Muqtasid 14(1),2023: 1-15
http://muqtasid.iainsalatiga.ac.id
DOI:http://dx.doi.org/10.18326/muqtasid.V14i1. 1-15

Non-linear Effect of Islamic Banks' Liquidity Risk to Financial Stability; Evidence from the Indonesian Banking Industry

Faaza Fakhrunnas[*1]
Department of Economics, Faculty of Business and Economics
Universitas Islam Indonesia, Indonesia

Submitted: 10 June 2023; Revised: 14 September 2023; Accepted: 17 September 2023

Abstract

Liquidity risk is a pivotal aspect that determines the soundness of financial performance in the banking system. Therefore, the study aims to examine the influence of Islamic banks' liquidity risk on banking stability. Using time series data ranging from 2004m1 to 2022m8, the study adopts a non-linear autoregressive distributed lag (NARDL) approach to examine the influence of liquidity risk on financial stability in the Indonesian banking sectors. The result of the study reveals that it has a non-linear and asymmetric relationship between liquidity risk and financial stability in the banking system. In the short run, an additional increase/decrease in the change of liquidity risk negatively affects financial stability. In addition, the long-run relationship shows that only an additional increase in change has a negative and significant relationship to financial stability. The COVID-19 pandemic also becomes a significant determinant that affects financial stability in the long-run relationship. The findings of the study imply that the Indonesian financial authorities should set suitable regulations to mitigate and address the issue of Islamic banks' liquidity risk, particularly in anticipating its non-linear and asymmetric impact on financial stability.

Keywords: financial stability, Islamic bank, liquidity risk, NARDL

*** Corresponding author**
fakhrunnasfaaza@uii.ac.id

ISSN 2087-7013
ISSN 2527-8304

INTRODUCTION

Lesson learned from the past financial crises, liquidity held a pivotal role in determining the soundness of financial institutions, including in the banking sectors (Contreras et al., 2021). Indeed, when a bank fails to manage liquidity risk, it prompts unstable financial performance at the institutional level. Moreover, as a bank has a tight relationship with other banks, it has a high potential to create a contagion effect that spreads an adverse impact to other banks' financial performance and suffers a whole bank in the banking industry (Kleinow & Nell, 2015; Chen, 2022). When a big-size bank is experiencing bad circumstances of liquidity risk, a higher contagion risk potentially emerges in the banking system.

In relation to Islamic banks, despite promising growth in the banking sector, following the Shariah principle does not mean that Islamic banks are free from financial risks (Hassan et al., 2019). Abedifar et al. (2013) explain that Islamic bank is expected to have some different risk exposures compared to conventional banks due to a different business model. However, because Islamic banks also exist in the dual banking system, many financial risks faced by Islamic banks remain unchanged, including liquidity risk (Waemustafa & Sukri, 2015). Therefore, with possessing a significant influence on banking stability, liquidity risk in Islamic banks still needs to be observed on how liquidity risk of Islamic banks affects financial stability in the banking system.

Hence, the study attempts to examine the impact of the liquidity risk of Islamic banks on financial stability, specifically in the context of the Indonesian banking system. It has three reasons why the Indonesian Islamic banking industry is selected. Firstly, Indonesia is one of the fastest-growing Islamic banking industries in the world (Trinugroho et al., 2018). Secondly, Indonesia already set a comprehensive regulation in the national level No. 21 2008 that firstly explains in detail the aspects of Islamic banking operations and the Islamic bank's role in the economic system (Fakhrunnas et al., 2022). Moreover, Indonesia also already established and operates an institutional catalyst, namely the National Committee of Islamic Economic and Finance/Komite Nasional Ekonomi dan Keuangan Syariah (KNEKS), that bridges the stakeholders of Islamic finance in Indonesia to quicken the Islamic economic and finance growth and development. Thirdly, Indonesia is considered to have a stable banking industry that survived the past financial crises (Khattak et al., 2021). It makes the Indonesian banking sectors successfully address the test of the financial turmoil period.

Theoretically, Diamond and Dybvig (1983) generally shed light that financial stability is a cardinal objective that must be achieved and maintained in the economic system where the liquidity of the bank plays a pivotal role. To manage the risk, the bank needs to manage the

liquidity performance in which the more liquidity the banks have, the safer financial stability the bank will be. Interestingly, Wagner (2007) has a different viewpoint that explains that an increase in liquidity can jeopardize financial stability. It comes from the modelling approach, which finds that when the bank has more liquidity, the bank is in a safe financial condition and tends to take more risk in financial decisions. The risk exposure are then able to be managed by using sufficient liquidity that the bank possesses. However, when the bank fails to manage the risk, the bank suffers from an unstable financial condition. Therefore, when the bank has more liquidity, the bank becomes a risk taker, which significantly increases the financial risk exposure in the banking system (Wagner, 2007).

