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# Credit Risk, Liquidity, and Financial Stability: An Investigation in the Indonesian Banking Sector

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**Abstract**

**Research Originality:** This study offers a clear and precise investigation into the relationship between credit risk, liquidity, and financial stability, addressing the inconclusive findings in prior literature. In addition, a nonlinear approach is adopted to capture the dynamic interaction of credit risk and liquidity on financial stability

**Research Objectives:** The study aims to assess the influence of Islamic banks' credit risk and liquidity on financial stability in the Indonesian banking sector.

**Research Method:** Utilizing time series data ranging from 2004m1 to 2022m8, a nonlinear autoregressive distributed lag (NARDL) approach is adopted to measure the impact of credit risk and liquidity on financial stability.

**Empirical Results:** The findings of the study reveal that it has nonlinear, symmetric, and asymmetric effects between independent variables and dependent variables. In the short run, only credit risk has a significant relationship, while in the long run, either credit risk or liquidity affects financial stability significantly.

**Implications:** The study's results imply that Islamic banks must implement liquidity monitoring and a credit risk early warning system. At the regulatory level, tailor-made liquidity instruments and encouraging Islamic banks to have a larger capital buffer need to be introduced and regulated.

**Keywords**:
financial stability; liquidity; credit risk; Islamic bank; a nonlinear autoregressive distributed lag

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## INTRODUCTION

Financial stability is one of the objectives that many financial institutions and authorities worldwide must achieve and maintain. This attainment is crucial because financial stability provides more room for financial players to grow, sustain, and prevent idiosyncratic risk (Creel et al., 2015). When the financial system is stable, all financial activities are under control, and it benefits all stakeholders to reach their financial objectives. In contrast, an unstable financial system worsens banking performance, especially during a financial crisis (Bilgin et al., 2021). Hence, achieving and maintaining financial stability is the duty of financial authorities and all financial players, including Islamic banks.

In practice, credit risk is one of the leading indicators of Islamic banking performance (Alandejani & Asutay, 2017). Another important variable for assessing the soundness of Islamic banking conditions is liquidity (Masood & Ashraf, 2012). Both indicators are pivotal in examining the performance of Islamic banks, especially during unstable economic conditions. For instance, during the Asian Crisis, the banking sector in Southeast Asia experienced a higher percentage of bad loans and liquidity management challenges due to macroeconomic factors that emerged during the crisis (Mishkin, 1999). It is also similar to the global financial crisis of 2008, during which many banking sectors struggled to manage liquidity.

Moreover, in a financial stability theory from the perspective of Diamond & Dybvig (1983) and Bryant (1980), under the Monti-Klein approach, the bank's assets and liabilities are connected. When a higher percentage of nonperforming loans significantly reduces asset size, banks suffer losses, directly affecting their ability to fulfill short- and long-term liabilities to surplus units or other parties. When liquidity is lacking, banks have much more difficulty fulfilling their liabilities. A shortage of liquidity sources of funds makes it difficult for banks to manage the risks, particularly during financial turmoil. These circumstances increase banks' default risk, potentially leading to instability in the banking sector.

Under the macroeconomic theory of banking, internal financial conditions, including credit and liquidity performance, determine the soundness of banking operations and the financial system (Dia & VanHoose, 2017). When both credit risk and liquidity are underperforming, the bank is undoubtedly in an unstable condition, potentially creating a contagion that endangers financial stability in the system. This condition also applies to Islamic banks when they experience an unstable financial condition. It may have a contagious impact on other banks' performance, spurring financial instability in the banking sector. Therefore, many financial authorities attempt to strictly regulate the banking sector to limit the percentage of bad financing and the required liquidity level, ensuring banks' stability and financial soundness.

Empirically, previous studies have examined the impact of credit risk and bank liquidity on financial stability. The first strand of previous studies argues that Islamic banks' credit risk plays an essential role in determining the level of financial stability in the financial system. The findings of Čihák & Hesse (2010) indicate that Islamic bank


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credit risk affects financial stability. In addition, Islamic banks' financial stability is more robust than that of conventional banks for banks with small assets, but this does not occur for banks with large assets. In the case of Islamic banking in Indonesia, Fakhrunnas et al. (2022) explain that macroeconomic variables affect the financial stability in the banking sector. It is characterized by a nonlinear, symmetric, and asymmetric relationship between macroeconomic variables and financial stability at the banking sector level. Djebali & Zaghdoudi (2020) also highlight that a decrease (increase) in credit risk can weaken (strengthen) financial stability if it exceeds certain thresholds. The thresholds define the optimal level of credit risk the bank must maintain. If it is not achieved, inefficiency in the banking operation is present, undermining financial stability.

In addition, Ghenimi et al. (2017), Alqahtani & Mayes (2018), and Hassan et al. (2019) explain that an increase in liquidity strengthens the financial stability at the banking sector level. It occurs because banks are expected to fulfill their financial obligations when they possess sufficient liquidity. On the contrary, Chen et al. (2021) find that higher liquidity levels do not significantly affect banking stability. The study also found that the bank with higher liquidity before the 2008 financial crisis was not better off than the bank with lower liquidity. In contrast, Wagner (2007) and Ahmad et al. (2022) argue that banks with higher liquidity are riskier because they feel safe taking on more risk, as sufficient liquidity provides a cushion against poor financial performance.

