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Financing Structure and Liquidity Risk: Lesson from Malaysian Experience[1]

Abstract: This study examines the relationship between financing structure and bank liquidity risk. We compare the findings between Islamic and conventional banks for the case of Malaysia. We adopt four measures to represent financing structure; namely 1) real estate financing, 2) financing concentration, 3) stability of short-term financing structure and 4) stability of medium-term financing structure. Two BASEL III liquidity risk measures are tested; namely, liquidity coverage ratio (LCR) and the net stable funding ratio (NSFR) to measure short- and long-term liquidity risk, respectively. Based on panel data regression comprising 27 conventional and 17 Islamic banks from 1994 to 2014, our findings show that real estate financing and stability of short-term financing structure for Islamic banks are positively related to both liquidity risk measures. This implies that an increasing number of real estate financing and a stable short-term financing structure may increase Islamic banks' short- and long-term liquidity risks. However, although real estate financing does not affect conventional banks' liquidity risks, a stable short-term financing structure and increasing financing concentration can positively influence bank long-term liquidity risk. Our findings shed light crucial policy implications for regulatory bodies and market players in the context of liquidity risk management framework as well as the need to develop a separate framework between conventional and Islamic banking institutions.

Keywords: liquidity risk, financing structure, LCR, NSFR

JEL classification: G28, G21, G32

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1. Introduction

Despite manageable challenges, the fast and structured development of the Islamic banking industry in Malaysia has made Malaysia to be referred as a model of Islamic finance (Rudnyckyj, 2014). Islamic banking industry has been in Malaysian financial market since 1983 with the establishment of Bank Islam Malaysia Berhad, the first Islamic bank in Malaysia. Malaysian Islamic banking is administered by the Islamic Banking Act 1983 (IBA), while the conventional banking is under the Banking and Financial Institutions Act 1989 (BAFIA). However, both acts were fully taken over by the Islamic Financial Services Act (IFSA 2013) and Financial Services Act (FSA 2013), respectively to modernize the laws governing the conduct and supervision of financial institutions in the country to ensure the relevancy of effectiveness of the law. Such move is important to maintain financial stability and support the growth of both financial systems that coexist in the economy.

Islamic banking grows rapidly and is one of the most important financial intermediaries in Malaysia. Similar to conventional banking, Islamic banking also serves as a platform to implement monetary policy through financing mechanisms (Mohamad, Borhan, & Sulaiman, 2012). Islamic banks also generate profit in addition to adherence to religious factors and values such as fairness in trade (Shuib, Borhan & Abu Bakar, 2011). Conventional banks are regarded as different to Islamic banks mainly due to the usury (*riba'*) element in its practice. The practice of usury (*riba'*) is forbidden in Islam because of the burdensome nature of the contracting parties and unfairness in transactions that are claimed to be occurred in conventional banking system. Unlike conventional banks, Islamic banks are not allowed to offer a fixed rate of return on deposits. In addition, profit rate charged on financing (be it fixed or floating) should have a counter value in the context of risk-taking by the Islamic banks (Man Kit & Abdul-Rahman, 2011). In a different study, Hadenan & Borhan (2006) and Rosland & Borhan (2013) reported the role of Islamic banks is not only the providing of unrestricted funding as a borrower and a lender, but also as a partner (either as investors or entrepreneurs). Similar to conventional banks, Islamic banks depend on customers' deposits as well as returns on the financing offered to customers as the main source of income. In this context, the financing offered by Islamic banks is typically long-term in nature and open to risk of credit default by customers. At the same time, failure to provide deposits to customers when they are in need of cash and failure to obtain the financing amount plus profit will lead to a decline in bank credibility in managing its liquidity risk, either on short- or long-term basis. Moreover, the limited money market instruments that are *shariah* compli-

ant have worsened the challenge for the Islamic banks in managing liquidity risk exposure efficiently.

Bank liquidity is an ideal criterion to evaluate its capability to fulfill its commitments to depositors while minimizing costs. Among the most important risks to be managed is liquidity risk which should be constantly analyzed and managed effectively (Khan & Ahmed, 2001). Iqbal (2012) emphasizes that liquidity risk management plays a crucial role in determining the direction of a banking institution, be it a conventional or an Islamic banking institution. According to Saidan & Ismail (2013), failure to have a systematic liquidity management will lead to the existence of insolvency risk or bank run, especially when involving the banks' inability to pay deposit when it is needed. In other words, liquidity risk is a result of the banks' failures to balance between their assets and liabilities, most often due to mismatch in the financing offered and deposit gathered (Samsudin, Abd Halim, Mohamad, & Sulaiman, 2012). Supporting the Basel III liquidity risk measures, Vazquez and Federico (2015) show that banks with fragile structural liquidity were more likely to fail, especially during a crisis.

Banks' income, resulting from efficient banking operation, is also recognized as an important source of internal funding to cover any shortfall in cash. In relation to this, Rossi, Schwaiger, Winkler (2009) reported that financing structures can affect bank efficiency. Not only that, previous studies also shows that financing structure may affects various types of bank risk. While Blasko & Sinkey, Jr (2006) found that real estate lending affects the ability of US banks to manage interest rate risk, Ahmad & Mohamad (2004) showed evidence that lending in a risky sector may reduce market risk for Malaysian depository institutions. Moreover, Abdul-Rahman (2009) and Abdul-Rahman & Shahimi (2010) found that lending structure affects the exposure level of both the Malaysian conventional as well as Islamic commercial banks' insolvency risk, market risk, interest rate risk and foreign exchange rate risk at some degree. Against this background, we post our research questions as follows. First, does financing structure influence liquidity risk in conventional and Islamic banking systems? Second, do regulators have to conduct different liquidity risk management framework for conventional and Islamic banks? Answering these questions by investigating the financing structure-liquidity risk hypothesis in the scope of comparative analysis between conventional and Islamic banks will provide essential policy implications for countries where dual banking systems coexist.

Combining the efficiency-liquidity risk hypothesis and financing structure-risks strand of literature mentioned above, we aim to investigate whether financing structure affects liquidity risk. To investigate the financing structure-liquidity

risk hypothesis, first we construct four financing structure measures based on Abdul-Rahman & Shahimi (2010) such as real estate financing, financing concentration, stability of short-term financing structure, and stability of medium-term financing structure. Second, we calculate two latest liquidity risk measures, introduced by Basel III, namely, the liquidity coverage ratio (LCR) and the net stable funding ratio (NSFR) to measure short- and long-term liquidity risk, respectively. Third, we then use panel regression analysis to alternately test the relationship between four types of financing structure measures and two types of liquidity risk measures.

