

The Role of Credit Risk, Liquidity, and Capital in Influencing Banking Profitability in Indonesia, 2020–2024

Ella Fitriana ^{1*}, Dian Prawitasari ², Usman ³, Fakhmi Zakaria ⁴

¹ Dian Nuswantoro University ; Semarang, Central Java, Indonesia; e-mail:211202207649@mhs.dinus.ac.id

² Dian Nuswantoro University; Semarang, Central Java, Indonesia; e-mail:sari.dianprawita@dsn.dinus.ac.id

³ Dian Nuswantoro University; Semarang, Central Java, Indonesia; e-mail:usman@dsn.dinus.ac.id

⁴ Dian Nuswantoro University; Semarang, Central Java, Indonesia; e-mail:fakhmi@dsn.dinus.ac.id

* Corresponding Author: Dian Prawitasari

Abstract: This investigation is intended to evaluate the impact of Credit Quality Ratio (NPL), Funding Utilization Ratio (LDR), and Capital Buffer Indicator (CAR) regarding the earnings capability of banks traded on the Indonesia Stock Exchange within 2020–2024. The investigation utilized an explanatory quantitative design supported by panel data regression techniques. The observed sample included 23 banks determined by purposive sampling, generating 110 research observations. Estimation was performed using the Stochastic Effects Approach (SEA) combined with *Estimated Generalized Least Squares* (EGLS) and robust standard errors for overcoming heteroscedasticity and autocorrelation problems. Findings reveal that NPL exerts a significant detrimental impact on earnings performance measured through ROA. LDR shows no significant relationship with ROA, suggesting that loan expansion alone cannot directly enhance profitability when credit quality remains insufficient. Conversely, CAR demonstrates a meaningful improvement in ROA, suggesting stronger capital resilience strengthens banks in creating earnings. Collectively, NPL, LDR, and CAR exert a significant influence on profitability, reflected by an Adjusted R-squared of 40.68%. The results suggest that preserving credit quality and reinforcing capital adequacy constitute crucial measures to enhance banking profitability in Indonesia.

Keywords: Non Performing Loa; Loan to Deposit Ratio; Capital Adequacy Ratio; Profitability; Return on Assets

Received: April 20, 2026

Revised: April 23, 2026

Accepted: June 22, 2026

Published: June 30, 2026

Curr. Ver.: June 30, 2026



Copyright: © 2026 by the authors.
Submitted for possible open
access publication under the
terms and conditions of the
Creative Commons Attribution
(CC BY SA) license
(<https://creativecommons.org/licenses/by-sa/4.0/>)

1. Introduction

Maintaining financial stability and promoting a country's economic growth heavily depend on the banking industry. Banks are intermediary organizations that collect funds from the general public and use them to finance productive industries. Therefore, the health of the banking sector is an aspect that cannot be overlooked. A healthy banking sector strengthens public confidence and enhances the economy's resilience, while disruptions in this sector have the potential to disrupt intermediary functions and slow economic growth[1].

In addition to being supported by sound financial conditions, an organization's success is also influenced through the competence of its workforce and organizational behaviors that support performance effectiveness. [2]Previous research explain that positive organizational behaviors can enhance organizational effectiveness and sustainability through individual contributions that go beyond formal duties. In the banking context, organizational effectiveness is a key prerequisite for maintaining sustainable financial performance and profitability.

Entering the following the pandemic recovery period, Indonesia's financial industry has shown a fairly encouraging recovery. According to Bank Indonesia's Institutional Report for the Third Quarter (2025), the banking industry's capital sufficiency level (ROA) remains above the regulatory minimum, and the level of non-performing loans is relatively under control. Nevertheless, the sector still faces a number of pressures, including global economic uncertainty, interest rate fluctuations, and credit risk [3]. These conditions make profitability a key performance indicator that needs to be monitored continuously, in line with finding that show profitability as a reflection of a bank's capacity to sustain its business operations[4].

Profitability is essentially an organization's ability to create earnings from utilized assets. In banking, ROA, a metric assessing the efficiency of asset utilization in producing profits, is frequently employed as an indicator of profitability[5]. Although performance is heavily affected by several organizational determinants such as financing risk and cash availability, and capital adequacy, a high ROA indicates strong operational efficiency. Findings from various developing countries also show that, despite technological transformation, these conventional internal factors remain the primary foundation for managing banking profitability [6].

Research on internal banking factors indicates that financial measurements including asset profitability, capital strength, and external funding sources funds are key determinants in maintaining a bank's intermediation function and performance. [7]It was also, found that internal banking factors have a greater influence than external factors in driving banking activities; thus, capital management and profitability are fundamental aspects in ensuring the sustainability of banking performance.

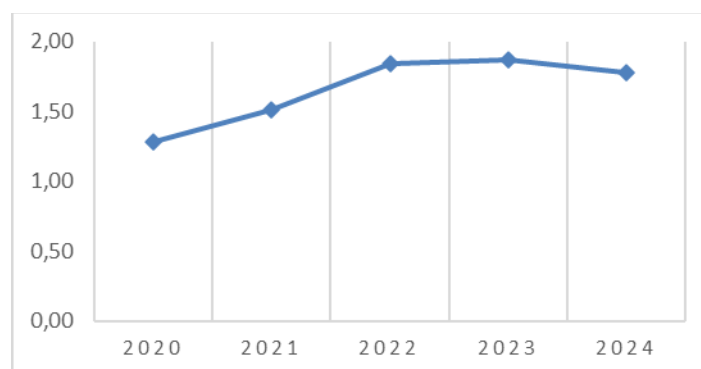


Figure1 . Trends in the Average ROA of Banking Companies, 2020–2024

Figure 1 illustrates that the average asset profitability levels of listed banking firms throughout 2020–2024 recorded continuous growth, advancing from 1.28% in 2020 to 1.87% in 2023. Such growth signifies stronger capability among banks to produce profits through asset utilization in the post COVID-19 pandemic period. In contrast, the average ROA decreased to 1.78% in 2024, suggesting that although profitability remains fairly robust, the banking sector continues to experience several pressures associated with global macroeconomic instability, fluctuating interest rates, and asset related risks.