The second strand of previous studies empirically measures the relationship between credit risk and liquidity concerning financial stability. The findings vary, and some conclude that only credit risk performance affects liquidity risk, not vice versa. This means the reciprocal relationship between these two variables is absent. For instance, Mdaghri (2021), in the case of the Middle East and North Africa (MENA) banking sector, and Hassan et al. (2019), in the case of the dual banking system, find that liquidity risk significantly affects nonperforming loans in the banking sector. On the contrary, Ghenimi et al. (2017) did not find a significant effect of liquidity on the credit risk relationship, but credit risk does affect liquidity risk performance.

Furthermore, credit and liquidity risks jointly affect the financial system's financial stability. This finding is evident in the studies of Ghenimi et al. (2017), who find that credit and liquidity risks are key determinants of financial stability in financial systems. Both variables significantly affect the financial stability of MENA's banking sector (Ghenimi et al., 2017). The interaction between credit and liquidity risks is closely related to financial stability. This means that when both variables are underperforming, financial instability is present. Similar studies are conducted by Djebali & Zaghdoudi (2020) and Chen et al. (2021), who also report similar findings.

As discussed earlier, the study aims to examine the nonlinear, symmetric, or asymmetric effects of credit and liquidity risk on financial stability in the Indonesian banking sector, with a focus on the role of Islamic banks. There are two research questions in this study. First, is a reciprocal relationship present between credit risk and liquidity? Second, do credit risk and liquidity separately and/or simultaneously influence financial

stability in the banking sector?. This paper uses the Indonesian banking sector as the object of study to assess the impact of credit risk and liquidity on Islamic banks' financial stability, for several reasons. A report of the ICD-Refinitiv Islamic Development (2022) reveals that the Indonesian banking sector ranks among the top in Islamic banking development. Furthermore, Indonesia already has comprehensive regulations for Islamic banks within its dual banking system, underscoring the importance of Islamic banks to the Indonesian banking sector.

Even though Islamic banks in Indonesia have only about 7.46% market share (IFSB, 2024), they are considered essential to financial stability. Fakhrunnas et al. (2023) confirm that Islamic banks play a significant role in shaping the financial stability of the banking sector. This role is particularly critical given the systemic interconnectedness inherent to modern finance (Chen, 2022). One bank's failure or significant distress can propagate through the entire financial network via contagion, amplifying the initial shock and jeopardizing the system's stability. Consequently, in the context of this study, the stability of each Islamic bank, regardless of its size, is of systemic importance.

The study's contribution and its position among previous studies are twofold. Firstly, this paper provides a clearer direction and a more precise investigation of the nexus among credit risk, liquidity, and financial stability in Islamic banks. The prior studies remain inconclusive, as explained in the first and second strands of the previous empirical studies. These findings are supported by earlier work by Alqahtani & Mayes (2018), Hassan et al. (2019), and Chen et al. (2021) on the determinants of financial stability from the banks' liquidity perspective. Addressing the disagreement in the findings of the previous study, additional studies are still necessary to precisely examine the impact of credit risk and liquidity on financial stability and clarify the interconnectedness among the observed variables.

Secondly, this paper offers new insights by using a nonlinear approach to examine how credit risk and liquidity in Islamic banks affect financial stability in the banking sector. Previous studies have continued to use a traditional approach, assuming a linear relationship among the observed variables, as in Ghenimi et al. (2017), Alqahtani & Mayes (2018), and Hassan et al. (2019). The assumption of linearity among economic variables often overlooks the complexity, such as nonlinear interactions that characterize actual economic processes. This viewpoint is highlighted by previous studies, such as Sriyana and Ge (2019) and Fakhrunnas et al. (2022), who stress the importance of applying a nonlinear approach to investigating economic activities.

The significance of this paper has two important aspects. Firstly, it is essential for Islamic banking institutions and practitioners to manage Islamic banking performance effectively, considering the impact of Islamic banks' credit risk and liquidity on financial stability in the banking sector. Secondly, it is useful for financial authorities to issue and implement financial policies to mitigate and address financial risks in the banking industry, thereby achieving and maintaining financial stability in Indonesia. Finally, the remaining sections of the paper comprise the method section. The results and discussion of the findings are highlighted in the next section, which concludes.


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## METHODS

To achieve the study's objective, we retrieved data from the Indonesian Financial Services Authority (Otoritas Jasa Keuangan, or OJK), the Central Bank of Indonesia, and the Indonesian Statistics Agency for the period from January 2004 to August 2022. This paper has limited the data to maintain analytical consistency and avoid structural changes arising from post-pandemic recovery policies and macroeconomic shifts. The independent variable, namely financial stability, is proxied by ZSCORE. It is measured in the level of the Indonesian banking sector by calculating the log of the return on assets plus equity to total assets, and both variables are divided by the standard deviation of return on assets. The use of ZSCORE as a proxy for financial stability is suggested by Korbi & Bougatef (2016), Ghenimi et al. (2017), and Rashid et al. (2017), who claim that this measure accurately explains financial stability in the banking sector.

In this study, we use credit and liquidity risks as independent variables, proxied by nonperforming financing (NPF) and liquidity (LIQ) for Islamic banks, respectively. NPF is measured as the percentage of bad financing to total financing for Islamic banks, while the log of total liquid assets is used to calculate LIQ. The control variables comprise the Islamic bank's size (SIZE), measured as the log of total assets. For macroeconomic variables, this study employs the Central Bank of Indonesia's overnight interest rate (INT) and the Production Index (PI).