Our analysis shows that real estate financing and stability of short-term financing structure for Islamic banks are positively related to both liquidity risk measures. This implies that the increasing number of real estate financing and a stable short term financing structure may increase Islamic banks' short- and long-term liquidity risks. However, although real estate financing does not affect conventional banks' liquidity risks, a stable short-term financing structure and increasing financing concentration can positively influence their long-term liquidity risk. In general, our findings somehow differ between Islamic and conventional banks.

Our contribution to the body of knowledge is threefold. First, to the best of our knowledge, this is the first study that evaluates the theoretical hypothesis of financing structure-liquidity risk. Second, we compare the relationship for conventional and Islamic banks. The majority of past studies for conventional and Islamic banks evaluate financing structure on various types of systematic risks using dummy variable for Islamic banks using a single data set, with no study considering comparative analysis for conventional and Islamic banks using two different data sets. Third, we adopt four different financing structure measures in testing both short- and long-term liquidity risk measures, introduced by Basel III. The four models capture different dimensions of financing composition, and thereby provide a more comprehensive exploration in investigating the financing structure-liquidity risk hypothesis.

Our findings offer a number of policy implications. First, they suggest that financing compositions to some extent may influence either short- or long-term liquidity risk exposures for Malaysian banks. Second, the impact of financing structures on liquidity risks does not only differ between short- and long-term liquidity risks, but also it differs between conventional and Islamic banking systems. Hence, we hope our findings may shed light to regulators and market players in both conventional and Islamic banking institutions to separately devise an effective strategy in drafting appropriate financing portfolio in order to minimize their liquidity risk exposures.

The remainder of this paper is organized as follows. The second section discusses the literature review, followed by the research methodologies. The fourth section describes the findings of the analysis, and the last section covers the conclusion, including the policy implications derived.

2. Literature Review

Bank liquidity risk is defined as the risk of being unable either to meet the obligations of the depositors or to fund increases in assets as they fall due without incurring unacceptable costs or losses. According to Iqbal (2012), liquidity problem also arises because of depositors' decisions to withdraw their deposits and a bank does not have enough cash in hand. In reality, banks find imbalances in the asset and liability side of balance sheet on the regular basis and need to manage it accurately; otherwise they would face insolvency risks.

Based on the above liquidity risk definition, Ruozi & Ferrari (2013), Drehmann & Nikolaou (2013) and Iskandar (2014) categorize liquidity risk into two types; namely, the market liquidity risk and funding liquidity risk. While the former refers to the risk of inability or difficulty of banks to convert a financial asset into cash, the latter refers to the incapability of banks to fulfill their liabilities straightaway or in a cost-effective way.

With regard to liquidity risk measures, most previous studies use various simple accounting measures such as the ratio of total deposit to total asset (in Sulaiman, Mohamad & Samsudin, 2013), cash to total asset (in Akhtar, Ali & Sadaqat, 2011; Anam, Hassan, Ahmed, Uddin & Mahbub, 2012; Abdul karim, 2013; Iqbal, 2012 and Ramzan & Zafar, 2014), capital to total assets (in Abdullah & Khan, 2012), and the ratio of current asset to total liabilities (in Ahmed, Ahmed & Naqvi, 2011) in investigating the impact of different factors on liquidity risk. From the perspective of investors, Buch and Goldberq (2015) measure market liquidity risk via money market spreads that capture investors' expectations of movements in liquidity risk. From the perspective of regulatory monitoring, there are four empirical studies by Horrath, Seidler & Weill, (2012), Cucinelli (2013), Ramzan (2014), and Brůna and Blahová (2016) that took into account the latest liquidity risk measures by constructing a more complex formula proposed by Basel III, namely the liquidity coverage ratio (LCR) and the net stable funding ratio (NSFR).

For our focal variable, Buch & Goldberg (2015) show that the structure of bank balance sheet and banks' business models influence their responses to liquidity

risk, inferring that financing composition may play a role. Since there is only one study on financing structure and liquidity risk, we discussed the findings from previous studies that examined the impact of financing structure on various types of risks. Ahmad & Mohamad (2004) identified that risky sectors may affect the market risk exposure of deposit-taking institutions in Malaysia using a single-factor Capital Asset Pricing Model (CAPM). Meanwhile, Abdul-Rahman (2009) and Abdul-Rahman & Shahimi (2010) examined the relationship between four financing structure measures, namely 1) real estate financing, 2) financing concentration, 3) stability of short-term financing structure, and 4) stability of medium-term financing structure on the insolvency risk and three factor CAPM risks, respectively for the context of Malaysian commercial Islamic and conventional banks. In general, their findings lent support to the impact of lending structure on insolvency risk and various types of systemic risks except liquidity risk.

For the control variables, most previous studies on the determinants of bank liquidity risk focused more on the bank-specific characteristics. Research done by Abdel Karim (2013) compared liquidity risk management between Saudi and Jordanian banks during the period 2007 and 2011. He proxied liquidity risk using cash divided by total assets and regress bank size, investment to asset ratio, capital to asset ratio, debt to equity ratio, loan to deposit ratio, the return on equity and return on assets to liquidity measure. His findings showed that the debt to equity ratio and the capital to total assets had positive relationships while size and loan to deposit ratio had negative relationships with liquidity risk for Saudi banks. The Jordanian banks showed that the debt to equity ratio, return on asset ratio, capital to asset ratio were positively related while the investment to assets ratio, loan to deposit ratio, and return on equity were negatively related. Furthermore, they concluded that Jordanian banks have better liquidity positions as compared to Saudi banks.

Comparing liquidity risk between domestic and foreign banks, Abdullah & Khan (2012) focused for the case of Pakistan for the period of 2001 to 2010. They measured liquidity risk using a different proxy, namely capital to total assets but included bank-specific variables similar to Mohammad Abdel Karim (2013). Their results showed that bank size and debt to equity ratio had positive relationships with liquidity risk for domestic banks while the debt to equity ratio and total loans to total deposits ratio had significant relationships with liquidity risk of foreign banks. As the debt to equity ratio showed positive relationship for both domestic bank and foreign banks, they suggested Pakistani banks to minimise the debt to equity ratio in order to reduce liquidity risk exposure.