Fluctuations in profitability highlight the main research issue, namely the persistent empirical uncertainty regarding the key internal determinants of banking performance, notably NPL representing financing risk, LDR reflecting funding liquidity, and CAR measuring capital strength capital sufficiency. Prior research highlights unresolved empirical disparities and divergent findings.

Accordingly, further empirical assessment is necessary to evaluate the effects of impaired loan ratio, liquidity utilization ratio, and capital sufficiency metric regarding banking profitability. A determinant frequently associated with profitability is the Non-Performing Loan (NPL) ratio, indicating the percentage of troubled financing contained in a bank's lending portfolio. A rising NPL ratio signifies increased default risk, causing larger provisioning expenditures and lower earnings from interest activities [8]. Such findings support the risk–reward

balancing framework, proposing that increasing risk is commonly associated with declining returns [9]. Previous research found that NPLs significantly reduce profitability[10]. Conversely, other findings NPLs do not significantly influence profitability[11]. Such inconsistent findings reflect unresolved matters that still require clarification.

In contrast, the effectiveness of a bank in transforming third party resources into revenue producing financing is reflected by the Loan to Deposit Ratio (LDR). Referring to financial intermediation theory, banking income is predominantly obtained from loan extension operations. [12] Thus, optimizing the LDR has the potential to increase interest income. Previous research has shown that the LDR ratio has a positive impact on profitability[13]; however, other studies have concluded that ROA is not significantly affected by the LDR ratio[14]. This discrepancy indicates that the connection between cash availability and earnings is inconclusive

The Capital Adequacy Ratio (CAR) constitutes another significant determinant in profitability analysis. The ratio assesses whether a bank possesses sufficient capital resources to accommodate possible financial losses. Under the Signaling Theory approach, higher capital ownership is frequently perceived by stakeholders as an indication of banking security and operational robustness [15]. Well-capitalized banks generally have greater scope to expand their operations, thereby increasing their profitability. [1] Previous research demonstrated a strong favorable influence of capital adequacy on earnings, whereas some studies reported insignificant outcomes[16]. This discrepancy underscores the need for further testing regarding the association between capital sufficiency and institutional profitability.

Aside from the empirical contradictions identified, prior studies reveal an ongoing weakness in methodological approaches. A large proportion of related analyses assess this linkage by employing standard Ordinary Least Squares (OLS) regression models. The OLS approach often yields misleading conclusions when applied to panel data from the banking industry, which exhibits highly skewed scale variations—a situation that theoretically gives rise to cross-sectional heteroscedasticity and serial correlation.

To address these issues, this study employs a robust approach using Estimated EGLS estimation under a stochastic-effects specification framework. The advantage of the EGLS approach lies in its mathematical capacity to explicitly capture and integrate the error component structure in banking panel data. By simultaneously correcting for heteroscedasticity and autocorrelation, the EGLS framework produces estimators that provide greater reliability and precision than traditional approaches OLS, resulting in more accurate hypothesis tests (t-statistics). Temporally, this approach is applied to a crucial economic window (2020–2024) that encompasses the acute shocks of the pandemic, mass credit restructuring, and the normalization phase following the relaxation of POJK policies at the end of 2024.

2. Literature Review

2.1 Theory of Financial Intermediation

The financial intermediation framework describes banks as mediating institutions linking fund providers (surplus units) and fund seekers (deficit units). Through such involvement, banking institutions help suppress transaction expenditures, alleviate asymmetric information issues, and improve resource allocation efficiency within the economy [12]. [17] The intermediation function includes maturity transformation, risk management, and borrower supervision, all of which contribute to financial system stability. The Loan-to-Deposit Ratio (LDR) in this study represents how well a bank performs in carrying out its intermediation function. A bank's prospective interest income increases in proportion to how effectively it uses the funds it has collected for efficient loan distribution, which ultimately enhances profitability.

2.2 Risk and Return Theory

According to risk return theory, expected profitability is influenced by the degree of risk accepted by investors or institutions. Its fundamental principle states that higher risk should be offset by a higher expected return as a form of compensation (Brigham & Houston, 2019).

Non-performing loans (NPLs) indicate that one of the primary vulnerabilities within financial institutions is credit risk. [18], [19] Non-performing loans has a dual impact: it reduces interest income while simultaneously increasing provisions for loan losses, thereby directly eroding bank profits. Thus, theoretically, a rise in NPLs will result in a decline in Return on Assets (ROA).

2.3 Signaling Theory

Signaling Theory explains how companies communicate their financial condition to external parties through the publication of disclosures aimed at minimizing knowledge gaps between executives and shareholders [20]. Financial information reflecting a company's positive condition is interpreted as a favorable signal by stakeholders. A high Capital Adequacy Ratio (CAR) in the banking industry indicates that a bank has sufficient capital to support business growth while mitigating operational risks. [15] Transparency regarding capital strength can bolster investor confidence, which in turn promotes stability and enhances the bank's profitability.

