

How Do Credit Risk and Liquidity Shape Bank Profitability? Evidence From Indonesia (2019-2024)

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Abstract

Objective: This study examines the effects of credit risk, liquidity, and interest rates on the profitability of publicly listed commercial banks in Indonesia during 2019–2024.

Design/Methods/Approach: A quantitative explanatory approach is employed using panel data regression to analyze secondary data obtained from annual financial reports. Credit risk is measured by Non-Performing Loans (NPL), liquidity by Loan to Deposit Ratio (LDR), and interest rates represent macroeconomic conditions. Profitability is proxied by Return on Equity (ROE). Panel regression is applied to capture both cross-sectional and time-series variations.

Findings: The results reveal that NPL has a significant negative effect on ROE, indicating that higher credit risk reduces bank profitability. LDR shows a negative but statistically insignificant relationship with ROE, suggesting liquidity is not a primary determinant of profitability during the observed period. Interest rates have a positive and significant impact on ROE, highlighting the importance of interest-based income in banking performance.

Originality/Value: This study provides recent empirical evidence from Indonesia by simultaneously examining credit risk, liquidity, and interest rates using panel data analysis in a developing country context.

Practical/Policy implication: The findings emphasize the importance of effective credit risk management and strategic responses to interest rate fluctuations to maintain sustainable bank profitability.

Keywords: banking profitability; credit risk; interest rates

JEL Classification: JEL Valid G21, G32, E43 [author should add 1-3 JEL classification number, information guide for the Journal of Economics Literature (JEL) can be found at <https://www.aeaweb.org/jel/guide/jel.php>]

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Introduction

Bank profitability is a key indicator for assessing the performance, stability, and resilience of the financial system. Banking literature emphasizes that a bank's ability to generate profit is influenced by a combination of internal and external factors, including credit risk, liquidity, as well as interest rate and macroeconomic conditions (Asli Demirgüç-Kunt & Huizinga, 1998; Athanasoglou et al., 2008; Bourke, 1989). Empirical studies in various developing countries show that banks capable of effectively managing risk tend to exhibit more stable and sustainable profitability levels (Dietrich & Wanzenried, 2014; Petria et al., 2015).

Credit risk, represented by Non-Performing Loans (NPL), is an important determinant of bank profitability. Several studies have found that NPL has a negative and significant effect on bank profitability due to decreased interest income and increased provisioning costs (Ayieko & Aluoch, 2025; Goddard et al., 2004; Siddique et al., 2022). Similar significant findings have also been reported in the context of Indonesian and ASEAN banking (Fajriani & Janudin, 2025; Kubertein et al., 2025; Sutrisno, 2025). However, some studies indicate that the impact of NPL on profitability is not always significant, especially for banks with strong income diversification and sound risk management (Berger & DeYoung, 1999; Goddard et al., 2004; Okeke, 2025). These discrepancies suggest that the effect of credit risk on profitability is contextual and influenced by bank characteristics and economic conditions.

Bank liquidity, measured by the Loan to Deposit Ratio (LDR), also shows mixed empirical results. Several studies find that LDR positively and significantly affects profitability as it reflects the efficiency of channeling third-party funds into productive loans (Aris et al., 2025; Bourke, 1989; Rafique et al., 2025). Conversely, other research shows that LDR has a negative or insignificant impact on profitability due to increased liquidity risk and funding pressures, especially during periods of economic instability (Ben Abdallah & Bahloul, 2025; Muawanah & Aprilia, 2025; Pasiouras & Kosmidou, 2007). Empirical evidence from Indonesian banking also reveals that the LDR-profitability relationship tends to be weak or insignificant when credit quality and funding structure are not optimal (Astuti et al., 2025; Wardana, 2025).