Empirically, several studies have been conducted in the field of financial stability in Islamic banks. Alqahtani and Mayes (2018) delineate that Islamic banks had no difference from conventional banks during the global financial crisis 2008 in the case of Gulf countries. However, Islamic banks suffered more from financial problems when the crisis disturbed the real economic sector than its counterparty, particularly large Islamic banks. In contrast, Čihák and Hesse (2010) explain that regardless of the type of size, conventional banks were found to be stronger in the stability of financial performance compared to Islamic banks. Another finding was found by Bilgin et al. (2021), who concluded that economic uncertainty does not affect Islamic bank stability but influences conventional bank stability. Therefore, what was found by Alqahtani and Mayes (2018), Čihák and Hesse (2010), and Bilgin et al. (2021) delineated which bank is more stable in the financial system is still in the ongoing debate where the variables used in the model, period of the study and the object of the study play are being the determinant of the conclusion.

Focusing on the impact of liquidity risk, many studies have been conducted in the area of liquidity issues to baking performance, such as Patel et al. (2022) examining the liquidity and capital structure, Mohammad et al. (2020) assessing liquidity risk's determinant for Islamic and conventional bank, Morkoetter et al., (2014) who studied liquidity and bank default, Robatto (2019) evaluating liquidity and monetary policy, Berger et al., (2019) and Mdaghri (2021) discussing the issue of liquidity creation and Islamic banking stability, and Chen et al. (2021) explaining liquidity risk during financial crisis in the banking sector.

However, to the best of the author's knowledge, it has still much room to fill to discuss the influence of liquidity risk on financial stability in Islamic banks. Not many studies have been sufficiently conducted to examine the impact of the liquidity risk of Islamic banks on financial stability in the banking system. Ahmad et al. (2022) found that liquidity has a negative effect on the bank stability in the QISMUT (Qatar, Indonesia, Saudi Arabia, Malaysia, United

Arab Emirates and Turkey) countries. Relying on the agency theory, excessive liquidity in Islamic banks makes the bank take excessive risk. The managers of the bank can take more risk with an aggressive strategy for financing activity for Islamic banks with less selection to the deficit units of Islamic banks, which potentially leads to bad customers and high-risk or high-volatile business activity.

On the contrary, by observing the Islamic banking industry in MENA countries, Ghenimi et al. (2017) explain that high liquidity strengthens the financial stability of Islamic banking. During the financial crisis, the most common cause of financial institutions bankruptcy was liquidity. When an Islamic bank has more liquidity, the bank has less potential to fail during financial turmoil (Ghenimi et al., 2017). It is because liquidity becomes a cushion that possibly offsets the financial loss during unstable financial conditions, especially when a crisis emerges. It is in line with Morkoetter et al. (2014), who state that bank default is caused by a lack of management from the liquidity side. When the bank fails to manage its liquidity risk, the bank experiences bad financial condition that leads to a higher possibility of going bankrupt.

In addition, Hassan et al. (2019) conclude that liquidity risk in Islamic banks has a negative and significant relationship to financial stability in the case of the Organization of Islamic Conference Countries (OIC Countries), either in the financial crisis period or post-financial crisis period. The result explains that when the bank has a higher liquidity risk, the financial stability of the bank decreases. Intuitively, when the banks have less possibility to fulfil their liabilities, the bank tends to face a failure condition in the financial performance. In the case of the impact of the COVID-19 pandemic on financial stability, some earlier studies have found that Islamic banks suffer from the adverse effects of the COVID-19 pandemic (Elnahass et al., 2021). In the case of Indonesia, as discussed by Fakhrunnas et al. (2021) and Fakhrunnas et al. (2022), Islamic banks were not immune from the financial risk due to the outbreak. The financial stability of Islamic banks in Indonesia has been affected by the COVID-19 pandemic in a non-linear direction.

The research contribution of the study is twofold. Firstly, the study comprehends the previous studies conducted by Ghenimi et al. (2017), Hassan et al. (2019) and Ahmad et al. (2022), who specifically explain the impact of liquidity on financial stability in Islamic banks. Secondly, the study adds an unprecedented effect of financial crisis due to the outbreak in the model to assess how the pandemic affects the relationship between liquidity risk and financial stability. Thirdly, the study provides a novel viewpoint to examine the non-linear symmetric or asymmetric influence of liquidity risk on financial stability in the banking system. As explained

By Fakhrunnas et al. (2022), the impact of independent variables on dependent variables is non-linear, and it can be in the form of symmetric and asymmetric relationships. Furthermore, the study is significant in providing scientific evidence on how the liquidity risk of Islamic banks affects financial stability in the banking system. The findings are important to issue appropriate financial policies in response to the existence of the non-linear symmetric or asymmetric relationship between liquidity risk and financial stability.