Using similar liquidity risk measure for Pakistani banks but different independent variables, Ahmed, Ahmed & Naqvi (2011) investigated similar issue over the period of 4 years from 2006 until 2009 and found that leverage (measured by ratio of debt assets to total assets), tangibility (measured by fixed assets to total assets) and different establishment age are important determinants to Pakistani Islamic banks' liquidity risk. The results were in contrast to Ramzan & Zafar (2014) who also investigated Pakistani banks, but for a period of 5 years, from 2007 until 2011 and using a different proxy of liquidity risk. He found only size is positively related to liquidity risk. The inconsistent results could be due to different measurement of liquidity risk between two authors as well as different sampling of time period.[2]

Despite focusing solely on Islamic banks, Akhtar et al. (2011), Anam et al (2012), Iqbal (2012), made comparative analysis between conventional and Islamic banks on the same issue. Firstly, Akhtar et al (2011), focused on Pakistan banks covering a period of 4 years from 2006 until 2009 and testing whether the size, networking capital, return on equity, capital adequacy ratio, and return on assets affect liquidity risk. They showed that only return on asset can negatively affect liquidity risk (cash to total asset ratio). Using the same proxies as Akhtar et al. (2011) but with a later time period covering year 2007 to 2010, Iqbal (2012) added another independent variable, which is non-performing financing (NPF). The results are in contrast to Akhtar et al. (2011) in which all variables are negatively related, while NPF is positively related to liquidity risk for both Islamic and conventional banks. They show that a higher ratio of NPF indicates higher liquidity risk due to banks having large numbers of bad debts. Failure of banks to collect debt increases liquidity risk as greater amount of bad debts decrease liquidity position of the banks.

Secondly, Anam et al. (2012) compared liquidity risk between Islamic and conventional banks in Bangladesh covering five years period, from 2006-2010. They only focused on bank-specific characteristic such as size, networking capital, return on equity, capital adequacy ratio, and return on assets. Using cash to total asset for liquidity risk measure, their results show that only size is negatively related to liquidity risk for Islamic banks while networking capital is negatively related to liquidity risk for conventional banks.

As the aforementioned studies only captured bank-specific variables, Sulaiman et al. (2013) investigated the determinants of liquidity risk (measured by total

[2] Asim and Qayyum (2012) and Naveed (2011) adopt capital to total asset, while Ramzan et al. (2014) use cash to total asset as liquidity risk measures

deposit to total asset) by taking into consideration economic cycles for the case of Malaysian Islamic banks. Besides bank-specific characteristics, they included 3-month Interbank Money Market rate, money supply, inflation rate, and gross domestic product (GDP) as additional independent variables. Using Generalized Method of Moments (GMM) in estimating panel data for 17 Islamic banks within the period from 1994 until 2009, they found that inflation and GDP are inversely related to liquidity risk.[3] Economic growth gives good prospects for banks to generate more income and thus reduce liquidity risk. The inverse relationship of GDP with liquidity risk is consistent with Cucinelli (2013) who measured liquidity risk via the liquidity coverage ratio (LCR).

For the Malaysian context, the study for liquidity risk is still limited. Besides Sulaiman et al. (2013) that focused on macroeconomic cycles on top of a few bank specific variables, Ariffin (2012) analysed the relationship between liquidity risk and performance during the crisis by using only two variables, which are the return on assets (ROA) and the return on equity (ROE). She selected the top six Islamic Banks in Malaysia from 2006 to 2008 to examine the crisis period. Via the correlation analysis, she found that during the financial crisis, performance is negatively related to liquidity risk. The higher the liquidity risk, the lower will be the ROA and the ROE and vice versa.

Against this background, most of the researchers used simple liquidity risk measures in investigating various factors affecting bank liquidity risk. For example, Akhtar et al. (2011), Anam et al. (2012), Abdel Karim (2013), Iqbal (2012), Ramzan et al. (2014) used cash to total assets as a proxy for liquidity risk. While Sulaiman et al. (2013) used total deposits to total assets, Asim and Khan (2012) adopted capital to total assets as liquidity risk measures. However, responding to the latest liquidity risk indicators proposed by Basel III, we adopt LCR and NSFR as the latest liquidity risk measures. LCR entails banks to maintain enough high quality liquid assets to control liquidity stress within 30 days while NSFR is a measure of funding risks that extends beyond loans and that deter banks' excessive dependence on short-term wholesale deposits (Yi Wu, Elif Ture, Danial & Nicholas, 2014) and promote better mobilization of stable sources (Gobat, 2014). Although Cucinelli (2012) examined LCR and NSFR, this study differs from hers in the sense that she investigated factors affecting liquidity risk within the context of European countries and focusing only on conventional banks; while our study looks at the financing structure-liquidity risk relationship by comparing the re-

[3] Although GMM is appropriate to solve endogeneity issue of time, Heino Bohn Nielsen (2005) suggests that a large cross section is required for GMM to produce an excellent estimation. Since Ahmad Azam et al. (2013) only have 17 banks, their findings could be challenge in future.

lationships between conventional and Islamic banks that co-exist in a similar financial landscape. In addition, we comprehensively considered all independent variables, comprising both bank-specific and macroeconomic variables that have been analysed in previous studies as control variables.

3. Methodology

The research from previous studies provides some basis theory on the relationship of each determinants of liquidity risk. The model developed in this study is the modification from previous studies. We comprised both bank-specific characteristics and macroeconomics factors as follows along with our focal variable, financing structure (*FS*):

$$LQ_{it} = \beta_0 + \beta_* FS_{i,t} + \beta_1 SIZE_{i,t} + \beta_2 CAR_{i,t} + \beta_3 ROA_{i,t} + \beta_4 NPF_{i,t} + \beta_5 FIN_{i,t} + \beta_5 GDP_t + \beta_6 INF_t + \alpha_i + \mu_{it}$$

The alternate dependent variables (LQ_{it}) considered two methods proposed by Basel III, namely Liquidity Coverage Ratio (LCR) and Net Stable Funding Ratio (NSFR). Cucinelli (2013) and Claudio (2010) have measured liquidity risk with same method but using different data sampling. As their studies focusing on developed countries (European countries and Italy), ours is on a developing country, Malaysia. In addition, to be aligned with the items in balance sheet for Islamic banking, we follow guidelines issued by Islamic Financial Services Board, namely the *'Guidance Note on Quantitative Measures for Liquidity Risk Management in Institutions Offering Islamic Financial Services [Excluding Islamic Insurance (Takāful) Institutions and Islamic Collective Investment Schemes'* to measure LCR and NSFR of Islamic Banks in Malaysia (IFSB, 2015).

