The Role of Regulation in Banking: Liquidity Risk Perspective

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Abstract

The liquidity crisis in 2008 sparked interest in the role of regulation that could promote resilience and stability in the banking system. While the Public Interest theory suggests that legal policies could discipline banking activities, the Private Interest theory predicts otherwise, which impairs banking performance. The conflicting theories warrant comprehensive research, especially for Islamic banks, as they emerge to gain their systemic importance. Given this, the study examines the role of banking regulation on liquidity risk management of banks in OIC countries from 2000 to 2014. The findings suggest that restrictions on banking activities and capital requirement pose a significant impact on liquidity risk. However, the marginal effect of regulatory capital is more pronounced in conventional banks compared to Islamic banks.

Keywords

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Introduction

In the aftermath of 2008 Global crisis, when the liquidity crisis hit the real economy, many financial institutions have failed including Islamic banks (Ali, 2013; Hasan & Dridi, 2011). Following this chaos, many academic studies have emphasized the importance of effective banking regulation and supervision to promote a more resilient banking sector. New liquidity regulations have been proposed under Basel III Accords in concomitant with the enhanced capital adequacy standards, and the other two pillars, that is, enhanced supervisory review process and risk disclosure and market discipline (Basel Committee on Banking Supervision, 2008). These regulatory measures are intended to discourage excessive risk taking by imposing a higher cost to banks from assuming more risk. Later, BCBS (2013) promotes transparency by requiring banks to disclose the fulfillment of the minimum regulatory requirements and recommends local authorities to intensify the supervision of liquidity risks.

Nonetheless, many criticisms have been reported on the failure of Basel III to address the risks associated with Islamic financing, which mostly source from the unique features of Islamic banks. Apart from the shortcomings, many countries in which Islamic banks operate alongside conventional banks are governed by the existing conventional banking regulations (Alam, 2013; Alam, Zainuddin, & Rizvi, 2018). Concerning this, IFSB developed risk management guidelines (by incorporating certain elements from the Basel standards) that are specific to Islamic financial service industry (IFSB 2008, 2012, 2013). Nevertheless, the issue of compliance with IFSB's standards across jurisdictions is still voluntary. For instance, Casey (2015) highlighted that the difficulties in implementing IFSB standards are due to the content of the standards, the different capacities of the regulatory and supervisory authorities across countries, and their effectiveness to allow a competitive legal environment for dual banking systems that tap the same market. Taken together, the non-mandatory compliance of IFSB standards implies that a set of uniform regulatory framework, especially for Islamic financial services industry, is still in deficiencies (Alam, 2013; Alam et al., 2018).

In spite of the limitations, the regulation and supervision is necessary because banks fail to address social optimum between risk and return objective, resulting in banking failure (Bonfim & Kim

2012). A single failure of one bank constitutes externalities to other banks and ultimately the whole economy (Diamond & Rajan, 2005). Nevertheless, the 'one-size-fits-all' approach for regulatory standards is no longer relevant considering varying factors involving institutional specificities, macroeconomics, and political and financial setting (Barth, Lin, Ma, Seade, & Song, 2013). Unlike conventional banks, Islamic banks operate according to the spirit of the Islamic religion. *Shariah* law forbids banking activities involving usury (riba'), gambling (*maisir*), and uncertainty (*gharar*) besides funding of illegal transactions (Abdul-Rahman, Said, & Sulaiman, 2017; Beck, Demirgüç-Kunt, & Merrouche , 2013). The practice of imposing 'interest charges' in return for lending money is not allowed in Islamic banking as it involves usury. The Islamic banking products are based on sales or partnership contracts in which both require underlying real assets. Given this background, Islamic banking activities have their risk implications, much different from conventional banking.

The challenges of liquidity risk management are intensified for the case of Islamic banks due to limited *Shariah*-compliant money market instruments and shallow secondary market (Amin, Shamser, & Eskandar, 2017; Ramzan & Zafar, 2014). The restrictions implicate poor marketability of financial securities, fewer investment opportunities, and expensive funding sources for Islamic banks (Amin et al., 2017). Besides, different interpretations of *Shariah*-compliant contracts and different legal practices across jurisdictions cause international liquidity management unlikely. Therefore, it is expected that the distinctive *Shariah*-compliant operation of Islamic banks and the associated risks that are complex and difficult to mitigate and the non-existent harmonization in regulation and supervision schemes would have an impact on different set of best practices for Islamic banks as compared to conventional banks across countries to optimize the trade-off between liquidity, solvency, and profitability.

