

Research Article

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Liquidity Risk Management in Islamic Banks: Review of the Literature and Future Research Perspectives

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ABSTRACT

This paper explores the distinctive characteristics of liquidity risk faced by Islamic banks as well as the typical challenges and constraints faced by these institutions; it also examines the strategies employed by these institutions to effectively manage and mitigate such risks. The inclusion of a literature review of most cited articles on the subject provides a summary of key studies and research conducted in the field of liquidity risk management in Islamic banking. It aims to cover various aspects of liquidity risk management in Islamic banks, including risk identification, measurement, mitigation strategies, governance, interbank relationships regulatory considerations, and the role of Shariah compliance. It offers both researchers and practitioners seeking comprehensive knowledge on the subject an overview of the existing body of knowledge, enabling them to understand the current state of research and build upon existing insights. By offering a comprehensive coverage of current information and practical strategies available in the literature, this paper aims to add significant value to the understanding and implementation of liquidity risk management in Islamic banks. We mean for it to serve as a valuable resource for researchers, practitioners, regulators, and stakeholders involved in Islamic finance and risk management. By stressing the persistent need for effective liquidity risk strategies in the Islamic banking sector and offering insights into the application of liquidity risk management practices that align with Islamic finance principles, we attempt to address a gap in the existing literature that could constitute the basis for future research perspectives.

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Introduction

For banks, liquidity risk results from an imbalance between the supply and demand for capital. Customer deposits, credit facility repayments, financial market borrowing, interest-based and interest-free revenue, and asset trades by banks all contribute to the supply of funds. On the other side, customer withdrawals, credit demand, interest costs, and non-interest expenses all contribute to the need for cash. "The net liquidity position" represents how much money is available versus how much is needed, and Banks must handle it properly to reduce their risk of liquidity (Rose & Hudgins, 2013).

Banks can use one of three ways to manage their liquidity positions: balanced, assets, or liabilities liquidity management. Banks control the liquidity of their assets by holding liquid assets during times of favorable liquidity and selling them during times of adverse liquidity. Banking institutions borrow money to make up for liquidity gaps as part of liabilities liquidity management. Last but not least, balanced liquidity management refers to the use of both assets and liabilities techniques by banks to manage their liquidity balances. Based on the benefits and drawbacks of each strategy, banks choose which of the preceding tactics to use.

Any of these tactics can be used without any issues by conventional banks. Islamic banks, however, are subject to several limitations because of their unique character. Islamic banks are forbidden from transacting in interest. Additionally, Islamic banks are only permitted to invest in securities that adhere to Shariah law.

The limitations imposed on Islamic banks raise the level of challenge in managing liquidity for these institutions. Islamic banks are not permitted to make investments in short-term interest-bearing financial instruments. Additionally, they are unable to borrow money because doing so would require them to pay interest on the loans to other banks or financial organizations. Even borrowing money from Central banks presents difficulties because interest would have to be paid on the loans. As a result of this predicament, and in their quest to reduce liquidity concerns, Islamic banks may be required to maintain higher levels of cash assets and pass up numerous profitable investment options.

Numerous researchers have studied liquidity risks in Islamic banks. The majority of these studies had an observational character and focused on identifying the risk factors, including liquidity risk, that may affect Islamic banks. While many studies have established techniques to quantify the liquidity risk in Islamic banks, others have provided advice for managing or reducing liquidity risk.

This paper aims to summarize the results of prominent studies in the subject right after the presentation of the methodology followed for the search and before concluding with the limits of the reviewed papers.

Methodology

Literature search

The review of the literature for this study focuses on the most cited articles available on Google scholar published between the years 2000 and 2022. A keyword search for articles containing combinations of the terms "Liquidity risk in Islamic banks" and " AI and Liquidity risk

management in Islamic Banks” produced 7 times more results for the first research than it did for the latter.

Most of the over 70,000 articles found with the key search “Liquidity risk in Islamic banks” result in papers about specific countries. A first overview of these articles classes the articles into two main categories: articles with empirical comparative studies of financial indicators (ROE, ROA, CAR, and bank size...) and their correlation with the risk of liquidity in Islamic banks and in conventional ones and articles focusing solely on the Islamic banks market, Islamic instruments, inter-banks interactions and relationship to Central banks.

No article was found at this stage concerning the use of AI in the management of liquidity risk management in Islamic banks.