Finally, after the introduction section, the next sequence of the section explains the data and method which are adopted in this study, and it is followed by results and discussion. The section of the study then ended with the conclusion.

METHOD

To examine the impact of liquidity risk on banking stability in Indonesia, the study utilizes monthly time-series data ranging from January 2004 to August 2022, considering the availability of the data in Indonesian banking industry issued by financial service authority/otoritas jasa keuangan (OJK) of Indonesia. As mentioned by Fakhrunnas et al. (2022) and Elsayed et al. (2022), in the financial system, the influence of an independent variable on a dependent variable is not linear and may not be symmetric. Hence, a measurement to examine the influence of liquidity risk on financial stability needs to be properly conducted.

Table 1. The Definition of the Variables

Variables	Definition	Reference	Data Source
ZSCORE	The sum of return on asset and equity to total asset and then it is divided by the standard deviation of return on asset in the Indonesian banking sector	Alqahtani & Mayes (2018)	OJK and author's calculation
LIQRISK	The comparison between liability to asset of Islamic banks in percentage	Berger et al. (2019)	OJK and author's calculation
COVID	The dummy variable was 1 for during the COVID-19 period (starting from March 2020) and 0 for before the COVID-19 period	Elnahass et al. (2021)	-

MS	The comparison between the total assets of Islamic banks asset to the total assets of the Indonesian banking sector in percentage	Čihák & Hesse, (2010)	OJK and author's calculation
INT	The percentage of interest rate	Fakhrunnas et al. (2022)	Central Bank of Indonesia
INF	The percentage of inflation rate based on consumer price index	Sriyana & Ge (2019)	Indonesia Statistics

Shin and Greenwood-Nimmo (2014) explain that non-linear autoregressive distributed lag (NARDL) can be used to measure the non-linear influence of certain variables on other variables. In addition, symmetric or asymmetric tests is also can be conducted through the Wald test, either in the short run or long run (Sriyana & Ge, 2019). Adapting from Wagner (2007) and Hassan et al. (2019), the models of the study are formulated in equation 1 (Model 1) and 2 (Model 2) in which the COVID-19 period is then involved in the second model to observe the impact of the COVID-19 to financial stability and how the liquidity risk affects the stability with the presence of the outbreak's variable.

$$\begin{aligned}\mathrm{ZSCORE}_t = {} & a_0 + a_1\,\Delta\mathrm{ZSCORE}_{t-1} + a_2\,\Delta LIQRISK\_POS_{t-1} \\ & + a_3\,\Delta LIQRISK\_NEG_{t-1} + a_4\,\Delta MS_{t-1} + a_5\,\Delta\mathrm{Int}_{t-1} \\ & + a_6\,\Delta\mathrm{Inf}_{t-1} + \sum_{i=1}^{n}\Theta_{1i}\,\Delta\mathrm{ZSCORE}_{t-1} \\ & + \sum_{i=1}^{n}\Theta_{2i}\,\Delta LIQRISK\_POS_{t-1} \\ & + \sum_{i=1}^{n}\Theta_{3i}\,\Delta LIQRISK\_NEG_{t-1} + \sum_{i=1}^{n}\Theta_{4i}\,\Delta MS_{t-1} \\ & + \sum_{i=1}^{n}\Theta_{5i}\,\Delta\mathrm{Int}_{t-1} + \sum_{i=1}^{n}\Theta_{6i}\,\Delta\mathrm{Inf}_{t-1} \\ & + \mu_t \qquad (1)\end{aligned}$$

$$\begin{aligned}\mathrm{ZSCORE}_t = {} & a_0 + a_1\,\Delta\mathrm{ZSCORE}_{t-1} + a_2\,\Delta LIQRISK\_POS_{t-1} \\ & + a_3\,\Delta LIQRISK\_NEG_{t-1} + a_4\,\Delta COVID_{t-1} + a_5\,\Delta MS_{t-1} \\ & + a_6\,\Delta\mathrm{Int}_{t-1} + a_7\,\Delta\mathrm{Inf}_{t-1} + \sum_{i=1}^{n}\Theta_{1i}\,\Delta\mathrm{ZSCORE}_{t-1} \\ & + \sum_{i=1}^{n}\Theta_{2i}\,\Delta LIQRISK\_POS_{t-1}\end{aligned}$$

$$+\sum_{i=1}^{n}\Theta_{3i}\ \Delta LIQRISK\_NEG_{t-1}+\sum_{i=1}^{n}\Theta_{4i}\ \Delta COVID_{t-1}$$
$$+\sum_{i=1}^{n}\Theta_{5i}\ \Delta MS_{t-1}$$
$$+\sum_{i=1}^{n}\Theta_{6i}\,\Delta \mathrm{Int}_{t-1}+\sum_{i=1}^{n}\Theta_{7i}\,\Delta \mathrm{Inf}_{t-1}$$
$$+\mu_t \qquad (2)$$