To investigate the reciprocal relationship between NPF and LIQ, we use the Granger Causality test proposed by Granger (1969). A time-series regression test is also conducted to examine the relationships between NPF and LIQ, and between NPF and financial stability, separately. The models of the study are derived from the theory of financial stability explained by Crockett (1997) and Borio (2011), as formulated below:

$$\begin{aligned}\mathrm{ZSCORE}_t = {} & a_0 + a_1\,\Delta\mathrm{ZSCORE}_{t-1} + a_2\,\Delta POSLIQ_{t-1} + a_3\,\Delta NEGLIQ_{t-1} + a_4\,\Delta SIZE_{t-1} \\ & + a_5\,\Delta\mathrm{Int}_{t-1} + a_6\,\Delta\mathrm{PI}_{t-1} + \sum_{i=1}^{n} \Theta_{1i}\,\Delta\mathrm{ZSCORE}_{t-1} \\ & + \sum_{i=1}^{n} \Theta_{2i}\,\Delta POSLIQ_{t-1} + \sum_{i=1}^{n} \Theta_{3i}\,\Delta NEGLIQ_{t-1} + \sum_{i=1}^{n} \Theta_{4i}\,\Delta SIZE_{t-1} \\ & + \sum_{i=1}^{n} \Theta_{5i}\,\Delta\mathrm{Int}_{t-1} + \sum_{i=1}^{n} \Theta_{6i}\,\Delta\mathrm{PI}_{t-1} + \mu_t \end{aligned} \tag{1}$$

$$\begin{aligned}\mathrm{ZSCORE}_t = {} & a_0 + a_1\,\Delta\mathrm{ZSCORE}_{t-1} + a_2\,\Delta POSNPF_{t-1} + a_3\,\Delta NEGNPF_{t-1} + a_4\,\Delta SIZE_{t-1} \\ & + a_5\,\Delta\mathrm{Int}_{t-1} + a_6\,\Delta\mathrm{PI}_{t-1} + \sum_{i=1}^{n} \Theta_{1i}\,\Delta\mathrm{ZSCORE}_{t-1} \\ & + \sum_{i=1}^{n} \Theta_{2i}\,\Delta POSNPF_{t-1} + \sum_{i=1}^{n} \Theta_{3i}\,\Delta NEGNPF_{t-1} \\ & + \sum_{i=1}^{n} \Theta_{4i}\,\Delta SIZE_{t-1} \\ & + \sum_{i=1}^{n} \Theta_{5i}\,\Delta\mathrm{Int}_{t-1} + \sum_{i=1}^{n} \Theta_{6i}\,\Delta\mathrm{PI}_{t-1} + \mu_t \end{aligned} \tag{2}$$

Where POS reflects an additional increase in the change of certain variables while NEG explains an additional decrease in the change of certain variables. Then, by referring to Ghenimi et al. (2017), to find out the simultaneous influence of credit risk and liquidity, both variables interact with each other as explained in equation 3.

$$\begin{aligned}\text{ZSCORE}_t = {} & a_0 + a_1\,\Delta\text{ZSCORE}_{t-1} + a_2\,\Delta POSLIQ * NPF_{t-1} + a_3\,\Delta NEGLIQ * NPF_{t-1} \\ & + a_4\,\Delta SIZE_{t-1} + a_5\,\Delta\text{Int}_{t-1} + a_6\,\Delta\text{PI}_{t-1} + \sum_{i=1}^{n} \Theta_{1i}\,\Delta\text{ZSCORE}_{t-1} \\ & + \sum_{i=1}^{n} \Theta_{2i}\,\Delta POSLIQ * NPF_{t-1} + \sum_{i=1}^{n} \Theta_{3i}\,\Delta NEGLIQ * NPF_{t-1} \\ & + \sum_{i=1}^{n} \Theta_{4i}\,\Delta SIZE_{t-1} \\ & + \sum_{i=1}^{n} \Theta_{5i}\,\Delta\text{Int}_{t-1} + \sum_{i=1}^{n} \Theta_{6i}\,\Delta\text{PI}_{t-1} + \mu_t \end{aligned} \tag{3}$$

Finally, both LIQ and NPF are included in the same model to examine their influence when merged.

$$\begin{aligned}\text{ZSCORE}_t = {} & a_0 + a_1\,\Delta\text{ZSCORE}_{t-1} + a_2\,\Delta POSLIQ_{t-1} + a_3\,\Delta NEGLIQ_{t-1} + a_4\,\Delta POSNPF_{t-1} \\ & + a_5\,\Delta NEGNPF_{t-1} + a_6\,\Delta SIZE_{t-1} + a_7\,\Delta\text{Int}_{t-1} + a_8\,\Delta\text{PI}_{t-1} \\ & + \sum_{i=1}^{n} \Theta_{1i}\,\Delta\text{ZSCORE}_{t-1} \\ & + \sum_{i=1}^{n} \Theta_{2i}\,\Delta POSLIQ_{t-1} + \sum_{i=1}^{n} \Theta_{3i}\,\Delta NEGLIQ_{t-1} \\ & + \sum_{i=1}^{n} \Theta_{4i}\,\Delta POSNPF_{t-1} + \sum_{i=1}^{n} \Theta_{5i}\,\Delta NEGNPF_{t-1} \\ & + \sum_{i=1}^{n} \Theta_{6i}\,\Delta SIZE_{t-1} \\ & + \sum_{i=1}^{n} \Theta_{7i}\,\Delta\text{Int}_{t-1} + \sum_{i=1}^{n} \Theta_{8i}\,\Delta\text{PI}_{t-1} + \mu_t \end{aligned} \tag{4}$$

All of the models have already been adjusted using the Nonlinear Autoregressive Distributed Lag (NARDL) model proposed by Shin and Greenwood-Nimmo (2014). The NARDL model is adopted because an additional increase or decrease in the change of a certain variable does not have a linear impact on another variable (Bussiere, 2012; Fakhrunnas et al., 2022). This condition precisely captures the nonlinear relationship among the focus variables.