2.4 Profitability

Profitability is defined as the capability of an enterprise to create financial gains by optimizing the use of resources, investment funds, personnel, and business processes [21]. In the banking industry, this concept illustrates how successfully assets are converted into profits. The application of Return on Assets (ROA) as a benchmark of profitability has gained broad acceptance across financial research in emerging economies [6], [22], as this ratio is considered the most representative in reflecting the effectiveness of banking financial management in optimizing all its assets to generate net profit. More effective asset management is reflected in a higher ROA figure. [23] The ROA formula is:

$$\text{ROA} = \frac{\text{Net Income}}{\text{Average Total Assets}} \times 100$$

2.5 Non-Performing Loans (NPL)

The ratio of impaired financing to overall lending activities undertaken by a bank is identified as NPL (Non Performing Loans) [24]. If a borrower has difficulty making principal and interest payments as stipulated in the relevant agreement, the loan is classified as non-performing. A bank's credit risk is indicated by the NPL (Non-Performing Loans) ratio; a higher figure indicates a greater risk of default, which can reduce revenue and profitability. [25] The NPL formula is:

$$\text{NPL} = \frac{\text{Total NPL}}{\text{Total Credit}} \times 100$$

2.6 Loan-to-Deposit Ratio (LDR)

The proportion of public funds mobilized by a bank and later converted into credit distribution can be assessed through the funding utilization indicator. [5] This ratio illustrates the effectiveness of the bank's intermediation function as well as its liquidity level. An LDR that is too low indicates suboptimal credit distribution, while an LDR that is too high risks causing liquidity pressure. The LDR formula is:

$$\text{LDR} = \frac{\text{Total Loans}}{\text{Total Deposits}} \times 100$$

2.7 Capital Adequacy Ratio (CAR)

The capital resilience indicator illustrates whether a bank possesses adequate capital reserves to mitigate loss risks associated with productive risk bearing assets [1]. The CAR reflects a bank's capital resilience in supporting operational sustainability and business expansion plans. A high CAR indicates a bank's increased ability to withstand potential losses, thereby enhancing financial stability and public confidence. The CAR formula [26] is:

$$\text{CAR} = \frac{\text{Tier 1 Capital} + \text{Tier 2 Capital}}{\text{Risk-Weighted Assets}} \times 100$$

2.8 Conceptual Framework and Hypothesis Development

The discussion below elaborates the conceptual linkage connecting profitability with each explanatory variable. Bank profitability is expected to be negatively affected by non-performing loans (NPLs). This occurs because a rise in problematic financing tends to raise the provisioning burden for losses related to defaults while simultaneously reducing the bank's prospective interest income. In other words, a higher NPL value indicates that the bank is more exposed to credit risk, which tends to reduce the bank's ability to generate profits. Research results [25], [27] indicate that problematic financing exerts a considerable adverse impact to profit performance in the banking sector.

H1: Non-performing loans have a negative effect on profitability.

The LDR is anticipated to enhance profitability performance. Banking revenue from interest activities tends to grow as public funds are utilized more efficiently for productive financing. In essence, the ratio represents the bank's effectiveness in carrying out its intermediary responsibilities. The capability of a banking institution to generate higher returns expands as the share of loans channelled effectively increases. [28], [29] Liquidity administration using the funding allocation ratio substantially enhances banking profitability.

H2: The Loan-to-Deposit Ratio has a positive effect on profitability.

Meanwhile, the Capital Adequacy Ratio (CAR) is expected to contribute positively to profitability as well. Adequate capitalization strengthens a bank's capacity to mitigate potential operational losses while opening up opportunities for broader business expansion. Moreover, a substantial capital adequacy ratio conveys assurance to stakeholders and depositors that the bank maintains a healthy financial position. Research conducted [25], [30] proves that the Capital Adequacy Ratio (CAR) positively and significantly affects profit generation within the banking sector.

H3: The Capital Adequacy Ratio has a positive effect on profitability.

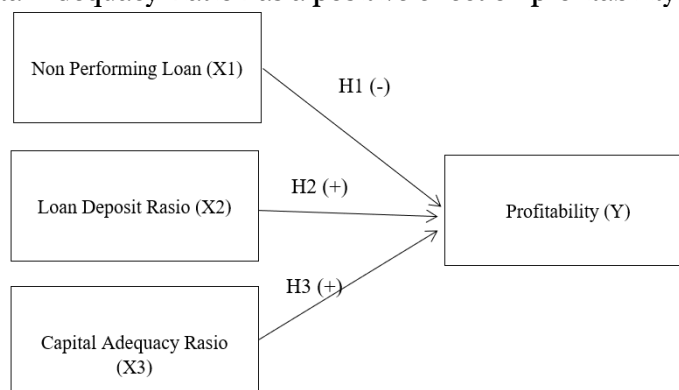


Figure2 . Conceptual Framework

3. Proposed Method

3.1 Research Approach

This research adopts an explanatory quantitative approach because the information analyzed consists of banking ratio data subjected to statistical testing. Such an approach is intended to investigate factual causal associations between the research [27]. Nazir (1988) asserts that explanatory research focuses on explaining causal relationships among variables to gain an objective and measurable understanding of a phenomenon. This method is used in this study to examine how NPL, LDR, and CAR affect the profitability of financial institutions, as measured by ROA.

3.2 Population and Sample

Banking firms recorded within the Indonesian capital market throughout the 2020 until 2024 period formed the research population. The sample was obtained through purposeful sampling, which involves choosing observations based on requirements associated with the research purpose [31]. The predetermined criteria consist of:

- Throughout 2020–2024, the banking businesses were consistently listed on the IDX.

- b. Companies that released comprehensive annual financial reports during the study period.
- c. Businesses that have all the research variables, namely NPL, LDR, CAR, and ROA.
- d. During the study period, 110 observations were collected based on these criteria.