Where the POS and NEG of liquidity risk is calculated from:

$$LIQRISK\_POS_t=\sum_{i=1}^{n}\Delta LIQRISK_t^{+}=\max(\mathrm{PIG}_t,0) \qquad (3)$$
$$LIQRISK\_NEG_t=\sum_{i=1}^{n}\Delta LIQRISK_t^{-}=\max(\mathrm{PIG}_t,0) \qquad (4)$$

Moreover, as suggested by Shin and Greenwood-Nimmo (2014), to examine symmetric or asymmetric long-run relationships, the coefficients of the variables are compared where $-\frac{a_3}{a_2}=\frac{a_4}{a_2}$, a_2 reflects the coefficient of financial stability, then a_3 and a_4 are the coefficient of $\sum_{i=1}^{n}\Delta LIQRISK_t^{+}$ and $\sum_{i=1}^{n}\Delta LIQRISK_t^{-}$ respectively.

Several preliminary tests are required to be conducted to fulfil the requirement of the NARDL approach in which the variables must be stationary at different levels (in level and 1st Difference) but not exceed the level stationary of 1st Difference. In the unit roots test, the study uses the Augmented Dickey-Fuller (ADF) test as proposed by Dickey and Fuller (1979) and the Philip and Perron (PP) test as suggested by Phillips and Perron (1988). Moreover, the study also selects the Akaike information criterion (AIC) approach to determine the lag selection process.

RESULT AND DISCUSSION

Table 2. Description of the Variables

Variables	Mean	Maximum	Minimum	Std. Dev.	Obs.
ZSCORE	5.04	7.19	0.95	0.98	224
LIQRISK	91.41%	96.47%	81.36%	3.03%	224
MS	3.11%	4.74%	0.76%	1.12%	224
INT	6.68%	12.75%	3.50%	2.10%	224
INF	5.65%	18.38%	1.32%	3.45%	224

Table 2 sheds light on the description variables used in the study. Over 224 observation periods, the highest ZSCORE is 7.19, while the minimum is 0.95. The higher the score of ZSCORE, the less risk banks tend to be bankrupt. In addition, the ratio of liability to total asset, as the reflection of liquidity risk, indicates the possibility of Islamic banks to fulfil their liability. On average, the percentage of LIQRISK is 91.41%. In terms of the value of the market

Share of Islamic banks, it is shown by the score of MS, which is an average of 3.11%. It indicates that Islamic banks still have a small percentage of market share in the Indonesian banking system. From the macroeconomic variable, the average score of interest and inflation rate is 6.68% and 5.65%, respectively.

Table 3. The result of the Unit Roots Test

Variables	In Level		1st Difference		Conclusion
	ADF	PP	ADF	PP	
ZSCORE	-0.73	-0.73	-14.62**	-14.62***	1st Difference
LIQRISK	-3.08**	-3.09**	-16.50***	-16.40***	In Level
COVID	0.00	0.00	-14.87***	-14.87***	1st Difference
MS	2.72	2.64	-14.11***	-14.28***	1st Difference
INF	-0.99	-1.33	-7.05***	-12.18***	1st Difference
INT	-2.02*	-3.56**	-15.04***	-26.09***	In Level

Note: *, **, *** indicate that it is significant in the level of 10%,5% and 1% respectively

Table 4. Lag Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	2103.84	NA	0.00	-19.42	-19.33	-19.39
1	3949.02	3570.76	0.00	-36.18	-35.51*	-35.91
2	4021.09	135.46	0.00*	-36.51*	-35.29	-36.01*
3	4040.37	35.17	0.00	-36.36	-34.57	-35.64
4	4066.58	46.35	0.00	-36.26	-33.92	-35.32
5	4102.25	61.10*	0.00	-36.26	-33.36	-35.09
6	4123.60	35.38	0.00	-36.13	-32.66	-34.72
7	4149.58	41.62	0.00	-36.03	-32.00	-34.40
8	4172.60	35.59	0.00	-35.91	-31.32	-34.06