To begin the analysis, a preliminary analysis is required, as suggested by Shin and Greenwood-Nimmo (2014) in the NARDL approach. The unit root test is first applied to measure the level of stationarity. In the NARDL approach, the stationary level and the 1st-difference levels must be included in each model. We adopt the Augmented Dickey-Fuller and Phillips-Perron approaches, initiated by Dickey and Fuller (1979) and Phillips & Perron (2017), respectively, to test for unit roots. In addition, a lag selection process is conducted to determine the optimal lag criteria for the models. After the preliminary test is completed, the NARDL test can be performed. Moreover, Pesaran et al. (2001) state that a cointegration test is necessary to examine the presence


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of long-run relationships among the variables. Finally, a nonlinear, symmetric, and asymmetric test is employed using the Wald test approach as suggested by Sriyana and Ge (2019).

## RESULTS AND DISCUSSION

The descriptive analysis shown in Table 1 indicates that the average LIQ during the observation period is IDR 65,986.85 billion, with a standard deviation exceeding the mean, suggesting greater variation in LIQ over the period. The same condition also holds for the size of Islamic banks, as reflected in the SIZE variable. Moreover, the NPF value is considered lower, with an average of 3.76%, while the highest is 6.63%. The NPF scores indicate that Islamic banks in Indonesia can manage their financing activities during the observation period. Moreover, the average value of ZSCORE is 5.04, and the maximum and minimum scores are 7.19 and 0.95, respectively. A higher ZSCORE indicates a better level of financial stability in the banking system, while a lower ZSCORE indicates the opposite.

**Table 1. Descriptive Analysis**

| Variables | Mean | Maximum | Minimum | Std. Dev. |
|---|---|---|---|---|
| ZSCORE | 5.04 | 7.19 | 0.95 | 0.98 |
| LIQ | 65,986.85 | 257,171.60 | 1,323.00 | 67,993.89 |
| NPF | 3.76 | 6.63 | 0.03 | 1.36 |
| SIZE | 173,496.60 | 492,536.00 | 8,757.00 | 134,869.10 |
| PI | 125.23 | 158.00 | 92.32 | 14.45 |
| INT | 6.68 | 12.75 | 3.50 | 2.10 |

Note: LIQ and IBSIZE are in IDR billion.

**Table 2. 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 |
| LIQ | -0.75 | -3.17 | -8.86 | -19.32 | In Level |
| NPF | -0.99 | -0.94 | -15.05 | -15.08 | 1st Difference |
| SIZE | -2.23 | -2.36 | -8.92 | -18.52 | 1st Difference |
| PI | 0.32 | 0.45 | -15.05 | -26.46 | 1st Difference |
| INT | -2.02 | -3.56 | -15.04 | -26.09 | In Level |

In addition to descriptive analysis, as explained by Shin and Greenwood-Nimmo (2014), a unit root test must be conducted to determine the variables' stationarity. In the NARDL approach, the variable must be stationary at the level and the 1st difference. According to the results, the stationary level satisfies the NARDL model, where INT and LIQ are stationary in level, while the others are in 1st differences (See Table 2). Moreover, a lag selection test is also applied to determine the optimum lag during the

NARDL test. Table 3 shows that the optimal lag in the model is 3, as indicated by the FPE and AIC-based lag selection.

To examine the relationship between LIQ and NPF in Islamic banks, Table 4 presents the results of the Granger Causality test, which indicate no reciprocal relationship between the variables. The findings of the test are in contrast with those of Mdaghri (2021) and Hassan et al. (2019). However, they align with Ghenimi et al. (2017), who state that the same movement and reciprocal relationship between variables is absent. Moreover, the insignificant relationship between the variables suggests that, within Islamic banks, risk management may not be comprehensive due to the lack of a strong association between the two (Ghenimi et al., 2017).

**Table 3. The Result of Lag Selection**

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|---|
| 0 | -1969.848 | NA | 5.017 | 18.640 | 18.735 | 18.678 |
| 1 | -279.708 | 3268.667 | 0.000 | 3.035 | 3.699* | 3.304 |
| 2 | -206.048 | 138.287 | 0.000 | 2.680 | 3.915 | 3.178* |
| 3 | -169.751 | 66.087 | 0.000* | 2.676* | 4.482 | 3.406 |
| 4 | -141.830 | 49.257 | 0.000 | 2.753 | 5.128 | 3.713 |
| 5 | -125.202 | 28.393 | 0.000 | 2.936 | 5.881 | 4.126 |
| 6 | -102.318 | 37.781 | 0.000 | 3.060 | 6.575 | 4.480 |
| 7 | -67.270 | 55.879 | 0.000 | 3.069 | 7.153 | 4.720 |
| 8 | -42.810 | 37.613 | 0.000 | 3.177 | 7.832 | 5.059 |
| 9 | -28.072 | 21.827 | 0.000 | 3.378 | 8.603 | 5.490 |
| 10 | -9.624 | 26.280 | 0.000 | 3.544 | 9.338 | 5.886 |
| 11 | 17.545 | 37.166 | 0.000 | 3.627 | 9.992 | 6.199 |
| 12 | 61.349 | 7.44102* | 0.000 | 3.553 | 10.488 | 6.356 |