Following Abdul-Rahman & Shahimi (2010), our alternate four Financing Structure variables (FS_{it}) are as follows:

1) **Real-Estate Financing**. A few previous studies have tried to assess the impact of real estate financing to bank risk, but there is still no standard definition for the real estate sector. In order to keep this study in line with previous studies, this study uses three measures: (i) Financing to Real Estate sector (RE), (ii) Financing to Broad Property Sector (BPS) and (iii) Financing to risky sector (RISKY).
2) **Financing concentration (SPEC)**. Similar to the Herfindahl-Hirschman Index, SPEC built is as follows:

$$SPEC = \sum_{t=1}^{14} s^2{}_{it}$$

Where, s_i is the amount of annual financing in sector *i*. Scores approaching 1 indicates the high level of financing concentration while a score approaching 0 indicates high level of diversity in the financing portfolio across different sectors.

3) **Lending-Composition Change (LCC)**. LCC is in respect of short-term stability in the composition of financing. LCC is generated using the following formula:

$$\text{LCC} = \sum_{i=1}^{14} min\,(s_{it}, s_{it-1})$$

S_{it} is when i is the contribution in the amount of annual funding (*t*). It takes a maximum value of 1 if there is no change in the composition of the financing and the minimum value is 0 if the portfolio of financing through financial sector is not funded in the previous year. Therefore, high LCC value indicates short-term stability of the financing composition.

3) **Variance of traditionality index (VART)**. VART refers to the stability of medium-term financing structure. It measures the changes in the financing composition over the medium term. It is the variance of traditionality index (*TI*) that is calculated using the five years intervals for each of the sectors involved. IT for 2005 is calculated using the data from the 2003 to 2007, while data for 2006 used the 2004-2008 data, and so on. Formula for *TI* is as follows:

$$TI_{it} = \frac{\sum_{l=-2}^{l=2} c_{i,t-2}}{5}$$

Where C_i, accumulated financing for each industry is calculated as follows:

$$C_{it} = \frac{\sum_{i=t_0}^{t} e_{it}}{\sum_{i=t_0}^{t_1} e_{it}}$$

Where t_0 and t_1 are the beginning and end of the period for the data, respectively and e_{it} is financing industry *i* in year *t*. VART is a variant of the entire *TI* sector, in which high variance shows different funding patterns in the next 5 years. Meanwhile, low variant signifies a stable loan.

For control variables, we include bank-specific variables; namely, size ($SIZE_{i,t}$) capital adequacy ratio ($CAR_{i,t}$), return on assets ($ROA_{i,t}$), non-performing financing ($NPF_{i,t}$) and financing ($FIN_{i,t}$). We also incorporate two macroeconomic variables; namely, gross domestic product (GDP_t) and inflation (INF_t). The inclusion of control variables are based from Cucinelli (2013), Sulaiman et al. (2013), Akhtar et al. (2011), Anam et al. (2012), Abdel Karim (2013), Iqbal (2012) and Ramzan & Zafar (2014).

Firstly, *SIZE* is logarithm of total assets and it normally increases the liquidity ratio, and reduce liquidity risk of banks. Secondly, *CAR* is measured by Tier 1 capital + Tier 2 capital to risk-weighted assets. *CAR* normally measures the bank's financial strength expressed by the ratio of its capital to its risk-weighted credit exposure. A banking institution is required to hold additional capital buffers above 8% as mentioned by the central bank of Malaysia. According to Adalsteinsson (2014), the liquidity reserve is liquidity available to cover additional funding needs for defined period of time under stress conditions. Hence, it is expected that *CAR* increases bank liquidity and reduces liquidity risk. Thirdly, *ROA* is measured by net income divided by total equity. *ROA* measures the profitability of the banks. It also shows the efficiency of the banks in using its assets to generate net income. It is expected that *ROA* decreases the liquidity risk and increases the liquidity ratio for bank due to bank have high profitability to cover risk. Fourthly, *NPF* is measured by total non-performing financing divided by total financing. It is a measure of financing quality. Theoretically, a low financing quality reduces profit and liquidity, thus leads to an increase in liquidity risk. Lastly, *FIN* is measured by total financing divided by total assets. Financing is the important role to banks to increase the profitability. Banks will generate more profit (liquidity) with given financing from depositor's fund. Nevertheless, given a higher financing may also lead to increase in liquidity risk due to banks not having sufficient cash to cover any possible losses.

With regards to macroeconomic factors, *GDP* is measured by growth of Gross Domestic Product. *GDP* is commonly used as an indicator of the economic health of a country. For banks, *GDP* can be a key indicator for demand of banking services in the context of receiving deposits and providing financing. Theoretically, a higher *GDP* increases bank liquidity as citizens have more money circulated in financial market, thus decreasing liquidity risk. Another macroeconomic variable, *INF*, is measured by Consumer Price Index. *INF* is the percentage change in the value of the price index on a year-on year basis. It measures the change in the prices of a goods and services in a year. *INF* can affect bank's cost and production. It is expected that higher inflation increases liquidity risk for banks. The summary of the variable specification is presented in Table 1.