Interest rates, as an external factor, influence bank profitability through net interest margin and funding costs. Some studies find that rising interest rates have a positive and significant effect on bank profitability by increasing net interest income (Asli Demirgüç-Kunt & Huizinga, 1998; Jiang et al., 2025; Karaş & Kil, 2025). However, other research indicates that the effect of interest rates on profitability may be negative or insignificant due to reduced credit demand and higher borrower default risk (Karkowska et al., 2025; Simon Tewolde, 2025). These inconsistent findings highlight that the impact of interest rates on profitability is highly influenced by the banking market structure and domestic monetary policy responses.

Based on this review, there remains a research gap in simultaneously examining credit risk, liquidity, and interest rates on the profitability of Indonesian banks using the most recent data. Most prior studies have investigated these variables partially or within more limited observation periods. The novelty of this study lies in providing updated empirical evidence by integrating NPL, LDR, and interest rates within a single panel regression model for publicly listed commercial banks in Indonesia during the period 2019–2024. The objective is to empirically analyze how credit risk, liquidity, and interest rates shape bank profitability as measured by Return on Equity (ROE).

This paper is organized as follows. Section 2 reviews the relevant literature and develops the research hypotheses. Section 3 describes the research methodology, including data sources, sample selection, variable measurement, and the panel data regression model. Section 4 presents the empirical results and discussion. Finally, Section 5 concludes the study and outlines the practical and policy implications.

Literature Review and Hypotheses Development

Bank Profitability and Return on Equity

Profitability reflects a bank's ability to efficiently manage resources to generate sustainable earnings. Return on Equity (ROE) is widely used as a primary indicator of profitability because it represents the rate of return on shareholders' equity. Banking literature positions ROE as a performance measure sensitive to credit risk, liquidity risk, and macroeconomic factors such as interest rates (Dietrich & Wanzenried, 2014; Goddard et al., 2004; Petria et al., 2015). Variations in ROE among banks indicate differences in risk management strategies, funding structures, and adaptability to economic conditions.

Non-Performing Loans and Bank Profitability

Credit risk is a major source of uncertainty in bank performance. Non-Performing Loans (NPL) serve as an asset quality indicator, reflecting the proportion of problematic loans to total loans. Financial intermediation theory suggests that rising NPLs reduce profitability due to higher provisioning costs, declining interest income, and weakened operational efficiency (Berger & DeYoung, 1999).

Empirical studies consistently find a negative and significant effect of NPLs on bank profitability. Cross-country and emerging market research conclude that increased non-performing loans consistently suppress ROE and ROA (Arthur-Sam, 2025; Kwashie et al., 2022; Naili & Lahrichi, 2022; Nguyen, 2025). Similar evidence is found in the Indonesian banking context, where high NPLs significantly impair the financial performance of publicly listed banks (Kubertein et al., 2025; Simatupang et al., 2026; Wardana, 2025).

Conversely, some studies indicate that the impact of NPLs on profitability is not always significant. This usually occurs in banks with strong credit risk management, diversified income streams, and high operational efficiency. Research by (Hani et al., 2025) and (Okeke, 2025) finds that the effect of NPLs on profitability weakens when banks can offset credit risk through non-interest income and effective cost management. These mixed findings suggest that the NPL-profitability relationship is contextual and influenced by internal bank characteristics and economic conditions.

Based on this theoretical and empirical foundation, the first hypothesis is formulated as follows:
H₁: Does NPL affect the ROE of publicly listed Indonesian banks?

Loan to Deposit Ratio and Bank Profitability

Liquidity plays a crucial role in maintaining bank stability and performance. The Loan to Deposit Ratio (LDR) reflects a bank's ability to channel third-party funds into productive loans. Asset-liability management theory posits that an optimal LDR level can enhance profitability by increasing interest income (Pasiouras & Kosmidou, 2007).

Several studies find that LDR has a positive and significant impact on bank profitability. These results indicate that effective intermediation functions can improve ROE through controlled credit expansion (Astuti et al., 2025; Le et al., 2025; Thakulla & Gautam, 2025). Empirical evidence from Indonesian banks also shows that increasing LDR within a safe range correlates positively with financial performance (Muawanah & Aprilia, 2025; Samosir et al., 2025).

