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Analysis Of The Effect Of Return On Assets And Reserve Requirements On Non Performing Loans Through Capital Adequacy Ratio As An Intervening Variable In Conventional Commercial Banks In Indonesia

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Abstract

Indonesia's banking sector plays an essential role in sustaining financial stability and supporting economic growth through credit allocation and risk supervision. This study examines the influence of Return on Assets (ROA) and Reserve Requirements on Non-Performing Loans (NPL), with the Capital Adequacy Ratio (CAR) acting as a mediating variable in conventional commercial banks in Indonesia during 2015–2025 using Partial Least Squares. The results indicate that ROA has a significant inverse effect on NPL, while Reserve Requirements and CAR show negative but insignificant relationships. ROA also has a positive yet weak connection to CAR, whereas Reserve Requirements negatively but insignificantly affect CAR. In addition, CAR cannot mediate the relationship between ROA, Reserve Requirements, and NPL. These findings suggest that financing quality is more strongly determined by internal managerial performance than by liquidity regulation or solvency policy.

Keywords: Return on Assets, Reserve Requirements, Capital Adequacy Ratio, Non-Performing Loans, Banking.

INTRODUCTION

Within the national financial framework, banking institutions function as crucial financial channels by mobilizing community savings and reallocating those resources into lending activities across various sectors (Almi and Aziz, 2023). Credit distribution is considered one of the key drivers of economic growth because it supports production,

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consumption, and investment activities (Desiyanti, 2024). However, credit disbursement activities are also inseparable from various risks, especially credit risks reflected in the Non-Performing Loan ratio. The high NPL level indicates a decline in credit quality which can have an impact on overall banking performance and stability (Sudarmanto *et al.*, 2021).

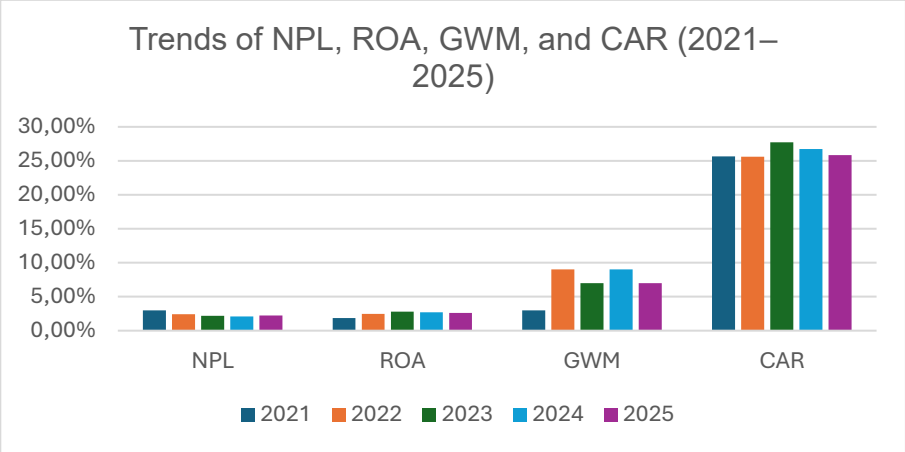


Figure 1. Trends of NPL, ROA, GWM, and CAR (2021–2025)
Source : OJK, 2025 (Data Processed)

Over the past several years, Non-Performing Loans (NPL) within Indonesia's conventional commercial banks have shown inconsistent patterns. Statistics issued by the Financial Services Authority revealed that NPL proportions gradually improved from 2021 through 2024 before reversing upward in 2025 (OJK, 2025). The rising level of Non-Performing Loans (NPL) reflects growing challenges in problematic credit management and highlights the need to identify the factors causing declining loan quality.

In assessing banking resilience, ROA and CAR are widely recognized as major indicators that may shape exposure to Non-Performing Loans (NPL) risk. Higher ROA is expected to reduce NPL levels (Ompusunggu and Wage, 2021), Conversely, capital adequacy reflects how effectively a banking institution can absorb potential threats while preserving overall monetary soundness (Oppusunggu and Allo, 2021).

In addition, the Reserve Requirement (GWM) policy also affects bank liquidity and credit distribution (Syarifuddin and Sakti, 2021). During 2021–2025, ROA, GWM, and CAR experienced fluctuations alongside changes in NPL levels, indicating a complex relationship among profitability, liquidity policy, capital adequacy, and credit risk. CAR is therefore suspected to act as an intervening variable between ROA, GWM, and NPL (Munthe *et al.*, 2025).