Note: 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

Regarding the relationship between LIQ and NPF of Islamic banks and financial stability in the Indonesian banking sector, the relationship between the independent variables and the dependent variable in Models 1 to 3 is nonlinear and symmetrical (See Table 5). However, when the LIQ and NPF are included in Model 4, the relationship becomes nonlinear and asymmetrical. The findings show that changes in the additional increases and decreases of independent variables have an asymmetric impact on financial stability. Moreover, the cointegration result reflects that the independent variables have a long-run relationship to the dependent variable. In terms of how LIQ and NPF affect banking stability, in the short run, LIQ has no statistically significant relationship with financial stability, as shown in Model 1. The findings are different from Ghenimi et al. (2017), Alqahtani & Mayes (2018), and Hassan et al. (2019) who claim that the bank's liquidity is vital to maintain the banking system's stability.


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**Table 4. Granger Causality Result**

| Null Hypothesis: | Obs. | F-Statistic | Prob. |
|---|---|---|---|
| NPF does not Granger-cause LIQ | 221 | 0.565 | 0.638 |
| LIQ does not Granger-cause NPF | 221 | 1.315 | 0.270 |

Furthermore, NPF_NEG in Islamic banks has a negative and significant relationship to financial stability as indicated in Model 2. This shows that a decrease in NPF_NEG score, which is equal to 1%, increases the level of financial stability equal to 0.235 points. This indicates that in the short run, a lower score of an additional decrease in NPF increases the financial stability. A similar result also occurs in Model 4 when LIQ and NPF are included in the same model. The findings are supported by Čihák & Hesse (2010) who conclude that an increase in credit risk worsens the financial stability, and the opposite condition occurs when credit risk decreases. Referring to the findings, in the short run, this relationship shows that Islamic banks' credit risk management is pivotal to determining financial stability in the Indonesian banking sector. This result also aligns with the notion of the macroeconomics theory of banking, explained by Dia & VanHoose (2017), arguing that banks' financial conditions at the bank level determine the stability of the banking sector.

**Table 5. The Result of Short-run Relationship**

| Variable | Model 1 | Model 2 | Model 3 | Model 4 |
|---|---|---|---|---|
| D(ZSCORE(-1)) | 0.000 | 0.111 | 0.120* | 0.056 |
| | (0.609) | (1.613) | (1.740) | (0.836) |
| D(ZSCORE(-2)) | -0.062 | 0.020 | 0.026 | -0.039 |
| | (-0.944) | (0.295) | (0.382) | (-0.606) |
| D(LIQ_POS) | 0.522 | | | 0.690 |
| | (1.112) | | | (1.356) |
| D(LIQ_POS(-1)) | 0.757 | | | 0.340 |
| | (1.559) | | | (0.630) |
| D(LIQ_POS(-2)) | 0.010 | | | -0.028 |
| | (0.025) | | | (-0.067) |
| D(LIQ_NEG) | 0.334 | | | 0.160 |
| | (0.743) | | | (0.357) |
| D(LIQ_NEG(-1)) | 0.151 | | | -0.140 |
| | (0.278) | | | (-0.241) |
| D(LIQ_NEG(-2)) | 0.175 | | | -0.323 |
| | (0.325) | | | (-0.563) |
| D(NPF_POS) | | -0.045 | | -0.081 |
| | | (-0.563) | | (-1.003) |
| D(NPF_POS(-1)) | | -0.058 | | -0.060 |
| | | (-0.732) | | (-0.736) |
| D(NPF_POS(-2)) | | 0.053 | | 0.058 |
| | | (0.675) | | (0.731) |