Although many have recognized the critical influence of banking regulation, less is known on how effective the current regulatory and supervisory frameworks are in affecting liquidity risk management in banking. While liquidity risk determinants literature has been well documented (Amin et al., 2017; Berger, Bouwman, Kick, & Schaeck, 2016; Bonfim & Kim 2012; Chen, Chou, Chang, & Fang, 2015;

Ghenimi & Omri, 2015; Horváth, Seidler, & Weill, 2014; Horváth, Seidler, & Weill, 2016; Khalib, Abdul-Rahman, & Janor, 2016; Roman & Sargu, 2015), it is remarkable that minimal studies have examined the impact of banking regulation on liquidity risk, particularly within Islamic banking perspective. The gap in the literature warrants comprehensive research to establish the theories of regulation-liquidity risk relationship so that policymakers, market players, and public would be guided towards objective decisions. The renewed focus on this issue is imperative to determine whether Islamic banking is well equipped to withstand future financial uncertainties. In this regard, this study aims to evaluate the impact of regulatory and supervisory measures on liquidity risk management in Islamic banks and conventional banks in OIC countries (2000-2014). Moreover, it also examines whether the impact of regulation and supervision differs between Islamic banks and conventional banks.

The significant contribution of the study is the emphasis on the impact of regulatory measures on Islamic banks. The findings provide policy recommendations on a set of best practices of regulation that would enhance or impede the liquidity decision in banking. The following section 2 reviews previous literature, section 3 presents data and methodology, and section 4 discusses findings and implications.

Literature Review

"Liquidity risk comes in many guises and sometimes, very difficult to define and measure in isolation" (Tirole, 2011). It is a consequent risk, accumulated from many different risks such as credit risk, interest rate risk, and operational risk (Ali, 2013; Vodova 2011). In the banking system, liquidity risk originates from the nature of its business, from the macro factors which are external to the bank, as well as from the banking policies that are internal to the banks. While there are established, documented factors in the literature determining liquidity risk in conventional banks (Berger et al., 2016; Chen et al., 2015; Horváth & Seidler, 2014; Horváth et al., 2016; Roman & Sargu, 2015), the current focus has been shifted to liquidity issues in Islamic banking.

Ghenimi and Omri (2015) studied banks in five Gulf countries between 2006 and 2013. The findings indicate that for Islamic banks, the influence factors of return on equity (ROE), net interest margin,

capital, and inflation rate are positive, while ROA, NPL, size, and GDP growth exert negative effect on liquidity risk. Khalib et al. (2016) examined cost efficiency and liquidity risk of Islamic banks and commercial banks in Malaysia (1994-2014) using panel static technique. They estimated cost efficiency using SFA method and Basel III liquidity risk measures (liquidity coverage ratio and net stable funding ratio). The results evidenced that cost efficiency poses no significant effect in short term and yet negative effect in long term, suggesting that the implication of cost efficiency takes time to reduce liquidity risk in banking. The results are consistent with conventional banks except for size and GDP growth. In contrast, Amin et al. (2017) found that cost efficiency encourages bank risk taking, and the effect is sensitive to efficiency measures. Other signifiant factors include capital, bank specialization, credit risk, profitability, size, GDP, inflation, and money market development.

The recurring banking failure, recently amid Global crisis, has evidenced poor liquidity risk management and ineffectiveness of banking regulations. The policy makers, academicians and practitioners are interested to understand how regulations play the role in affecting risk and return policy in banking. There are two opposite theories of banking regulation (Barth et al., 2013). The Public Interest theory assumes the government is independent from private interest and thus, the government will act in the interest of public which then encourages efficiency and prevents banking failure. In contrast, the Private Interest theory holds that government is not independent from the influence of pressure of certain groups of interest at the cost of public benefit. Consequently, the intervening of pressure groups will indirectly force laxity in regulation which encourages risk taking incentives in banking.

