient. Hence, limited access to liquid funds in bad times, or higher demands for more funds from Islamic banks, will put more pressure on the overall liquidity scenario. More catastrophes are ahead unless the Central Banks, and the regulators, manage to institutionalise the supply of excess funds for Islamic banks in a *shari'ah* compliant way.

5.2. Contingency determinants of liquidity risk management in Islamic banks

Based on the findings of this study, we have modified the contingency model for enterprise risk management that is initially proposed by Mikes and Kaplan (2014). Figure 2 shows the modified model where we have listed the industry- and company-specific contingency variables that carry greater influence on the management of liquidity of Islamic banks. This study finds that alongside the past liquidity condition of the bank, the management of liquidity in Islamic banks is contingent upon at least two important industry specific variables, such as the growth of GDP, and growth of broad money, and at least two company specific variables, such as the size of the bank and loan loss provision. In previous studies, size of the (non-financial) organisation is identified as an important contingency variable (Pagach and Warr, 2011).



Figure 2: Modified contingency theory model – firm and industry specific contingency variables

Source: Modified for this study from Mikes and Kaplan (2014)

REFERENCES

- Ahmed, N., Ahmed, Z., & Naqvi, I. H. (2011). Liquidity Risk and Islamic Banks: Evidence from Pakistan. *Interdisciplinary Journal of Research in Business*, 1(9), 99-102.
- Akhtar, M. F., Ali, K., & Sadaqat, S., (2011). Liquidity Risk Management: A comparative study between Conventional and Islamic Banks of Pakistan. *Interdisciplinary Journal of Research in Business*, 1(1), 35-44.
- Ali, S. S. (2013). State of liquidity management in Islamic financial institutions. *Islamic Economic Studies*, 21(1), 63-98.
- Aspachs, O., Nier, E., & Tiesset, M. (2005). Liquidity, Banking Regulation and the Macroeconomy. Evidence on bank liquidity holdings from a panel of UK-resident banks. *Unpublished manuscript*. BIS, Basel.
- Ben Moussa, M. A., (2015). The Determinants of Bank Liquidity: Case of Tunisia. *International Journal of Economics and Financial Issues*, 5(1), 249-259.
- BIS. (2008). Principles for sound liquidity risk management and supervision. BIS, Basel.
- Bunda, I., & Desquilbet, J. B., (2008). The bank liquidity smile across exchange rate regimes. *International Economic Journal*, 22(3), 361–386.
- Chagwiza, W. (2014). Zimbabwean Commercial Banks Liquidity and Its Determinants. Internatonal Journal of Empirical Finance, 2(2), 52-64.
- Choong, Y. V. Thim, C. K., & Kyzy, B. T. (2012). Performance of Islamic Commercial Banks in Malaysia: An Empirical Study. *Journal of Islamic Economics, Banking and Finance*, 8(2), 67-80.
- Cucinelli, D. (2013). The Determinants of Bank Liquidity Risk within the Context of Euro Area. Interdisciplinary Journal of Research in Business, 2(10), 51-64.
- Deléchat, C., Henao, C., Muthoora, P., & Vtyurina, S., (2012). *The Determinants of Banks'* Liquidity Buffers in Central America. IMF Working Paper WP/12/301
- E&Y. (2016). World Islamic Banking Competitiveness Report 2016: New Realities New Opportunities. Ernst & Young.
- Fadare, S. O. (2011). Banking Sector Liquidity and Financial Crisis in Nigeria. *International Journal of Economics and Finance*, 3(5), 3-11.
- Farooq, U., Maqbool, M. Q., Humanyun, A. A., Nawaz, M. S., & Abbas, M. (2015). An Empricial Study on Impact Liquidity Risk Management on Firm Performance in the Conventional Banking of Pakistan. *IOSR Journal of Business and Management*, 17(2), 110-118.
- Fielding, D., & Shortland, A. (2005). Political Violence and Excess Liquidity in Egypt. Journal of Development Studies, 41(4), 542-547.
- Grira, J., Hassan, M. K., & Soumare, I. (2016). Pricing beliefs: Empirical evidence from the implied cost of deposit insurance for Islamic banks. *Economic Modelling*, 55, 152-168.
- Hausman, J. (1978). Specification tests in econometrics. *Econemetrica*, 44(6), 1251-1271.
- Hidayat, S. E., Al-Khalifa, M. D., & Aryasantana, A. G. P. (2012). A Survey on the Level of Effectiveness of Liquidity Risk Management of Islamic Banks in Bahrain. *International Research Journal of Finance and Economics*, 91(2012), 39-45.
- How, J. C. Y., Karim, M. A., & Verhoeven, P. (2005). Islamic Financing and Bank Risks: The Case of Malaysia. *Thunderbird International Business Review*, 47(1), 75-94.
- Iqbal, A. (2012). Liquidity Risk Management: A Comparative Study between Conventional and Islamic Banks of Pakistan. Global Journal of Management and Business Research, 12(5), 54-64.