Table 1: Mnemonics and Specifications of Variables

Mnemonics	Meaning	Formula
LQ_{it}	Liquidity Coverage ratio	$\frac{High\ Quality\ Liquid\ Asset\ (HQLA)}{Total\ net\ cash\ Outflows\ Over\ The\ next\ 30\ Calender\ days} \geq 100$
	Net Stable Funding Ratio	$\frac{Availableamount\ of\ stable\ funding}{Required\ amount\ of\ stable\ funding} \geq 100$
FS_{it}	Four alternate measures: 1) real estate financing, 2) financing concentration, 3) short-term financing stability and 4) medium-term financing stability	Real estate financing is divided into 3 subcategories, RE, BPS and RISKY. This was followed by the index of specialization (SPEC), short-term loans (LCC) and long-term loans (VART)
$SIZE_{i,t}$	Total Asset	Log Total Asset
$ROA_{i,t}$	Return on Assets	Profit After Tax and *Zakat* / Total Asset
$NPF_{i,t}$	Non-performing Financing	Total Non-performing Financing / Total Asset
$FIN_{i,t}$	Financing	Total Financing / Total Asset
$CAR_{i,t}$	Capital Adequacy Ratio	Total Capital / Total Asset
GDP_{t}	The growth of the Gross Domestic Product	Value of the growth of the Gross Domestic Product
INF_{t}	Inflation Rate	Value of Inflation

In terms of data sampling, we collected a sample of all 27 conventional banks and 17 full-fledged Islamic banks for the period from 1994 to 2014. We constructed bank-specific measures using unconsolidated individual bank financial statement data from the Bureau Van Dijk Bankscope database and publicly available audited reports where available. While, macroeconomic data were retrieved from the websites of Global Market Data Index (GMDI). Using unbalanced panel regression, two models re tested - fixed effect and random effect. The best model is selected based on the Hausman test, Likihood ratio Test and F--Statistics.

4. Findings and Discussions

Descriptive analysis was conducted to examine the statistical characteristics of each variable to be used as the independent variables in the model. The analysis includes the mean, median, standard deviation, skewness and kurtosis Jaque-Bera value. Mean value refers to the average value of the variables in the entire sample and standard deviation or variation refers to the distribution of the scattered data from the mean value. Table 2 (a) and (b) show a summary of the basic descriptive statistics of the variables involved in the model for the conventional and Islamic banks, respectively.

Table 2: Descriptive Analysis

	Panel A: Conventional Banks					Panel B: Islamic Banks				
	Mean	Std. Dev	Skewness	Kurtosis	Jarque-Bera	Mean	Std. Dev	Skewness	Kurtosis	Jarque-Bera
LCR	4.913	40.896	13.584	197.988	713800 ***	0.881	1.488	2.250	38.786	13930 ***
NSFR	1.089	3.483	20.044	415.464	3177071 ***	1.026	1.272	9.508	132.691	189710 ***
RE	0.262	0.182	0.302	2.132	18.959 ***	0.319	0.253	1.202	4.020	71***
BPS	0.306	0.182	0.017	2.049	15.342 ***	0.380	0.265	0.878	3.114	32 ***
RISKY	0.382	0.229	-0.057	1.900	20.684 ***	0.527	0.247	0.206	2.397	5 ***
LCC	0.841	0.208	-2.618	10.098	1244 ***	0.854	0.210	-1.268	6.356	182 ***
SPEC	0.280	0.198	1.946	6.664	484 ***	0.417	0.234	1.432	4.061	97 ***
VART	25.531	132.020	7.014	57.983	39980 ***	0.052	0.040	0.459	2.239	10 ***
SIZE	6.402	0.709	-0.566	3.525	28***	6.736	1.007	-0.083	4.881	39***
CAR	0.122	0.153	5.181	40.980	28737***	0.090	0.188	11.744	164.519	284162 ***
ROA	0.009	0.016	-0.131	43.243	30029***	0.004	0.035	1.050	54.596	29332 ***
NPF	0.090	0.528	0.150	24.508	1407997 ***	0.022	0.875	5.053	27.863	4621 ***
FIN	0.738	0.340	0.349	18.021	6482 ***	0.893	0.940	7.201	57.310	34595 ***
GDP	5.305	3.891	-1.780	6.374	568 ***	5.305	3.893	-1.780	6.374	357 ***
INF	2.619	1.255	0.607	2.816	35 ***	2.619	1.255	0.607	2.812	22 ***

Note. ***, ** and * is significant at 1%, 5% and 10% confidence interval

Before conducting panel regression estimation, we run a correlation analysis to ensure our data is free from severe multicollinearity issue. Table 3 (a) and (b) shows the correlation matrix between the dependent variables (LCR and NSFR) and other independent variable for conventional and Islamic banks, respectively. In general, the coefficient correlations for all variables are less than 0.8, conjecturing that multicollinearity problem is not severe for our data sets.

Table 3 (a): Correlation Matrix for Conventional Banks

	LCR	NSFR	RE	BPS	RISKY	LCC	SPEC	VART	SIZE	CAR	ROA	NPF	FIN	GDP	INF
LCR	1.000														
NSFR	-0.108	1.000													
RE	0.111	-0.114	1.000												
BPS	0.092	-0.146	0.971	1.000											
RISKY	0.062	-0.127	0.946	0.968	1.000										
LCC	0.049	-0.091	0.340	0.339	0.358	1.000									
SPEC	-0.014	0.306	-0.291	-0.397	-0.397	-0.245	1.000								
VART	-0.016	0.045	-0.153	-0.160	-0.178	0.073	0.135	1.000							
SIZE	0.116	0.068	0.560	0.559	0.582	0.275	-0.256	-0.033	1.000						
CAR	-0.016	0.163	-0.232	-0.249	-0.277	-0.075	0.187	0.035	-0.166	1.000					
ROA	0.016	-0.332	-0.052	-0.110	-0.083	-0.036	0.053	-0.020	-0.070	0.256	1.000				
NPF	0.002	-0.010	0.044	0.071	0.079	0.059	-0.130	-0.035	0.203	-0.024	-0.032	1.000			
FIN	0.213	-0.025	0.358	0.351	0.373	0.250	-0.240	-0.067	0.673	-0.093	-0.032	0.255	1.000		
GDP	-0.072	-0.046	0.016	0.000	-0.012	-0.043	-0.003	0.019	0.082	-0.063	0.003	0.035	0.013	1.000	
INF	-0.078	-0.021	-0.058	-0.065	-0.046	-0.118	0.112	-0.024	-0.008	-0.062	0.030	-0.068	0.023	-0.083	1.000