Previous empirical studies discovered mix evidence. Berger et al. (2016) highlighted that changes in banking regulation will influence bank's decisions. For instance, under stronger supervisory regime, banks will be encouraged to restrict excessive risk taking behaviour and expected to undertake prudent liquidity risk management, whereas, in a country with low disclosure requirements, banks tend to adopt riskier investments to boost profitability at the expense of uninformed investors. Fernandez and Gonzalez (2005) evidenced that stringent capital requirement reduces bank risk. However, they also

found that private monitoring increases financial soundness and, thus, lowers moral hazard created by information asymmetries. Klomp and De Haan (2012) further highlighted that based on Boyd, Graham, and Hewitt (1993), banks may engage in high risk projects if low restrictions were imposed by the regulator. In contrary, Barth, Caprio, and Levine (2004) showed that restrictions on banking activities have negative impact on banking stability that in turn increase the probability of crisis. Later, Demirgüç-Kunt and Huizinga (2010) argued that banking activities related to generating non-interest income and/ or non-deposit funding cause financial instability. With regard to supervisory regime, Barth et al. (2004) failed to support the theory that supervisory control can prevent banks from undertaking excessive risk. In contrast, Fernandez and Gonzalez (2005) outlined that supervisory power reduces bank risk, especially in countries with low accounting and auditing requirements.

Klomp and De Haan (2012) extended previous studies by examining the impact of banking regulation and supervision on various indicators of bank risk: capital and asset risk and, liquidity and market risk—in 21 OECD countries from 2002 to 2008. The study found that the impact of supervisory control, capital regulations, and market entry regulations is significant on capital and asset risk, while supervisory control, restrictions on banking activities, private monitoring, market entry restrictions, and liquidity have a significant effect on liquidity and market risk. They concluded the study by stating that the impact of banking regulation is important to discourage moral hazard incentives, yet the impact is not uniform across different types of risk. To establish these findings, in their later studies, Klomp and De Haan (2014) analysed their previous model on banks from 70 non-industrial countries from 2002 to 2008. The study evidenced that regulatory measures reduce bank risk. In particular, the findings outline that capital requirement and supervisory control have negative impact on bank risk, while the negative effect of liquidity regulation and restriction activities on bank risk is only pronounced in banks with high level of institutional quality. It is suggested that the effectiveness of banking regulation is dependant on the development of a country and banking structure. Specifically, it shows that the impact of banking regulation is bigger on high-risk and/ or non-listed banks than on low-risk and/ or listed banks.

It also points out that regulation on restriction activies has a stronger impact on large banks, while capital and liquidity regulations have the largest effect on small banks.

Despite the highlights on the influence of regulation on risk taking behaviour of banks in previous literature, it is noticeably scant as far as Islamic banking perspective is concerned. Alam (2013) analysed the impact of banking regulation and supervision on efficiency and risk taking behaviour of Islamic banks of 11 emerging countries from 2006 to 2010. The findings indicate that technical efficiency of Islamic banks can be improved when there are regulations and strict monitoring of banking operation and higher supervisory power of the authorities. It is also evidenced that more severe restrictions on banking activities reduce the incentives of risk taking. Recently, Alam et al. (2018) found that regulatory measures enhance the performance of Islamic banks in Asia but not in the GCC, implying the importance of regional effects. Additionally, they found that competition and banking sector development have a significant influence on the performance of Islamic banks in Asia region while in GCC, bank size and capital increase Islamic banking performance. The findings also suggest that separate banking acts for Islamic banks are not relevant in countries which practice *Shariah* law as the ruling law but they are relevant if otherwise. Besides, the existence of *Shariah* Board at the national level is beneficial to boost profitability (Rashid, Abdul-Rahman, & Markom, 2018). In brief, the paper suggests that each legal policy should account for regional, specific factors rather than the universal approach.

Against this background, and the very limited studies on the influence of regulations on bank risk, this study attempts to fill the gap and contributes to the literature by re-examining the issue in the context of liquidity risk in Islamic banking.

Research Methodology
Sample
The study employs secondary data from Bankscope, involving conventional banks and Islamic banks from selected 13 OIC countries, namely, Bahrain, Bangladesh, Egypt, Indonesia, Jordan, Kuwait, Malaysia, Pakistan, Qatar, Saudi Arabia, Tunisia, Turkey, and United Arab Emirates. The selected countries practice dual banking system with

a vivid presence of Islamic banking where there are significant Muslim populations. The emerging countries have experienced deregulation and economic reform in recent decades. Macroeconomic variables are collected from World Development Indicators, while for regulation measures they are sourced from World Bank's 2013 Regulation and Supervisory database. All dataset ranges from 2000 to 2014.

Data Analysis

Table 1 details the descriptive statistics of variables. In comparison, Islamic banks (4.25) have higher liquidity risk than their conventional peers (4.12). Islamic banks have higher capital (*ETA*) and leverage (*LLR*), but lower credit risk (*LLR*), size (*lnTA*), profitability (*ROA*), and market concentration (*Com*) compared to conventional banks.