* Indicates lag order selected by the criterion. LR: sequential modified LR test statistic (each test at 5% level), FPE: Final prediction error, AIC: Akaike information criterion, SC: Schwarz information criterion and HQ: Hannan-Quinn information criterion

To begin the NARDL analysis, preliminary tests are conducted to examine the suitability of the analysis. According to the unit roots test, it can be seen that LIQRISK and INT are stationary in level while others are in the 1st Difference. It indicates that the requirement to apply the NARDL test is fulfilled. In addition, the optimum lag selection criteria, as shown in Table 4, is in 2 lags. The study utilizes the Akaike Information Criterion (AIC) to determine the optimum lag for the NARDL test.

Table 5 exhibits that independent variables can explain 83% of the dependent variable, as it is reflected by the R-square value. In addition, the result from the cointegration test is significant, which explains that independent variables have a long-run relationship to the dependent variable. Following Sriyana and Ge (2019), the result of the Wald test is significant,

which indicates that it rejects Ho, stating that the relationship is symmetric. Therefore, the result of the Wald test confirms that the relationship between liquidity risk and financial stability is asymmetric.

Table 5. The result of the NARDL Short-run Relationship

Variable	Model 1		Model 2	
	Coefficient	t-Statistic	Coefficient	-Statistic
ZSCORE(-1)	0.84	13.02***	0.82	12.67***
ZSCORE(-2)	-0.06	-0.97	-0.08	-1.20
LIQRISK_POS	-3.60	-0.46	-3.34	-0.43
LIQRISK_POS(-1)	-48.36	-4.23***	-48.88	-4.28***
LIQRISK_POS(-2)	46.02	5.94***	45.86	5.94***
LIQRISK_NEG	-19.55	-2.67***	-20.02	-2.74***
LIQRISK_NEG(-1)	30.66	2.95***	30.94	2.99***
LIQRISK_NEG(-2)	-11.04	-1.53	-11.38	-1.58
MS	-13.51	-0.33	-14.77	-0.36
MS(-1)	68.58	1.19	61.80	1.07
MS(-2)	-7.72	-0.18	-0.74	-0.02
INF	4.73	1.41	5.05	1.51
INF(-1)	0.75	0.17	0.96	0.21
INF(-2)	-3.34	-0.99	-2.79	-0.82
INT	-55.34	-3.07***	-59.10	-3.26***
INT(-1)	32.71	1.09	29.85	0.99
INT(-2)	20.10	1.15	23.18	1.33
COVID			-0.12	-0.27
COVID(-1)			-0.33	-0.54
COVID(-2)			0.20	0.46
C	1.49	3.77***	1.90	4.25***
R-squared	0.83		0.83	
Cointegration Test	6.16***		5.89***	
Asymmetric Test	17.85***		17.80***	

Note: *, **, *** indicate that it is significant in the level of 10%, 5% and 1% respectively

To discuss the individual influence of independent variables on financial stability in the banking system, in the short-run relationship, in Model 1, an additional increase in change of liquidity risk has a negative and significant relationship to the financial stability in the banking industry. Moreover, an additional decrease in the change of liquidity risk has the same direction

and significant. It indicates that in the short run, liquidity risk becomes the determinant of financial stability. The finding is supported by Ghenimi et al. (2017), Hassan et al. (2019) and Ahmad et al. (2022), who found the significance of liquidity to banks' stability.

Furthermore, as explained by Hassan et al. (2019), liquidity risk has a negative and significant relationship to financial stability. It also asserts the finding that in the short-run relationship and in any direction of an additional decrease or increase, liquidity risk matters to the financial stability. The presence of a non-linear and asymmetric relationship for the influence of liquidity risk also sheds light that the impact of liquidity risk on financial stability needs to be carefully observed and examined. As highlighted by Morkoetter et al. (2014), mismanagement of liquidity risk causes a significant impact on financial stability in the banking sector.

In Model 2, surprisingly, the impact of the COVID-19 pandemic is not significant to financial stability in the short run. The finding is in contrast to Elnahass et al. (2021) and Fakhrunnas et al. (2021), who found that the pandemic worsens banking performance as well as financial stability in the banking system. For other complementary variables in the short run, it is found that interest rate has a negative and significant relationship to financial stability. It explains that when the interest rate increases, it makes financial stability more vulnerable. Interestingly, the market share of Islamic banks in the banking sector is not significant to financial stability in the short run. The finding reveals that regardless of how significant the market share possessed by Islamic banks, it does not impact financial stability, which also indicates that the financial performance of Islamic banks is much more significant to impact the financial stability of the banking system in the short-run period.

