

DOES DIGITALIZATION MODERATE THE EFFECT OF INTERNAL FACTORS ON CONVENTIONAL BANK STABILITY? EVIDENCE FROM INDONESIA

Rifki Azis Syahrizal^{1*}, Entot Suhartono², Zaky Machmuddah³,
Arditya Dian Andika⁴
rifkiazis05@gmail.com*

Universitas Dian Nuswantoro, Indonesia^{1,2,3,4}

Accepted:	Reviewed:	Published:
June 14, 2026	June 15, 2026	August 30, 2026

Abstract

Examination of the moderating function is the objective of this investigation of banking digitalization in addition to examining the effects of the Cost-to-Income Ratio, Loan Loss Provision to Total Loans, Bank Size, and Liquidity Ratio on banking stability. Although previous research has extensively investigated the impact of digitalization on banking stability, empirical findings regarding its function as a moderator in the relationship between banks' internal determinants and banking stability are still scarce, particularly for the conventional commercial institutions in developing countries such as Indonesia. Whether the effects of banks' internal determinants on banking stability are strengthened or weakened by banking digitalization is the focus of this study. During the 2020–2025 period, this study analyzed panel data from 47 conventional commercial banks listed on the Indonesia Stock Exchange using a quantitative approach, resulting in 282 observations. The Z-Score is employed as a metric for banking stability, while the IT Cost Ratio is employed to assess digitalization. Using a Moderated Regression Analysis approach, the data are analyzed using panel data regression. According to the findings, the Cost-to-Income Ratio and Bank Size have a significant and adverse impact on banking stability, whereas the Liquidity Ratio and Loan Loss Provision to Total Loans have a positive and significant impact. The Liquidity Ratio's beneficial impact on banking stability is further bolstered by the digitalization of banking.

Keywords: Banking Stability, Income Ratio, Loan Loss Provision to Total Loans, Bank Size, and Liquidity Ratio

*Correspondence Author



By Authors

This work is licensed under a [Creative Commons Attribution-ShareAlike 4.0 International License](https://creativecommons.org/licenses/by-sa/4.0/).

1. Introduction

The banking sector assumes an essential role in Indonesia's financial system because it performs an intermediation function by collecting public funds and redistributing them into productive financing. In accordance with Law No. 10 of 1998, banks have an important function in improving public welfare through financial intermediation. Therefore, bank stability needs to be assessed using indicators that reflect resilience to insolvency risk, not merely profitability (Pratiwi et al., 2022; Sutandijo & Sugiyarti, 2022). The failure of one institution can trigger a ripple effect to other institutions due to close financial linkages. Therefore, strengthening the resilience of the banking industry remains an important agenda for regulators and industry players (Sitorus et al., 2022). This phenomenon is important because the stability of a bank is not only determined by asset growth, but also by the bank's ability to maintain efficiency, credit quality, capital, and liquidity.

Table 1. Indonesia's Banking Performance

Bank Type	Assets (Rp T)	Asset Growth	Deposit (Rp T)	Deposit Growth	Credit (Rp T)	Credit Growth
Conventional	12.849	8,93%	9.420	13,14%	8.068	8,76%
Sharia	797	19,95%	639	25,00%	518	25,28%

Source: OJK (2026)

Table 1 shows that conventional banks dominate Indonesia's banking industry, with assets of IDR 12,849 trillion, deposits of IDR 9,420 trillion, and credit of IDR 8,068 trillion. However, deposit growth in conventional banks reached 13.14%, while credit growth was only 8.76%. This condition indicates that fund collection grew faster than credit distribution, suggesting that liquidity has not been fully transformed into productive intermediation. Therefore, bank stability needs to be examined not only from the perspective of asset growth, but also through operational efficiency, credit risk, bank size, liquidity, and digital capability. The financial condition of conventional banks also shows pressure on efficiency and intermediation, as presented in Table 2.

Table 2. Conventional Bank Financial Ratio 2025

Financial Indicators	Des-24	Sep-25	Des-25	qtq (bps)	yoy (bps)
CAR (%)	26,75	26,23	25,91	-32	-84
LENGTH (%)	2,72	2,56	2,56	0	-16
NIM (%)	4,72	4,69	4,67	-2	-5
BOPO (%)	81,50	87,55	87,45	-10	+595
NPL Gross (%)	2,08	2,24	2,04	-20	-4

Financial Indicators	Des-24	Sep-25	Des-25	qtq (bps)	yoy (bps)
NPL Net (%)	0,74	0,87	0,79	-8	+5
LDR (%)	89,10	84,41	85,65	+124	-345
AL/DPK (%)	25,20	29,29	28,47	-82	+327

Source: OJK (2026)

Table 2 indicates that conventional banks still have strong capital, as reflected in CAR of 25.91%. However, the industry also faces efficiency pressure, shown by BOPO of 87.45%, and weakening intermediation, reflected in the annual decline of LDR by 345 bps. At the same time, AL/DPK remained relatively high at 28.47%, indicating that banks hold substantial liquidity. The Z-Score is employed as a proxy for banking stability in this study due to its ability to combine profitability, capital adequacy, and earnings volatility into a single measure of insolvency risk. A stronger financial resilience and a lower likelihood of insolvency are correlated with a higher Z-Score (Trung, 2025; Saeed et al., 2020). Meanwhile, banking digitalization is positioned as a moderating variable because It is anticipated that digital transformation will occur to change the strength of the relationship between internal bank factors and stability through process automation, real-time risk monitoring, and better decision-making quality (Milojević & Redzepagic, 2021; Khattak et al., 2023).

Various perspectives have been employed in previous research to investigate the determinants of banking stability. Liu et al. (2025) an examination of the correlation between banking risk and fintech development. while Khattak et al. (2023) show that digital transformation can influence diversification and bank stability. However, most prior studies focus on the direct effect of digitalization on banking stability or risk-taking. Particularly in emerging markets, there is inadequate evidence regarding whether digitalization serves to mitigate the correlation between internal bank factors and banking stability. This gap is important because digitalization may not automatically improve stability; its effect may depend on whether digital capability can reduce inefficiency, improve credit risk monitoring, manage the complexity of large banks, or strengthen liquidity management.

The use of the IT Cost Ratio measured as the share of ICT and IT related expenses in total operating expenses serves as a robust input side proxy for banking digitalization, reflecting a bank strategic resource commitment to core digital infrastructure, automation, cloud deployment, and cybersecurity rather than mere channel digitization (Grigorieva, 2025; Manukyan & Parsyan, 2024). Empirically, higher IT spending is strongly linked to enhanced profit efficiency,

reduced marginal costs, optimized data processing, and strengthened risk management functions across global banking (Ayadi et al., 2025; Shen et al., 2025).

This research is designed to investigate the manner in which banking digitalization modifies the relationship between the financial stability of conventional banks in Indonesia and internal bank factors in order to address the identified gap. The internal factors that are evaluated include the Liquidity Ratio, Bank Size, Loan Loss Provision to Total Loans, and Cost-to-Income Ratio. IT Cost Ratio is employed to assess the digitalization of banks, thereby determining the extent of technology-related expenditures in banking operations. Four research questions are investigated in this investigation: What is the impact of the Cost-to-Income Ratio on the financial stability of conventional commercial banks in Indonesia? Compared to the total amount of loans, bank size, and bank liquidity, what is the proportion of loan loss provisions? Does the stability of a bank depend on its ratios? Can the relationship between the internal factors of banks and their stability be moderated by the digitalization of banking? What internal factor does digitalization most effectively support in the improvement of banking stability?