Based on the banking regulatory measures analyses in Table 2, Indonesia has the highest level of restrictions on banking activities and Kuwait has the lowest restrictions. Saudi Arabia has the strongest supervisory control and private monitoring while Jordan and Tunisia have the least supervisory and private control on banking activities, respectively. In terms of capital standards, Pakistan has the highest requirements, and Egypt has the lowest.

Table 1. Descriptive statistics

Banks	Stats	*LR*	*ETA*	*LTA*	*LLR*	*lnTA*	*ROA*	*Com*	*Inf*	*GDP*
IB	obs	478	478	478	478	478	478	478	478	478
	mean	4.25	12.66	57.83	4.74	14.50	1.23	7.04	5.74	5.17
	Std	0.47	12.11	16.11	5.37	1.30	2.21	0.42	6.62	3.96
	min	0.37	-92.01	1.20	0.00	10.46	-12.72	6.1	-4.86	-7.08
	max	6.61	90.17	92.74	42.38	18.13	13.2	8.18	54.4	26.17
CB	obs	2492	2492	2492	2492	2492	2492	2492	2492	2492
	mean	4.12	11.30	53.27	5.78	14.71	1.35	6.97	6.92	5.26
	Std	0.51	6.52	16.66	6.70	1.65	1.68	0.37	6.95	2.96
	min	-0.31	-31.37	0.43	0.00	10.05	-26.55	6.10	-4.86	-7.08
	max	6.3	68.13	91.48	88.92	18.62	7.89	8.19	54.92	26.17
All Banks	obs	2970	2970	2970	2970	2970	2970	2970	2970	2970
	mean	4.15	11.62	57.37	5.52	14.76	1.35	6.99	6.62	5.17
	Std	0.50	7.71	16.62	6.44	1.61	1.77	0.38	6.88	3.19
	min	-0.31	-92.01	0.43	0.00	10.05	-26.55	6.10	-4.86	-7.08
	max	6.61	90.17	92.74	88.92	18.62	13.20	8.19	54.92	26.17

Notes: IB – Islamic bank; CB – Conventional bank; *LR* – liquidity risk ((log of) financing or loans/ deposit and short-term borrowings); *LLR* – asset quality (loan loss reserve/ gross loans); *ETA* – capital (equity/ total assets); *lnTA* – size ((log of) total assets); *ROA* – profitability (net income/ total assets); *Com* – Competition ((log of) HHI the sum of the squares of the market shares of each individual bank); *Inf* – annual inflation rate; *GDP* – real Gross Domestic Product growth.

Table 2. Regulation and supervision standards

Country	AR	SP	PM	CR
Bahrain	2.26	10.99	6.00	5.46
Bangladesh	3.17	10.71	4.51	4.42
Egypt	2.54	12.00	6.21	3.77
Indonesia	3.32	11.64	5.02	4.00
Jordan	2.72	7.20	5.60	5.39
Kuwait	1.87	9.84	7.31	5.88
Malaysia	2.37	10.92	5.85	5.02
Pakistan	2.93	12.21	6.83	7.10
Qatar	2.04	8.93	6.46	4.32
Saudi Arabia	2.79	13.48	7.52	5.21
Tunisia	2.57	11.00	3.24	4.53
Turkey	2.19	12.48	5.51	4.00
U.A.E	2.64	10.44	5.97	5.00

Notes: *AR* – Asset Restrictions; *SP* – Supervisory Power; *PM* – Private Monitoring; *CR* – Capital Requirements
Source: World Bank's 2013 Regulation and Supervisory Database (Barth et al., 2013)

Model

To achieve the objective of the study, the study applies Generalized Methods of Moments (GMM) developed for the dynamic model by Holtz-Eakin, Newey, and Rosen (1988), Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1998). Since previous studies indicate the dynamic behaviour of bank liquidity persistent over time (Amin et al., 2017; Horváth & Seidler, 2014; Horváth et al., 2016; Mohamad et al., 2013), the GMM enables the study to incorporate lags of dependent variable as explanatory variables (or instruments) to control the dynamic process. By modelling an appropriate behaviour specification, a new or different link between dependent and explanatory variables can be discovered. As Beck, Demirgüç-Kunt, and Levine (2000) outlined, the advantages of applying the dynamic GMM estimator are: First, the model is efficient in allowing the influence of time series variation. Second, it permits for unobserved individual-specific effects to be captured. Third, it controls endogeneity problems by introducing internal instruments in the model. Fourth, the dynamic panel framework suits broad cross-section and short time series (N>T), as the case with the sample in this study. Consequently, the GMM's results help to avoid any bias from time series dynamics, heterogeneity of banks, endogeneity, and large data files with small T. Therefore, the adoption

of dynamic GMM is appropriate as it produces efficient and consistent parameter estimates for panel approach.