| Variable | Model 1 | Model 2 | Model 3 | Model 4 |
|---|---|---|---|---|
| D(NPF_NEG) | | 0.016 | | 0.060 |
| | | (0.153) | | (0.525) |
| D(NPF_NEG(-1)) | | -0.235** | | -0.189* |
| | | (-2.225) | | (-1.655) |
| D(NPF_NEG(-2)) | | -0.117 | | -0.110 |
| | | (-1.107) | | (-0.992) |
| D(LIQ*NPF_POS) | | | -0.004 | |
| | | | (-0.509) | |
| D(LIQ*NPF_POS(-1)) | | | -0.006 | |
| | | | (-0.881) | |
| D(LIQ*NPF_POS(-2)) | | | 0.006 | |
| | | | (0.838) | |
| D(LIQ*NPF_NEG) | | | 0.003 | |
| | | | (0.292) | |
| D(LIQ*NPF_NEG(-1)) | | | -0.017 | |
| | | | (-1.621) | |
| D(LIQ*NPF_NEG(-2)) | | | -0.010 | |
| | | | (-0.975) | |
| D(SIZE) | -0.444 | -0.539 | -0.538 | -0.466 |
| | (-0.457) | (-0.598) | (-0.604) | (-0.473) |
| D(SIZE(-1)) | 1.188 | 0.615 | 0.759 | 0.840 |
| | (1.182) | (0.679) | (0.850) | (0.833) |
| D(SIZE(-2)) | 0.668 | 0.219 | 0.269 | 0.688 |
| | (0.671) | (0.240) | (0.298) | (0.690) |
| D(INT) | -0.119 | -0.339** | -0.366** | -0.215 |
| | (-0.645) | (-1.851) | (-1.993) | (-1.160) |
| D(INT(-1)) | -0.131 | -0.135 | -0.136 | -0.140 |
| | (-0.625) | (-0.647) | (-0.652) | (-0.666) |
| D(INT(-2)) | -0.047 | -0.049 | -0.010 | -0.113 |
| | (-0.248) | (-0.259) | (-0.052) | (-0.599) |
| D(PI) | -0.001 | -0.001 | -0.002 | 0.001 |
| | (-0.186) | (-0.222) | (-0.336) | (0.196) |
| D(PI(-1)) | 0.006 | 0.001 | 0.001 | 0.003 |
| | (1.036) | (0.273) | (0.136) | (0.613) |
| D(PI(-2)) | 0.010* | 0.007 | 0.006 | 0.008 |
| | (1.909) | (1.307) | (1.248) | (1.580) |
| CointEq(-1)* | -0.144*** | -0.226*** | -0.235*** | -0.193*** |
| | (-4.915) | (-5.100) | (-5.149) | (-5.458) |
| | | | | |
| R-squared | 0.173 | 0.176 | 0.170 | 0.217 |
| Bound Cointegration | 3.350** | 3.605* | 3.675** | 3.175* |
| Asymmetry Test | 0.514 | 0.453 | 0.251 | 2.687** |

Note: *, **, and *** explain the level of significance in 10%, 5%, and 1% respectively


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In the long run, Table 6 shows that LIQ and NPF generally affect financial stability in the Indonesian banking sector, unlike in the short run. The study's findings show that an additional increase in NPF (NPF_POS) is negatively related to financial stability. This result means that an additional increase in the NPF of Islamic banks worsens the financial stability in the Indonesian banking sector. The findings are supported by Čihák & Hesse (2010) and Ghenimi et al. (2017) , who generally state that credit risk and financial stability have a negative relationship. It also confirms that when the nonperforming financing increases in Islamic banks, the financial system becomes unstable.

Intuitively, the financial stability in the banking sector reflects financial stability at the bank level. Hence, achieving and maintaining financial stability in the banking sector must be aligned with that at the institutional level (Dia & VanHoose, 2017). The significant effect of NPF on financial stability in the banking sector also indicates that Islamic banking financing possesses a crucial role and significantly affects financial stability (Fakhrunnas et al., 2023). This is also supported by Chen (2022), who argues that interconnectedness among banks is present in the banking industry. Therefore, in the long run, an additional increase in Islamic banks' NPF may significantly lower financial stability in the banking sector.

**Table 6. The Result of Long-run Relationship**

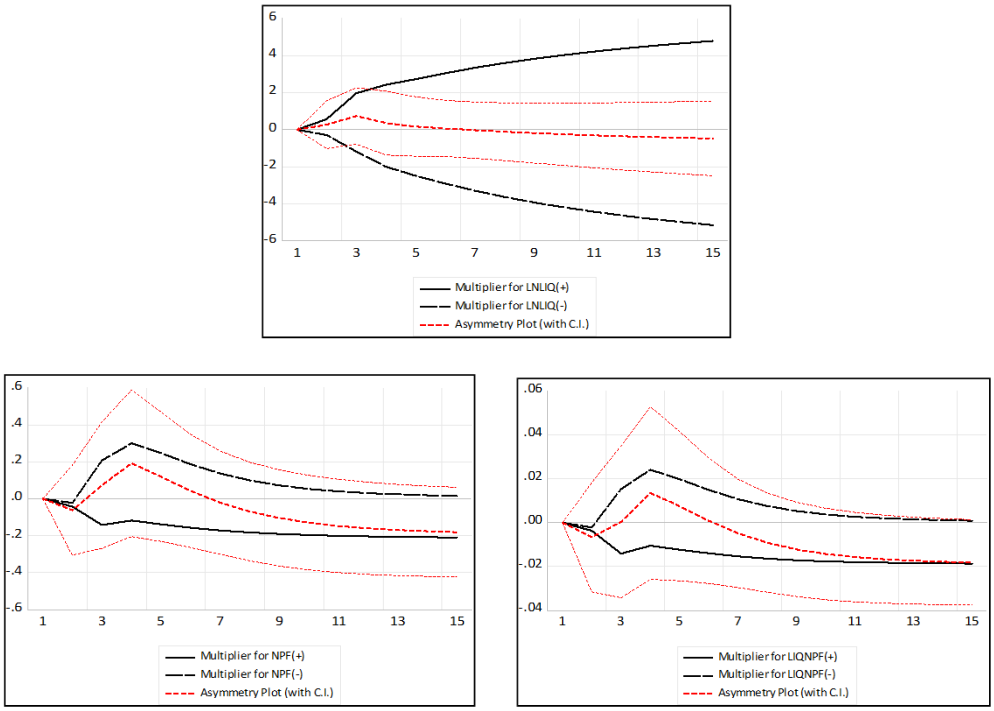
| Variable | Model 1 | Model 2 | Model 3 | Model 4 |
|---|---|---|---|---|
| LIQ_POS | 4.845 | | | 4.995** |
| | (1.472) | | | (1.980) |
| LIQ_NEG | 5.519 | | | 5.703* |
| | (1.394) | | | (1.815) |
| NPF_POS | | -0.212* | | -0.288* |
| | | (-1.701) | | (-1.838) |
| NPF_NEG | | -0.007 | | 0.135 |
| | | (-0.045) | | (0.575) |
| LIQ*NPF_POS | | | -0.018* | |
| | | | (-1.646) | |
| LIQ*NPF_NEG | | | 0.001 | |
| | | | (0.064) | |
| SIZE | -4.532 | 1.628 | 1.537* | -1.796 |
| | (-1.217) | (1.564) | (1.918) | (-0.639) |
| INT | 0.413 | 0.001 | -0.029 | 0.266 |
| | (1.233) | (0.001) | (-0.232) | (1.136) |
| PI | -0.053** | -0.011 | -0.077 | -0.007 |
| | (-2.133) | (-0.634) | (-0.427) | (-0.307) |
| C | 51.668 | -9.245 | -8.663 | 21.944 |
| | (1.436) | (-0.812) | (-0.935) | (0.793) |