Methodology used in reviewed empirical studies

Most of the articles reviewed tackle the subject using empirical studies through comparative research between conventional and Islamic banks in specific countries. They collect balanced panel data from the sampled banks’ annual reports and published financial statements. Many use descriptive, correlation, and panel data regression analysis.

They employ thorough models that take into account a number of factors that affect Islamic banks' liquidity.

Liquidity risk management

Liquidity risk concepts

The capacity of a bank to finance the growth of its assets and fulfill its obligations on time without sustaining any undue losses represents its actual liquidity (Basel Committee, 2008). It serves as a radar for market health, and its volatility is an early warning indicator of a financial crisis (Waemustafa & Sukri, 2016).

Liquidity risk is constituted of market liquidity risk and funding liquidity risk.

- The first component is the bank’s capability to sell assets for a convenient cash price (Willem, 2010).
- The second component represents the bank’s capability to raise money conditionally to fund the assets (Willem, 2010) through asset sales or debt. It is consequently integrally linked to market liquidity (Borio, 2000; Gatev, Schuermann, & Strahan, 2009; Brunnermeier & Pedersen, 2009).

Banks can obtain liquidity from the central bank, interbank, and money market, which together make up a reserve from which banks can draw funds (Archer & Rifaat, 2018).

Liquidity risks concern both Islamic and conventional banks as it affects their longevity and competitiveness.

In Islamic finance, risk is defined as uncertainty. It stands for any circumstance that, under Islamic law, renders a contract void (Hassan et al., 2013).

Sources of liquidity risk

Although many practices like depending greatly on large corporate deposits (Abdel-Megeid, 2017), large off-balance sheet exposure, high short-term spread between deposits and loans, and

comparatively limited investment in risk-free government assets all aggravate it (Ayub, 2007; Zheng, 2006); liquidity risk stems mainly from a duration mismatch between the deposit products that are liquid and short term based and the loan products that are less liquid and long-term based assets (Akhizidis & Khandelwal, 2008).

If depositors make unfavorable money withdrawals or do so massively at first signs of trouble, banks can face a critical liquidity situation, leading to real economic damage and financial crisis (Diamond & Rajan, 2001).

Therefore, one of the most important tools for preventing bank failure and making sure the financial system is stable is liquidity risk management (Majid, 2003).

Islamic banking idiosyncrasies

Even though conventional and Islamic banks are similar, the prohibition of Riba (interest-based transactions), speculation, and investment in prohibited or inequitable resources (Alexandria Bank, 2012) restricts the scope of possible operations for Islamic banks.

In Islamic finance, money has no intrinsic value (Parashar & Venkatesh, 2010). In any given transaction, the compensation is based on how well the underlying asset performs.

Operating under equity-based mode of financing, and because he is treated like an investor and shares in both the losses and gains of the project he has agreed to fund through his Islamic bank, any customer who makes money deposits is subject to an actual investment risk (Toussi, 2010).

Islamic banks' service offer is lacking and risky for both the Islamic banks and their clients, mainly for the following reasons:

- A lack of guarantees for depositors discouraging them from depositing more cash with Islamic banks (Lotfi & Elaatchi, 2022);
- The large maturity gap stemming from the predominance of long-term receivables (Murabaha) in assets and short-term liabilities (mainly deposits from private clients and fewer deposits from institutions and other banks) (Akhizidis & Khandelwal, 2008);
- A great immaturity of available Shariah-compliant financial instruments (Majid, 2003);
- Small number of participants in comparison to conventional banks;
- Lack of an interbank market that adheres to Shariah laws (Hesse and al., 2008). This limit makes Islamic banks in Morocco, to cite an example, resort to Wakala financing contracts with their parent companies, which is very costly and not profitable for the Islamic banks (Lotfi & Elaatchi, 2022); and
- The limited role of central banks as the final recourse to make up for Islamic banks' shortfalls.

All of the above elements reduce the banks' potential for development and lead them to detain supplemental liquidity compared to conventional banks (Pappas et al., 2017) to cover the risks incurred.

This excess liquidity held by Islamic banks is, however, called dead liquidity stock, as liquid assets generate low or no return (Muneeza, 2019), which hinders the banks' competitiveness (Waemustafa & Sukri, 2016) and makes liquidity risk the most important risk for Islamic banks (Abu Hussain & Al-Ajmi, 2012).