Following recent Islamic banking literature (Amin et al., 2017; Khalib et al., 2016), empirical framework for liquidity risk determinants is specified as follows:

$$LR_{it} = \alpha_i + \beta_1 LR_{it-1} + \beta_2 internal_{it} + \beta_3 external_{it} + \beta_4 D + \beta_5 reg + f_i + \varepsilon_i$$

where *LR* is liquidity risk and LR_{it-1} is the lagged dependent variable. The *internal* refers to bank specific variables adopted from previous studies (capital, size, profitability, credit risk, asset concentration). The *external* includes inflation, GDP, and competition. *D* is the vector of dummy variables for Islamic banks (IB), crisis (*Cri*), and interactive dummy Islamic bank*crisis (*IB*Cri*). *Reg* is the vector capturing regulatory and supervisory measures which are activity restrictions, capital requirements, private monitoring, and supervisory power. *f* is fixed effects controlling unobserved heterogeneity across countries and years, *α* is a bank-specific intercept, *ε* is the error term, and *i* and *t* refer to bank and time respectively.

Variable Selection
Table 3 provides brief descriptions of all variables.

Table 3. Variables definition

Variable	Definition	Sources
Internal factors		
Liquidity risk (*LR*)	ln (Net loans/deposit and short-term funding)	BankScope
Asset concentration (*LTA*)	loans/ total assets	BankScope
Credit risk (*LLR*)	Loan loss reserve/gross loans	BankScope
Capital (*ETA*)	Equity/total assets	BankScope
Profitability (*ROA*)	Net income/ total assets	BankScope
Size (*lnTA*)	ln (Total assets)	BankScope
External factors		
Competition (*Com*)	ln (HHI the sum of the squares of the market shares of each individual bank assets)	BankScope
GDP growth (*GDP*)	real GDP growth rate	WDI
Inflation (*Inf*)	Inflation rate	WDI
Dummy variables		
Islamic bank (*IB*)	Dummy that takes the value of one for Islamic bank and 0 for conventional bank	Own
Crisis (*Cri*)	Dummy crisis that is equal to one for the crisis period during 2008-2009 and 0 for other years	Own
*IB*Cri*	Interactive dummy Islamic bank*Crisis	Own

Table 3. Variables definition

Variable	Definition	Sources
Regulation measures		
Activity Restrictions (*AR*)	Restrictions on banking activities in securities, insurance, real estate activities, and ownership of non-financial firms. The index value is 0 to 4; high value indicates higher level of restrictions.	
*IB*AR*	Interactive dummy Islamic bank*Asset restrictions	
Capital Requirements (*CR*)	Includes regulatory capital and capital from assets other than cash or government securities and borrowed funds. The index value is 0 to 8; high value indicates rigid capital requirement.	World Bank's 2013 Regulation and Supervisory Database (Barth et al., 2013)
*IB*CR*	Interactive dummy Islamic bank*Capital requirements	
Private Monitoring (*PM*)	The degree of information disclosure and market discipline by private investors on banks. The index value is 0 to 8; high value indicates greater private monitoring on banks	
*IB*PM*	Interactive dummy Islamic bank*Private monitoring	
Supervisory Power (*SP*)	Regulatory empowerment to intervene in banking decisions like organizational structure, taking disciplinary actions on top management and directors, shareholders, and auditors. The index is 0 to 14; high value indicates greater supervisory power.	
*IB*SP*	Interactive dummy Islamic bank* Supervisory power	

Results and Discussions

Table 4 presents the results for liquidity risk determinants based on the panel system GMM models. The statistical results for Sargan test and Arellano-Bond (AR Bond) tests suggest that the instruments are valid and there are no autocorrelation problems. Thus, all models are adequately specified. Besides, all regressions present consistent results for almost all variables indicating that our specifications models are robust.