Through a purposive sampling process, 23 banking companies were identified that met all research criteria. The observation period used was five years, specifically 2020–2024. Thus, the total number of observations should have been 115 (23 companies $\times$ 5 years). However, five observations could not be used due to incomplete information on several research variables following the data collection and adjustment process; consequently, the final number of observations used in this study was 110. The observation total is deemed suitable for estimating panel-based regression models since it provides representative coverage of listed banks observed throughout the research timeframe.

3.3 Data Types and Sources

The study relied on secondary data sourced from annual reports issued by banking companies. [32]Secondary data comprises information assembled and distributed for examination by parties other than the original collector. the authorized online portal of the Indonesian securities market which provides financial reports and issuer information, as well as the official websites of each banking institution, which offer additional verification tools, are the two main channels for data collection.

3.4 Operationalization of Variables

This investigation applies one dependent variable and three explanatory variables. Profitability proxied by ROA is employed as the dependent variable to assess a bank's effectiveness in producing profits from available resources. The explanatory variables include NPL as an indicator of non performing credit, LDR as a gauge of fund intermediation capability, and CAR as an indicator of capital sufficiency against possible losses.

Prior to the regression analysis stage, the Capital Adequacy Ratio (CAR) variable underwent square root conversion. This transformation was performed to reduce data distribution skewness, minimize the influence of outliers, and improve the stability of data variance. Consequently, the CAR values presented in the descriptive statistics are no longer the original percentage values but rather the results of the square root transformation; thus, numerically, they appear smaller than typical banking CAR values.

3.5 Data Collection Methods

Data for this investigation was collected through documentation. The sources of information consisted of annual financial statements available through the domestic securities exchange together with the authorized webpages of each company. Subsequently, the data was recorded and processed in accordance with the analysis specifications.

3.6 Data Analysis Techniques

This research analyzed data using panel data regression alongside descriptive statistics with the assistance of EViews 12. Descriptive measures were utilized to present the features of each variable, encompassing lowest, highest, average, and dispersion measures. Variable profiles were summarized through descriptive analysis.

Before the regression estimation was performed, a series of tests to select the best model were first conducted, namely:

- a. Selection between the individual-effects specification and the pooled-effects approach is conducted through the Chow test.
- b. Determination of either the Random Effects Model or the Fixed Effects Model is carried out using the Hausman test.
- c. Employ the LM testing approach to determine the preferred specification among Common Effects Model and the Random Effects Model.

The panel data regression model used in this study is:

$$ROA_{it} = \alpha + \beta_1 NPL_{it} + \beta_2 LDR_{it} + \beta_3 CAR_{it} + \epsilon_{it}$$

Notes:

ROA_{it} = Profitability of company i
in period t

NPL_{it} = *Non-Performing Loans*

LDR_{it} = *Loan-to-Deposit Ratio*

CAR_{it} = *Capital Adequacy Ratio*

α = Constant

$\beta_1, \beta_2, \beta_3$ = Regression coefficients

ϵ_{it} = Error term

i = Company

t = Year

As symptoms of unequal variance and serial correlation are identified, then concluding estimation adopts the Random Effects Model EGLS technique with robust standard errors. [33] The use of robust standard errors produces consistent covariance estimators, ensuring that statistical inferences remain valid even if certain classical assumptions are violated in the panel data regression model.

The R-square statistic is employed to measure the explanatory power of the model is accounted for by the independent variables. The effect of each independent variable on profitability is examined using a partial test (t test), while the collective effect of all independent variables on bank profitability is examined using a simultaneous test (F test).

4. Results and Discussion

4.1 Descriptive Statistical Analysis

Table 1 . Results of Descriptive Statistical Analysis

Variable	Mean	Maximum	Minimum	Std. Dev.
Return on Assets (ROA)	1.472000	4.310000	-1.750000	1.172759
Non-Performing Loans (NPL)	2.583273	5.690000	0.300000	1.057138
Loan-to-Deposit Ratio (LDR)	84.06927	147.0000	29.67000	22.19837
Capital Adequacy Ratio (CAR)	5.063455	7.350000	3.240000	0.889987

Source: Secondary data processed using EViews 12, 2026

Referring to the results presented in Table 1, the average Return on Assets (ROA) of 1.472000 indicates moderate profitability, with a relatively high standard deviation of 1.172759, reflecting the heterogeneity of performance among banks during the study period. The minimum ROA value of -1.750000 for the “ ” indicates that some banks incurred losses in certain years, consistent with the consequences of the global health crisis on 2020.

With an average figure of 2.583273, the Non Performing Loan (NPL) ratio stays under the OJK benchmark (5%), showing that problematic loan conditions among the observed banks are relatively under control; however, the peak value of 5.690000 reveals that certain banks are approaching the risk threshold for non performing loans.

The mean score recorded for the LDR indicator amounts to 84.06927, signifying that banks are generally capable of allocating third party funds through credit facilities. The highest value of 147.0000, the lowest value of 29.67000, and the substantial standard deviation of 22.19837 indicate disparities in liquidity positions and loan distribution among banks during the research period.

The Capital Adequacy Ratio (CAR) variable exhibits a average score of 5.063455, highest observation of 7.350000, lowest observation of 3.240000, and variability measure of 0.889987. Such values suggest the presence of capital adequacy variation among banks, indicated by a comparatively smaller standard deviation relative to other variables.

4.2 Results of the Panel Data Regression Model Selection Chow Test

Table 2. Results of the Chow Test

Effects Test	Statistic	d.f.	Prob.
Cross-section F	14.520552	(22.84)	0.0000
Cross-section Chi-square	172.616517	22	0.0000

Source: Secondary data processed using EViews 12, 2026

According to Table 2, the Chow assessment yields a cross-sectional F significance level of 0.0000. Because it falls below 0.05, H_0 cannot be accepted. Consequently, the Fixed Effects Model (FEM) provides a better choice compared with the Common Effects Model (CEM). The outcomes imply that variations in the characteristics of banking companies must be accommodated within the panel data regression framework.