Earlier empirical findings have shown inconsistent conclusions concerning the interaction among ROA, Reserve Requirements, CAR, and NPL. A number of prior

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analyses demonstrate that higher ROA is associated with lower NPL exposure, suggesting that banks with better earnings efficiency are generally more capable of minimizing credit risk (Permatasari and Susilo, 2023). Meanwhile, research on the Minimum Reserve Requirement (GWM) shows that its influence on banking performance and credit risk is not always significant (Maulana *et al.*, 2023).

In addition, the effect of CAR on NPL also remains inconsistent, as some studies reported a significant relationship while others found no significant effect depending on banking conditions and the research period (Fachrurrozie *et al.*, 2025). These differences indicate that the relationship among these variables still requires further analysis, especially in the context of Indonesia's banking sector, which continues to experience changing economic and financial conditions.

Objectives

This research is designed to investigate how Return on Assets (ROA) and Reserve Requirements influence Non-Performing Loans (NPL) within Indonesia's conventional banking industry by positioning the Capital Adequacy Ratio (CAR) as an intermediary mechanism. More specifically, the analysis explores both immediate and mediated interactions among these determinants through partial as well as comprehensive assessment. In addition, the study seeks to determine the extent to which CAR contributes to shaping NPL risk transmission. The expected outcomes are intended to enrich scholarly discourse in banking economics while providing practical references for financial institutions and policymakers in strengthening monetary system resilience.

LITERATUR VIEW

Financial Intermediation Theory

Financial Intermediation Theory explains that banking institutions operate as financial distributors that connect parties with excess funds to those requiring capital within resource allocation activities. Through this mechanism, financial resources obtained from society as savings instruments are subsequently transformed into financing facilities for productive activities across multiple economic fields. In carrying out this role, banks also manage risks, particularly credit risk, since ineffective credit distribution may lead to non-performing loans (NPL). Therefore, proper management of profitability, liquidity, and capital adequacy is essential. Indicators such as ROA, Minimum Reserve Requirements (GWM), and CAR are important for assessing the effectiveness and stability of banking intermediation (Diamond, Bernanke and Dybvig, 2022).

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Non-Performing Loans (NPL)

NPL serve as a key benchmark for assessing the magnitude of credit risk encountered by banking institutions. This indicator represents the proportion of distributed credit experiencing repayment obstacles, including both principal and interest obligations. Elevated NPL levels generally signal weakening credit quality and increase the possibility of financial losses for banks (Sudarmanto *et al.*, 2021).

Return on Assets (ROA)

ROA represents a financial performance measure that evaluates how effectively a bank generates earnings from its total assets. Higher ROA reflects more efficient asset utilization and superior operational management. In addition, improved profitability often illustrates a stronger ability to suppress Non-Performing Loans (NPL) and maintain healthier credit quality (Ompusunggu and Wage, 2021).

Reserve Requirements (GWM)

Reserve Requirements (GWM) is a monetary policy instrument that requires banks to place a certain amount of funds with the central bank. This policy aims to control banking liquidity. An increase in the reserve requirement can tighten liquidity and limit credit disbursement, while a decrease in the reserve requirement provides greater room for credit expansion (Fahirah *et al.*, 2024).

Capital Capital strength adequacy functions as an indicator for evaluating whether a banking institution possesses enough financial reserves to cover potential exposure arising from operational and credit-related uncertainties (Oppusunggu and Allo, 2021).

METHODOLOGY

Research Location

This investigation was carried out within Indonesia's banking environment, with primary attention directed toward conventional commercial banking institutions over the 2015–2025 observation horizon.

Data Sources and Data Types

The research employs annual secondary time-series data consisting of ROA, Reserve Requirements, CAR, and NPL. The data were obtained from authorized institutions, including OJK, Bank Indonesia, and published annual reports of conventional commercial banks. These datasets are used to examine how profitability performance, liquidity regulation, and capital resilience contribute to credit risk exposure within Indonesia's banking sector.