The significant positive effect of lagged dependent variable (LR_{t-1}) at 1% in all models substantiates the justification use of GMM technique, as there exist dynamic specifications in the models. It shows that previous liquidity influences current liquidity and takes time to adjust. In other terms, liquidity policy in banking is determined based

on experience in the previous year. The finding is in line with previous studies (Amin et al., 2107; Horváth & Seidler, 2014; Horváth et al., 2016).

The findings on the effect of regulation and supervision on liquidity risk are as follows. With respect to the impact of the asset restrictions (*AR*), it has a significant negative effect on liquidity risk. The finding is in line with Klomp and De Haan (2012), suggesting that by restricting banks from engaging in the broad range of risky investments, it prevents the creation of complex structures (i.e. investment in securities, insurance, real estate activities, and ownership of non-financial firms) that could be hard to monitor and too big to discipline. Alam (2013) added that when banks have limited options of investments, they will potentially acquire expertise and specialize in a devoted market segment which in turn improves bank efficiency and, thus, profitability. This contradicts the popular view of Barth et al. (2004) that links restrictions activities with financial stabilities. The effect of asset restrictions is similar between Islamic bank and conventional bank (*IB*AR*). Perhaps, the indifferent result could be due to the equivalent effect between regulatory asset restrictions and the *Shariah* law, which is to restrain banks from involving in high-risk taking behavior.

Interestingly, the positive effect of regulatory Capital Requirements (*CR*) on liquidity risk is in conformity with the earlier finding by Altunbas, Binici, and Gambacorta (2018), showing that capital and macro-prudential tools improve bank's risk-bearing capacities. This is consistent with Sassi (2013) who argued that capital stringency may help managing risk, even at a price of reducing cost efficiency. Since capital is a cost to the bank (more expensive than deposits), this finding supports the policy relevant to the implementation of risk-based capital standard in concomitant with the liquidity standards to curtail excessive risk taking in banking and, thus, promote a more resilient banking sector (Basel Committee, 2008). The finding of *IB*CR* is significantly negative. It shows that the impact of capital requirements is more pronounced on conventional banks than on Islamic bank. It can be explained by the inferiority of Islamic banks compared to conventional peers in terms of relatively restricted risk management tools and shallow secondary market to manage liquidity

risk (Amin et al., 2017; Ramzan et al., 2014). Islamic banks tend to hold excess capital to absorb losses and, thus, to be less affected by the regulatory capital requirements.

The effect of Supervisory Power (*SP*) on liquidity risk is not significant. The findings imply that supervisory power in the context of restructuring, declaring bankruptcy, and immediate correction action has less influence on bank liquidity decisions. It is consistent with the findings in Laeven and Majnoni (2003) that the effect of supervisory regime might not be significant, especially for transition economies[1], where leading banks may influence politicians and supervisors to pursue banks' objectives rather than to meet the society's interest. Besides, Barth et al. (2004) argued that the important role of supervisory power may not be held across different levels of political openness (i.e. the country where the media is independent from government intervention). Similarly, private monitoring (*PM*) poses no significant effect on liquidity risk. This could be due to a high asymmetric information and/or window dressing technique, causing public information to differ from internal/ private information. These factors explain the non-uniformity of accounting and auditing practice, rendering some of the regulatory requirements less effective to discipline banking practice.

Concerning the impact of bank-specific variables, the study found that credit risk (*LLR*) has a negative impact on liquidity risk. The findings are consistent with several studies (Amin et al., 2017; Berger & Bouwman, 2017; Horváth & Seidler, 2014). Banks with numerous cases of defaults in previous records (poor asset quality) have to be cautious and tighten the terms of credit that results in reduced lending opportunities. Moreover, since the bank has allocated a high amount of reserve to absorb loan losses, liquidity issues arising from uncollectable payments in future have been at least addressed.

For capital (*ETA*), the finding is in line with risk absorption theory, indicating a positive relationship with liquidity risk (Amin et al., 2017; Berger & Bouwman, 2017; Chen et al., 2015; Horváth et al., 2016; Roman & Sargu, 2015). The theory predicts that banks with substantial

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1. Transition economies includes, among others, economic liberalization towards privatization to facilitate the movement of private capital and thus, macroeconomic stability like the some of the Third World countries in the sampled study.

capital often aim for high profit (high risk) investments since they have a high capacity to absorb the losses. Therefore, a high capitalized bank with risky portfolios will be exposed to high liquidity risk.