4.3 Hausman Test

Table 3. Results of the Hausman Test

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	6.120038	3	0.1059

Source: Secondary data processed using EViews 12, 2026

According to according to Table 3, the Hausman procedure reveals that the random cross-section probability effect is 0.1059. Since the figure is above the significance threshold of 0.05, H_0 is accepted. Consequently, the stochastic-effects specification is selected instead of the fixed-effects approach. The results suggest that differences among company characteristics are more appropriately classified under random effects.

4.4 Lagrange Multiplier Test

Table 4. Results of the Lagrange Multiplier Test

Test	Cross-section	Time	Both
Breusch-Pagan	94.93625	0.871535	95.80778
Prob.	0.0000	0.3505	0.0000

Source: Secondary data processed using EViews 12, 2026

According to Table 4, the Lagrange Multiplier test generates Breusch Pagan probability values of 0.0000 for the cross section and 0.0000 for both. Since the obtained values are less exceeds the 0.05 threshold, leading to the rejection of H_0 . Therefore, the Random Effects approach is regarded as a better alternative than the Common Effect Model (CEM). The results further confirm that the common effects model is insufficient for accurately analyzing panel data regression.

Table 5. Summary of Panel Data Regression Model Selection Results

Test Type	Probability Value	Criteria	Decision
Chow Test	0.0000	Prob. < 0.05	Fixed-Effects Model
Hausman Test	0.1059	Prob. > 0.05	Random Effects Model
Lagrange Multiplier Test	0.0000	Prob. < 0.05	Random Effects Model

Source: Secondary data processed using EViews 12, 2026

According to findings from panel data regression model assessment, the Chow test suggests the superiority of the Fixed Effects Model over the Common Effects Model. Moreover, the Hausman test indicates that the Random Effects approach provides a better fit than the Fixed Effects specification. Support for these outcomes is provided by the Lagrange Multiplier procedure reveals that the Random Effects specification outperforms the Common Effects approach. Accordingly, REM is selected for analysis.

4.5 Classical Assumption Tests

a. Normality Test

Table 6. Results of the Normality Test

Description	Value
Jarque-Bera	0.579528
Probability	0.748440
Observations	110

Source: Secondary data processed using EViews 12, 2026

Referring to Table 6, the normality examination yields a Jarque-Bera probability score of 0.748440. Because the value is above 0.05, the residual distribution may be considered normal. Accordingly, the estimated equation satisfies the requirement of normally distributed residuals.

b. Multicollinearity Test

Table 7. Results of the Multicollinearity Test

Variable	Centered VIF
Non-Performing Loan (NPL)	1.027
Loan-to-Deposit Ratio (LDR)	1.002
Capital Adequacy Ratio (CAR)	1.029

Source: Secondary data processed using EViews 12, 2026

Table 7 shows VIF figures of 1.027 for NPL, 1.002 for LDR, and 1.029 for CAR. Every VIF value falls below the benchmark of 10. Accordingly, no indication of multicollinearity is detected within the regression model. This signifies that the explanatory variables do not possess highly correlated linear connections among themselves.

c. Heteroscedasticity Test

Table 8. Heteroscedasticity Test Results

Test Type	Likelihood Ratio	d.f.	Probability
Panel Cross-Section Heteroskedasticity LR Test	72.66429	23	0.0000
Panel Period Heteroskedasticity LR Test	2.896360	23	1.0000

Source: Secondary data processed using EViews 12, 2026

As reported in Table 8, the probability obtained from the Panel Cross-Section Heteroskedasticity LR Test equals 0.0000. Since the result is below the 0.05 significance criterion, heteroskedasticity is present in the regression model. Meanwhile, the Panel Period Heteroskedasticity LR assessment yields a probability score of 1.0000, indicating that there is no heteroskedasticity based on the period. Since there is an indication of heteroskedasticity in the cross-section, the final estimation is performed using robust standard errors.

d. Autocorrelation Test

Table 9. Autocorrelation Test Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RESID_1	0.817196	0.065461	12.48365	0.0000

Source: Secondary data processed using EViews 12, 2026

Table 9 reveals that the lagged residual regression approach produces a probability value of 0.0000 for RESID_1. Given that the figure is less than 0.05, the estimated model exhibits indications of serial correlation. Consequently, the final estimation should apply robust standard errors to obtain more dependable testing outcomes.

4.6 Estimation Results Using Robust Standard Errors

Table 10. Panel Data Regression Results Using Robust Standard Errors

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.926228	0.697451	2.761811	0.0114
Non-Performing Loans (NPL)	-0.508071	0.097394	-5.216633	0.0000
Loan-to-Deposit Ratio (LDR)	-0.001372	0.006254	-0.219392	0.8284
Capital Adequacy Ratio (CAR)	0.196793	0.048271	4.076835	0.0005

Source: Secondary data processed using EViews 12, 2026

As presented in Table 10, empirical outcomes generated by the Random Effects specification using robust standard errors demonstrate that NPL negatively and significantly affects ROA. Evidence for this result can be identified through the estimated parameter magnitude of -0.508071 together with a p-value of 0.0000. The LDR variable records an estimated parameter of -0.001372 with a significance probability of 0.8284, indicating an insignificant relationship with ROA. On the other hand, CAR shows a parameter estimate of 0.196793 with a probability value of 0.0005, indicating a statistically positive influence on ROA.