Due to the aforementioned high risk, Islamic banks are less likely to engage in real economic

activity out of concern that they may experience the same kind of significant losses that Islamic banks, operating based on profit-loss sharing mode, endured during 1970. Still, the careful application of an equity-based model will create real economic activities and generate higher returns than the debt-based operating mode (Waemustafa & Sukri, 2016).

Liquidity management instruments

Source of liquidity for conventional banks

Conventional banks deal in both equity and debt financing utilizing various instruments for liquidity management, including (Hassan et al., 2013):

- Customer deposits: Deposits are a key source of liquidity. Interest rates impact deposits as higher interest rates result in more deposits. However, the more a bank relies solely on its customers' deposits, the higher its liquidity risk.
- Shares: Ordinary or equity shares represent ownership in a firm's assets and are a common financing mode and a stable liquidity source. Preferred stocks are less risky than common stocks, guaranteeing fixed dividends, while common stocks offer more risk but potentially higher rewards.
- Bonds: Long-term and intermediate-term bonds are utilized as debt financing instruments. They are less risky compared to shares.
- Bills of Exchange and Commercial Papers: These are used as short-term debt financing tools, becoming marketable securities upon acceptance. Their market value depends on interest rates and maturity life (Wilson, 1991). Conventional banks also employ accounts or note receivables and repurchase agreements to ensure better liquidity management.

Financial instruments available in Islamic finance

To manage their liquidity, Islamic banks use (Hassan et al., 2013):

- Equity-based instruments like Sukuk that uphold the principle of risk-sharing;
- Lease-based or service-based products, mostly Ijarah financing, allow access to the usufruct of the asset by means of fee-based contracts, avoiding the incorporation of interest in dealings; and
- Sales-based products, such as Murabahah financing, are basically sales transactions with marked-up prices as an alternative to interest-based loans.

Table 1.
Innovative Islamic instruments for liquidity risk management Islamic securitization

Instrument	Definition	Risk	Conventional equivalent
Murabahah Financing	Cost-plus profit financing. It involves selling goods to customers at a profit, revealing the original cost and profit charged.	Renders banks subject to liquidity risk, particularly when the typical deposit duration is less than standard Murabahah contract maturity. (Mansoor & Ishaq, 2008).	Interest-based loans
Ijarah	A tool allowing the use of assets against fixed charges paid to the bank. Ownership may remain with the bank or be transferred to the customer at the end of the contract.	Liquidity risk increases when the bank must pay upfront for an asset before leasing. The asset's resalability impacts liquidity risk, which is generally lower than in Murabahah.	Leasing
Moudarabah and Moucharakah	Profit and Loss Sharing Equity Participation consisting of a partnership agreement whereby the investor would supply funds to a firm or operation that is handled by the entrepreneur	If each deposit is placed in a specific investment and depositors are only permitted to take out money after the project's conclusion, there is no asset-liability imbalance concern for the bank. However, a strong payback ability is required since for Mudharabah financing, capital sources have the right to retrieve their funding at any moment, and for Musharakah financing, the bank is required to supply the allocated funding and pay the expenditures or profit to the partners (Febianto, 2012).	
Wakalah	An agency contract is where one party appoints another as an agent (Wakeel) to manage investments on their behalf. It can be either restricted or unrestricted. It is a service provision contract, and Islamic banks charge service fees rather than engaging in profit sharing.	Is not very financially profitable for the Wakeel banks.	
Salam	A commercial trade where the payment is made in cash upfront and the delivery of a good with particular attributes is differed to a predetermined date.	Due to Shariah restrictions, there's no secondary market for Salam contracts. Parallel offsetting Salam contracts can mitigate risk but doesn't eliminate completely the liquidity risk associated with Salam.	
Istisna'	A Manufacture-to-Order is a commitment to ensure the production of a good to the exact specifications of a customer and sell it to said customer at a predetermined price at a later date.	Similar to Salam, liquidity risk exists. However, Istisna's liquidity risk is less than that of Salam due to its allowance for installment-based financing or to defer the payment to a later time. Before the manufacturer begins production,	

		unilateral cancellation of an Istisna contract is permitted. Provided the clarity with which the terms are set, this clause may impact the bank's liquidity risk.	
Qard Hassan	Interest-free loans are designed to give the borrower access to the money for a set amount of time.	For the banks, these loans present a negative net present value.	Interest-Free Loan
Bay bi-Thaman Ajil	Similar to Murabahah, the main difference is that in Bai Muajjal there is no obligation to reveal the cost.	This contract involves the bank acting as a middleman trader, facilitating credit sales. Deferred installments are charged at a higher price than the bank's cost, like conventional loan installments (Siddiqui, 2008).	Credit sales
Sukuk	Asset-Backed Security: These are Islamic investment certificates representing ownership of tangible assets. They are categorized into three types: lease-based, equity-based, and sale-based. They provide liquidity and tradability.		Obligations and Conventional Bonds