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Data Analysis

Multiple Linear Regression Analysis

To assess the interaction between multiple explanatory variables and Non-Performing Loans (NPL), this study applied multivariable regression modeling. Statistical processing was performed using SmartPLS 4 to verify the proposed hypotheses and measure both simultaneous and partial relationships among the examined variables. The analytical model utilized in this research is expressed through the following mathematical framework:

$$NPL = \beta_0 + \beta_1 ROA + \beta_2 GWM + \varepsilon$$

RESEARCH RESULTS AND DISCUSSION

Analysis and Results of Determining Factors of Non-Performing Loans (NPL) in Conventional Commercial Banks in Indonesia

Normality Test

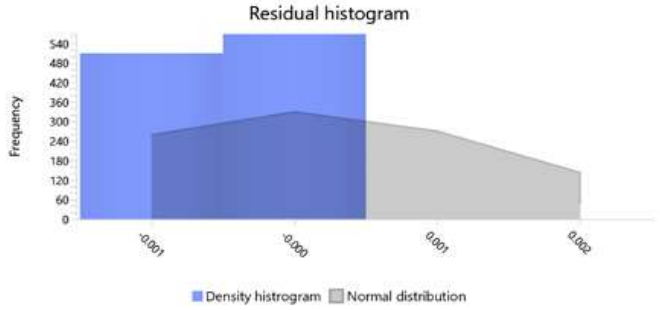


Figure 2. Normality Test

Source: Data processed Output SmartPLS, 2026

The residual distribution demonstrates a balanced, mound-like curve on the histogram, indicating a symmetrical pattern that confirms compliance with distributional requirements. Accordingly, the estimation framework fulfills the required standard for distribution consistency.

Multicollinearity Test

Table 1. Multicollinearity Test

Variabel	VIF
ROA	1,755
GWM	1,755

Source: Data processed Output SmartPLS, 2026

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The intercorrelation evaluation reveals that profitability and reserve obligation variables each record a VIF score of 1.755, remaining far beneath the maximum threshold of 10. These values confirm that no excessive correlation exists between explanatory components, indicating that the statistical framework is appropriate for advanced examination.

Heteroscedasticity Test

Table 2. Heteroscedasticity Test

Breusch-Pagan Test	Test-Statistic	df	P Value
	0,584	2	0,747

Source: Data processed Output SmartPLS, 2026

The Breusch–Pagan examination produced a significance score of 0.747, exceeding the 0.05 benchmark, which confirms that variance inconsistency is not detected within the estimation structure. Thus, the analytical framework satisfies the equal variance requirement.

Autocorrelation Test

Table 3. Autocorrelation Test

	NPL (Y)
R-Square	0,871
R-Square Adjusted	0,839
Durbin Watson Test	1,101

Source: Data processed Output SmartPLS, 2026

The Durbin–Watson statistic of 1.101 reflects an indication of positive sequential correlation within the estimation output. On the other hand, the explanatory strength measurement reached 0.871, demonstrating that the constructed framework accounts for 87.1% of fluctuations in problematic financing, which signifies substantial predictive strength.

Hypothesis Test

Coefficient Determination Test

Table 4. Coefficient Determination Test

	NPL (Y)
R-Square	0,871
R-Square Adjusted	0,839
Durbin Watson Test	1,101

Source: Data processed Output SmartPLS, 2026

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The coefficient of determination of 0.871 indicates that Return on Assets (ROA) and Reserve Requirements contribute 87.1% to variations in Non-Performing Loans (NPLwhile the other 12.9% is affected by variables beyond the scope of the model examined. Furthermore, the adjusted coefficient of determination of 0.839 confirms that, after adjustment, the model remains capable of explaining 83.9% of the variation in NPL.

Test F

Table 5. F Test

	Sum Square	df	Mean Square	F	P Value
Total	0,000	10	0,000	0,000	0,000
Error	0,000	8	0,000	0,000	0,000
Regression	0,000	2	0,000	27,087	0,000

Source: Data processed Output SmartPLS, 2026

The simultaneous significance test generated a probability value of 0.000, indicating that Return on Assets (ROA) and Reserve Requirements collectively demonstrate a statistically meaningful influence on NPL.

T Test

Table 6. T test

Variabel	Unstandardized coefficient	Standardized Coefficients	SE	T Value	P Value	2,5%	97,5%
ROA	-0,788	-0,846	0,156	5,034	0,001	-1,142	-0,434
GWM	-0,026	-0,126	0,034	0,751	0,472	-0,104	0,052
Intercept	0,046	0,000	0,003	16,190	0,000	0,039	0,052

Source: Data processed Output SmartPLS, 2026

According to the statistical estimation output, the formulated multivariable equation is presented as follows:

$$NPL = 0.046 - 0.788\,ROA - 0.026\,GWM$$

The findings reveal that ROA exerts a negative and statistically significant effect on NPL, indicating that higher profitability tends to reduce the degree of credit distress. In contrast, Reserve Requirements display a negative but statistically insignificant effect, suggesting that liquidity policy does not substantially influence NPL conditions.