4.7 Panel Data Regression Analysis

Table 11. Panel Data Regression Estimation Results

Variable	Coefficient	Std. Error
C	1.926228	0.697451
Non-Performing Loans (NPL)	-0.508071	0.097394
Loan-to-Deposit Ratio (LDR)	-0.001372	0.006254
Capital Adequacy Ratio (CAR)	0.196793	0.048271

Source: Secondary data processed using EViews 12, 2026

The panel data regression estimation employing the Random Effects Model and robust standard errors yields the following regression equation:

$$\text{ROA} = 1.926228 - 0.508071 \text{ NPL} - 0.001372 \text{ LDR} + 0.196793 \text{ CAR} + \epsilon$$

The intercept value of 1.926228 suggests an estimated ROA of 1.926228 when NPL, LDR, and CAR are fixed. Furthermore, the NPL the estimated parameter of -0.508071 indicates that a one-unit rise in NPL lowers ROA by 0.508071 under the assumption that the remaining variables do not change. An LDR coefficient of -0.001372 reflects a tendency for ROA to decrease by 0.001372 following a one-unit increase in LDR, provided the other variables remain fixed. Conversely, the coefficient of CAR amounting to 0.196793 indicates that ROA increases by 0.196793 for every one-unit increase in CAR when the remaining variables are held constant.

4.8 Hypothesis Testing and Discussion

a. T-Test

Table 11 . T-Test Results

Variable	Coefficient	t-Statistic	Prob.	Notes
Non-Performing Loan (NPL)	-0.508071	-5.216633	0.0000	Significant
Loan-to-Deposit Ratio (LDR)	-0.001372	-0.219392	0.8284	Not significant
Capital Adequacy Ratio (CAR)	0.196793	4.076835	0.0005	Significant

Source: Secondary data processed using EViews 12, 2026

1) The Effect of Non-Performing Loans (NPL) on ROA

As presented in Table 12, the Non-Performing Loan (NPL) indicator demonstrates a probability score of 0.0000. Since this figure is under 0.05, NPL negatively and significantly affects ROA. The coefficient direction reveals that greater levels of problematic financing are associated with lower banking profitability. Such a situation emerges as growth in non performing loans weakens interest earnings and elevates allowances for loan losses. The evidence supports risk return theory, explaining that escalating credit risk leads to reduced returns. In addition, the obtained evidence conforms to financial intermediation theory, emphasizing the importance of banks as facilitators between savers and borrowers less effective as credit quality worsens. [25], [27] This research reinforces the conclusions in previous research, indicating a significant negative impact of NPL on bank profitability. Accordingly, the first hypothesis is confirmed.

2) The Effect of the Loan-to-Deposit Ratio (LDR) on ROA

The significance probability for the Loan to Deposit Ratio (LDR) reaches 0.8284. Since it exceeds 0.05, LDR does not exert a statistically meaningful influence on ROA statistically significant. These outcomes imply that expanding loan distribution relative to public funds may not consistently raise bank profits. This may occur if credit disbursement is not accompanied by good credit quality or fails to generate optimal interest income.

This aligns with the argument put forward in previous studies on the dynamics of liquidity-credit risk, which states that lending will not yield optimal returns if there are constraints related to asset quality[29]. The outcomes of this investigation align with previous empirical evidence and the econometric evidence, which confirm that banking liquidity expansion does not always increase profitability in a linear manner[29], [34]. Thus, the second hypothesis is rejected.

3) The Effect of the Capital Adequacy Ratio (CAR) on ROA

The Capital Adequacy Ratio (CAR) variable records a p value of 0.0005. Given that this figure is under 0.05, CAR shows a significant positive relationship with ROA. The coefficient suggests that profitability rises alongside stronger capital adequacy. Sufficient capital enables banks to withstand risk, broaden operational activities, and strengthen market trust. These findings correspond to the evidence reported in previous research [25], [30], showing that CAR significantly enhances banking profitability. Hence, the third hypothesis is confirmed.

b. F-Test

Table 12 . F-Test Results

Description	Value
F-statistic	25.92113
Prob(F-statistic)	0.000000

Source: Secondary data processed using EViews 12, 2026

As shown in Table 13, the F test produces a Prob(F statistic) value of 0.000000. Since the value is lower than 0.05, NPL, LDR, and CAR simultaneously affect ROA in a significant

manner. These findings demonstrate that credit exposure, liquidity position, and capital adequacy collectively explain variations in bank profitability.

c. Coefficient of Determination Test

Table 13 . Results of the Coefficient of Determination Test

Notes	Value
R-squared	0.423171
Adjusted R-squared	0.406846

Source: Secondary data processed using EViews 12, 2026

Table 14 shows an Adjusted R squared value of 0.406846. This means that 40.68% of ROA fluctuations can be attributed to NPL, LDR, and CAR. Meanwhile, 59.32% of the variation is associated with external variables not incorporated in the model, such as BOPO, Net Interest Margin (NIM), company scale, interest rates, inflation, and managerial aspects.

5. Conclusions

This research examines the influence of NPL, LDR, and CAR on ROA among 23 banking institutions registered on the Indonesia Stock Exchange (IDX) during 2020–2024 through the REM EGLS approach using 110 observations. The findings establish a significant inverse association between Non-Performing Loans (NPL) and Return on Assets (ROA), identifying NPL as the dominant explanatory variable. Growth in nonperforming loans diminishes profitability because interest earnings decline while reserve expenses increase. The Loan to Deposit Ratio (LDR) is not significantly related to ROA. Under post pandemic economic conditions, expanding credit distribution alone cannot ensure profitability unless supported by sound credit quality oversight. On the other hand, the Capital Adequacy Ratio (CAR) demonstrates a significant positive impact on ROA. Sufficient capital improves resilience against risk and facilitates broader business opportunities. Greater capital adequacy enables banks to achieve higher profits. Jointly, NPL, LDR, and CAR have a statistically meaningful influence on ROA, as indicated by a Prob (F-statistic) of 0.000000, which falls below the 5 percent threshold criterion. Moreover, the Adjusted R Squared value of 0.406846 suggests that approximately 40.68% of changes in banking profitability are accounted for by NPL, LDR, and CAR, while the remaining 59.32% results from other determinants outside the proposed model.