In contrast, other research reports a negative or insignificant effect of LDR on profitability. This typically occurs when credit growth is not matched by adequate asset quality, leading to liquidity risk and funding pressures (Ben Abdallah & Bahloul, 2025; Rafique et al., 2025). (Pasiouras & Kosmidou, 2007) also show that during economic instability, a high LDR tends to reduce profitability due to increased funding costs and default risk.

These varying results indicate that the effect of LDR on profitability depends heavily on credit quality, funding structure, and economic stability. Therefore, the second hypothesis is proposed:
H₂: Does LDR affect the ROE of publicly listed Indonesian banks?

Interest Rates and Bank Profitability

Interest rates are an external factor influencing bank profitability through net interest margin and funding costs. Interest rate structure theory suggests that rising interest rates can increase bank profitability if credit interest rates adjust faster than deposit rates (Asli Demirgüç-Kunt & Huizinga, 1998).

Several empirical studies demonstrate a positive and significant effect of interest rates on bank profitability. These findings indicate that a high interest rate environment tends to increase net interest income and ROE (Jiang et al., 2025; Karaś & Kil, 2025; Simon Tewolde, 2025). Cross-country evidence also shows that banks benefit more when they have pricing flexibility during periods of rising interest rates (Karkowska et al., 2025).

Conversely, other studies find that the impact of interest rates on profitability is weak or insignificant. This typically occurs when rising interest rates increase borrower default risk and reduce credit demand (EBINUM & EHIEDU, 2025; Ibrahimov et al., 2025). These findings confirm that the effect of interest rates on profitability is nonlinear and heavily influenced by banking market structure and macroeconomic conditions.

Based on the theoretical framework and empirical evidence, the third hypothesis is formulated as follows:

H₃: Does interest rate affect the ROE of publicly listed Indonesian banks?

Method

This study employs a quantitative approach with an explanatory design to analyze the effects of credit risk, liquidity, and interest rates on bank profitability. The sample consists of 33 publicly listed commercial banks in Indonesia during the 2019–2024 period, selected through purposive sampling based on consistent availability of annual financial data. Bank profitability is measured using Return on Equity (ROE) as the dependent variable, while Non-Performing Loans (NPL), Loan to Deposit Ratio (LDR), and interest rates serve as independent variables. Data analysis is conducted using panel regression to capture variations across banks and periods and to test the influence of each variable on bank profitability performance.

The data are analyzed using panel data regression to capture both cross-sectional and time-series variations across banks and periods. The estimation and statistical tests are conducted using EViews software. Model selection procedures, including the Chow test, Hausman test, and Lagrange Multiplier test, are applied to determine the most appropriate panel regression model. This approach enables robust estimation of the effects of each independent variable on bank profitability.

Result and Discussion

Table 1. Descriptive Statistics of Publicly Listed Indonesian Banks

Variable	Mean	Maximum	Minimum	Std. Deviation
ROE	2.887071	27.31000	-154.6000	19.80621
NPL	1.426768	4.960000	0.000000	1.286144
LDR	82.66848	171.2800	0.760000	27.60889
SUKU BUNGA	4.958333	6.000000	3.500000	1.006877

Source: Processed data, E-Views, 2026

Table 1 presents descriptive statistics illustrating the general characteristics of the financial performance and condition of publicly listed Indonesian banks during the observation period. The average Return on Equity indicates relatively low profitability, accompanied by a very wide range between maximum and minimum values. This suggests significant differences in profitability performance among banks, including some experiencing serious financial distress during the study period.

The average Non-Performing Loan is at a moderate level, with the maximum value still within banking regulatory limits. The relatively low standard deviation indicates controlled variation in credit risk across banks, although the minimum value of zero reflects differences in credit management quality. These findings imply that, overall, banks can maintain asset quality, yet credit risk levels still have the potential to impact profitability.

The Loan to Deposit Ratio average reflects active banking intermediation. The wide range and high standard deviation reveal variation in credit distribution policies and liquidity management among banks. This indicates that not all banks maintain optimal liquidity levels, thus liquidity pressure may arise in banks with extreme ratios.

