

ANALYSIS OF FACTORS INFLUENCING NON-PERFORMING LOANS IN BANKS LISTED ON THE INDONESIA STOCK EXCHANGE

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ABSTRACT

Non-performing loans (NPLs) represent a systemic risk that threatens financial stability and the efficiency of capital allocation. Therefore, identifying their determinants is essential for the Indonesian banking system. This study aims to analyze the factors affecting non-performing loans in Indonesian banks. Secondary data were obtained from the annual reports of banks listed on the Indonesia Stock Exchange during the 2021–2025 period. The sample consisted of 44 banks, resulting in 220 observations selected using purposive sampling. The data were analyzed using dynamic panel data regression with EViews software. The independent variables included Return on Assets (ROA), Capital Ratio (CAP), Credit Growth, GDP Growth Rate, Inflation Rate, Lagged NPL Ratio, and Bank Size. The results indicate that the Lagged NPL Ratio and ROA have a positive effect on non-performing loans, while CAP, Credit Growth, GDP Growth Rate, Inflation Rate, and Bank Size have no significant effect on non-performing loans. Based on these findings, bank managers are encouraged to strengthen credit risk management, while investors should consider these factors in making investment decisions. Future research is recommended to improve the model specification and incorporate additional variables, such as bank liquidity, to provide more comprehensive results.

Keywords : Banking Performance; Banking Ratios; Generalized Method of Moments (GMM); Non-Performing Loans (NPL)

ABSTRAK

Kredit bermasalah merupakan suatu risiko sistemik yang mengancam stabilitas keuangan dan efisiensi dari alokasi modal sehingga identifikasi faktor penentunya penting bagi sistem perbankan di Indonesia. Penelitian ini bertujuan untuk menganalisis faktor-faktor yang memengaruhi terjadinya kredit bermasalah pada bank di Indonesia. Data sekunder bersumber dari laporan tahunan perbankan yang tercatat di Bursa Efek Indonesia periode 2021-2025, dengan sampel 44 bank dengan total 220 observasi yang dipilih menggunakan purposive sampling. Analisis dilakukan dengan regresi data panel dinamis menggunakan software E-views, dengan variabel independen berupa Return on assets (ROA), Capital Ratio (CAP), credit growth, GDP growth rate, inflation rate, lagged NPL ratio dan bank size. Hasil penelitian menunjukkan bahwa lagged NPL dan ROA berpengaruh positif terhadap kredit bermasalah, CAP, credit growth, GDP growth rate, inflation rate dan bank size terhadap kredit bermasalah. Berdasarkan temuan tersebut, disarankan agar manajer bank memperkuat manajemen risiko kredit dan investor mempertimbangkan faktor-faktor tersebut dalam keputusan investasi. Penelitian selanjutnya disarankan untuk menyempurnakan spesifikasi model dan menambahkan variabel lain, seperti bank liquidity, guna memperoleh hasil yang lebih komprehensif.

Kata Kunci : Generalized Method Of Moments (GMM); Kinerja Perbankan; Non-Performing Loan (NPL); Rasio Perbankan

INTRODUCTION

One of the sectors that holds a strategic position in the national economy is the banking sector. The primary function of banks is to act as financial intermediaries by collecting public funds in the form of deposits and subsequently channeling them through credit to support

various economic activities. However, lending activities conducted by banks involve significant risks, particularly credit risk. One of the indicators used to assess the quality of a bank's credit portfolio is the non-performing loan (NPL) ratio. The NPL ratio serves as an important indicator for assessing a bank's financial health. An increase in the NPL ratio indicates a deterioration in credit quality, which may potentially increase the risk of losses incurred by banks ((Arhinful, Mensah, Gyamfi, & Obeng, 2025). The NPL ratio also represents a credit risk indicator that measures problem loans within a bank's loan portfolio. An increase in the NPL ratio requires banks to allocate greater provisions for potential credit losses (Chandra, Angelina, & Pakpahan, 2026). Non-performing loans constitute a critical issue in the banking industry that requires further investigation, as reinforced by the study conducted by Ozili (2025).