Table 3 (b): Correlation Matrix for Islamic Banks

	LCR	NSFR	RE	BPS	RISKY	LCC	SPEC	VART	SIZE	CAR	ROA	NPF	FIN	GDP	INF
LCR	1.000														
NSFR	0.235	1.000													
RE	-0.144	0.163	1.000												
BPS	-0.221	0.143	0.938	1.000											
RISKY	-0.208	-0.005	0.446	0.500	1.000										
LCC	-0.228	-0.090	0.308	0.305	0.025	1.000									
SPEC	-0.014	0.043	0.272	0.195	0.303	0.324	1.000								
VART	0.184	0.097	0.093	-0.053	-0.155	-0.013	0.256	1.000							
SIZE	0.287	0.179	-0.122	-0.187	-0.177	0.153	0.261	-0.149	1.000						
CAR	0.012	-0.264	-0.207	-0.215	-0.272	-0.148	0.033	0.128	0.057	1.000					
ROA	-0.032	-0.012	0.027	-0.016	0.063	0.026	0.154	0.210	-0.163	0.087	1.000				
NPF	0.220	0.144	-0.056	-0.093	-0.239	-0.017	0.158	0.017	0.671	0.271	-0.171	1.000			
FIN	0.293	0.231	-0.093	-0.149	-0.304	-0.002	0.223	-0.021	0.721	0.303	-0.142	0.761	1.000		
GDP	-0.071	-0.040	0.006	0.033	0.097	-0.182	0.032	-0.122	-0.049	-0.129	0.002	0.069	-0.050	1.000	
INF	0.122	0.073	-0.041	-0.036	-0.024	-0.081	-0.042	0.091	-0.158	0.091	-0.096	-0.008	-0.063	0.279	1.000

Table 4 and 5 show our panel regression results using two liquidity risk indicators, LCR, and NSFR. LCR measures short term liquidity risk within 30 days period while NSFR measures longer term liquidity risk within a year. As a higher value of LCR and NSFR means that banks hold higher liquidity position, the interpretation towards liquidity risk is reverse from the coefficients in Table 4 and 5. Since our study focuses on liquidity risk (not liquidity position), the following discussion directly deliberates towards liquidity risk exposures.

Based on Table 4: Panel B, the financing structure variables for the real estate sector (model 1a) and *BPS* (model 1b) for Islamic banking shows a positive correlation with short-term liquidity risk (LCR), while illustrating insignificant relationship for conventional banking. This implies that an increase in real estate funding will reduce the liquidity position and increase liquidity risk of Islamic banks, but not conventional banks. Meanwhile, it is noted that *LCC* shows a significant positive relationship with liquidity risk of Islamic banking. When Islamic banking stabilises its short-term financing structure, it increases its short-term liquidity risk. This result is consistent with the findings by Abdul-Rahman (2009). Given the fact that Islamic banks rely quite heavily on real estate sectors, the increasing liquidity risk may be resulted by negligence in ensuring the financial background of borrowers. If borrowers fail to repay financing, it will directly lead to the exposure to credit risk and eventually increase liquidity risk, resulted from the failure of banks to maintain stable income from banking operation to fulfil the demand from depositors. As our results show evidence that financing structure does not influence liquidity risk of conventional banks, proper and separate regulations for Islamic banks must be put in place so that banks can avoid losses that indirectly lead to increasing their liquidity risk exposure.

For bank-specific variables, Table 4 Panel (B) shows significant positive relationships between *SIZE* and liquidity risk of Islamic banks, implying the bigger the Islamic banks are, the higher will be the liquidity risk. Similarly, variable *CAR* also shows significant positive relationships with liquidity risk for the case of Islamic banks. This is in line with studies of Saidan & Ismail (2013) where Islamic banks would reduce their liquidity position by increasing the amount of financing as its capital buffer increases, which later on leads to increment in liquidity risk.

Next, the *FIN* variables show significant relationship to liquidity risk. Financing is positively connected to liquidity risk for Islamic Banking, which is parallel with the study of Sulaiman et al. (2013) and Yaacob, Abdul-Rahman, & Abdul Karim (2015). The increase in total funding will enhance liquidity risk in Islamic banking. This shows that Islamic banking negligence in monitoring and collecting back their financing would indirectly increase short-term liquidity risk.

Table 4: Regression Analysis for Short-term Liquidity Risk (LCR)

	Panel A: Conventional Banks						Panel B: Islamic Banks					
	Model 1 (a)	Model 1 (b)	Model 1 (c)	Model 2	Model 3	Model 4	Model 1 (a)	Model 1 (b)	Model 1 (c)	Model 2	Model 3	Model 4
constant	35.448 (1.023)	34.109 (0.976)	39.464 (1.110)	27.721 (0.699)	37.073 (1.055)	15.743 (0.306)	4.479 (2.389)***	**4.912** **(2.622)***	**3.536** **(1.784)***	**5.052** **(2.680)***	**4.286** **(2.228)**	-4.575 (-1.311)
RE	4.171 (0.161)						-1.478 (-2.731)***					
BPS		6.025 (0.231)						**-1.522** **(-3.094)***				
RISKY			-13.320 (-0.535)						-0.655 (-1.164)			
LCC				0.698 (0.059)						**-1.207** **(-3.171)***		
SPEC					4.970 (0.312)						-0.595 (-1.023)	
VART						-0.005 (-0.214)						4.830 (1.602)
SIZE	-4.492 (-0.822)	-4.415 (-0.826)	-4.104 (-0.768)	-3.120 (-0.515)	-4.474 (-0.862)	-1.838 (-0.227)	-0.373 (1.496)	**-0.424** **(-1.709)***	-0.251 (-0902)	-0.339 (-1.350)	-0.374 (-1.462)	0.768 (1.625)
CAR	0.975 (0.058)	1.132 (0.067)	0.034 (0.002)	2.173 (0.120)	0.259 (0.015)	0.999 (0.042)	**-3.388** **(1.797)***	**-3.142** **(-1.675)***	**-3.541** **(-1.834)***	**-5.017** **(-2.620)***	**-3.454** **(-1.778)***	-2.272 (-0.762)
ROA	-73.178 (-0.483)	-71.765 (-0.473)	-75.932 (-0.500)	-70.728 (-0.445)	-69.069 (-0.452)	-89.979 (-0.428)	-2.627 (-0.473)	-2.413 (-0.439)	-1.163 (-0.205)	2.123 (0.378)	-1.402 (-0.247)	-0.859 (-0.121)
NPF	3.69 (0.995)	3.68 (0.993)	3.84 (1.037)	3.76 (0.987)	3.75 (1.015)	4.66 (1.057)	6.38 (0.427)	6.76 (0.456)	4.14 (0.271)	7.92 (0.532)	2.86 (0.186)	-2.11 (-0.087)
FIN	**4.47** **(4.512)***	**4.47** **(4.678)***	**4.63** **(4.856)***	**4.52** **(4.668)***	**4.50** **(4.823)***	**6.60** **(4.039)***	**-2.24** **(-3.600)***	**-2.22** **(-3.603)***	**-2.22** **(-3.490)***	**-2.00** **(-3.234)***	**-2.05** **(-3.166)***	-4.33 (-0.891)
GDP	**-0.996** **(-1.773)***	**-0.997** **(-1.774)***	**-1.017** **(-1.805)***	**-1.120** **(-1.842)***	**-1.003** **(-1.784)***	-1.067 (-1.274)	**-0.052** **(-2.307)**	**-0.051** **(-2.274)**	**-0.052** **(--2.254)**	**-0.068** **(-3.002)***	**-0.051** **(-2.226)**	-0.027 (-0.982)
INF	**-3.234** **(-1.945)**	**-3.213** **(-1.932)**	**-3.429** **(-0.207)**	**-3.560** **(-2.045)**	**-3.336** **(-2.035)**	**-3.745** **(-1.814)***	0.075 (1.585)	0.072 (1.533)	**0.081** **(1.667)***	**0.098** **(2.012)**	**0.084** **(1.734)***	**0.104** **(1.753)***
R^2	0.216	0.216	0.216	0.217	0.216	0.191	0.416	0.425	0.387	0.430	0.386	0.377
Adj R^2	0.143	0.143	0.143	0.140	0.143	0.106	0.308	0.319	0.275	0.323	0.273	0.203
F-Stat	**2.967*** **	**2.967*** **	**2.967*** **	**2.800*** **	**2.963*** **	**2.239*** **	**3.865*** **	**4.013*** **	**3.436*** **	**4.035*** **	**3.415*** **	**2.164*** **
DW	1.379	1.379	1.383	1.385	1.387	1.386	1.832	1.864	1.774	1.860	1.762	2.353