Implications

Theoretically, this study confirms the validity of the Risk-Return Theory and Signaling theoretical perspective within Indonesia's banking sector after the pandemic period. The non-significance of LDR adds a new perspective to the Financial Intermediation Theory, demonstrating that the intermediation function does not automatically increase profitability without maintaining credit quality. From a managerial perspective, bank management needs to shift its paradigm from quantity-based (volume-driven) credit expansion to a quality-oriented (quality-driven) approach. Investments in early-warning systems for non-performing loans and capital strengthening are strategies that have been empirically proven to increase ROA. These findings also have policy implications. They support the OJK's policy direction of maintaining strict CAR requirements and strengthening credit quality supervision following the end of the POJK restructuring relaxation period.

Limitations and Recommendations

This study has several limitations. First, the model includes only three variables that explain 40.68% of the variation in ROA; factors such as BOPO, NIM, and macroeconomic variables have not been included. Second, the sample focuses exclusively on conventional banking institutions publicly traded on the Indonesia Stock Exchange (BEI). Third, the use of annual data does not capture the dynamics of performance changes over shorter intervals. Given this, the following areas for further research are suggested: (1) adding the variables BOPO, NIM, bank size, inflation, and the BI Rate; (2) expanding the sample to include

Islamic banks and rural banks (BPR); (3) using quarterly data; (4) applying the Generalized Method of Moments (GMM) to address possible endogeneity concerns; and (5) testing the nonlinear relationship between CAR or NPL and ROA.