In this study, Ozili examined NPLs after 2020 and found that the factors influencing NPLs have continued to evolve and become increasingly complex over time. The study also indicated that Indonesia is among the Asian countries with a relatively high level of research publications on NPLs in recent years, suggesting considerable academic attention to non-performing loans in Indonesia's banking sector. Therefore, investigating the factors influencing non-performing loans among banks in Indonesia is important. The phenomenon of non-performing loans has also become an issue of global interest. A study by Salas, Lamothe, and Delgado (2024) examined the determinants of non-performing loans at the global level. Their findings indicate that NPLs are one of the primary indicators of credit risk and can serve as an early warning signal of potential banking crises.

The determinants of NPLs can generally be categorized into internal and external factors. The study found that bank size, profitability, unemployment, interest rates, and exchange rates are among the factors influencing NPLs across banking sectors in various countries. Since banking conditions and characteristics differ across countries, further research is necessary to identify the factors influencing non-performing loans specifically within the Indonesian banking sector. The Coronavirus Disease 2019 (COVID-19) pandemic, which began spreading globally in early 2020, had a significant impact on the economy, including the banking sector. The decline in economic activity during the pandemic caused many borrowers to experience reduced income, thereby weakening their ability to meet credit obligations and potentially increasing the risk of non-performing loans (Barua & Barua, 2021).

Since 2021, economic recovery has gradually taken place through increased economic activity and financial sector stabilization, making this period relevant for examining the dynamics of banking credit quality (Susanti, Putra, & Bahtiar,, 2023). During this period, banks experienced various changes in economic and financial conditions that affected credit quality, as reflected in the NPL ratio. Therefore, the period is considered relevant for examining the factors

influencing NPL levels among banks listed in Indonesia. Based on Figure 1, which presents the development of non-performing loans using data from the Financial Services Authority (Otoritas Jasa Keuangan or OJK), the NPL ratio of the Indonesian banking sector showed a declining trend from 2021 to 2025.

The NPL ratio reflects the dynamics of credit quality within the Indonesian banking sector. In 2020, the NPL ratio increased from 2.53% to 3.06%, representing an increase of 0.53 percentage points, as a result of economic pressures caused by the COVID-19 pandemic, which increased the risk of non-performing loans. During the economic recovery period, the NPL ratio declined consistently. In 2021, the NPL ratio decreased to 3.00%, followed by a decline to 2.44% in 2022 and 2.19% in 2023. In 2024, the NPL ratio continued to decline to 2.08% and subsequently reached 2.05% in 2025. Throughout this period, the NPL ratio remained within the range of 2.05%–3.00%, which was still below the threshold established by the Financial Services Authority (OJK). This phenomenon warrants further investigation to identify the factors contributing to the improvement in credit quality, which may provide valuable insights for banks in maintaining and improving their management of non-performing loans in the future.

High bank profitability generally reflects the effective implementation of risk management through more selective credit screening and improved governance in conducting banking operations. These conditions enable banks to control credit risk and reduce the level of non-performing loans (Kalkan, 2025). Various international studies have demonstrated that bank profitability influences the level of non-performing loans. Mai & Tien (2026) found that bank profitability has a negative effect on the Non-Performing Loan (NPL) ratio, indicating that an increase in profitability is generally followed by a decrease in non-performing loans.

This finding suggests that banks with higher profitability tend to have better credit risk management capabilities, enabling them to maintain credit quality and reduce the level of non-performing loans. The capital ratio (CAP) is one of the proxies used to measure a bank's capacity to absorb credit risk (Akhter, 2023). Chun & Ardaaragchaa (2024), in their study of Mongolian commercial banks, employed bank-specific variables, including the equity-to-asset ratio, to examine the relationship between CAP and NPL. Mai & Tien (2026) found that CAP has a positive effect on non-performing loans. An increase in credit distribution, reflected in credit growth, indicates the expansion of banking intermediation in channeling funds to the public.

Chun & Ardaaragchaa (2024) found that credit growth has a negative effect on NPL. Similarly, Pancotto, Gwilym, & Williams (2024) reported a negative relationship between credit growth and NPL, indicating that higher credit growth is associated with lower levels of non-performing loans. Mai & Tien (2026) also found that credit growth has a negative effect on non-

performing loans. These findings indicate that an increase in lending does not necessarily lead to an increase in credit risk. The GDP growth rate reflects the economic conditions of a country, whereby higher economic growth indicates increased economic activity, household income, and business performance (Pancotto, Gwilym, & Williams, 2024).