Likewise, the study found that banks with high loan concentrations (*LTA*) have high liquidity risk. It indicates that the more assets tied up in loans' baskets which are highly illiquid, the more hazards banks will face, especially during immediate large withdrawals and loan commitments. The positive relationship between asset concentration and liquidity risk is supported by Amin et al. (2017) and Bonfim and Kim (2014).

The impact of size (*LnTA*) on liquidity risk is found to be significantly negative. It suggests that large banks, associated with high reputation, economies of scales and sophistication in risk management, are able to formulate better decisions in managing liquidity risk, whereas for small banks, they have fewer resources (fund) to expand credit supply.

The profit (*ROA*) has no significant effect on liquidity risk. This finding is not consistent with Ghenimi and Omri (2015) who suggest positive profitability-liquidity risk relationship, which relates bank financial soundness with risk bearing capacity. The findings also differ from Chen et al. (2015) who found negative relationship due to moral hazard incentives of less profitable banks in taking more risk to remain competitive. The insignificant finding is, however, supported by several studies (Berger & Bouwman, 2017; Bonfim & Kim, 2014).

Based on the results for macro and market factors, the impact of inflation (*Inf*) on liquidity risk is negative (Amin et al., 2017; Ghenimi & Omri, 2015). It indicates that inflation increases bank cost, for instance, by increasing nominal interest rates and diminishing collateral value and, thus, decreasing realized profit. Although the bank may transfer the cost by increasing the profit rate on lending, the bank will be exposed to problem loans that, in turn, affect liquidity in banking. Therefore, during inflation, the bank prefers to hold liquid assets rather than to offer loans.

Table 4. Liquidity risk determinants results

	1	2	3	4	5	6
Cons	2.429***	2.360***	2.538***	2.392***	2.330***	2.282***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
LRt-1	0.315***	0.326***	0.321***	0.327***	0.326***	0.325***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
LLR	-0.006***	-0.006***	-0.006***	-0.006***	-0.006***	-0.006***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
ETA	0.011***	0.011***	0.011***	0.011***	0.011***	0.011***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
LnTA	-0.043***	-0.047***	-0.052***	-0.047***	-0.049***	-0.047***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
ROA	-0.002	-0.003	-0.003	-0.003	-0.003	-0.003
	(0.21)	(0.13)	(0.13)	(0.12)	(0.10)	(0.15)
LTA	0.020***	0.020***	0.020***	0.020***	0.020***	0.020***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Inf	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
GDP	0.002**	0.002**	0.002**	0.002*	0.002*	0.001*
	(0.04)	(0.05)	(0.04)	(0.05)	(0.05)	(0.07)
Com	-0.015	0.001	-0.008	-0.003	0.006	0.009
	(0.56)	(0.96)	(0.76)	(0.91)	(0.82)	(0.74)
IB		-0.143**	-0.146**	-0.140**	-0.143**	-0.132**
		(0.01)	(0.01)	(0.02)	(0.01)	(0.02)
Cri		-0.041***	-0.037***	-0.035	-0.028	-0.033
		(0.00)	(0.01)	(0.1)	(0.18)	(0.12)
*IB*Cri*		-0.007	-0.008	-0.008	-0.008	-0.007
		(0.39)	(0.35)	(0.3)	(0.34)	(0.39)
AR			-0.009**			
			(0.02)			
*IB*AR*			-0.165			
			(0.49)			
PM				-0.002		
				(0.19)		
*IB*PM*				-0.003		
				(0.78)		
SP					0.002	
					(0.16)	
*IB*SP*					-0.006	
					(0.45)	
CR						0.003*
						(0.08)
*IB*CR*						-0.019**
						(0.02)
Sargan	105.073	102.029	101.236	100.837	103.089	102.098
	(0.100)	(0.146)	(0.158)	(0.1651)	(0.130)	(0.145)
AR Bond 1	-2.644	-2.652	-2.639	-2.649	-2.645	-2.651
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
AR Bond 2	-0.961	-0.953	-0.942	-0.951	-0.958	-0.957
	(0.337)	(0.341)	(0.346)	(0.342)	(0.338)	(0.339)

Notes: LR_{t-1} – Lag liquidity risk; *LLR* – Credit Risk; *ETA* – Capital; *ROA* – Profitability; *LTA* – Asset concentration; *Inf* - Inflation; *Com* – Competition; *IB* – Dummy Islamic banks; *Cri* - Dummy Crisis; *IB*Cri* – Interactive dummy *IB*Cri*; *AR* – Asset Restrictions; *IB*AR* – Interactive dummy *IB*AR*; *SP* – Supervisory Power; *IB*SP* – Interactive dummy *IB*SP*; *PM* – Private Monitoring; *IB*PM* - Interactive dummy *IB*PM*; *CR* – Capital Requirements; *IB*CR* – Interactive dummy *IB*CR*. The *p*-values are provided in parentheses and the ***, **, *, indicate the significance level at 1%, 5% and 10% accordingly.