Agency theory and signaling theory serve as the foundations of this investigation. Agency theory elucidates that the distinction between principals and agents creates information asymmetry and potential opportunistic behavior, which may appear in banking through cost inefficiency, excessive credit risk-taking, aggressive asset expansion, and suboptimal liquidity management (Maulana et al., 2025; Gan, 2024; Setyaningrum et al., 2022; Jensen & Meckling, 1976). Signaling theory complements agency theory by explaining how financial ratios and digital capability send signals to investors, depositors, and regulators regarding bank resilience, risk control, and institutional adaptability (Barakat, 2025; Connelly et al., 2025; Snjawati & Essa, 2021; Ross, 1977; Spence, 1973)

Cost to Income Ratio reflects operational management effectiveness. Operating expenses are indicative of a higher Cost-to-Income Ratio are large relative to operating income. From the agency perspective, high operating costs may reflect weak managerial discipline, inefficient resource allocation, or non-productive expansion. This condition increases agency costs, suppresses profitability, and weakens the bank's ability to absorb losses (Hani et al., 2025; Kismawati, 2025; Limon, 2025). Empirical studies also show that inefficient cost structures may reduce bank stability, especially under macroeconomic pressure

(Aniemeke, 2024; Budhathoki et al., 2024; Saddam et al., 2024). Consequently, the initial hypothesis is formulated as follows.

H1: Cost to Income Ratio has a negative effect on banking stability.

Loan Loss Provision to Total Loans reflects the proportion of credit loss reserves relative to total loans. Higher provisions may indicate increased credit risk and deterioration in asset quality. From the agency perspective, weak credit monitoring can encourage managers to take excessive lending risks, which increases the need for loan loss provisions and reduces stability (Lewano et al., 2025; Chuesta et al., 2024; Kim, 2022). Previous studies also show that loan loss provisions may increase during economic slowdown and reduce financial resilience when asset quality deteriorates (Lim et al., 2025).

H2: Loan Loss Provision to Total Loans has a negative effect on banking stability.

Bank Size reflects the scale and complexity of banking operations. Larger banks may benefit from diversification and broader access to funding, but they may also face higher information asymmetry, operational complexity, and moral hazard due to too-big-to-fail expectations (Akmal et al., 2025; Sutandijo & Sugiyarti, 2023). When managers believe that large and systemically important banks are more likely to receive support during financial distress, they may have weaker incentives to maintain prudent risk-taking behavior (Andersen & Jensen, 2022). Moreover, complex banking operations can make risk monitoring more difficult and allow hidden risks to accumulate (Chernobai et al., 2021). Therefore, larger bank size may reduce stability when agency problems and operational complexity dominate diversification benefits.

H3: Bank Size has a negative effect on banking stability.

Liquidity Ratio reflects the proportion of liquid assets to total assets. Adequate liquidity enables banks to fulfill immediate obligations, withstand sudden withdrawals, and reduce funding pressure. From the agency perspective, liquidity limits excessive managerial risk-taking in illiquid assets and aligns managerial decisions with long-term stability (Chen et al., 2025; Javid et al., 2023). From the signaling perspective, strong liquidity sends a credible signal regarding the bank's ability to meet obligations and maintain public confidence (Nguyen et al., 2024; Ahmad et al., 2022). Therefore, liquidity is expected to strengthen banking stability, although excessive liquidity may

reduce profitability due to opportunity costs (Samarasinghe, 2023; Sidhu et al., 2022).

H4: Liquidity Ratio has a positive effect on banking stability.

Banking digitalization is positioned as a moderating variable because it can strengthen or weaken the relationship between internal bank factors and banking stability. Through process automation, performance dashboards, real-time information access, artificial intelligence, and digital risk monitoring, digitalization functions as a governance mechanism that reduces monitoring costs, information asymmetry, managerial opportunism, and moral hazard, which are central concerns in agency theory (Begimkulov, 2025; Jia & Liu, 2024). From the perspective of signaling theory, successful digital transformation also sends a positive signal to the market regarding banks' adaptability, transparency, operational responsiveness, and resilience to financial and operational risks (Mustafa, 2024). Therefore, digitalization is expected to weaken the negative effect of Cost to Income Ratio on banking stability by improving operational efficiency and cost control, weaken the negative effect of Loan Loss Provision to Total Loans by strengthening credit screening, early warning systems, and risk monitoring, and weaken the negative effect of Bank Size by improving internal control and reducing complexity-related agency problems in large banks (Meero, 2025; Wen & Liang, 2025). In addition, digitalization is expected to strengthen the positive effect of Liquidity Ratio on banking stability by improving real-time cash flow monitoring, asset allocation accuracy, liquidity creation, and funding stress management, especially in emerging markets (Adebayo et al., 2025; Huynh, 2025; Khattak et al., 2023).

H5: Banking digitalization weakens the negative effect of Cost to Income Ratio on banking stability.

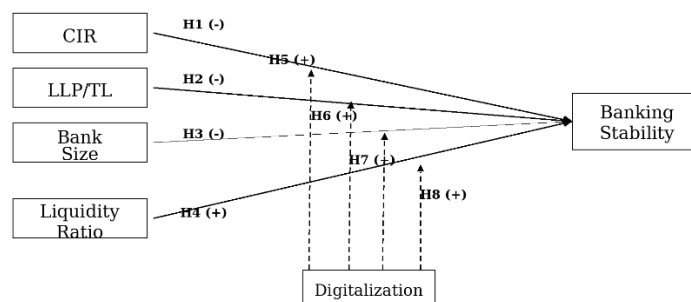
H6: Banking digitalization weakens the negative effect of Loan Loss Provision to Total Loans on banking stability.

H7: Banking digitalization weakens the negative effect of Bank Size on banking stability.

H8: Banking digitalization strengthens the positive effect of Liquidity Ratio on banking stability.

The direct effects internal bank factors on banking stability and the moderating role of banking digitalization are illustrated this study's conceptual paradigm by Figure 1., which is based on the proposed hypotheses.

Figure 1. Conceptual Framework



Source: Data Processed, 2026

2. Research Method

The quantitative methodology employed in this study relies on secondary panel datasets covering the 2020–2025 period, obtained from conventional commercial banks listed on the Indonesia Stock Exchange which were included in the research subject. The Indonesia Stock Exchange's official websites were consulted to acquire the data and each respective bank, as well as from annual and sustainability reports. Specifically, the research sample was selected through purposive sampling based on the following selection criteria: conventional commercial banks which were listed during the observation period, were not delisted throughout the study period, consistently issued annual reports and audited financial statements, as well as possessed complete data for all research variables.