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Additionally, the intercept component demonstrates statistical significance within the estimation model.

Path Analysis

Table 7. Path Analysis

Variabel	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
CAR → NPL	-0,194	-0,233	0,776	0,250	0,803
GWM → CAR	-0,112	-0,037	0,455	0,246	0,806
GWM → NPL	-0,148	-0,212	0,749	0,197	0,844
ROA → CAR	0,397	0,335	0,378	1,050	0,296
ROA → NPL	-0,769	-0,848	0,172	4,474	0,000

Source: Data processed Output SmartPLS, 2026

The empirical findings demonstrate that the CAR exerts a negative but statistically insignificant effect on NPL, reflected by a coefficient of −0.194 and a p-value of 0.803, which exceeds the accepted significance level. In addition, Reserve Requirements show a negative but insignificant relationship with CAR, as indicated by a coefficient of −0.112 and a p-value of 0.806. A similar pattern appears in the relationship between Reserve Requirements and NPL, where the coefficient of −0.148 with a p-value of 0.844 confirms a weak explanatory contribution. Conversely, Return on Assets (ROA) exhibits a positive but statistically insignificant relationship with CAR, represented by a coefficient of 0.397 and a p-value of 0.296. However, ROA demonstrates a strong negative and statistically significant effect on NPL, as reflected by a coefficient of −0.769 and a p-value below the accepted significance threshold.

The Effect of Return on Assets on Non-Performing Loans

The analytical results confirm that ROA has a negative and significant effect on NPL, with a coefficient of −0.788 and a p-value of 0.001. These findings indicate that higher profitability is consistently associated with lower levels of NPL. A higher ROA reflects better asset management, more effective credit allocation, and stronger implementation of prudential banking principles. Banks with high profitability are generally more selective in distributing credit and more capable of managing credit risk, thereby reducing the possibility of loan defaults. Conversely, banks with lower profitability tend to face greater challenges in maintaining credit quality.

From the perspective of financial intermediation theory, banks not only function as intermediaries but also as monitoring institutions that supervise borrowers to minimize credit risk. Banks with strong profitability usually possess better systems for credit analysis, borrower monitoring, and internal control, enabling them to detect potential

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credit problems earlier and implement preventive measures. These findings are consistent with previous studies conducted by (Permatasari and Susilo, 2023) Permatasari and Susilo (2023) and (Loang, Ahmad and Naveenan, 2022), which state that ROA has a significant effect on NPL. Higher profitability reflects more efficient operational performance and stronger risk management practices, which contribute to healthier credit quality and lower NPL exposure.

The Effect of Minimum Reserve Requirements on Non-Performing Loans

The statistical evaluation demonstrates that Reserve Requirements have a negative relationship with Non-Performing Loans (NPL), reflected by a coefficient of −0.026 and a p-value of 0.472, indicating that the relationship is not statistically significant. This suggests that tighter reserve policies may be associated with lower NPL levels, but the effect is too weak to meaningfully explain variations in credit distress. Therefore, liquidity regulation through Reserve Requirements does not appear to have a substantial direct influence on NPL conditions within banking institutions.

Conceptually, Reserve Requirements are monetary policy instruments used to regulate banking liquidity rather than credit quality. Credit quality is more strongly influenced by internal bank factors such as credit analysis, prudential banking principles, and risk management, as well as external factors including economic conditions and borrowers' repayment capacity. These findings are consistent with previous studies conducted by (Fajriati, Chaidir and Yudha, 2022) and (Banna, Munandar and Mutmainah, 2025), which reported that Reserve Requirements do not have a significant effect on NPL. This is because Reserve Requirements primarily function as instruments for liquidity control and financial system stability, making their relationship with credit risk relatively weak.

The Effect of Return on Assets on Non-Performing Loans through Capital Adequacy Ratio as an Intervening Variable

The statistical findings reveal that ROA does not have a significant effect on the CAR, as demonstrated by a coefficient value of 0.397 with a p-value of 0.296. In the same manner, CAR fails to exert a significant influence on Non-Performing Loans (NPL), as evidenced by a coefficient of −0.194 and a p-value of 0.803. Although the relationship between CAR and NPL is negative, its explanatory contribution remains weak. In contrast, ROA demonstrates a direct negative and highly significant effect on NPL, as shown by a coefficient of −0.769 and a p-value far below the accepted significance level, indicating that higher profitability is associated with lower NPL levels.