Table 6. The result of the NARDL Long-run Relationship

Variable	Model 1		Model 2	
	Coefficient	**t-Statistic**	**Coefficient**	**t-Statistic**
LIQRISK_POS	-26.82	-2.86***	-25.12	-3.08***
LIQRISK_NEG	0.33	0.06	-1.83	-0.36
MS	213.73	3.71***	183.00	3.56***
INF	9.64	0.95	12.74	1.39
INT	-11.42	-0.60	-23.99	-1.35
COVID			-0.97	-2.09**
C	6.70	4.32***	7.53	5.25***

Note: *, **, *** indicate that it is significant in the level of 10%, 5% and 1% respectively

In the long-run relationship, the influence of independent variables on financial stability is different from the short-run, as is exhibited in Table 6. In Model 1, an additional increase of liquidity risk in change to financial stability has a negative and significant relationship.

However, it has no significant relationship of LIQRISK_NEG to financial stability. Both findings occur either in model 1 or model 2. Therefore, what is found by Hassan et al. (2019) supports the finding in the long-run relationship of this study. It reveals that when an Islamic bank has an increase in liquidity risk, it endangers its financial stability at the same time.

Moreover, in general, the finding is in contrast to the theoretical framework by Wagner (2007), who stated that an increase in the amount of liquidity in banking triggers the bank to be less stable. It is also not in line with Ahmad et al. (2022), who conclude that an increase in liquidity makes Islamic bank takes excessive risks. According to the findings of this study, liquidity can be a cushion to deal with the financial instability in the banking system. An increase in liquidity in Islamic banks means the bank has less liquidity risk, which causes the bank to manage the risk well, and it directly affects the financial performance of the banking system.

In terms of the impact of the pandemic, in model 2, it can be seen that in the long run, the COVID-19 pandemic has a negative and significant relationship. The finding is supported by Elnahass et al. (2021), who states that during the outbreak, the level of risks faced by the banking system increased. Furthermore, the significant level of the COVID-19 pandemic's effect on financial stability in the long run is possibly because the pandemic deeply hit the Indonesian banking system, which disturbs the level of financial stability. During the pandemic, particularly in the first year of the pandemic, Islamic banks must struggle to maintain the level of financial risks, including liquidity risk, amid economic uncertainty.

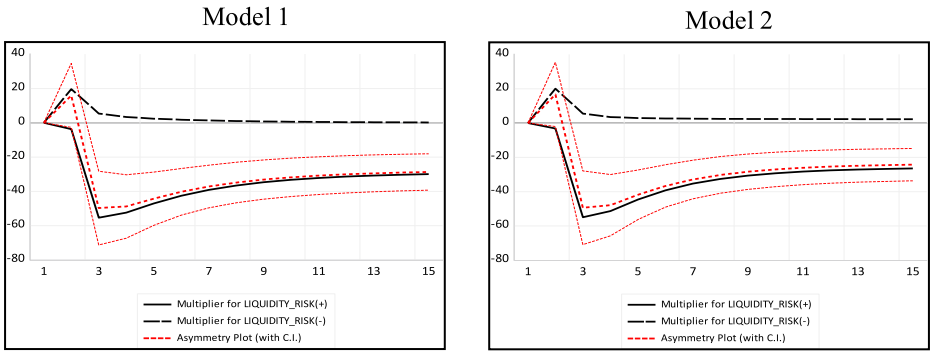

Figure 1. Bootstrapping Analysis

Regarding the impact of other independent variables, the market share of Islamic banks has a positive and significant impact on financial stability in Indonesia. An increase/decrease in the market share of Islamic banks can raise/fall the financial stability of the banking system. As mentioned by Alqahtani and Mayes (2018), a bigger size of Islamic banks tends to be more vulnerable to financial distress because the bank engages in more financial activities in the banking system. However, the finding of this study also shows that if an Islamic bank has a

Bigger asset size, the bank tends to increase the financial stability of the banking system. It is possibly because Islamic banks still do not possess well-managed financial risk, including liquidity risk. Therefore, Islamic banks are required to increase the level of risk management since the larger bank should have more flexibility to manage the risks through a diversification strategy, especially for the long-run relationship.

Furthermore, inflation and interest rates are not the determinants of financial stability in the banking system in the long run. It possibly indicates that the banking system can manage the interest and inflation risks in the long-run period, which does not disturb the level of stability. Finally, to examine how the non-linear and symmetric relationship of liquidity risk affects financial stability in the banking system over the observation period, it is shown in Figure 1. According to the same figure, models 1 and 2 have similar trends during the observation period.