Of the instruments detailed in Table 1, the most frequently employed is Murabahah financing (Warde, 2000). However, it is considered a rather ineffective tool for managing finances due to its poor rate of return (Majid, 2003).

The asset and/ or liability liquidity risk can be caused either by the essence of the contract or incidentally through other types of risks like default risk and market risk (Abdel Megeid, 2017). Islamic securitization consists of issuing securities of equal amounts against the ownership of tangible assets in accordance with ethical standards and Shariah rules. Islamic securitization is centered on ownership of securities, such as Sukuk. These securities are different from conventional fixed-income securities involving debt certificates as they bear intrinsic risk, and the shared profit is generated from underlying assets. Unlike the conventional finance practice, Islamic securitization compels the issuance of shares against previously existing assets (Hassan et al., 2013).

Various forms of securitization exist such as Musharakah, Salam, Ijarah. This Shariah-compatible practice is highly beneficial to Islamic institutions in their liquidity risk management and the community through the promotion of wealth-generating economic activities (Lotfi & Elaatchi, 2022).

The case of the Maldives

In order to manage its short-term liquidity risk, the central bank of Maldives, Maldives Monetary Authority (MMA), proposed Wadiah Yad Dhamana certificate. In February 14th 2013, the Shariah Council of MMA decided to allow MMA to issue the aforementioned certificate according to the guidelines they suggested. It was agreed that the framework may only be utilized by Islamic financial institutions and the Maldives government; there should be no pre-agreement or clause

requiring the provision of any advantages or compensation for the funds; if there is, the transaction will be void; if any benefits are granted, they must be in the form of a gift, or Hibah, entirely at the exclusive discretion of the Maldives government.

In November 2013, the first Maldives-specific Islamic Treasury Bill was issued by MMA. It features a distinctive structure comprising Mudharabah, Murabahah, and Wakalah bi al Istithmar certificates. These certificates were created to meet the government's unique demands, such as those related to the purchase of oil, the purchase of generator sets, or housing construction projects.

MMA then proposed a commodity Murabahah product, which was not agreeable to the Sharia Board of Islamic financial institutions due to the lack of availability of a domestic commodity financial market in the country.

Finally, MMA introduced a Sukuk structure based on Salam and Ijarah, and the government of the Maldives created a Special purpose vehicle (SPV) to facilitate the issuances by making it possible for multiple parties to become Sukuk holders, keeping assets off the balance sheet of the originator, and managing them separately.

Another product discussed in this context in the Maldives is the development of an Overnight Deposit structured based on the Shariah concept of Mudharabah, whereby the capital provider would be the Islamic bank and the manager would be MMA (Muneeza, 2019).

The Maldivian case study illustrates that having proper Islamic liquidity management instruments is vital for Islamic banking sustainability.

The IILM's HQLA: Sukuk

With respect to Basel III's Alternative Liquidity Approaches, starting from August 2013, the International Islamic Liquidity Management Corporation (IILM) has issued over 25 short-term Sukuk for maturities of three and six months. These Sukuk are rated A1 by the international rating agency Standard and Poor's and are traded on quite active secondary markets.

The structure of the IILM Sukuk is similar to a commercial paper backed with an asset collateral based on the Wakalah contract, with underlying assets constructed from a combination of at least 49% receivables and 51% tangible assets. The assets backing the IILM are either sovereign, sovereign-linked or supranational assets from several countries. The tangible part of the collateral is a selection of Ijarah leases that could have different maturities. Through a sale and leaseback agreement, the ownership of the assets is transferred from the initial owner to an SPV acting as a lender, an SPV that issues long-term Sukuk to an IILM Holding SPV incorporated in Luxembourg (The asset obligor thus makes rental payments that provide a cash-inflow for the Sukuk investors.) Then, short-term Sukuk backed by the assets of the IILM issuer SPV is created, and assets are administered by the IILM Corporation as a Wakeel. An auction approach similar to the one used for conventional government papers is employed for the acquisition of the short-term Sukuk; auctions are open to primary dealers as market makers.