Kalimoldayev, Popova, Cernisevs, and Popovs (2025) found that macroeconomic stability and improvements in economic conditions can reduce NPLs, indicating a negative relationship between economic growth and NPLs. Mai & Tien (2026) found that GDP growth has no significant effect on non-performing loans. Meanwhile, Hakimi, Saidi, and Saidi (2025) demonstrated that GDP growth has a negative effect on NPLs. An increase in inflation may reduce borrowers' ability to meet their credit obligations because declining real income and increasing living costs weaken their repayment capacity. Higher inflation may therefore increase the level of non-performing loans (Hakimi, Saidi, & Adili, 2025).

Khoirunisa & Karnasi (2023) found that an increase in inflation increases the likelihood of non-performing loans. Similarly, Mai & Tien (2026) found that the inflation rate has a positive effect on non-performing loans. This positive relationship indicates that inflation is an important factor to consider when examining credit risk in the banking sector. Large banks generally have greater resources, more advanced technological capabilities, and stronger risk management capacity. Arhinful et al. (2025) found that bank size has a negative effect on NPLs. Hakimi and Saidi (2025) also identified bank size as an important factor in explaining credit risk. Larger banks tend to have greater capacity to absorb potential losses and manage credit risk more effectively, potentially resulting in lower NPL levels. However, Mai & Tien (2026) found that bank size has no significant effect on non-performing loans.

Previous studies have produced inconsistent findings regarding the factors influencing non-performing loans. Hakimi et al. (2025) found that lagged NPL has a positive effect on NPL, while Reigl (2025) also identified a relationship between lagged NPL and non-performing loans. Mai and Tien (2026) found that ROA has a negative effect on non-performing loans, whereas Dolinšek & Kovač (2024) found a positive effect of ROA on NPLs. Pardosi, Hutabarat, and Siagian (2024) reported that ROA has no significant effect on NPLs. Regarding CAP, Mai & Tien (2026) found a positive effect on non-performing loans, while Makri, Tsagkanos, and Bellas (2014) found a negative effect. Berger and DeYoung (1997) reported that CAP has no significant effect on non-performing loans. With regard to credit growth, Erdas & Ezanoglu (2022) found a positive effect on non-performing loans, whereas Dwitama & Hasanudin (2024) found no significant effect.

Ozili (2025) found that bank size has a negative effect on non-performing loans, while Mai and Tien (2026) reported that bank size has no significant effect. In contrast, Salas et al.

(2024) found that bank size has a positive effect on NPLs. Regarding GDP growth, Erdas & Ezanoglu (2022) found a negative relationship with NPLs, while Žunić et al., (2021) reported a positive effect of GDP growth on non-performing loans. Kjosevski & Petkovski (2021) found that inflation has a negative effect on non-performing loans, whereas Msomi (2022) found that the inflation rate has a positive effect on non-performing loans. These variations in findings indicate the existence of a research gap and highlight the need for further investigation of the determinants of non-performing loans in the Indonesian banking sector during the 2021–2025 period.

This period was selected because it represents the post-COVID-19 economic recovery phase. The COVID-19 pandemic began to significantly affect Indonesia in 2020 and was officially declared over after the World Health Organization (WHO) terminated the global public health emergency on May 5, 2023. The novelty of this study lies primarily in the use of the 2021–2025 research period, which represents the condition of the Indonesian banking sector during the post-COVID-19 recovery period. In addition, this study incorporates lagged NPL as a determinant to identify the persistence of non-performing loans, a variable that has been relatively rarely employed in NPL studies in Indonesia.

Furthermore, this study simultaneously examines the effects of both bank-specific internal factors and external macroeconomic factors on NPLs, thereby providing a more comprehensive analysis. This study is expected to provide more recent empirical evidence regarding the determinants of non-performing loans in the Indonesian banking industry. Based on previous studies, particularly the research conducted by Mai and Tien (2026) on the determinants of non-performing loans in the Vietnamese banking sector, the present study is entitled *“Analysis of Factors Influencing Non-Performing Loans in Banks Listed on the Indonesia Stock Exchange.”*

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Literature Review

Information Asymmetry Theory (Grand Theory)

Zhang (2024) stated that information asymmetry refers to a condition in which parties involved in a transaction do not possess the same level of information, resulting in one party having more accurate or comprehensive information than the other. Differences in the availability and quality of information can influence the quality of economic decision-making, lead to inefficiencies in resource allocation, and increase the possibility of market failure. Yan, Yu, and Zhao (2015) found that, in addition to being influenced by contractual clauses, contract effectiveness may be reduced by information asymmetry, which represents a major challenge for creditors in controlling default risk.