- Islam, M. M., & Chowdhury, H. A. (2009). A Comparative Study of Liquidity Management of an Islamic Bank and a Convetional Bank: The Evidence from Bangladesh. *Journal of Islamic Economics, Banking and Finance*, 5(1), 89-108.
- Islamic Financial Services Board. (2015). Guiding Principles of Risk Management for Institutions (other than Insurance Institutions) offering only Islamic Financial Services. Malaysia: Islamic Financial Services Board.
- Ismal, R. (2010a). Assessment of liquidity management in Islamic banking industry. International Journal of Islamic and Middle Eastern Finance and Management, 3(2), 147-167.
- Ismal, R. (2010b). Strengthening and improving the liquidity management in Islamic banking. *Humanomics*, 24(1), 18-35.
- Jedidia, K. B., & Hamza, H. (2015). Determinants of Liquidity Risk in Islamic Banks: A Panel Study. Islamic Management and Business, 2(2), 137-146.
- Lucchetta, M. (2007). What Do Data Say About Monetary Policy, Bank Liquidity and Bank Risk Taking? *Review of Banking, Finance and Monetary Economic, 34*(2), 189-203.
- Majid, A., & Rais, A. (2003, March). *Development of liquidity management instruments: challenges and opportunities.* Paper presented at International Conference on Islamic Banking: Risk Management, Regulation and Supervision, Jakarta, Indonesia.
- Makiyan, S. N. (2008). Risk Management and Challenges in Islamic Banks. *Journal of Islamic Economics, Banking and Finance*, 6(3), 45-54.
- Mehmed, G. (2014). An Empirical Study on Liquidity risk and its determinants in Bosnia and Herzegovina. *The Romanian Economic Journal*, *17*(52), 157-184.
- Mikes, A., & Kaplan, R. S. (2014). *Towards a Contingency Theory of Enterprise Risk Management*. Harvard Business School Working Paper No. 13-063.
- Mohamad, A. A. S., Mohamad, M. T., & Samsudin, M. L. (2013). How Islamic Banks of Malaysia Managing Liquidity? An Emphasis on Confronting Economic Cycles. *International Journal of Business and Social Science*, 4(7), 253-263.
- Mohd Ariffin, N. (2012). Liquidity Risk Management And Financial Performance In Malaysia: Empirical Evidence From Islamic Banks. *Aceh International Journal of Social Sciences*, 1(2), 77-84.
- Moore, W. (2009). *How do financial crises affect commercial bank liquidity? Evidence from Latin America and the Caribbean*. MPRA Paper No. 21473.
- Munteanu, I. (2012). Bank liquidity and its determinants in Romania. *Procedia Economics and Finance*, *3*(2012), 993–998.
- Nikolaou, K., (2009). *Liquidity (Risk) Concepts: Definitions and Interactions*. European Central Bank Working Paper No 1008.
- Otley, D. T. (1980). The contingency theory of management accounting: achievement and prognosis. *Accounting, organizations and society*, 5(4), 413-428.
- Pagach, D., & Warr, R. (2011). The Characteristics of Firms that Hire Chief Risk Officers. *The Journal of Risk and Insurance*, 78(1), 185–211.
- Patora, K. (2013). Bank liquidity determinants in CEE countries. *Research Papers of Wrocław* University of Economics, 316, 133-144.
- Ramzan, M., & Zafar, M. I. (2014). Liquidity Risk Management in Islamic Banks: A Study of Islamic Banks of Pakistan. *InterdiscipLInary Journal Of Contemporary Research In Business*, 5(12), 199-215.
- Rochet, J. C. (2008). Liquidity regulation and the lender of last resort. *Financial Stability Review: Special Issue on Liquidity, 11*(February), 45-52.