The Sukuk described above were constructed with the objective to be compliant with the requirements of Basel III committee regarding the High-Quality Liquid Assets (HQLA) and are deemed compliant with the Level 2A standards, or even as Level 1 in some countries.

Given that the IILM Sukuk have a maturity inferior to one year, while the underlying assets have maturities that could span up to 8 years, the management of the Sukuk set-up raises a major liquidity challenge: in order to pay the investors of the previous issuance, funds need to be raised through new issuance. To ensure sufficient funding is available, the IILM has a variety of safety mechanisms. The demand for IILM Sukuk is high, and the issuances are oversubscribed and very far from meeting the needs of Islamic banks for HQLA (Archer & Abdel Karim, 2018).

Regulatory environment

The Islamic finance model is well specified at the “bank-to-client” level, but it is lacking in the “central bank-to-bank” and “bank-to-bank” interactions (Yandiev, 2015).

A Central Bank is a risk-free institution. It does not engage in commercial profit-making activities. Thus, when an Islamic bank places money with a Central Bank, it may not receive any compensation.

Hence, the absence of suitable Shariah compatible tools for Central Banks to interact in a profitable manner with Islamic banks, the way they serve as lenders of last resort for conventional banks through interest-based transactions.

Yandiev (2015) outlines a specific Shariah-compliant mechanism for establishing an Islamic interbank loan market to regulate Islamic bank liquidity. In the proposed model, the Central Bank creates an SPV as an intermediary responsible for managing liquidity between Central banks and Islamic banks in a manner consistent with Shariah principles. The paper also proposes the issuance of Sukuk with daily payable coupons as a viable financial instrument for liquidity management.

These Sukuk can then be traded between Islamic banks in the secondary market creating an Islamic interbank loan market compatible with Shariah rules. Islamic banks should, however, delink from LIBOR and other traditional reference rates and come up with their own financial benchmarks, transcending a critical challenge that hinders the sector's full autonomy and integration and working towards the growth of a more independent and self-reliant Islamic finance sector. Majid (2003) also stresses the value of adding Islamic Sukuk to capital requirements and the necessity of central banks and the International Islamic Financial Market (IIFM) working together on this.

Empirical studies

Bank-specific factors: unsystematic risk

Alzoubi (2017) studied from 2007 to 2014 a sample of forty-two international banks in fifteen countries. As the cash available can be used to satisfy any demand for liquidity by Bank customers, the study results show a negative correlation between liquidity risk and cash ratio. Because banks that require liquidity can sell owned securities to make up for any lack, there is a negative correlation between liquidity risk and securities held by the bank.

Moreover, a negative correlation has been observed between the size of a bank in terms of assets and the liquidity risk to which the bank is exposed. This could be explained by the fact that large banks aspire to more confidence in their customers. Similarly, there is a negative correlation

between equity size and liquidity risk, given the stability of the funds.

The study, however, shows a positive correlation between the profitability of assets and the exposure to liquidity risk, as shifting liquid, low-yield assets to more profitable, less liquid assets makes the banks more vulnerable to liquidity risk. The same correlation is observed between liquidity risk and provision. Moreover, the study shows that the relationship between bank's asset size and liquidity risk is not linear.

Rahman and Banna (2015) found that the size of the bank, return on assets, and net working capital impact the three medium-sized Bengal Islamic banks they sampled, but not to a significant extent. While in the same size sample of conventional banks studied from 2007 to 2011, return on assets is positively correlated to the liquidity risk, the bank size is negatively correlated to the risk of liquidity. The return on equity and capital adequacy ratios are found to be insignificant in affecting the liquidity risk for both types of banks.

Abdel Megeid (2017) compares liquidity risk management between Egyptian conventional and Islamic banks, exploiting a sample of six Egyptian conventional banks and two Islamic banks covering the years 2004 to 2011. Findings show that in conventional banking, loan quality, funding, and asset management have a positive impact on liquidity management. However, in Islamic banking, loan quality and funding management have a positive impact, while asset quality has a negative impact. According to descriptive statistics, Islamic banks outperform conventional banks in managing loan quality, whereas conventional banks perform better in managing asset quality and funding.