Interest rates show a relatively stable average with limited variation during the observation period. This stability reflects a relatively controlled monetary policy environment, so interest rate changes may systematically influence bank profitability through interest income and funding cost mechanisms.

Table 2. Model Selection, F-Test Results, and Coefficient of Determination (R^2)

Description	Probability	Result
Chow Test	0.0000	Fixed Effect Model
Hausman Test	0.0043	Fixed Effect Model
Lagrange Multiplier Test	0.0000	Random Effect Model
Coefficient of Determination (R^2)	0.001346	Hypothesis Accepted
Adjusted R^2	0.062978	

Source: Processed data, E-Views, 2026

Table 2 shows the results of panel regression model selection and model feasibility tests. The Chow test yields a probability value of 0.0000, indicating the Fixed Effect model is more appropriate than the

Common Effect model. This suggests individual bank characteristics affect the relationship between independent variables and profitability.

The Hausman test supports this result with a probability of 0.0043, confirming the Fixed Effect model is better than the Random Effect model. This indicates bank-specific effects correlate with independent variables, making the Fixed Effect model provide more consistent and unbiased estimates.

The Lagrange Multiplier test shows a probability of 0.0000, indicating the Random Effect model is superior to the Common Effect model. However, based on the Chow and Hausman tests, the Fixed Effect model is chosen as the main estimation model due to stronger statistical suitability.

The coefficient of determination shows that NPL, LDR, and interest rates have limited ability to explain variations in ROE. The relatively low Adjusted R^2 indicates bank profitability is also influenced by other factors outside the model, such as operational efficiency, capital structure, and macroeconomic conditions. This finding shows that although the model is statistically significant, the complexity of profitability determinants requires a broader approach.

Table 3. Regression Results of Independent Variables on ROE

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.289716	6.092087	-0.047556	0.9621
X1	-3.571851	1.149530	-3.107226	0.0022
X2	-0.024100	0.054516	-0.442074	0.6589
X3	2.070312	1.015299	2.039116	0.0428

Source: Processed data, E-Views, 2026

Table 3 presents panel regression estimates testing the effects of credit risk, liquidity, and interest rates on bank profitability proxied by ROE. The results show that the independent variables have differing relationships with profitability in both direction and significance.

Non-Performing Loans have a significant negative coefficient toward ROE with a probability of 0.0022. This indicates that increased credit risk tends to reduce bank profitability due to higher provisioning burdens and reduced interest income. This result aligns with theoretical perspectives emphasizing the importance of asset quality in maintaining bank financial performance.

The Loan to Deposit Ratio shows a negative but insignificant effect on ROE. This suggests that liquidity levels and credit distribution aggressiveness have not significantly influenced profitability during the period. This finding implies that banking intermediation has not fully optimized or still faces liquidity risks that pressure profit performance.

Interest rates display a positive and significant effect on ROE with a probability of 0.0428. This indicates that rising interest rates can boost profitability through increased net interest margins and interest income. This highlights the critical role of macroeconomic factors in shaping bank profitability.

The model constant is negative but insignificant, indicating that without influence from independent variables, ROE tends to remain low. This underscores the importance of managing credit risk and responding to interest rate changes to sustain bank profitability.

The panel regression results demonstrate that credit risk, liquidity, and interest rates impact bank profitability differently, reflected in the varied directions and significance levels, thus addressing the previously formulated hypotheses.

Credit risk, proxied by NPL, shows a significant negative effect on ROE. This confirms that higher non-performing loans potentially reduce banks' ability to generate shareholder returns, consistent with hypothesis one. This aligns with studies (Arthur-Sam, 2025; Ayieko & Aluoch, 2025; Berger & DeYoung, 1999; Muawanah & Aprilia, 2025; Nguyen, 2025) confirming that high NPLs increase provisioning costs and reduce operational efficiency. Empirical support is also found in (Chaudhary, 2025; Saydullayeva, 2025; Siddique et al., 2022), emphasizing asset quality as a key determinant of bank profitability. However, this contrasts with findings by (Abdelraouf, 2026) and (Okeke, 2025) who report insignificant credit risk effects, particularly for banks with strong income diversification. This suggests the credit risk impact is contextual and influenced by bank characteristics and financial system stability.