The data analysis method implements the Moderated Regression Analysis (MRA) approach, which involves panel data regression. In order to implement the estimation procedure, three modeling methodologies are implemented: the Common Effect Model (CEM), the Fixed Effect Model (FEM), and the Random Effect Model (REM). The optimal model selection is performed in phases using the Chow Test, Hausman Test, and Lagrange Multiplier Test. The data characteristics were delineated through descriptive statistics in this study before hypothesis testing. EViews software is employed to perform all data processing.

Table 3. Variable Operationalization Summary

Variabel	Proxies	Brief Definition	Measurement	Scale
Banking Stability (Farooq et al., 2026)	Z-Score	Distance of the bank from the insolvency situation	(ROA + Equity/Total Assets) / σ (ROA)	Ratio
Cost to Income Ratio (Petrović et al., 2025)	CIR	Comparison of operating costs and revenues	Operating expenses / operating income	Ratio
Risk Credit (Salazar et al., 2023; Silva, 2021)	LLP/TL	Credit loss reserves relative to total credit	Loan loss provisions / total loans	Ratio
Bank Size (Maudy et al., 2024)	Size	The scale of a bank as reflected by its total assets	LN(total assets)	Ratio
Liquidity (Al-Homaidi et al., 2020; Dahiyat et al., 2021)	LATA	Proportion of liquid assets to total assets	Liquid assets / total assets	Ratio
Digitalization (Hoque et al., 2024;)	ITCR	Technology adoption and investment maturity index	IT Repair & Maintenance Load/Total Operational Load	Ratio

Source: Researcher-Processed Data (2026)

3. Result and Discussion

Secondary panel data from traditional commercial banks listed on the Indonesia Stock Exchange for the 2020–2025 period is employed in this research, which employs a quantitative methodology. Out of a population of 48 banks, 47 banks satisfied the purposive sampling criteria, yielding 282 observations. Descriptive statistics summarize data characteristics, including median, mean, maximum, minimum, and statistical standard deviation. The analyzed variables encompass banking stability represented by Z-Score, independent variables comprising CIR, LLP/TL, Size, and LATA, and banking digitalization indicated by ITCR.

Table 4. Statistics Descriptive

Variabel	N	Mean	Median	Maximum	Minimum	Std. Dev.
Z-Score	282	2,563404	2,645205	16,83390	-3,618135	2,648878
CIR	282	5,041816	1,701982	80,93538	-8,246520	10,53297
LLP/TL	282	0,023248	0,007181	0,329045	-0,031707	0,050785
SIZE	282	38,19156	37,80484	42,48679	29,54256	2,093011
LATA	282	0,008583	0,000286	0,445795	0,000000764	0,056574
DIGI	282	0,509743	0,488282	1,524648	0,005065	0,191273

Source: Researcher-Processed Data (2026)

The study includes 282 observations, as shown in Table 4. Disparities in operational efficiency, credit risk, liquidity, digitalization, and banking stability

are highlighted by the descriptive results. The standard deviation of 2.64878 is indicative of fluctuations in bank stability, as indicated by the average Z-Score of 2.563404. Significant variability is demonstrated by the CIR and LATA, suggesting that there are discrepancies in liquidity and operational efficiency among banks. LLP/TL fluctuates among banks, suggesting varying levels of credit risk, whereas SIZE is relatively consistent, with an average value of 38.19156 and a standard deviation of 2.093011. The ITCR has recorded an average value of 0.50974 and a standard deviation of 0.191273, which is indicative of moderate variations in banking digitalization. The Common Effect Model, Fixed Effect Model, and Random Effect Model were compared using the Chow Test and Hausman Test to ascertain the most suitable panel data estimation technique. This was undertaken to ascertain the most appropriate model for the panel data.

On the basis of the Chow Test, the most suitable model is chosen from the Common Effect Model and the Fixed Effect Model. Decisions are contingent upon the probability value of the Cross-section F. If the probability is less than 0.05, the Fixed Effect Model is recommended, while a probability greater than 0.05 indicates that the Common Effect Model is more appropriate. Table 5 illustrates the outcomes of the Chow Test.

Table 5. Chow Test Results

Test Method	Statistics	D.F.	Probability
Cross-section F	18,148478	(46,230)	0,0000
Cross-section Chi-square	432,162498	46	0,0000

Source: Researcher-Processed Data (2026)

The probable value of Cross-section F is 0.0000, as shown in Table 5. The Fixed Effect Model is determined to be more suitable than the Common Effect Model due to the fact that the value is less than the significance level of 0.05 ($0.0000 < 0.05$). As a result, the Hausman Test was implemented to ascertain the appropriateness of employing either the Fixed Effect Model or the Random Effect Model in this investigation.

In order to determine the preferable model between the Fixed Effect Model and the Random Effect Model, the Hausman test is implemented. The requirement of the cross-sectional random probability is the foundation of the decision-making criteria. When the probability value is less than 0.05, the Fixed Effect Model is the more suitable alternative. In cases where the probability value

exceeds 0.05, the Random Effect Model is the more suitable alternative. The Hausman Test results are illustrated in Table 6.

Table 6. Hausman Test Results

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Probability
Cross-section random	36,368050	5	0,0000

Source: Researcher-Processed Data (2026)

According to Table 6, the probability is 0.0000, that was less than 0.05. As a result, the Fixed Effect Model is regarded as the most appropriate model. This finding eliminates the need for the Lagrange Multiplier test, which is compatible with the results of the Chow Test. The ensuing hypothesis testing is conducted using the Fixed Effect Model, which comprises the F-test, coefficient of determination, and t-test.

In addition, the Centered VIF value is employed to conduct the multicollinearity assessment, which is intended to verify the absence of significant correlation among independent variables. A model is considered multicollinearity is avoided if the Centered VIF value is less than 10., as demonstrated in Table 7.

Table 7. Multicollinearity Test Results

Variable	Coefficient Variance	Centered VIF
CIR	0,003752	1,052886
LLP/TL	0,003762	1,056090
SIZE	0,004029	1,131231
LATA	0,003994	1,121286
DIGI	0,003883	1,087922

Source: Researcher-Processed Data (2026)

All Centered VIF values, which range from 1.052886 to 1.131231, are below 10, according to Table 7. This signifies that the regression model is devoid of multicollinearity, indicating that the independent variables lack significant linear correlation, thereby allowing for reliable estimation of the coefficients.

The heteroscedasticity test is performed utilizing the Glejser method by regressing the absolute residuals against CIR, LLP/TL, SIZE, LATA, and ITCR. The model is deemed free from heteroscedasticity if each variable possesses a p-value exceeding 0.05. According to Table 8, all independent variables exhibit probability values exceeding 0.05, signifying that none have a significant impact

on the absolute residual value. Consequently, the regression model is devoid of heteroscedasticity and satisfies the homoscedasticity assumption, rendering it appropriate for hypothesis testing.

Table 8. Results of the Glejser

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0,784384	0,035926	21,83321	0,0000
CIR	-0,013137	0,036957	-0,355458	0,7225
LLP/TL	0,015948	0,037006	0,430962	0,6668
SIZE	0,071166	0,038299	1,858146	0,0642
LATA	-0,002995	0,038130	-0,078558	0,9374
DIGI	0,053559	0,037597	1,424553	0,1554

Source: Researcher-Processed Data (2026)

In addition, autocorrelation testing is implemented to ascertain whether residuals from the current period are correlated with residuals from the previous period. The Durbin-Watson statistic is employed to conduct the initial autocorrelation test. The Durbin-Watson value is 1.452397, which is between dL and dU, or $1.30731 < 1.452397 < 1.77361$ on the basis of Table 9. This suggests that the Durbin-Watson test result is inconclusive, and it is unable to ascertain whether autocorrelation is present in the regression model.