This study also demonstrates that conventional banks have better liquidity risk management thanks to their higher cash preparedness and firmer regulations.

Rahman and Banna (2016) used the fixed effect model to show that Financial Expansion (FEXP), Financing Loss Provision (FLP), CAR, and Non Performing Financing (NPF) affect liquidity risk in Islamic banks, while FEXP, FLP, ROA, and NPL have an impact on it in conventional banks in Bangladesh.

Sukmana and Suryaningtyas (2016) showed that in Indonesia, ROA has a negative influence on liquidity risk in Islamic banks, whereas CAR has a positive impact, with conventional banks raising liquid assets as a buffer when NPL levels are high.

Shamas et al. (2018) investigate the factors affecting liquidity risk in Islamic and conventional banks in the Gulf. The study demonstrates a positive effect of ROE, CAR, and net interest margin on Islamic banks' liquidity risk and a negative effect of ROA and non-performing loans.

In Sri Lanka, Lassoued et al. (2018) found that the capital adequacy ratio's impact on liquidity risk was minimal and not significant and that Islamic banks showed a negative effect of ROA on liquidity risk, while conventional banks showed a positive association.

Khan et al. (2017) found Pakistan's Islamic banks to be more profitable and have better risk management thanks to their adherence to Shariah law and broad appeal to customers. Conventional banks were more efficient, cost-effective, and had higher asset quality during financial crises.

Milhem and Istaiteyeh (2016) found Jordanian conventional banks to be more profitable, less liquid, riskier, and more efficient than Islamic banks between 2009 and 2013.

Suleiman et al. (2020) compared liquidity risk management in three conventional and three Islamic financial institutions in Jordan between 2013 and 2017. A positive and significant relationship was found between ROA, ROE, size, and capital adequacy ratio with liquidity risk management in both conventional and Islamic banks.

Ismal (2010a) examined the liquidity of three Islamic banks in Indonesia by considering three characteristics: liquidity management policy and assets and liabilities sides. The outcomes demonstrated the numerous accomplishments of these banks.

Ahmed et al. (2011) examined a sample of six Islamic banks between 2006 and 2009. They discovered that while the size of the bank and profitability did not show a connection to liquidity risk, leverage, tangibility, and age all significantly affect it.

Akhtar et al. (2011) compared the liquidity risk of Islamic and conventional banks. According to their research, which used data from six conventional banks and six Islamic banks from the years 2006 to 2009, size has a negligible positive impact on liquidity risk for both types of banks, but there is a strong positive correlation between return on assets and liquidity risk for Islamic banks. Furthermore, for conventional banks, net working capital to net assets is strongly correlated to the risk of liquidity.

Iqbal (2012) studied the risk of liquidity in a sample of five conventional banks and five Islamic banks between 2007 and 2010. The results demonstrated a positive association between liquidity risk and size, return on equity, return on assets, and capital adequacy ratio, while a negative rapport existed between liquidity risk and non-performing loans.

Sampling a group of twenty-two banks operating in Pakistan between 2004 and 2009, Arif and Anees (2012) investigated the impact of liquidity risk on profitability. The results demonstrated that non-performing financing and a liquidity gap both have a detrimental impact on bank profitability.

Paldi (2014) investigated the potential impact of capital adequacy on liquidity and other hazards in Islamic banks. He discovered that it is challenging to establish authentic Shariah banking because of the expense and risk involved. Using a regression model, Sawada (2010) showed that liquidity risk is positively linked to the size of the bank.

Ojo (2010) emphasized the importance of the Basel II agreement's definition of capital adequacy ratio as a risk-reduction mechanism. Sensarma and Jayadev (2009) provided additional support for this study's conclusion.

However, the article by Tarawneh (2006) finds that the capital adequacy ratio in the case of Islamic banks is insignificant, whereas Rosly and Zaini (2008) revealed that risk-taking characteristics are not imitated by return on equity.

Siddiqui (2008) demonstrates a positive and significant relation for ROE in Islamic banks but a positive and negligible relation in conventional banks.

İncekara and Çetinkayaa (2019) demonstrate that both conventional and Islamic banks have an obviously negative and statistically significant association between liquid assets and liquidity risk, whereas NPL has a positive and statistically significant impact in Islamic banks and a negative effect on conventional banks.