GDP poses a positive impact on liquidity risk. The positive relationship confirms the finding in Mahmood et al (2017), suggesting that demand for credits increases as businesses perform well during an economic boom, resulting in increased financing offerings. As a result, the probability of default tends to escalate, which exposes banks into higher liquidity risk. However, no significant relationship is found between competition (*Com*) and liquidity risk. Like Amin et al. (2017) opined the explanations might have to do with the characteristics of the sampled developing countries with dual banking systems that are associated with high transaction cost and no economies of scale, making no comparative advantage in achieving a high return. Therefore, market power is less effective to affect banking activities, including liquidity decisions.

In comparison, Islamic banks have lower liquidity risk than conventional banks. The finding is inconsistent with the existing literature (Ali, 2013), indicating Islamic banks have higher liquidity risk and (Amin et al., 2017), suggesting no significant difference between both banking systems. The result must be explained by the infancy stage of Islamic banking development that lacks many aspects such as few liquidity instruments and shallow money and secondary markets, forcing Islamic banks to hold more liquidity. The finding of *Cri* provides weak support on the important effect of the crisis on liquidity risk as in Amin et al. (2017). It is also found that crisis has an indifferent impact on both banking systems. This could be the case for the market structure of dual banking systems where collective behavior is present both in good and bad economies.

In sum, liquidity risk increases by the influence of past liquidity, capital, assets concentration, and GDP, and decreases due to poor asset quality, big size, and inflation. Nevertheless, the impact of profitability, competition, and crisis are not significant. The findings also show that Islamic banks have lower liquidity risk than conventional banks, yet no significant difference between the liquidity risk of Islamic banks and conventional banks is evidenced during a crisis. For regulatory and supervisory measures, restriction on banking activities reduces liquidity risk, while capital requirement increases liquidity risk. The marginal impact of capital requirements is more pronounced for conventional banks compared to Islamic banks,

whereas, supervisory power and private monitoring have no significant influence on liquidity risk.

Conclusion and Implication

This study examines the role of regulatory and supervisory standards on liquidity risk of Islamic banks and conventional banks in 13 OIC countries from 2000 to 2014. The findings suggest that the impact of regulations on liquidity risk is not uniform. The restriction on banking activities impedes liquidity risk, while capital requirements heighten liquidity risk in banking. Conventional banks are more affected by the regulatory capital requirements than Islamic banks, whereas the influence of supervisory power and private monitoring is not significant. This study submits to the fact that regulation is important to influence risk taking incentives in banking (Alam, 2013; Alam et al., 2018; Klomp & De Haan, 2012, 2014). Therefore, it is necessary for effective regulatory mechanisms to be in place to secure stable and long-term viability of the financial system.

For internal factors, the impact of past liquidity, capital, and assets concentration on liquidity risk is positive, while asset quality and size pose a negative effect. For macro and market factors, the impact of GDP and inflation is positive and negative, respectively. The findings suggest that Islamic banks have lower liquidity risk than conventional ones. It indicates that Islamic banks have been forced to hold high liquidity buffer due to limitations of liquidity management tools and markets. It underscores the critical importance of a proactive role by the government to provide *Shariah*-compliant financial solutions and instrumental support towards the development of Islamic financial instruments and liquidity infrastructures.

The significance of this study is the risk analyses on OIC's banks and their current state of performance despite the regulatory challenges that they are facing. For Islamic banks, the findings serve as a benchmark for measuring the banking policies whether they are in parallel with the current regulatory requirements in enhancing the stability of the Islamic banking industry. Thus, policymakers will make more informed decisions on regulation that would improve banking performance, perhaps unique for Islamic banks as well as for conventional banks. Accordingly, enhanced banking credibility will

ensure the confidence of the stakeholders and the public. The shareholders and investors, in particular, will have better updates on their investments (banks) and the risk involved in these sectors.

However, the limitation of the study is the restriction on cross-country data involving Islamic banks. Future research should extend the issue on the need for separate Islamic banking regulation to improve risk and performance in Islamic banking using a more sophisticated approach.

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