Table 9. Durbin-Watson Autocorrelation Test Results

Testing Criteria	Value
Durbin-Watson stat (d)	1,452397
dL	1,30731
dU	1,77361
4 - dU	2,22639
4 - dL	2,69269

Source: Researcher-Processed Data (2026)

A subsequent use Breusch-Godfrey Serial Correlation LM Test is employed to administer the test, with a maximum of two lags, as shown in Table 10. The Breusch-Godfrey test indicates that the F-statistic probability value is 0.1892 and the Obs*R-squared probability value is 0.1821, both of which exceed the 0.05 threshold. The regression model is devoid of autocorrelation for up to two lags, as evidenced by the results. Therefore, the Breusch-Godfrey test confirms the model's appropriateness for further investigation, despite the inconclusiveness of the Durbin-Watson test.

Table 10. Breusch-Godfrey Autocorrelation Test Results

Testing Criteria	Statistical Value	Probability
F-statistic	1,675039	0,1892
Obs*R-squared	3,406244	0,1821

Source: Researcher-Processed Data (2026)

Additionally, the normality test is performed utilizing the Jarque-Bera method in EViews to ascertain if the residuals follow a normal distribution. According to Table 11, the Jarque-Bera statistic is 0.065586, with a corresponding probability of 0.967739, exceeding 0.05. This signifies that the residuals follow a normal distribution. Consequently, the normality assumption is satisfied, rendering the model viable for additional testing.

Table 11. Normality Test Results

Testing Criteria	Statistical Value
Jarque-Bera	0,065586
Probability	0,967739
Observations	282

Source: Researcher-Processed Data (2026)

The direct effect test is conducted utilizing the Fixed Effect Model to assess the impact of CIR, LLP/TL, SIZE, and LATA on banking stability, as indicated by the Z-Score. The simultaneously significance test assesses whether these independent variables collectively influence banking stability.

Table 12. Results of Direct Influence Model F

Model	F-statistic	Prob(F-statistic)	Conclusion
Direct Effect Model	22,84184	0,000000	Significant
Moderation Model	22,29627	0,000000	Significant

Source: Researcher-Processed Data (2026)

As indicated by Table 12, both the direct effect model and the moderation model exhibit Prob(F-statistic) values of 0.000000, which are below 0.05. This signifies that the independent variables in the direct effect model and those in the moderation model concurrently exert a significant influence on banking stability. Consequently, both models are viable for additional analysis.

Table 13. Results of the Direct Influence Model Determination Coefficient

Model	R-squared	Adjusted R-squared	S.E. of Regression
Direct Effect Model	0,831767	0,795352	1,198299
Moderation Model	0,844384	0,806513	1,165166

Source: Researcher-Processed Data (2026)

The direct effect model has an R-squared value of 0.831767, as indicated in Table 13. This indicates that the Cost to Income Ratio, Loan Loss Provision to Total Loans, Bank Size, and Liquidity Ratio account for 83.18% of the variation in banking stability. The explanatory power of the moderation model is increased to 84.45% by the inclusion of banking digitalization and interaction variables, as evidenced by its higher R-squared value of 0.844384. The Adjusted R-squared value also increases from 0,795352 to 0,806513, showing that the moderation model provides a slightly better explanation of banking stability.

Table 14. Results of the Direct Influence Model t Test

Variabel	Coeficin	Std. Error	t-Statistic	Prob.	Remarks
Constanta	16,08025	5,510862	2,917919	0,0039	Signifikan
CIR	-0,023682	0,009310	-2,543680	0,0116	Significant Negative
LLP/TL	8,977855	2,738192	3,278753	0,0012	Positive Signifikan
SIZE	-0,361115	0,143526	-2,516022	0,0125	Significant Negative
LATA	21,59801	3,145122	6,867145	0,0000	Positive Signifikan

Source: Researcher-Processed Data (2026)

The Cost to Income Ratio has a negative and significant impact on banking stability, according to Table 14's direct effect test, suggesting that increased operational inefficiency lowers bank stability. The Loan Loss Provision to Total Loans ratio exhibits a positive and significant impact, indicating that increased credit loss provisions may signify banks' proactive measures in mitigating credit risk, despite this outcome contrasting with the theoretical assumption that credit risk undermines stability. The size of a bank exerts a negative and significant influence, suggesting that larger banks do not necessarily exhibit greater stability, particularly when asset growth is not accompanied by efficiency and risk management. Simultaneously, the ratio of Liquid Assets to Total Assets exerts a positive and significant influence, indicating that increased liquidity enhances banks' capacity to endure funding pressures and sustain financial resilience. Additionally, moderation analysis is performed through Moderated Regression Analysis to investigate whether banking digitalization, represented by the Information Technology Cost Ratio, moderates the relationship between internal bank factors and banking stability.

The t-test on the moderation model focused on interaction variables to see whether banking digitalization was able to strengthen or weaken the influence of independent variables on banking stability. The results of the interaction variable test are presented in Table 15. below.

Table 15. Results Of The t-Test Of The Interaction Variables Of The Moderation Model

Interaction	Coeficin	t-Statistic	Prob.	Remarks
CIR×ITCR	0,008237	0,153491	0,8781	Insignificant
LLP/TL×ITCR	-12,77602	-1,086258	0,2785	Insignificant
SIZE×ITCR	0,018787	0,040156	0,9680	Insignificant
LATA×ITCR	96,22272	3,465815	0,0006	Positive Significance

Source: Researcher-Processed Data (2026)

The moderation table 15., contains the results of the test for indicate that the effect of Cost to Income Ratio on banking stability is not moderated by banking digitalization, as indicated by the Information Technology Cost Ratio. A value of 0.8781 for the interaction probability, which is greater than 0.05, is evidence that this is the case. The interaction probability value of 0.2785 also indicates that banking digitalization does not moderate the effect of Loan Loss Provision to Total Loans on banking stability. In addition, banking digitalization does not moderate the effect of Bank Size on banking stability, as indicated by the interaction probability value of 0.9680. These results indicate that Information Technology Cost Ratio does not significantly change the relationship between operational inefficiency, credit risk, bank size, and banking stability. However, the interaction between Liquid Assets to Total Assets and Information Technology Cost Ratio has a positive and significant effect on banking stability, as shown by a coefficient value of 96.22272 and a probability value of 0.0006, which is lower than 0.05. Therefore, banking digitalization strengthens the positive effect of liquidity on banking stability. This finding indicates that digitalization can improve liquidity management through better cash flow monitoring, more effective liquid asset management, and faster responses to funding pressure.