Waemustafa and Sukri (2016) demonstrate that ROA is positively significant with liquidity

ratio. Ghazali (2008) and Kosmidou and Pasiouras (2005) also observed a strong positive correlation between ROA and liquidity. The results are at odds with those of Choon et al. (2012), who revealed that liquidity risk is adversely significant to ROA, suggesting that more funding was provided by Islamic banks with less liquidity.

Macroeconomic factors: Systematic risk

Waemustafa and Sukri (2016) studied systematic determinants of liquidity risk applying a time series regression analysis to Islamic and conventional banks from 2000 to 2010.

Results show that Gross Domestic Product (GDP) shows positive but not significant to liquidity, money supply shows positive significance to liquidity risk, and output gaps show negative significance to liquidity in Islamic banks.

In conventional banks, GDP is also positive but not significant to liquidity risk, consumer price index is positively significant, the output gap is negatively significant, whereas money supply is not significant to the liquidity.

There is a positive correlation between liquidity risk and inflation, as a surge in the inflation rate generally motivates banks to hold more liquid assets and a higher position of cash to meet the potential needs of depositors, which is consistent with the Fisher effect assumption. This has the implication of pushing downwards the bank's funding cost.

Banks are generally damaged by high inflation rates in the case of an imbalance between lending and borrowing, as the interest paid for short-term liabilities becomes more expensive in contrast with interest earned from the assets side on long-term borrowing that remains unchanged. Bordeleau and Graham (2010) state that the increase in interest rates harms banks with long term maturity liquid assets.

Macroeconomic variables show a comparable correlation to liquidity risk for both conventional banks as well as Islamic ones, given that both players are competing in the same market for the same customers. Among those variables, money supply is the one highly correlated to liquidity risk. Another study conducted by İncekara and Çetinkayaa (2019) on a scope of a total of 6 banks in Turkey (3 Islamic and 3 conventional) operating between 2014 and 2018 found that there is a negative and statistically significant relationship between the GDP and inflation variables and liquidity risk at 99% confidence level for Islamic banks.

Chen (2018) evaluated liquidity risk and the factors that contribute to it in a sample of 12 nations between 1994 and 2006. He discovered that liquidity risk is intrinsic to banks' performance, dependent on external funding and liquid assets, as well as macroeconomic, governmental, and supervisory factors. Additionally, he discovered that liquidity risk might affect a bank's profitability. When he divided the world into market-based and bank-based nations, he discovered that while there is no relationship between performance and liquidity risk in bank-based nations, there is one in market-based nations.

Strategies for effective liquidity risk management

Both Islamic and conventional financial systems must constantly monitor, evaluate, and adhere to their respective laws and principles in order to effectively manage liquidity risk (Hassan et al.,

2013).

Efficient liquidity management means meeting medium-term goals and commitments in a timely manner (Parashar & Venkatesh, 2010), addressing both asset liquidity and liability obligations (Ismal, 2010b).

Following are some observations on liquidity risk management that may be made from examining the balance sheet's efficiency (Ismal, 2010b):

- Liquidity on the asset section is the assessment of a financial institution's capacity to convert an asset into cash in a timely manner by selling liquid assets at current market prices.
- Liquidity on the liability end refers to the aptness of the bank to determine whether there are enough resources to cover obligations on time (Toby, 2006). This may be accomplished through shortening the durations of deposits and debt and extending the duration of liabilities or by acquiring additional capital (Helmy, 2012).

There are three main approaches banks adopt with regard to liquidity risk management: conservative (prioritizing safety by investing more in current assets), aggressive (seeking higher profitability with less investment in current assets), and moderate (balancing risk and return with a moderate investment in current assets) (Saini & Sharma, 2009).

Both conventional and Islamic banks should use periodic cash flow projections to anticipate liquidity levels and establish minimum operating liquidity levels for a comfortable buffer beyond reserve requirements (Abdel Megeid, 2017) and invest in profitable projects (Febianto, 2012).

They should increase safe liquid asset holdings, use regulation to discourage excessive risk, impose standards on high-risk institutions, enhance central bank facilities, and establish comprehensive risk management systems within banks (Jenkinson, 2009).