Note: Based on Hausman Test, Fixed effect is the best model for both Conventional and Islamic banks. ***, ** and * is significant at 1%, 5% and 10% confidence interval. The dependent variable is LCR, measuring short term liquidity position. The higher index means a low bank liquidity risk exposure, thus the relationship between independent variables and liquidity risk exposure is reversed from the coefficient sign in this table.

Table 5: Regression Analysis for Long-term Liquidity Risk (NSFR)

	Panel A: Conventional Banks						Panel B: Islamic Banks					
	Model 1 (a)	Model 1 (b)	Model 1 (c)	Model 2	Model 3	Model 4	Model 1 (a)	Model 1 (b)	Model 1 (c)	Model 2	Model 3	Model 4
constant	-0.844 (-0.334)	-0.707 (-0.282)	0.653 (-0.260)	1.111 (0.400)	-0.902 (-0.367)	-0.720 (-1.479)	1.587 (2.784)***	1.704 (2.992)***	1.417 (2.359)***	1.731 (3.013)***	1.476 (2.538)***	0.311 (0.354)
RE	-0.834 (-0.507)						-0.373 (-2.263)**					
BPS		-1.018 (-0.628)						-0.404 (-2.691)***				
RISKY			-0.409 (-0.290)						-0.082 (-0.486)			
LCC				-3.205 (-3.207)***						-0.247 (-2.131)**		
SPEC					-3.872 (-3.692)***						0.065 (0.372)	
VART						-2.41 (-0.106)						1.594 (2.086)**
SIZE	0.159 (0.400)	0.154 (0.395)	0.121 (0.308)	0.266 (0.629)	0.292 (0.773)	0.278 (3.668)***	-0.052 (-0.681)	-0.065 (-0.858)	-0.035 (-0.421)	-0.051 (-0.660)	-0.052 (-0.673)	0.110 (0.926)
CAR	8.787 (7.245)***	8.728 (7.140)***	8.779 (7.079)***	7.666 (6.021)***	9.582 (8.055)***	1.019 (4.221)***	0.222 (0.387)	0.292 (0.513)	0.172 (0.293)	-0.144 (-0.247)	0.127 (0.217)	-0.532 (-0.717)
ROA	-32.363 (-2.854)***	-32.478 (-2.867)***	-32.456 (-2.855)***	-28.287 (-2.418)***	-36.828 (-3.297)***	-14.596 (-7.043)***	-4.374 (-4.418)***	-4.390 (-4.471)***	-4.224 (-4.193)***	-4.033 (-3.957)***	-4.209 (-4.181)***	-2.999 (-2.922)***
NPF	5.44 (0.019)	9.32 (0.034)	3.51 (0.013)	1.41 (0.005)	-6.06 (-0.222)	-2.18 (-0.501)	-1.77 (-3.895)***	-1.76 (-3.902)***	-1.83 (-3.949)***	-1.75 (-3.853)***	-1.80 (-3.872)***	-5.32 (-0.869)
FIN	7.18 (0.104)	6.37 (0.093)	1.83 (0.027)	1.60 (0.234)	-1.07 (-0.164)	-2.48 (-1.655)*	-1.08 (-5.731)***	-1.08 (-5.756)***	-1.07 (-5.558)***	-1.02 (-5.398)***	-1.08 (-5.510)***	-1.82 (-1.474)
GDP	0.019 (0.451)	0.019 (0.444)	0.020 (0.454)	0.010 (0.208)	0.027 (0.640)	-0.001 (-1.133)	-0.007 (-1.095)	-0.007 (-1.054)	-0.008 (-1.099)	-0.011 (-1.630)	-0.008 (-1.160)	-0.004 (-0.576)
INF	0.118 (0.923)	0.116 (0.913)	0.124 (0.975)	0.098 (0.747)	0.157 (1.270)	0.007 (0.328)	0.030 (2.108)**	0.029 (2.053)**	0.032 (2.181)**	0.039 (2.615)***	0.033 (2.227)**	0.012 (0.799)
R^2	0.123	0.123	0.123	0.141	0.149	0.208	0.643	0.648	0.629	0.648	0.629	0.573
Adj R^2	0.105	0.106	0.105	0.122	0.131	0.186	0.578	0.585	0.562	0.583	0.561	0.457
F-Stat	6.934***	6.952***	6.894***	7.588***	8.581***	9.405***	9.925***	10.175***	9.255***	9.987***	9.344***	4.921***
DW	1.298	1.298	1.302	1.359	1.317	1.482	1.505	1.511	1.467	1.599	1.464	1.699

Note: Based on Hausman Test, Random effect is the best model for Conventional banks while Fixed Effect is the best model for Islamic banks. ***, ** and * is significant at 1%, 5% and 10% confidence interval. The dependent variable is NSFR, measuring long term liquidity position. The higher index means a low bank liquidity risk exposure, thus the relationship between independent variables and liquidity risk exposure is reversed from the coefficient sign in this table.