Cost to Income Ratio has a negative effect on banking stability

The findings demonstrate that the Cost-to-Income Ratio has a substantial and adverse impact on banking stability, with a coefficient of -0.023682 and a probability value of 0.0116. Thus, H1 is accepted. This finding indicates that higher operational inefficiency reduces bank stability. From the agency theory

perspective, high Cost to Income Ratio reflects weak managerial control, inefficient resource allocation, and potential non-productive expansion, which increase agency costs and weaken the bank's ability to generate income and absorb losses (Kismawadi, 2025; Limon, 2025).

The increase in agency costs directly reduces profitability and weakens banking stability, as reflected in a lower Z-Score. Higher Cost to Income Ratio indicates greater operational inefficiency, meaning that a larger portion of operating income is absorbed by operating costs. This condition reduces the bank's ability to generate profit, absorb risk, and maintain financial resilience (Hani et al., 2025). This empirical evidence is in line with conditions in various regions, including Asia and Nigeria, which suggest that inefficient cost structures will limit loss *absorption capacity*, especially in the face of macroeconomic stresses (Aniemeke, 2024; Budhathoki et al., 2024; Saddam et al., 2024). Although there are anomalies in certain contexts such as in Turkey, this research predominantly proves that cost efficiency is a crucial determinant for the long-term stability of banking (Gungor, 2023).

Loan Loss Provision to Total Loans Has a Positive Effect on Banking Stability

The empirical analysis shows that the loan loss provisions to total loans ratio has a positive and significant effect on banking stability, as indicated by a coefficient of 8.977855 and a probability value of 0.0012, which is below the 5% significance level. Therefore, H2 is rejected because the observed positive relationship contradicts the initially hypothesized negative effect under the agency theory perspective. From the traditional agency perspective, higher provisioning is often interpreted as a discretionary managerial tool used for income smoothing or capital signaling, which may increase informational opacity and obscure the actual deterioration of credit asset quality. However, the positive effect found in this study is more consistent with the prudential buffer view, which argues that adequate loan loss provisions can strengthen banking soundness by providing a loss-absorption cushion against unexpected credit shocks and preserving capital resilience during macroeconomic downturns (Ahmed et al., 2026). This finding is in line with previous studies showing that timely and forward-looking provisioning can improve risk discipline, support long-term financial resilience, and strengthen banks' capacity to absorb potential credit losses (Ng et al., 2020; Jia & Liu, 2024; Mala, 2024). This interpretation is also relevant to the Indonesian banking context, where regulatory enforcement and forward-looking credit risk assessment encourage banks to recognize

expected credit losses earlier and smooth the impact of asset deterioration over the business cycle (Fatouh & Giansante, 2023; Mala, 2024). In contrast, this result differs from studies that interpret higher loan loss provisions as a signal of worsening asset quality, declining profitability, or managerial discretion in income smoothing, which may weaken transparency and market discipline (Gurung et al., 2023; Danisman et al., 2021). Thus, the positive effect of LLP/TL in this study suggests that, in Indonesian conventional banks, higher provisioning is more likely to represent anticipatory risk management and reserve strengthening rather than merely a symptom of credit deterioration.

Bank Size Has a Negative Effect on Banking Stability

The results of the examination suggest that the bank's scale has a substantial and detrimental impact on the stability of the banking system. This is corroborated by a coefficient value of -0.361115 and a probability value of 0.0125, which is less than 0.05. Consequently, H3 is accepted, as the negative coefficient is in accordance with the proposed hypothesis. This discovery suggests that stability is not always associated with larger banks. Although large banks may theoretically take advantage of economies of scale, broader funding access, and diversification, their size can also exacerbate agency problems, operational complexity, and risk-taking incentives. From the standpoint of Agency Theory, larger banks exhibit more intricate organizational structures, broader business networks, and a greater information asymmetry between managers as agents and shareholders, depositors, or regulators as principals.

This condition makes monitoring more difficult and may allow managerial opportunism to occur, such as managerial empire building behaviors where executives prioritize aggressive asset expansion over operational efficiency (Alzoubi et al., 2022). Empirically, this destabilizing effect of bank size aligns with previous studies in emerging markets which demonstrate that larger bank size significantly erodes financial stability when measured by distance to default metrics such as the Z-score (Chai et al., 2022). Furthermore, the operational fragility of these larger institutions is often exacerbated by the too big to fail moral hazard, where implicit government bailout guarantees distort risk-taking incentives and encourage management to pursue high-risk portfolios (Freixas & Rochet, 2013; Zardkoohi et al., 2018), leaving them highly vulnerable during periods of systemic or geopolitical stress (Phan et al., 2021; Danisman & Tarazi, 2023).

Liquidity Ratio Has a Positive Effect on Banking Stability

The empirical analysis reveals that the liquidity ratio, proxied by liquid assets to total assets, has a positive and significant effect on banking stability, as demonstrated by a coefficient value of 21.59801 and a probability value of $0.0000 < 0.05$, thereby providing strong empirical support to accept H4. This finding indicates that a higher in liquid assets to total assets ratio reflects a robust liquidity buffer that directly elevates banking resilience by enabling institutions to meet short-term obligations, absorb sudden withdrawal shocks, and mitigate both maturity mismatches and systemic cash-flow disruptions. This outcome is consistent with global banking regulatory frameworks, including the ratio of net stable funding and the Liquidity Coverage Ratio, which necessitate that banks maintain a sufficient amount of high-quality liquid assets to preserve institutional integrity during periods of market duress (Akbar & Laksana, 2025). From an Agency Theory perspective, maintaining adequate liquidity serves as an external discipline and internal control mechanism to constrain opportunistic managerial behaviors. In the absence of strict liquidity thresholds, executives acting as agents are often incentivized to overallocate resources into illiquid, high-yield risky investments to maximize short-term performance bonuses, thereby transferring structural insolvency risks onto shareholders, depositors, and the public safety net. Consequently, while holding liquid reserves carries an inherent opportunity cost by limiting immediate profitability, forcing managers to maintain defensive asset pools effectively suppresses moral hazard, enforces structural prudence, preserves depositor confidence, and secures long-term financial stability over the economic cycle (Berger et al., 2020; Safi et al., 2021; Gharaibeh, 2023).

Banking digitalization does not moderate of Cost to Income Ratio on banking stability.

The coefficient value of 0.008237, a t-statistic of 0.153491, and a probability value of 0.8781 are the results of the empirical analysis of the interaction between the cost-to-income ratio and banking digitalization. The interaction effect is statistically insignificant, and H5 is rejected, as the probability value exceeds the 5% significance threshold ($0.8781 > 0.05$). This suggests that banking digitalization fails to exhibit a substantial attenuate the impact of operational inefficiency on financial stability. From an Agency Theory perspective, digital transformation was hypothesized to mitigate the adverse effects of high operational costs by enhancing monitoring quality, expanding transparency, and

reducing the information asymmetry that enables managerial overspending (Begimkulov, 2025). Automated workflows and real-time internal control mechanisms were expected to curb bureaucratic slack and optimize expenditure tracking (Khattak et al., 2023; Meero, 2025). However, the statistical insignificance demonstrates that within the observed sample, the level of technological adoption has not yet achieved the structural maturity necessary to counteract or offset baseline cost inefficiencies (Karunaratne et al., 2025). This neutral interaction is economically plausible because early-stage digital implementation frequently demands substantial upfront capital expenditures, system maintenance fees, advanced cybersecurity protocols, and intensive employee retraining, which collectively inflate operating expenses in the short run (Akbar et al., 2025; Faiz et al., 2024).