In the specific case of Islamic banks, they should use the following practices to manage their liquidity risk:

- Line up investment opportunities before advertising for new investment deposits to ensure profitable fund utilization (Syed, 2004);
- Diversify the Investment Modes by utilizing products with conditionally predictable cash flows such as Murabahah, Salam, and Istisnah contracts, as they allow to fix the maturity at the time of the contract, and products linked to equity participation such as Musharakah or Mudharabah, where maturity depends on the financed project (Syed, 2004);
- Maintain prudent reserves (Profit Equalization and Investment Risk) for insuring against liquidity risk due to deposit outflows and default-induced shortages (Syed, 2004);
- Utilize reciprocal inter-bank mutual loan agreements (Mudharabah) for short-term liquidity needs (Syed, 2004);
- Use instruments like Institutional Ijarah Sukuk to hold liquid assets earning income, minimizing liquidity risk and costs (Syed, 2004);
- Ensure adequate capital (CAR) to absorb losses and prevent failure (Syed, 2004);
- Establish policies and processes for managing risks like effective oversight and implementing monitoring systems supported by supervisory review and rational assessments;
- Consider Islamic derivative instruments for hedging risks arising from activities (Mohd et al., 2009);

- Use assets intended for purchase as collateral to mitigate risk in case of default (Siddiqui, 2008);
- Promote an atmosphere that is favorable to the rise of Islamic banks by implementing ecosystems with rules tailored to their unique characteristics (Goodhart, 2008);
- Develop Islamic financial markets for trading Islamic financial instruments to create proactive competition (Hassan et al., 2013);
- Invest in the development of innovative Islamic liquidity management instruments with careful consideration of the unique legal framework of the countries (Muneeza, 2019) and issuances that meet HQLA criteria (Archer & Abdel Karim, 2018).

Islamic financial firms are believed to have survived the global financial crisis thanks to their high liquidity and good liquidity risk management strategy (Sukmana & Suryaningtyas, 2016; Suryanto, 2016a, 2016b).

Potential new avenues of research

Aside from the unsystematic risk factors studied in the articles reviewed, other variables can prove relevant to the evaluation and management of liquidity risk in banks in general and Islamic Banks in particular.

Regarding the Assets to Liabilities structure, future research should explore the impact of variables such as: Proportion of risk-weighted assets, Ratio of short-term to long-term assets, Quality and diversification of the asset portfolio, Ratio of demand deposits to total deposits, Maturity profile of liabilities and Concentration of large depositors.

As for the size of the bank largely used as a variable in the studies reviewed, we suggest it be pondered with the age of the bank and the Ownership structure (public vs. private, domestic vs. foreign).

For the systematic factors, Geopolitical events, Financial crises in neighboring countries, and Global economic downturns should have an impact on liquidity risk management dynamics in Islamic banks.

Also, the current literature review highlights a noticeable gap in research focusing more closely on the Islamic interbank market. Future studies should delve deeper into this area, exploring its intricacies and its role in liquidity management for Islamic banks.

Surprisingly, a significant portion of existing research has overlooked the potential impact of management techniques and marketing strategies on liquidity risk. Future research should investigate how these factors influence liquidity risk in Islamic banks, potentially offering new avenues for effective risk management.

Finally, in the modern banking landscape, Artificial Intelligence (AI) is playing an increasingly pivotal role. Yet, its role in managing liquidity risk in Islamic banks remains underexplored. Future studies should probe into how AI and other technological advancements can be harnessed to better manage and predict liquidity risks in the context of Islamic banking.

Conclusion

The overall finding of this study is that the issue of Islamic banks' lack of access to Central banks' liquidity management instruments and the lack of a sufficiently developed Islamic Interbank Loan market genuinely exists on a cross-national scale.

Most of the empirical research reviewed has looked into the liquidity risk in Islamic banks by using their models on a limited sample of banks spanning a short time and, in most cases, across a single country. While some of these studies were descriptive, others made use of a straightforward model with few variables.

The divergence in results can be due to the difference in economies and sizes of banks sampled or the size of the samples selected for data collection. In fact, in given research, variables might prove insignificant not because they do not affect liquidity risk but because the data used is insufficient to show such a conclusion.

For future researchers, this paper suggests that the study should try to apply a more extensive model that uses a wider cross-country sample and more variables besides the ones largely examined in the literature to improve the reliability of the model and better understand the liquidity risk in Islamic banks on an international dimension.

The present review of existing literature also reveals a scarcity of research on the Islamic interbank market and liquidity management.

Much of the existing literature did not examine the role of management techniques, marketing strategies, and AI in managing liquidity risk in Islamic banks.

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