- Roman, A., & Sargu, A. C. (2014). Banks liquidity risk analysis in the new European Union member countries: evidence from Bulgaria and Romania. *Procedia Economics and Finance*, 15, 569 – 576.
- Rosman, R. (2009). Risk Management Practices and Risk Management Processes of Islamic Banks: A Proposed Framework. *International Review of Business Research Papers*, 5(1), 242-254.
- Trenca, I., Petria, N., Mutu, S., & Corovei, E. (2012). Evaluating the liquidity determinants in the central and eastern european banking system. *Finance Challenges of the Future*, *1*(14), 85-90.
- Vodova, P. (2011). Liquidity of Czech Commercial Banks and its Determinants. *International Journal Of Mathematical Models And Methods In Applied Sciences*, 5(6), 1060-1067.
- Vodova, P. (2013). Determinants which affect liquid asset ratio of Czech and Slovak Commercial Banks. *Financial Assets and Investing*, 1(2013), 25-41.

APPENDICES

(Jedidia & Hamza, 2015) (Ben Moussa, 2015) (Farooq et al, 2015) (Ramzan & Zafar, 2014) (Mehmed, 2014) (Roman & Sargu, 2014) (Chagwiza, 2014) (Cucinelli, 2013)	1 1 1	~			>			~ ~	>			~ /	~					>	1	
(Monamad et al, 2013) (Patora, 2013) (Iqbal, 2012) (Trenca et al, 2012) (Munteanu, 2012) (Mohd Ariffin, 2012) (Deléchat et al, 2012)	/ / /		~			>	>			> >		>		>			>			
(Akhtar & Sadaqat, 2011) (Vodova, 2011) (Fadare, 2011) (Ahmed et al, 2011) (Moore, 2009) (Islam & Chowdhury, 2009)	>				>			>	>	>	>	>			>	>				
(Bunda & Desquilbert, 2008) (Aspachs et al, 2005)	/ /	>	>	>						>						osits				
	Liquid Assets/Total Assets	Liquid Assets/Total Deposits	Liquid Assets/Customer and Short Term Financing	Liquid Assets/Total Deposits and Borrowings	Liquid Assets/Deposit and Short Term Borrowings	Liquid Assets/Deposit and Short Term Funding	Liquid Assets/Liabilities	Current Assets/Total Liabilities.	Cash/Total Assets	Net Loans/Total Assets	Loans/Deposits and Short Term Financing	Net Loans/Total Deposits	Total Loans/Total Liabilities	Total Deposits/Total Assets	Net Liquidity Gap	Natural log of Total Loans/Total Banking Sector Dep	Log Difference of Liquid Assets/ Total Assets	Liquidity Coverage Ratio	Net Stable Funding Ratio	Source: Author's own compilation