Banking digitalization does not moderate of Loan Loss Provision to Total Loans on banking stability.

The empirical analysis indicates that the interaction between the loan loss provisions to total loans ratio and banking digitalization results in a coefficient value of -12.77602, a t-statistic of -1.086258, and a probability value of 0.2785. The effect of the interaction is statistically insignificant, as the probability value exceeds the 5% significance threshold ($0.2785 > 0.05$). Consequently, H6 is rejected, indicating that banking digitalization does not significantly moderate the impact of LLP/TL on financial stability. From an Agency Theory perspective, digitalization was anticipated to enhance credit risk governance by reducing information asymmetry and limiting managerial discretion in provisioning decisions through big data analytics, automated credit scoring, and real-time monitoring systems (Hu et al., 2025). However, the statistical insignificance in this model suggests that the implementation of digital technology within the observed sample has not reached the structural maturity required to alter the institutional relationship between loss reserves and stability. This independent effect implies that the efficacy of loan loss provisions as a prudential loss-absorption buffer remains driven by baseline regulatory mandates and traditional risk screening, rather than being amplified or reshaped by digital infrastructure. Furthermore, this outcome indicates that the potential of digital transformation to mitigate credit-related agency friction is likely constrained by uneven technology integration, data quality limitations, and a lag in human resource adaptation across the sampled institutions (Sparta & Trinova, 2020).

Banking digitalization does not moderate the effect of Bank Size on banking stability.

The empirical analysis reveals that the interaction between Bank Size and banking digitalization yields a coefficient value of 0.018787, a t-statistic of 0.040156, and a probability value of 0.9680. Because the probability value exceeds the 5% significance threshold ($0.9680 > 0.05$), the interaction effect is statistically insignificant, and H7 is rejected. From an Agency Theory perspective, digitalization was hypothesized to weaken the negative impact of bank size on stability by enhancing monitoring capacity, expanding transparency, and reducing the information asymmetry inherent in large, complex banking hierarchies (Ali & Puah, 2018; Hu et al., 2025). Advanced data analytics and automated reporting were expected to constrain managerial opportunism, such as empire-building behaviors, and mitigate moral hazard tied to too big to fail perceptions (Jia & Liu, 2024). However, the statistical insignificance in this study demonstrates that implementation of digital technologies within the observed sample has not yet achieved the structural threshold required to alter the core relationship between organizational size and financial stability. This independent effect suggests that the deep-seated agency frictions, bureaucratic complexity, and risk-taking incentives typical of larger institutions remain resilient against digital internal control mechanisms, echoing the limited empirical consensus regarding the specific moderating channel of digitalization on size-driven risk frameworks (Trang et al., 2022; Podder & Ghosh, 2025).

Banking digitalization strengthens the positive effect of Liquidity Ratio on banking stability.

The empirical analysis indicates that the t-statistic of 3.465815, a coefficient value of 96.22272, and a probability value of 0.0006 all indicate that there is an interaction between the liquidity ratio and banking digitalization has a positive and significant impact on banking stability. H8 is accepted due to the fact that the probability value is significantly lower than the 5% significance threshold ($0.0006 < 0.05$), which confirms that the positive impact of liquidity on financial stability is significantly enhanced by banking digitalization. From an Agency Theory perspective, this significant interaction provides a robust mechanism to mitigate agency conflicts inherent in liquidity management, where principals demand defensive liquid buffers while opportunistic managers tend to favor riskier, high-yield investments to boost short-term performance metrics. Digitalization resolves this deep-seated information asymmetry by instituting

real-time cash-flow transparency, automated reporting, and dynamic liquidity risk management systems, thereby constraining managerial moral hazard and enforcing disciplined asset allocation (Hao & Peng, 2023; Hou & Yang, 2024). Consequently, liquid assets in digitally mature banking environments transition from passive regulatory reserves into actively optimized, strategic resources that elevate operational efficiency and structural responsiveness against funding pressures (Huynh, 2025; Wen & Liang, 2025). This synergy explains why the integration of advanced digital infrastructure with robust liquidity positions yields an amplified, combined stabilizing effect on the Z-score framework (Hu et al., 2025; Mustafa, 2024).

4. Conclusion

The findings of this investigation indicate that the stability of conventional commercial banks listed on the Indonesia Stock Exchange during the 2020–2025 period is jointly driven by internal efficiency, asset size, and liquidity management, revealing that higher cost to income ratios and larger bank sizes significantly weaken stability due to agency problems, whereas liquidity and loan loss provisions operate as crucial resilience enhancing buffers. While banking digitalization fails to moderate the impacts of operational inefficiency, credit risk, or bank size, it significantly strengthens the positive effect of liquidity on stability, indicating that digital capabilities are highly specialized toward optimizing dynamic cash flow management rather than acting as a universal remedy for structural frictions. Despite these insights, the study is limited by its single financial proxy for digitalization, the IT Cost Ratio. A significant limitation of this specific proxy is that it functions strictly as a measure of resource commitment and resource allocation, failing to capture the actual quality or realized utilization of digital transformation. Financial metrics alone can misrepresent the real state of technological advancement without qualitative context, meaning that a higher expenditure ratio does not automatically guarantee effective adoption or superior operational execution. Furthermore, because banking still lacks a globally standardized digital efficiency index, relying solely on spending data overlooks whether these investments are being deployed efficiently or if they are translating into meaningful organizational capabilities. Consequently, because of these constraints and the exclusive focus on conventional listed banks within a post pandemic observation window, future research should incorporate broader digital metrics, implement comparative

analyses between conventional and Islamic banking architectures, examine non linear threshold effects, and integrate various macroeconomic variables, including inflation and interest rates as additional moderators.

5. Reference

- Adebayo, O., Mensah, N., & Tobias Kwame Adukpo. (2025). Navigating Liquidity Management Challenges In The Era Of Digital Banking In The United States. *World Journal Of Advanced Research And Reviews*, 25(2), 2711–2719. <https://doi.org/10.30574/Wjarr.2025.25.2.0576>
- Ahmad, S., Wan, W. M. A., & 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>
- Akbary, N. M. M., Trinugroho, I., Risfandy, T., & Pamungkas, P. (2025). Digital Transformation And Efficiency: Evidence From Indonesian Banks. *International Journal Of Business And Society*, 26(1), 135–150. <https://doi.org/10.33736/Ijbs.9555.2025>
- Akmal, M. R., Pribadi, M. I., & Anshari, R. (2025). Pengaruh Ukuran Perusahaan Dan Risiko Kredit Terhadap Stabilitas Keuangan Bank Di Indonesia Periode 2019-2023. *Gemilang: Jurnal Manajemen Dan Akuntansi*, 5(2), 766–782. <https://doi.org/10.56910/Gemilang.V5i2.2570>
- Andersen, T. B., & Jensen, P. S. (2022). Too Big To Fail And Moral Hazard: Evidence From An Epoch Of Unregulated Commercial Banking. *Imf Economic Review*, 70(4), 808–830. <https://doi.org/10.1057/S41308-022-00167-7>
- Aniemeke, E. H. (2024). Determinants Of Bank Stability In Nigeria. *American Journal Of Economics And Business Innovation*, 3(2), 85–93. <https://doi.org/10.54536/Ajebi.V3i2.2675>
- Barakat, H. A. (2025). Banking Soundness And Systemic Risk: Insights From The Egyptian Banking Sector. *International Journal Of Innovative Research And Scientific Studies*, 8(2), 4322–4333. <https://doi.org/10.53894/Ijirss.V8i2.6305>
- Beginkulov, E. (2025). Bank Digitalization And Financial Stability In Central Asia: Assessing Risk And Resilience. *Journal Of Eastern European And Central Asian Research (Jeecar)*, 12(1), 17–30. <https://doi.org/10.15549/Jeecar.V12i1.2100>
- Budhathoki, P. B., Bhattarai, G., Aryal, N. P., & Ghimire, S. R. (2024). The Bank Concentration And Risk Exposure: Empirical Insights From Asian Countries. *Nepal Journal Of Multidisciplinary Research*, 7(2), 12–29. <https://doi.org/10.3126/Njmr.V7i2.68190>