These findings suggest that CAR is unable to mediate the relationship between ROA and NPL because ROA does not significantly affect CAR, and CAR also does not

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significantly influence NPL. This indicates that the effect of ROA on NPL occurs directly rather than through CAR as an intervening variable. From a theoretical perspective, higher profitability reflects better asset management, credit selection, and monitoring processes, which directly contribute to lower credit risk. Meanwhile, CAR primarily functions as a capital buffer to absorb risk rather than as a determinant of credit quality. These results are consistent with previous studies conducted by (Permatasari and Susilo, 2023), (Matanubun and Wiyarni, 2023), and (Maulana and Salim, 2025), which state that ROA significantly affects NPL, whereas CAR does not have a significant effect and cannot act as an intervening variable. Therefore, the relationship between ROA and NPL is predominantly direct, with CAR providing only limited mediating influence.

The Effect of Reserve Requirements on Non-Performing Loans through Capital Adequacy Ratio as an Intervening Variable

The empirical results demonstrate that Reserve Requirements do not have a significant effect on the CAR, as reflected by a coefficient of −0.112 and a p-value of 0.806. Likewise, CAR also does not show a significant effect on NPL, indicated by a coefficient of −0.194 and a p-value of 0.803. Similarly, Reserve Requirements have a negative but statistically insignificant direct effect on NPL, as demonstrated by a coefficient of −0.148 and a p-value of 0.844. These findings indicate that changes in reserve policy do not substantially influence capital resilience or NPL conditions.

Based on the overall estimation results, CAR cannot function as an intervening variable in the relationship between Reserve Requirements and NPL because neither the relationship between Reserve Requirements and CAR nor the relationship between CAR and NPL shows significant statistical support. Conceptually, Reserve Requirements mainly function as a monetary policy instrument used to regulate banking liquidity, whereas credit quality is more strongly influenced by internal bank factors, including the quality of credit analysis, accuracy of debtor selection, and effectiveness of supervisory control. Consequently, the relationship between Reserve Requirements and NPL remains relatively weak, both directly and indirectly through CAR. These findings are consistent with previous studies conducted by (Fajriati, Chaidir and Yudha, 2022), (Maulana *et al.*, 2023), (Cendani and Puspitasari, 2025), and (Matanubun and Wiyarni, 2023), which emphasize that Reserve Requirements provide limited influence on NPL and that CAR does not effectively function as an intervening variable.

Comparison of Direct and Indirect Effects of Return on Assets and Reserve Requirements on Non-Performing Loans through Capital Adequacy Ratio

The analytical findings reveal that ROA demonstrates a substantially stronger direct effect on NPL than its indirect effect through the CAR. The statistically significant

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direct relationship confirms that higher profitability directly contributes to the reduction of NPL levels. In contrast, the indirect effect through CAR remains relatively weak because CAR does not provide significant explanatory power over NPL conditions. Therefore, the influence of ROA on NPL predominantly occurs through a direct mechanism rather than through CAR as an intervening variable.

Conversely, Reserve Requirements demonstrate neither a significant direct effect nor an indirect effect on NPL. Reserve Requirements do not significantly contribute to CAR, and CAR likewise fails to provide significant explanatory power over NPL, indicating a minimal mediating role. From the perspective of financial intermediation theory, credit quality is primarily determined by a bank's capability in evaluating borrowers, supervising lending activities, and controlling credit risk exposure, while Reserve Requirements mainly function as instruments for liquidity stabilization. These findings are consistent with previous studies conducted by (Rahmawati and Pratiwi, 2025) and (Maharani and Trishananto, 2025), which suggest that the mediating role of CAR is limited and not consistently effective across different variable relationships. CAR may function as a mediating variable only under certain conditions, depending on the type of risk involved.

CONCLUSIONS AND RECOMMENDATIONS

According to the analysis results, the financial condition of conventional commercial banks in Indonesia throughout 2015–2025 experienced fluctuating movements, where ROA was found to have a negative and significant influence on NPL, indicating that increased profitability may contribute to lowering credit risk. Meanwhile, Reserve Requirements (GWM) and CAR have negative but insignificant effects on NPL. In addition, ROA and GWM also have insignificant effects on CAR, indicating that CAR is unable to mediate the relationship between ROA, GWM, and NPL.

Practically, banks are expected to improve profitability and strengthen credit risk management to maintain credit quality. Regulators are also expected to implement adaptive Reserve Requirement policies to maintain liquidity stability. Future studies are recommended to include additional variables and broader research objects for more comprehensive results.

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