CONCLUSION

The study assesses the impact of liquidity risk on financial stability in the banking system. The results of the study reveal that there is a non-linear and asymmetric relationship between liquidity risk and financial stability in the banking system. Moreover, in the short-run relationship, liquidity risk is the determinant of financial stability in the banking system in the case of an additional increase/decrease in change of liquidity risk. In the short-run period, the COVID-19 pandemic evidently does not impact financial stability in the banking system. In the long-run period, an additional increase in the change of liquidity risk and the COVID-19 pandemic have a negative and significant relationship to financial stability in the banking system, either in Model 1 or Model 2. The finding indicates that a higher liquidity risk suffers financial stability in the banking system.

Based on the above-mentioned findings, the study contributes to enriching the previous studies in the relation of liquidity risk and financial stability in the banking system as well as providing a novel viewpoint to assess that relationship in a non-linear and asymmetric perspective. The results of the study also imply that the policy to maintain liquidity in a certain level is still relevant, including for Islamic banks to achieve, maintain, and strengthen the financial stability in the banking system. Finally, the author confesses that the study still has much room to be improved. Because this study only focuses on single countries, to pave the way forward, future research is suggested to assess cross-country analysis in examining the impact of liquidity risk on financial stability, particularly in the non-linear viewpoint.

BIBLIOGRAPHY

Abedifar, P., Molyneux, P., & Tarazi, A. (2013). Risk in Islamic Banking. *Review of Finance*, *17*(6), 2035–2096. https://doi.org/10.1093/rof/rfs041.

Ahmad, S., Wan Ahmad, W. M., & Shaharuddin, S. S. (2022). Is Excess of Everything Bad? Ramifications of Excess Liquidity on Bank Stability: Evidence from the Dual Banking System. *Borsa Istanbul Review, 22*(4), 1-16. https://doi.org/10.1016/j.bir.2022.09.008.

Alqahtani, F., & Mayes, D. G. (2018). Financial Stability of Islamic Banking and The Global Financial Crisis: Evidence from the Gulf Cooperation Council. *Economic Systems*, *42*(2), 346–360. https://doi.org/10.1016/j.ecosys.2017.09.001.

Berger, A. N., Boubakri, N., Guedhami, O., & Li, X. (2019). Liquidity Creation Performance and Financial Stability Consequences of Islamic Banking: Evidence from a Multinational Study. *Journal of Financial Stability*, *44*, 100692. https://doi.org/10.1016/j.jfs.2019.100692.

Bilgin, M. H., Danisman, G. O., Demir, E., & Tarazi, A. (2021). Economic Uncertainty and Bank Stability: Conventional vs Islamic Banking. *Journal of Financial Stability*, *56*(100911), 1–20.

Chen, W. D., Chen, Y., & Huang, S. C. (2021). Liquidity Risk and Bank Performance During Financial Crises. *Journal of Financial Stability*, *56*, 100906. https://doi.org/10.1016/J.jfs.2021.100906.

Chen, Y. (2022). Bank Interconnectedness and Financial Stability: The Role of Bank Capital. *Journal of Financial Stability*, *61*(May), 1–10. https://doi.org/10.1016/j.jfs.2022.101019.

Čihák, M., & Hesse, H. (2010). Islamic Banks and Financial Stability: An Empirical Analysis. *Journal of Financial Services Research*, *38*(2), 95–113. https://doi.org/10.1007/S10693-010-0089-0.

Contreras, S., Ghosh, A., & Kong, J. H. (2021). Financial Crisis, Bank Failures and Corporate Innovation. *Journal of Banking and Finance*, *129*, 106161. https://doi.org/10.1016/J.jbankfin.2021.106161.

Diamond, D. W., & Dybvig, P. H. (1983). Bank Runs, Deposit Insurance, and Liquidity. *Journal of Political Economy*, *91*(3), 401–419. https://doi.org/10.1086/261155.

Dickey, D. A., & Fuller, W. A. (1979). Distribution of the Estimators for Autoregressive Time Series With a Unit Root. *Journal of the American Statistical Association*, *74*(366), 427. https://doi.org/10.2307/2286348.

Elnahass, M., Trinh, V. Q., & Li, T. (2021). Global Banking Stability in the Shadow of Covid-19 Outbreak. *Journal of International Financial Markets, Institutions and Money*, *72*, 101322. https://doi.org/10.1016/j.intfin.2021.101322.

Elsayed, A. H., Naifar, N., & Nasreen, S. (2022). Financial Stability and Monetary Policy Reaction: Evidence from the GCC Countries. *Quarterly Review of Economics and Finance*, *87(C), 396-405*. https://doi.org/10.1016/j.qref.2022.03.003.