Appendix A: List of dependent variables

Independent variables	(Bunda & Desquilbert, 2008) (Aspachs et al, 2005)	(Moore, 2009) (Islam & Chowdhury, 2009)	(Akhtar & Sadapat, 2011)	(Vodova, 2011)	(Fadare, 2011)	(Ahmed et al, 2012)	(Delechat et al. 2012)	(Trenca et al. 2012)	(Iqbal, 2012) (Munteenu, 2012)	(Mohd Ariffin, 2012)	(Vodova, 2013)	(Cucinelli, 2013)	(Patora, 2013)	(Mohamad, et al., 2013)	(Chagwiza, 2014)	(Ramzan & Zafar, 2014)	(Roman & Sargu, 2014)	(Mehmed, 2014)	(Farooq, et al., 2015)	(Jedidia & Hamza, 2015)	(Ben Mousa, 2015)
Advance Deposit Ratio		>				1															ĺ
Bank Assets/Banking Sector Assets					\mathbf{i}								\geq								
Bank Rate															\geq						
Bank Size	> >		>	\geq		>	Ś	>		>		\geq	\geq	\geq	\geq	\geq	\geq	\geq		\geq	\mathbf{i}
Capitalisation	>	>	\geq	\geq			Ś	Ś		>		\geq	\geq	\geq	\geq	\geq	\geq	\geq		\geq	\mathbf{i}
Credit Flow (Private Sector) expressed as a percentage of GDP		>					Ś	>													
Current Account Balance expressed as a percentage of GDP								>													
Debt/Total Assets						\mathbf{i}															
Deposit Dollarisation							\mathbf{i}														
Deposit Volatility							\mathbf{i}														
Difference between Establishment and Observation Year						\mathbf{i}															
Dummy Variable (Country Region)	>																				
Dummy Variable (Enforcement of Basel Core Principles)	>																				
Dummy Variable (Financial Crisis)				\geq						>		\geq									\mathbf{i}
Dummy Variable (Foreign Banks)							\mathbf{i}														\mathbf{i}
Dummy Variable (History of Banking Crisis)						•	\mathbf{i}														
Dummy Variable (Listed Banks)												\geq									
Dummy Variable (Private Banks)							\mathbf{i}														
Dummy (Realisation of a twin/banking /currency crisis)	>																				
Dummy Variable (Specialization)	>						`	Ś					\geq	\geq							
Earnings per Share		>																			
Exchange rate		>																			
Financial Expense/Total Assets																				\geq	
Fixed Asset/Total Asset										>											
Gross Interest Expense/Total Deposits	/ /			\geq			`	\langle	_	>		\geq	\geq	>	>			>			

Independent variables	(Bunda & Desquilbert, 2008) (Aspachs et al. 2005)	(Moore, 2009)	(Vodova, 2011) (Akhtar & Sadapat, 2011)	(Fadare, 2011) (Vodova, 2011)	(Ahmed et al, 2011)	(Delechat et al, 2012)	(Trenca et al, 2012)	(Munteanu, 2012)	(Johal, 2012)	(Mohd Ariffin 2012)	(Vodova 2013)	(Patora, 2013)	(Mohamad, et al., 2013)	(Chagwiza, 2014)	(Ramzan & Zafar, 2014)	(Roman & Sargu, 2014)	(Mehmed, 2014)	(Farooq, et al., 2015)	(Jedidia & Hamza, 2015)	(Ben Mousa, 2015)
Gross Interest Income/Total Deposits												>								
Gross Interest Income/Total Gross Income												>								
Growth Rate of GDP					>	\geq													>	\mathbf{i}
Households and non-profit institutions 'deposits of original maturity of over 1 and up to 2 years, annualized agreed rate												>								
Households and non-profit institutions 'loans due from -5 years												>								
Inflation Rate												>							>	
Inflation Volatility						\geq														
Interbank Assets/ Interbank Liabilities	>		>				\mathbf{i}	\mathbf{i}		~	,		>	>						
Interbank Rate and Central Bank Rate Spread in BPS								\mathbf{i}												
Interest Rate on Interbank Transaction																\geq				
Interest Rate on Loans	>		,						,	~										
Investment Deposit Ratio			,				\mathbf{i}		,	~										
Investment/Total Assets																				>
Lender of Last Resort						\geq														
Liquid Assets/Total Current Liabilities											,									
Loan Loss Reserve Ratio						\geq								>						
Loan Rate and Deposit Rate Spread in BPS						\geq					,	2					>			
Loans/Deposit Ratio		>					\mathbf{i}					>							\geq	
Money Supply			,	>					`	~		>								
Net Interest Income/Average Earnings Assets						\geq														
Net Interest Margin																			\geq	
Net International Reserve						\mathbf{i}														
Non-earning Assets/Total Deposits													>							
Non-Performing Loans																	\geq			