- Chen, I.-J., Tsai, H., Chen, Y.-S., Lin, W. C., & Li, T.-Y. (2025). Bank Performance And Liquidity Management. *Review Of Quantitative Finance And Accounting*, 64(4), 1453–1490. <https://doi.org/10.1007/S11156-024-01342-9>
- Chernobai, A., Ozdagli, A., & Wang, J. (2021). Business Complexity And Risk Management: Evidence From Operational Risk Events In U.S. Bank Holding Companies. *Journal Of Monetary Economics*, 117, 418–440. <https://doi.org/10.1016/J.Jmoneco.2020.02.004>
- Chuesta, R. N. B., Sanga, K. P., & Gheta, A. P. K. (2024). Peran Agency Theory Terkait Manajemen Risiko Kredit Dalam Upaya Meminimalisir Kredit Bermasalah Pada Ksp Kopdit Obor Mas Kanca Pasar Alok. *Budgeting: Journal Of Business, Management And Accounting*, 5(2), 1354–1359. <https://doi.org/10.31539/Budgeting.V5i2.9215>
- Connelly, B. L., Certo, S. T., Reutzel, C. R., Desjardine, M. R., & Zhou, Y. S. (2025). Signaling Theory: State Of The Theory And Its Future. *Journal Of Management*, 51(1), 24–61. <https://doi.org/10.1177/01492063241268459>
- Faiz, F., Le, V., & Masli, E. K. (2024). Determinants Of Digital Technology Adoption In Innovative Smes. *Journal Of Innovation & Knowledge*, 9(4), 100610. <https://doi.org/10.1016/J.Jik.2024.100610>
- Farooq, M., Al-Jabri, Q., Saleem, H. M. N., Munir, M., & Zulqarnain, M. (2026). Does Family Ownership Moderate The Relationship Between Working Capital Management And Financial Distress? Empirical Evidence. *South Asian Journal Of Business Studies*, 1–25. <https://doi.org/10.1108/Sajbs-01-2024-0045>
- Gan, Y. (2024). Research On The Influence Mechanism Of The Agency Problem On Financial Stability From The Perspective Of Economics And Sociology. *Advances In Economics, Management And Political Sciences*, 85(1), 41–46. <https://doi.org/10.54254/2754-1169/85/20240835>
- Gungor, S. (2023). Bank-Specific Determinants Of Financial Stability In Participation Banks: Fresh Evidence From The Driscoll-Kraay Estimator. *International Journal Of Business And Economic Studies*, 5(3), 166–181. <https://doi.org/10.54821/Uiecd.1333150>
- Hani, F., Saputri, I. P., & Randyantini, V. (2025). Capital Adequacy, Credit Risk, And Efficiency In Islamic Bank Profitability. *Involvement International Journal Of Business*, 2(2), 120–130. <https://doi.org/10.62569/Iijb.V2i2.116>
- Huynh, J. (2025). Digital Transformation And Bank Liquidity Creation: Evidence From A Bank-Based Market. *Sage Open*, 15(4). <https://doi.org/10.1177/21582440251390670>
- Javid, M., Chandia, K. E., Zaman, Q. U., & Akhter, W. (2023). Examining The Effect Of Liquidity Creation On Banking Profitability And Stability: Moderating Role Of Political Instability. *Kybernetes*, 52(10), 4061–4080. <https://doi.org/10.1108/K-01-2022-0021>

- Jensen, M. C., & Meckling, W. H. (1976). Theory Of The Firm: Managerial Behavior, Agency Costs And Ownership Structure. *Journal Of Financial Economics*, 3(4), 305–360. [https://doi.org/10.1016/0304-405x\(76\)90026-X](https://doi.org/10.1016/0304-405x(76)90026-X)
- Jia, K., & Liu, X. (2024). Bank Digital Transformation, Bank Competitiveness And Systemic Risk. *Frontiers In Physics*, 11. <https://doi.org/10.3389/fphy.2023.1297912>
- Karunaratne, T., Ajiero, I. R., Joseph, R., Farr, E., & Piroozfar, P. (2025). Evaluating The Economic Impact Of Digital Twinning In The Aec Industry: A Systematic Review. *Buildings*, 15(14), 2583. <https://doi.org/10.3390/buildings15142583>
- Khattak, M. A., Ali, M., Azmi, W., & Rizvi, S. A. R. (2023). Digital Transformation, Diversification And Stability: What Do We Know About Banks? *Economic Analysis And Policy*, 78, 122–132. <https://doi.org/10.1016/j.eap.2023.03.004>
- Kim, Q. T. N. (2022). The Effect Of Agency Problem And Internal Control On Credit Risk At Commercial Banks In Vietnam. *International Journal Of Asian Business And Information Management*, 13(1), 1–22. <https://doi.org/10.4018/ijabim.305114>
- Kismawadi, E. R. (2025). Improving Islamic Bank Performance Through Agency Cost And Dual Board Governance. *Journal Of Islamic Accounting And Business Research*, 16(3), 461–483. <https://doi.org/10.1108/jiab-01-2023-0035>
- Lewano, A. K., Kalunda, E., & Wambalaba, F. W. (2025). Influence Of Credit Risk On Intermediation Efficiency Of Commercial Banks In Kenya. *African Journal Of Business And Development Studies*, 2(1), 554–566. <https://doi.org/10.70641/ajbds.v2i1.163>
- Lim, K. Y., Liu, C., & Tan, L. (2025). Loan Loss Provision, Unsecured-Collateralized Loan Choice And Macro-Stability In China. *The B.E. Journal Of Macroeconomics*, 25(2), 847–884. <https://doi.org/10.1515/bejm-2025-0101>
- Limon, A. (2025). Exploring The Role Of Bank-Specific Factors In Nonperforming Loans: A Study Of Islamic Banks In Bangladesh. *Asian Journal Of Managerial Science*, 14(1), 1–7. <https://doi.org/10.70112/ajms-2025.14.1.4256>
- Liu, Y., Abdul Rahman, A., Imna Mohd Amin, S., & Ja'afar, R. (2025). Navigating Fintech And Banking Risks: Insights From A Systematic Literature Review. *Humanities And Social Sciences Communications*, 12(1), 717. <https://doi.org/10.1057/s41599-025-05055-9>
- Maudy, M., Andriana, I., Mu'izzuddin, M., & Widiyanti, M. (2024). The Effect Of Competition And Bank Size On Bank Stability In Asean-5 Countries. *American Journal Of Economic And Management Business (Ajemb)*, 3(7), 195–205. <https://doi.org/10.58631/ajemb.v3i7.104>
- Maulana, A., Murdhaningsih, & Luthfi, N. F. (2025). Financial Risk Management, Capital Adequacy, And Stability Of Islamic Banks: The Moderating Effect Of