Liquidity, proxied by LDR, has a negative but insignificant effect on ROE. This indicates that credit distribution relative to third-party funds has not contributed significantly to profitability enhancement, leading to rejection of hypothesis two. This aligns with (Febrianti et al., 2024) who conclude liquidity acts more as a financial stability instrument than a short-term profit driver. Similar findings are reported by (Astuti et al., 2025; Rafique et al., 2025; Thakulla & Gautam, 2025; Wardana, 2025) stating certain liquidity ratios do not always significantly impact bank profit performance. This suggests liquidity functions more as a stability tool than a direct profitability driver. Conversely, this study contrasts with (Ben Abdallah &

Bahloul, 2025; Muawanah & Aprilia, 2025; Sutrisno, 2025) who find significant liquidity effects on profitability, especially when asset quality acts as a moderating variable. These differing results reinforce that liquidity's role depends heavily on funding structure and risk management.

Interest rates have a positive and significant effect on ROE, supporting hypothesis three that interest rates positively affect bank profitability. This suggests rising interest rates enhance interest income and net interest margins. This finding aligns with (Febrianti et al., 2024), who find interest rate changes play a crucial role in shaping bank profitability through interest income mechanisms. Empirical support is also evident in (EBINUM & EHIEDU, 2025; Karaş & Kil, 2025; Mada & Arrasyid, 2026; Simon Tewolde, 2025) showing interest rate changes directly impact bank profitability. Theoretically, (Blessing, 2025) emphasizes interest rates as key in shaping leverage-profitability relationships. However, this contrasts with (Karkowska et al., 2025), who report ambiguous interest rate effects under certain economic conditions, making profitability impacts inconsistent across countries.

Overall, the results show that credit risk and interest rates are primary determinants of bank profitability, whereas liquidity does not show a direct significant role. These findings reinforce empirical literature emphasizing the importance of asset quality management and policy responsiveness to interest rate dynamics in sustaining bank profitability. This study contributes by strengthening empirical evidence on the differential effects of internal and external variables on bank profitability in developing country contexts, particularly Indonesia.

Conclusion and future direction

This study analyzed the effects of credit risk, liquidity, and interest rates on the profitability of Indonesian banks. The results indicate that Non-Performing Loans have a negative and significant impact on Return on Equity, meaning that an increase in non-performing loans reduces banks' ability to generate profits. The Loan to Deposit Ratio shows a negative but insignificant effect on Return on Equity, suggesting that liquidity has not yet played a direct role in enhancing profitability. Interest rates have a positive and significant effect on Return on Equity, indicating that rising interest rates can increase banks' interest income.

Future research could explore the role of other variables such as operational efficiency, income structure, and corporate governance in influencing bank profitability. Employing more diverse methodological approaches and grouping banks based on specific characteristics may also provide deeper insights into the determinants of bank profitability.

Implication

The findings highlight the critical role of credit risk in determining bank profitability. The significant negative impact of Non-Performing Loans on Return on Equity reinforces theories emphasizing the importance of asset quality in maintaining bank performance. The insignificance of the Loan to Deposit Ratio suggests that liquidity does not always directly influence profitability. These results provide additional empirical evidence that internal and macroeconomic factors need to be understood comprehensively to explain banking performance.

The results offer guidance for bank management to focus more on controlling non-performing loans to preserve profitability. Liquidity management should be conducted cautiously, without focusing solely on the volume of credit distribution. Changes in interest rates should be addressed through adjustments in asset and liability management strategies. Implementing these measures is expected to enhance banks' financial performance sustainably.

Conflict of Interest

The author declares no commercial or financial conflicts of interest in conducting this research.

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