On the other hand, the *FIN* variable for conventional bank shows a significant negative relation with short-term liquidity risk. Perhaps, conventional banking is likely to provide financing to those sectors that are less risky but still capable to generate high returns, which finally reduces their liquidity risk.

The findings for both macroeconomic variables, *INF* and *GDP* is contrary to our initial expectations as well as in contrast with Brůna and Blahová (2016) who show weak relationship between macroeconomic factors on LCR, conjecturing banks experience liquidity shocks in non-persistent manner. In the current study, all models show a significant positive relationship with *GDP* and short-term liquidity risk and they are consistent with the study by Yaacob et al. (2015), but contrary to the study by Sulaiman et al. (2013) and Cucinelli (2013) in terms of the sign of direction of the relationship. This situation occurs when an economy is expanding and the two banking sectors try to reduce the liquidity position (which translated means to increase liquidity risk) in their banks by increasing the supply of financing and promoting investments to increase their profits. Similarly, the INF variable in Table 4: Panel A is in line with the study by Yaacob et al. (2015) in which it shows a significant negative association for Islamic banking as an increase of the inflation rate will reduce liquidity risk of Islamic banking. These results indicate that during inflation, banks will increase their liquidity position (reduce liquidity risk) to protect the depositors and to take the necessary precautions against the occurrence of "bank run". In contrast, for conventional banking, our result in Table 4: Panel A shows a significant positive effect of *INF* on liquidity risk which is consistent with the findings of Sulaiman et al. (2013) and Cucinelli (2013). The negative coefficient indicates that a bank has to reduce the liquidity position because of the rising costs incurred and being indirectly exposed to higher liquidity risk.

Turning to Table 5: Panel B, it can be seen that financing the real estate sector (model 1a and 1 b) shows significant positive relationships towards long-term liquidity risk (within one year) for Islamic banks. This is in coherence with the study of Abdul-Rahman (2009). Islamic banking is more likely to offer real estate financing even though it is riskier. Continuing offering financing to real estate sectors will cause Islamic banking to be exposed to long term liquidity risk. Next, *LCC* variables show a significant positive 'short term financing structure stability-liquidity risk' relationship for both banking systems. An increase in the supply of financing to lower creditworthy customers will reduce liquidity position and increase liquidity risk. Nevertheless, if a bank offers financing to sectors with lower default risk, the bank might get its benefits. Against this view, it implies that both conventional and Islamic banks should change their financing portfolios, either across sectors or across financing tenure to reduce liquidity risk exposure.

For conventional banking, model 3 (*SPEC*) of Table 5: Panel A, our result shows a significant positive relationship between financing concentration and long-term liquidity risk. Taken together, a stable short-term financing structure along with increasing financing concentration in certain market segments will increase liquidity risk of conventional banks. As financing concentration does not play a role in influencing liquidity risk of Islamic banks, the medium-term financing structure stability (*VART*) can inversely affect its liquidity risk. Being stable in the financing structure for a medium term helps to reduce liquidity risk of Islamic banks.

For the control variables, NPF shows positive significant associations with liquidity risk for Islamic banks, and consistent with studies by Iqbal (2012). A high ratio of non-performing financing refers to a large number of bad debts. If the banks keep on losing income due to bad debts, eventually they will be exposed to liquidity risk. Similarly, FIN shows significant positive relationships with liquidity risk of Islamic banks, but not for the conventional banks. This shows that granting financing can increase the Islamic banks' liquidity risk, hence, we suggest the Islamic banks to start thinking of diversifying their banking activities towards fee-based product offering.

In terms of profitability, our results show that the higher the banks' profitability (*ROA*), the higher will be liquidity risk for both banking systems. This is consistent with the 'high risk-high return' investment concept, but contradicts the study by Akhtar et al. (2011) and Iqbal (2012). This implies in order for banks to gain higher return, they naturally involve in risk-taking activities that indirectly increase their long-term liquidity risk. For capital buffer, our results find that CAR is negatively related to liquidity risk for conventional banks, but not for the Islamic banks. Our results support the role of capital buffer in minimizing risk and consistent with Iqbal (2012), Saidan & Ismail (2013) and (Yaacob et al. (2015) although it contradicts the results by Sulaiman et al. (2012) and Ramzan & Zafar (2014).

In terms of macroeconomic variables, *GDP* shows no significant relationship for all models of Islamic and conventional banks. This finding is in line with the study by Mohamad et al. (2012). Despite *INF* does not significant for conventional banks, it shows significant negative relationships with long-term liquidity risk for Islamic banks and consistent with studies by Yaacob et al. (2015).

5. Conclusion and Policy Implication

We found that, to some degree, the financing structure in Islamic banks shows a significant influence with either the short- or long-term liquidity risk exposures. First, financing the real estate sector is one of the significant variables and it proves that increasing exposure to the property sector is associated with higher liquidity risk faced by Islamic banks. Nevertheless, we suspect efficient banks may be capable to overshadow this positive relationship, thus showing insignificant result for conventional banks. Second, short-term financing structure stability shows positive relationships to long-term liquidity risk for both banks as well as to short-term liquidity risk of Islamic banks. Third, financing concentration affects long-term liquidity risk of conventional banks, but not the rest. Finally, medium-term financing structure stability influences long-term liquidity risk of Islamic banks, nonetheless not the others. Responding to our aforementioned complicated findings on various perspectives of financing structure on both short- and long-term liquidity risk measures in the context of conventional and Islamic banks, we recommend the regulators and practitioners in both banking systems that coexist in Malaysia to carefully consider our discoveries when developing the liquidity risk management framework. Specifically, a separate ruling on liquidity risk framework should be made for conventional and Islamic banking systems as they are exposed to different factors. For future research, our study may be improved by focusing primarily on real estate financing and issues arising from increasing Islamic banks' financing of property sectors due to speculations and investors' sentiment effect on liquidity risk.

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