Note: *, **, and *** explain the level of significance in 10%, 5%, and 1% respectively

Regarding liquidity, an additional increase in liquidity has a positive and significant effect on financial stability (See Model 4). Similarly, an additional decrease in liquidity also has the same influence direction. However, the significance level is higher for the first one than for the latter, at 5% and 10%, respectively. The finding is in line with Ghenimi et al. (2017) and Hassan et al. (2019), who stated that Islamic banks with sufficient liquidity tend to be less risky, positively strengthening financial stability. This circumstance occurs because the banks can fulfill their financial obligations. However, excess liquidity may lead to inefficiency in Islamic banks because they cannot proportionally allocate funds to the deficit unit.

As generally explained by Wagner (2007), Chen et al. (2021), and Ahmad et al. (2022), a lower liquidity level indicates the bank's willingness to engage in financing activities, provided it can still maintain the minimum liquidity required by regulation. Wagner's (2007) and Chen et al.'s (2021) findings also confirm that LIQ_NEG has a positive and significant relationship with financial stability in the banking sector. In a nutshell, the liquidity of Islamic banks has a significant impact on financial stability, indicating that Islamic banks can evidently contribute to achieving and maintaining financial stability.

**Figure 1. Bootstrapping Result**




Furthermore, for the interaction variable between liquidity and an additional increase in nonperforming financing (LIQ*NPF_POS), the long-run relationship indicates that it is negative and significant. The finding is supported by Ghenimi et al. (2017) who claim that liquidity and nonperforming financing at Islamic banks are key factors in determining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the banking sector's stability level. Both variables, liquidity and nonperforming financing of Islamic banks, statistically and concurrently have a significant impact on financial stability in the banking sector (Ghenimi et al., 2017). To explain how liquidity, nonperforming financing, and their interaction influence financial stability in the banking sector, Figure 1 shows the nonlinear effects of both independent variables during the observation period.

## CONCLUSION

After examining the relationship between credit risk and liquidity to financial stability in the Indonesian banking sector, the study finds two main results. Firstly, the study reveals that nonperforming financing does not have a reciprocal effect on the liquidity of Islamic banks. Secondly, an additional decrease in credit risk has a significant and negative relationship with financial stability in the short run, while other variables do not exhibit a significant relationship. In the long run, credit risk, liquidity, and their interaction significantly influence the banking sector's financial stability.

According to the findings, several policy implications emerge. At the bank level, Islamic banks should strengthen their liquidity monitoring tools, given their nonlinear impact on banking stability. The activities can be implemented by developing various liquidity management alternatives, with an emphasis on Shariah-compliant liquidity buffers. In addition, Islamic banks need a credit risk early warning system to ensure the dynamic movement of risks is appropriately managed. At the regulatory level, the Central Bank of Indonesia and other relevant financial authorities must innovate to introduce relevant liquidity management instruments with differentiated liquidity coverage ratios for Islamic banks. Incentivizing Islamic banks to diversify their funding sources is also encouraged, given their distinct asset-and-liability structures.

Despite revealing a non-linear relationship among credit risk, liquidity, and financial stability in the Indonesian banking sector, the study's limitations remain, particularly regarding data use. To pave the way forward, future studies should extend the data period to capture the nonlinear effects of credit risk and liquidity on financial stability in the banking sector. It may provide more information, especially after the post-pandemic period. In addition, comparing with other countries that adopt a dual banking system can provide more insight into the contribution of Islamic banks to financial stability across countries, emphasizing the nonlinear influence of credit risk and bank liquidity.

## REFERENCES

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*, s92-s107. https://doi.org/10.1016/j.bir.2022.09.008.

Alandejani, M., & Asutay, M. (2017). Nonperforming Loans in the GCC Banking Sectors: Does the Islamic Finance Matter? *Research in International Business and Finance*, *42*, 832–854. https://doi.org/10.1016/j.ribaf.2017.07.020.

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.

Beck, T., Demirgüç-Kunt, A., & Merrouche, O. (2013). Islamic vs Conventional Banking: Business Model, Efficiency and Stability. *Journal of Banking & Finance*, *37*(2), 433–447. https://doi.org/10.1016/j.jbankfin.2012.09.016.