References

- [1] A. Kinanti and A. Putra, "Pengaruh NPL, LDR, dan CAR terhadap ROA pada Bank Umum Konvensional," *J. Pendidik. Tambusa*, vol. 8, no. 1, pp. 16482–16493, 2024.
- [2] U. Luthfiana Afifah, "Organizational Citizenship Behavior Islamic Perspective (OCBIP) pada Organisasi Tidak Berbasis Islam," *J. Ilm. Ekon. Islam*, vol. 7, no. 02, pp. 999–1007, 2021.
- [3] "Laporan Kelembagaan Bank Indonesia Triwulan III - 2025." Accessed: May 29, 2026. [Online]. Available: <https://www.bi.go.id/id/publikasi/laporan/Pages/LKBI-Tw.III-2025.aspx>
- [4] F. Fauziah and I. W. Ningsih, "Optimizing firm value : insights," 2025, doi: 10.1108/JEAS-02-2025-0104.
- [5] N. Grilseda and S. Riyadi, "Pengaruh CAR, LDR, KAP dan NPL terhadap ROA Bank Go Public yang terdaftar di BEI," *J. Ilmu Manaj.*, vol. 11, no. 1, p. 53, 2021, doi: 10.32502/jimn.v11i1.3252.
- [6] Q. T. T. Nguyen, L. T. H. Ho, and D. T. Nguyen, "Digitalization and bank profitability: evidence from an emerging country," *Int. J. Bank Mark.*, vol. 41, no. 7, pp. 1847–1871, 2023, doi: 10.1108/IJBM-03-2023-0156.
- [7] D. Prawitasari, A. Kadarningsih, Z. Machmuddah, and M. Ud-Din, "Internal company factors as determining variables for improving bank lending," *J. Asian Financ. Econ. Bus.*, vol. 7, no. 8, pp. 205–212, 2020, doi: 10.13106/JAFEB.2020.VOL7.NO8.205.
- [8] J. Christopher Chandra, A. Elvina Putri, A. Zefania Ongko, and E. Tiur Manurung, "The Effect of Non-Performing Loan (NPL) on Net Income at PT Bank Central Asia Tbk," *Account.*, vol. 12, no. 1, pp. 2610–2616, 2025, doi: 10.32722/account.v12i1.7547.
- [9] E. F. Brigham and J. F. Houston, *Fundamentals of Financial Institution Management*. Cengage Learning, 2019.
- [10] A. Al Zafir and G. M. Sudarjah, "Credit risk, COVID, and bank profitability in Indonesian conventional banks," *Econ. Financ. Bus. Rev.*, vol. 2, no. 2, pp. 78–87, 2025, doi: 10.20885/efbr.vol2.iss2.art2.
- [11] dan Sofia Prima Dewi, "Clarissya dan Dewi: Faktor-Faktor yang Memengaruhi Kinerja Keuangan. FAKTOR-FAKTOR YANG MEMENGARUHI KINERJA KEUANGAN," *J. Multiparadigma Akunt.*, vol. VI, no. 2, pp. 849–860, 2024.
- [12] X. Freixas and J.-C. Rochet, "Microeconomics of Banking," *MIT Press*, no. December, p. 363, 2008, [Online]. Available: http://www.nccr-finrisk.uzh.ch/media/pdf/tablecontentsSECONDEDITION_MicroeconomicsOfBanking.pdf
- [13] E. Winarso, R. Gunanta, and Y. H. Prayitno, "Analisis Non Performing Loan (NPL) dan Loan to Deposit Ratio (LDR) Terhadap Kinerja Bank Perkreditan Rakyat (BPR) di Kota Bandung," *J. Accounting, Financ. Taxation, Audit.*, vol. 2, no. 1, pp. 67–88, 2020, doi: 10.28932/jafta.v2i1.2942.
- [14] F. Abi and M. Zuhri, "Financial Performance And Its Implications On The Profitability Of Banks Listed On The Indonesia Stock Exchange (IDX) 2018 - 2022," vol. 2, no. 1, pp. 50–67, 2026.
- [15] P. O. William Scott, *No Title*, 8th, berilus ed. Pearson, 2019, 2019.
- [16] Nazariyah Syafi, Roni Mukhammad, and kusriini nurul azizah ria, "Pengaruh Manajemen Risiko Dengan Good Corporate Governance," *J. Islam. Bank.*, vol. 2, pp. 24–54, 2021.
- [17] S. Bhattacharya and A. V. Thakor, "Contemporary Banking Theory," *J. Financ. Intermediation*, vol. 3, no. 1, pp. 2–50, Oct. 1993, doi: 10.1006/JFIN.1993.1001.
- [18] P. S. R. and S. C. Hudgins, *Bank Management & Financial Services*. 2013.
- [19] P. K. Ozili, "Bank non-performing loans research around the world," *Asian J. Econ. Bank.*, vol. 9, no. 3, pp. 437–462, 2025, doi: 10.1108/ajeb-09-2024-0103.
- [20] M. Spence, "Job market signaling," *Q. J. Econ.*, vol. 87, no. 3, pp. 355–374, 1973, doi: 10.2307/1882010.
- [21] M. M. Ma'aji, C. Barnett, S. A. Bin-Nashwan, N. H. Roslan, and R. A. Ali, "Risk-driven profitability: the role of bank capital, liquidity and credit in frontier banking markets," *J. Financ. Regul. Compliance*, vol. 34, no. 1, pp. 60–80, 2025, doi: 10.1108/JFRC-01-2025-0008.
- [22] S. A. Admadja, S. W. Setyowati, A. Retnasari, and M. F. Irianto, "Pengaruh CAR, LDR Dan NPL Terhadap Profitabilitas (Studi Kasus Pada Bank yang Teraftar di Bursa Efek Indonesia Periode Tahun 2019-2022)," *J. Akunt. Neraca*, vol. 1, no. 2, pp. 24–34, 2023, doi: 10.59837/jan.v1i2.8.
- [23] I. W. W. G. P. T. Ni Luh Ayu Grahetha Tirta Dewi Suastra, "7.+2344-2361," *Emas*, vol. 4, pp. 10–10, 2023.
- [24] O. Gabriel, I. E. Victor, and I. O. Innocent, "Effect of Non-Performing Loans on the Financial Performance of Commercial Banks in Nigeria," *Am. Int. J. Bus. Manag. Stud.*, vol. 1, no. 2, pp. 1–9, 2019.
- [25] R. H. Eni Puji Astuti1, Rahmi Hermawati2, "Pengaruh Capital Adequacy Ratio, Non Perfirming Loan, Dan Loan To Deposit Ratio Terhadap Return On Asset," *Movere J.*, vol. 6, no. 2, pp. 243–254, 2024, doi: 10.53654/mv.v6i2.444.
- [26] C. B. Dhea Ayu Recita Dwi Putri. A1*), "Pengaruh Capital Adequacy Ratio (CAR), Non Performing Loan (NPL), Loan to Deposit Ratio (LDR) dan Net Interest Margin (NIM) Terhadap Return on Asset (ROA)," pp. 1015–1032, 2025.
- [27] S. Meidisari and Sugiyono, "Pengaruh ldr dan nim melalui npl terhadap profitabilitas bank umum," *J. Ilmu dan Ris. Manaj.*, vol. 7, no. 1, pp. 1–17, 2018, [Online]. Available: <http://jurnalmahasiswa.stesia.ac.id/index.php/jirm/article/view/15>
- [28] M. S. Pratama, "Pengaruh BOPO, LDR, CAR, dan NPL terhadap Profitabilitas Sektor Perbankan Indonesia," *I-Finance a Res. J. Islam. Financ.*, vol. 7, no. 1, pp. 43–55, 2021, doi: 10.19109/ifinance.v7i1.8189.
- [29] R. Mousa, J. Nabil, A. Safty, I. Hassan, and Y. Ibrahim, "Liquidity–credit risk dynamics and bank profitability: hybrid econometric and machine learning evidence from MENA," *J. Financ. Report. Account.*, pp. 1–27, 2025, doi: 10.1108/JFRA-04-2025-0291.
- [30] R. Hasan, H. Uddin, and M. D. Miah, "The effect of bank regulatory capital on the risk, efficiency and profitability: evidence from GCC countries," *Asian Rev. Account.*, vol. 33, no. 5, pp. 880–903, 2025, doi: 10.1108/ARA-10-2024-0326.
- [31] SUGIYONO, *Metode Penelitian kuantitatif, Kualitatif, dan Re&D*. Bandung: Alfabeta, 2022.

-
- [32] I. Ghozali, *Aplikasi analisis multivariate dengan program IBM SPSS 25 / Imam Ghozali*, Edisi 9. Semarang :Badan Penerbit Universitas Diponegoro, 2018., 2018.
- [33] D. C. P. Damodar N. Gujarati, *Basic Econometrics*. McGraw-Hill Irwin, 2009, 2009.
- [34] D. Rahmatullah and Kartini, "Role of Bank Profitability and Liquidity in Indonesia's Economic Growth: An Empirical Study on ROA, LDR, and CAR," *J. Ilm. Ekon. Glob. Masa Kini*, vol. 16, no. 2, pp. 102–114, 2025, doi: 10.36982/jiegm.v16i2.5885.