- Efficiency In The Indonesian And Malaysian Context. *Banks And Bank Systems*, 20(3), 249–262. [https://doi.org/10.21511/Bbs.20\(3\).2025.18](https://doi.org/10.21511/Bbs.20(3).2025.18)
- Meero, A. (2025). Islamic Vs. Conventional Banking In The Age Of Fintech And Ai: Evolving Business Models, Efficiency, And Stability (2020–2024). *International Journal Of Financial Studies*, 13(3), 148. <https://doi.org/10.3390/Ijfs13030148>
- Milojević, N., & Redzepagic, S. (2021). Prospects Of Artificial Intelligence And Machine Learning Application In Banking Risk Management. *Journal Of Central Banking Theory And Practice*, 10(3), 41–57. <https://doi.org/10.2478/Jcbtp-2021-0023>
- Mustafa, J. A. (2024). From Innovation To Stability: Evaluating The Ripple Influence Of Digital Payment Systems And Capital Adequacy Ratio On A Bank's Z-Score. *Banks And Bank Systems*, 19(3), 67–79. [https://doi.org/10.21511/Bbs.19\(3\).2024.07](https://doi.org/10.21511/Bbs.19(3).2024.07)
- Nguyen, T. Le, Do, T. T., & Nguyen, L. T. A. (2024). Determinants Of Bank Stability In Emerging Economies: Empirical Evidence From Vietnam. *International Journal Of Social Science And Economic Research*, 09(08), 2767–2781. <https://doi.org/10.46609/Ijsser.2024.V09i08.014>
- Petrović, D., Dasilas, A., & Karanović, G. (2025). Bank Risk-Adjusted Efficiency Using A Composite Risk Management Index. *Journal Of Risk Finance*, 26(3), 485–515. <https://doi.org/10.1108/Jrf-11-2024-0362>
- Pratiwi, R., Daulay, W. A. A., & Chairina, C. (2022). Studi Literatur Peran Bank Indonesia Terhadap Stabilitas Keuangan. *Jurnal Ekonomika Dan Bisnis (Jebs)*, 2(3), 748–753. <https://doi.org/10.47233/Jebs.V2i3.261>
- Ross, S. A. (1977). The Determination Of Financial Structure: The Incentive-Signalling Approach. *The Bell Journal Of Economics*, 8(1), 23–40. <https://doi.org/10.2307/3003485>
- Saddam, S. Z., Jaafar, M. N., Muhamat, A. A., Nizam, N. S. M., & Halim, N. A. (2024). Determinants Of Islamic Banks' Stability In Malaysia And Indonesia. *The Indonesian Capital Market Review*, 16(1), 17–29. <https://doi.org/10.21002/Icmr.V16i1.1193>
- Saeed, M., Izzeldin, M., Hassan, M. K., & Pappas, V. (2020). The Inter-Temporal Relationship Between Risk, Capital And Efficiency: The Case Of Islamic And Conventional Banks. *Pacific-Basin Finance Journal*, 62, 101328. <https://doi.org/10.1016/J.Pacfin.2020.101328>
- Salazar, Y., Merello, P., & Zorio-Grima, A. (2023). Ifrs 9, Banking Risk And Covid-19: Evidence From Europe. *Finance Research Letters*, 56, 104130. <https://doi.org/10.1016/J.Frl.2023.104130>
- Samarasinghe, A. (2023). Stock Market Liquidity And Bank Stability. *Pacific-Basin Finance Journal*, 79, 102028. <https://doi.org/10.1016/J.Pacfin.2023.102028>
- Setyaningrum, N. A., Setiawan, M. N. K., Maghfiroh, S., & Ansori, S. (2022). Assessing Agency Theory And Solutions On The Financing Of Revenue

- Sharing Systems In Islamic Banking. *Ijtimā Iyya Journal Of Muslim Society Research*, 7(1), 16–27. <https://doi.org/10.24090/Ijtimaiyya.V7i1.6387>
- Sidhu, A. V., Rastogi, S., Gupte, R., & Bhimavarapu, V. M. (2022). Impact Of Liquidity Coverage Ratio On Performance Of Select Indian Banks. *Journal Of Risk And Financial Management*, 15(5), 226. <https://doi.org/10.3390/Jrfm15050226>
- Silva, F. B. G. (2021). Fiscal Deficits, Bank Credit Risk, And Loan-Loss Provisions. *Journal Of Financial And Quantitative Analysis*, 56(5), 1537–1589. <https://doi.org/10.1017/S0022109020000472>
- Sitorus, A. P., Mahlel, Majid, M. S. A., Marliyah, & Handayani, R. (2022). Krisis Keuangan Masa Depan Dan Sistem Keuangan Baru. *Jurnal Emt Kita*, 6(1), 136–146. <https://doi.org/10.35870/Emt.V6i1.561>
- Snjawi, S. A. K., & Essa, S. K. (2021). The Role Of Liquidity Indicators To Assess Its Risks And Enhance Capital Adequacy In Banking Activity. *Journal Of Economics And Administrative Sciences*, 27(130), 243–255. <https://doi.org/10.33095/Jeas.V27i130.2218>
- Spence, M. (1973). Job Market Signaling. *The Quarterly Journal Of Economics*, 87(3), 355. <https://doi.org/10.2307/1882010>
- Sutandijo, S., & Sugiyarti, L. (2022). Ukuran Bank, Manajemen Laba, Dan Stabilitas Keuangan Bank. *Scientific Journal Of Reflection: Economic, Accounting, Management And Business*, 5(2), 310–320. <https://doi.org/10.37481/Sjr.V5i2.466>
- Sutandijo, S., & Sugiyarti, L. (2023). Relevansi Stabilitas Keuangan Bank Terhadap Risiko Investasi Dan Kebijakan Dividen Sebagai Variabel Mediasi. *Scientific Journal Of Reflection: Economic, Accounting, Management And Business*, 6(3), 672–679. <https://doi.org/10.37481/Sjr.V6i3.708>
- Trung, N. T. (2025). The Impact Of Gdp Growth On Banking Stability In Vietnam: A Pvar Model Analysis. *Journal Of Accounting, Business And Finance Research*, 20(2), 31–41. <https://doi.org/10.55217/102.V20i2.996>
- Wen, W., & Liang, Y. (2025). Digital Transformation And Liquidity Creation In Commercial Banks: Evidence From The Chinese Banking Industry. *Plos One*, 20(2), E0318785. <https://doi.org/10.1371/Journal.Pone.0318785>