Bilgin, M. H., Danisman, G. O., Demir, E., & Amine Tarazi. (2021). Economic Uncertainty and Bank Stability : Conventional vs Islamic Banking. *Journal of Financial Stability*, *56*(100911), 100911. https://doi.org/10.1016/j.jfs.2021.100911.

Borio, C. (2011). Rediscovering the Macroeconomic Roots of Financial Stability Policy: Journey, Challenges, and a Way Forward. *Annual Review of Financial Economics, 3,*87-117. https://doi.org/10.1146/annurev-financial-102710-144819.

Bryant, J. (1980). A Model of Reserves, Bank Runs, and Deposit Insurance. *Journal of Banking and Finance*, *4*(4), 335–344. https://doi.org/10.1016/0378-4266(80)90012-6.

Bussiere, M. (2012). Exchange Rate Pass-through to Trade Prices: The Role of Nonlinearities and Asymmetries. *Oxford Bulletin of Economics and Statistics*, *75*, 731–758. https://doi.org/10.1111/j.1468-0084.2012.00711.x.

Chen, W. Da, 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*, 101019. 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.

Creel, J., Hubert, P., & Labondance, F. (2015). Financial Stability and Economic Performance. *Economic Modelling*, *48*, 25–40. https://doi.org/10.1016/j.econmod.2014.10.025.

Crockett, A. (1996). The Theory and Practice of Financial Stability. *De Economist*, *144*, 531–568. https://doi.org/10.1007/BF01371939.

Dia, E., & VanHoose, D. (2017). Banking in Macroeconomic Theory and Policy. *Journal of Macroeconomics*, *54*, 149–160. https://doi.org/10.1016/j.jmacro.2017.07.009.

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. (1981). Distribution of the Estimators for Autoregressive Time Series with a Unit Root. *Journal of the American Statistical Association*, *74*(366), 427–431. https://doi.org/10.1080/01621459.1979.10482531.

Djebali, N., & Zaghdoudi, K. (2020). Threshold Effects of Liquidity Risk and Credit Risk on Bank Stability in the MENA Region. *Journal of Policy Modeling*, *42*(5), 1049–1063. https://doi.org/10.1016/j.jpolmod.2020.01.013.


https://journal.uinjkt.ac.id/index.php/etikonomi
DOI: https://doi.org/10.15408/etk.v25i1.44917

Fakhrunnas, F., Nahda, K., & Chowdhury, M. A. M. (2023). The Contribution of Islamic and Conventional Banks to Financial Stability in Indonesia. *Etikonomi*, *22*(1), 213–232. https://doi.org/10.15408/etk.v22i1.26656.

Fakhrunnas, F., Nugrohowati, R. N. I., Haron, R., & Anto, M. B. H. (2022). The Determinants of Nonperforming 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.

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.

Granger, C. J. W. (1969). Investigating Causal Relations by Econometric Models and Cross-spectral Methods. *Econometrica*, *37*(3), 424–438. https://doi.org/10.2307/1912791.

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.

ICD-Refinitiv Islamic Development Report. (2022). *Islamic Finance Development Indicator 2022*. Retrieved from https://icd-ps.org/uploads/files/ICD%20Refinitiv%20ifdi-report-20221669878247_1321.pdf.

IFSB. (2024). *Islamic Financial Services Industry Stability Report 2024*. Retrieved from https://www.ifsb.org/wp-content/uploads/2024/09/IFSB-Stability-Report-2024-8.pdf.

Korbi, F., & Bougatef, K. (2016). Regulatory Capital and Stability of Islamic and Conventional Banks. *International Journal of Islamic and Middle Eastern Finance and Management*, *10*(3), 312–330. https://doi.org/10.1108/IMEFM-06-2016-0079.

Masood, O., & Ashraf, M. (2012). Bank-specific and Macroeconomic Profitability Determinants of Islamic Banks: The Case of Different Countries. *Qualitative Research in Financial Markets*, *4*(2/3), 255–268. https://doi.org/10.1108/17554171211252565.

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

Mishkin, F. (1999). Lessons from the Asian Crisis. *Journal of International Money and Finance*, *18*(18), 709–723. https://doi.org/10.1080/14649880050008827.

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds Testing Approaches to the Analysis of Level Relationships. *Journal of Applied Econometrics*, *16*(3), 289–326. https://doi.org/10.1002/jae.616.

Phillips, P. C. . B. ., & Perron, P. (2017). Testing for a Unit Root in Time Series Regression. *Biometrika*, *75*(2), 335–346. https://doi.org/10.2307/2336182.

Rashid, A., Yousaf, S., & Khaleequzzaman, M. (2017). Does Islamic Banking really Strengthen Financial Stability? Empirical Evidence from Pakistan. *International Journal of Islamic and Middle Eastern Finance and Management*, *10*(2), 130–148. https://doi.org/10.1108/IMEFM-11-2015-0137.

Shin, Y., & Greenwood-nimmo, M. (2014). Modelling Asymmetric Cointegration and Dynamic Multipliers in a Nonlinear ARDL Framework. In R. Sickels and W. Horrace (Eds.), *Festschrift in Honor of Peter Schmidt: Econometric Methods and Applications*, 44. Berlin: Springer.

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

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.


https://journal.uinjkt.ac.id/index.php/etikonomi
DOI: https://doi.org/10.15408/etk.v25i1.44917