Fakhrunnas, F., Nugrohowati, R. N. I., Haron, R., & Anto, M. B. H. (2022). The Determinants of Non-Performing Loans in the Indonesian Banking Industry: An Asymmetric Approach Before and During the Pandemic Crisis. *SAGE Open*, *12*(2), 1–13. https://doi.org/10.1177/21582440221102421.

Fakhrunnas, F., Tumewang, Y. K., & Anto, M. B. H. (2021). The Impact of Inflation on Islamic Banks' Home Financing Risk: Before and During the COVID-19 Outbreak. *Banks and Bank Systems*, *16*(2). https://doi.org/10.21511/bbs.16(2).2021.08.

Ghenimi, A., Chaibi, H., & Omri, M. A. B. (2017). The Effects of Liquidity Risk and Credit Risk on Bank Stability: Evidence from the MENA Region. *Borsa Istanbul Review*, *17*(4), 238–248. https://doi.org/10.1016/j.bir.2017.05.002.

Hassan, M. K., Khan, A., & Paltrinieri, A. (2019). Liquidity Risk, Credit Risk and Stability in Islamic and Conventional Banks. *Research in International Business and Finance*, *48*, 17–31. https://doi.org/10.1016/j.ribaf.2018.10.006.

Khattak, M. A., Ali, M., Hamid, B. A., & Islam, M. U. (2021). Competition, Diverisfication and Stability in the Indonesian Banking System. *Buletin Ekonomi Moneter dan Perbankan*, *24*(Special Issue), 59–88. https://doi.org/10.21098/bemp.v24i0.1481.

Kleinow, J., & Nell, T. (2015). Determinants of Systemically Important Banks: the Case of Europe. *Journal of Financial Economic Policy,* 7(4), 446-476. https://doi.org/10.1108/JFEP-07-2015-0042.

Mdaghri, A. A. (2021). How Does Bank Liquidity Creation Affect Non-performing Loans in the MENA Region? *International Journal of Emerging Markets*, *17*(7), 1635–1658. https://doi.org/10.1108/IJOEM-05-2021-0670.

Mohammad, S., Asutay, M., Dixon, R., & Platonova, E. (2020). Liquidity Risk Exposure and its Determinants in the Banking Sector: A Comparative Analysis between Islamic, Conventional and Hybrid Banks. *Journal of International Financial Markets, Institutions and Money*, *66*, 101196. https://doi.org/10.1016/j.intfin.2020.101196

Morkoetter, S., Schaller, M., & Westerfeld, S. (2014). The Liquidity Dynamics of Bank Defaults. *European Financial Management*, *20*(2), 291–320. https://doi.org/10.1111/j.1468-036X.2011.00637.x.

Patel, A., Sorokina, N., & Thornton, J. H. (2022). Liquidity and Bank Capital Structure. *Journal of Financial Stability*, *62*(July). https://doi.org/10.1016/j.jfs.2022.101038.

Phillips, P. C. B., & Perron, P. (1988). Testing for a Unit Root in Time Series Regression. *Biometrika*, *75*(2), 335–346.

Robatto, R. (2019). Systemic Banking Panics, Liquidity Risk, and Monetary Policy. *Review of Economic Dynamics*, *34*, 20–42. https://doi.org/10.1016/j.red.2019.03.001.

Shin, Y., & Greenwood-Nimmo, M. (2014). Modelling Asymmetric Cointegration and Dynamic Multipliers in a Non-linear ARDL Framework. In R. Sickels and W. Horrace (Ed.), *In Festschrift in Honor of Peter Schmidt: Econometric Methods and Applications*. Springer.

Sriyana, J., & Ge, J. J. (2019). Asymmetric Responses of Fiscal Policy to the Inflation Rate in Indonesia. *Economics Bulletin*, *39*(3), 1701–1713.

Trinugroho, I., Risfandy, T., & Ariefianto, M. D. (2018). Competition, Diversification, and Bank Margins: Evidence from Indonesian Islamic Rural Banks. *Borsa Istanbul Review*, *18*(4), 349–358. https://doi.org/10.1016/j.bir.2018.07.006.

Waemustafa, W., & Sukri, S. (2015). Bank Specific and Macroeconomics Dynamic Determinants of Credit Risk in Islamic Banks and Conventional Banks. *International Journal of Economics and Financial Issues*, *5*(2), 476–481.

Wagner, W. (2007). The Liquidity of Bank Assets and Banking Stability. *Journal of Banking and Finance*, *31*(1), 121–139. https://doi.org/10.1016/j.jbankfin.2005.07.019.