		Total Assets as at year end 2014 (USD)	Country
1	Al Rajhi Banking and Investment Corporation (J.S.C.)	82,002,839	Kingdom of Saudi Arabia
2	Kuwait Finance House (K.S.C.P)	58,661,355	State of Kuwait
3	Maybank Islamic Berhad	41,853,520	Malaysia
4	Dubai Islamic Bank (P.J.S.C.)	33,729,202	United Arab Emirates
5	Abu Dhabi Islamic Bank (P.J.S.C.)	30,466,595	United Arab Emirates
6	Qatar Islamic Bank (S.A.Q.)	26,393,231	State of Qatar
7	Bank Kerjasama Rakyat Malaysia Berhad	25,531,953	Malaysia
8	Al Bakara Banking Group (B.S.C.)	23,463,589	Kingdom of Bahrain
9	Masraf Al Rayan (Q.S.C.)	21,995,883	State of Qatar
10	Alinma Bank (J.S.C.)	21,549,084	Kingdom of Saudi Arabia
11	Bank AlJazira (J.S.C.)	17,736,127	Kingdom of Saudi Arabia
12	CIMB Islamic Bank Berhad	14,255,842	Malaysia
13	Bank Islam Malaysia Berhad	13,099,933	Malaysia
14	Bank AlBilad (J.S.C.)	12,053,435	Kingdom of Saudi Arabia
15	Kuwait International Bank (K.S.C.P)	11,946,190	State of Kuwait
16	Emirates Islamic Bank (P.J.S.C.)	11,683,425	United Arab Emirates
17	Public Islamic Bank Berhad	10,907,537	Malaysia
18	Qatar International Islamic Bank (Q.S.C.)	10,544,898	State of Qatar
19	RHB Islamic Bank Berhad	10,324,773	Malaysia
20	AmIslamic Bank Berhad	10,066,462	Malaysia
21	Ahli United Bank (K.S.C.P)	9,040,389	State of Kuwait
22	Kuwait Finance House Bahrain (B.S.C.)	7,860,904	Kingdom of Bahrain
23	Sharjah Islamic Bank (P.J.S.C.)	7,082,191	United Arab Emirates
24	Hong Leong Islamic Bank Berhad	6,231,833	Malaysia
25	Bank Muamalat Malaysia Berhad	5,735,549	Malaysia
26	Boubyan Bank (K.S.C.P)	5,676,268	State of Kuwait
27	Al-Salam Bank-Bahrain (B.S.C.)	5,186,189	Kingdom of Bahrain
28	HSBC Amanah Malaysia Berhad	4,683,506	Malaysia
29	Bahrain Islamic Bank (B.S.C.)	3,930,943	Kingdom of Bahrain
30	OCBC Al-Amin Bank Berhad	3,907,733	Malaysia
31	Affin Islamic Bank Berhad	3,637,347	Malaysia
32	Ajman Bank (P.J.S.C.)	3,057,797	United Arab Emirates
33	Kuwait Finance House (Malaysia) Berhad	2,993,779	Malaysia
34	Standard Chartered Saadiq Berhad	2,770,066	Malaysia
35	Ithmaar Bank (B.S.C.)	2,321,381	Kingdom of Bahrain
36	Alliance Islamic Bank Berhad	2,112,866	Malaysia
37	Al Rajhi Banking & Investment Corporation	2,078,728	Malaysia
	(Malaysia) Berhad		-
38	Asian Finance Bank Berhad	817,959	Malaysia
39	Arab Banking Corporation Islamic Bank (E.C.)	29,356	Kingdom of Bahrain

Appendix C: List of Islamic Banks Ranked by Total Assets

Source: Author's own computation and compilation.

-