Therefore, various studies have focused on reducing information gaps between borrowers and lenders during the credit allocation process. Rodoni & Yaman (2018) explained that information asymmetry in lending activities may trigger moral hazard and adverse selection. Moral hazard occurs when customers fail to provide accurate information regarding their business conditions or deliberately conceal certain information from banks.

This risk may become more severe when banks do not conduct adequate supervision and monitoring of customers' business activities. Meanwhile, adverse selection arises from banks' limited information regarding borrowers' financial conditions, characteristics, and reputations. Both conditions may increase the risk of non-performing loans and adversely affect bank performance.

Non-Performing Loans

Referring to Financial Services Authority Regulation (POJK) No. 40/POJK.03/2019 concerning the Assessment of Commercial Bank Asset Quality, credit is defined as the provision of funds or claims that are equivalent to funds based on an agreement or lending arrangement between a bank and another party, requiring the borrower to repay the debt within a specified period together with interest or other forms of compensation. Credit also includes overdrafts in the form of negative balances in customers' current accounts that cannot be settled at the end of the day, the acquisition of receivables for factoring activities, and the acquisition or purchase of receivables from other parties.

Non-Performing Loans (NPLs) refer to problem loans and constitute an important indicator of banking performance and credit quality. Based on POJK No. 40/POJK.03/2019, the quality of bank credit is classified into five categories: current, special mention, substandard, doubtful, and loss. Current loans are loans for which payments are made on time, account performance is satisfactory, there are no arrears, and all credit requirements are fulfilled. Special Mention loans involve arrears of principal and/or interest payments of up to 90 days. Substandard loans involve arrears exceeding 90 days up to 120 days.

Doubtful loans involve arrears exceeding 120 days up to 180 days, while loss loans involve arrears exceeding 180 days. Furthermore, POJK No. 15/POJK.03/2017 defines non-performing loans (NPLs) or non-performing financing (NPF) as loans or financing classified as substandard, doubtful, or loss. Mai and Tien (2026) demonstrated that a high NPL ratio increases default risk and may deteriorate a bank's overall financial condition. Arhinful et al. (2025) also found that non-performing loans have negative implications for banking growth and stability. Therefore, NPLs represent an important risk faced by banks because they may affect the sustainability and stability of the banking sector (Ozili, 2025).

Lagged Non-Performing

Loans Lagged NPL refers to the NPL value from the previous period that is incorporated into a dynamic model to capture the persistence of non-performing loans, namely the tendency for the current NPL level to be influenced by the NPL level in the previous period (Salas et al., 2024). The NPL ratio is an important measure for assessing the quality of a bank's assets. A high NPL ratio indicates increasing credit risk, which may potentially disrupt financial system stability. Mai and Tien (2026), in their study of commercial banks in Vietnam, found that lagged NPL has a positive effect on current NPL. This finding indicates that non-performing loans have a persistent nature, whereby the NPL level in the previous period influences the NPL level in the current period.

This persistence may occur because credit generally has a long-term nature, meaning that credit risk cannot change instantaneously within a single period. Non-performing loans arising in the previous period reflect the continuing quality of the bank's credit portfolio and may potentially generate additional credit problems in subsequent periods (Hakimi et al., 2025). Mai and Tien (2026) confirmed that lagged NPL has a positive effect on non-performing loans. Similarly, Rabby, Rahaman, Tanim, and Chowdhury (2026) found that NPLs exhibit strong persistence over time, indicating that banks with high NPL levels tend to continue experiencing credit quality problems in subsequent periods. Hakimi et al. (2025) also found that lagged NPL has a positive effect on current NPL, demonstrating that credit risk tends to persist and cannot be eliminated within a short period.

Return on Assets (ROA)

Return on Assets (ROA) is a profitability ratio that reflects a company's ability to generate profits from the utilization of all assets owned during a specific period (Choiriya et al., 2020). Aisy, Eufunny, Lestari, and Leon (2026) explained that ROA serves as an important indicator of banking performance because it reflects the efficiency of asset utilization in generating profits. ROA is considered more representative than several other profitability indicators because it is indirectly influenced by the bank's capital structure. In the banking sector, ROA is commonly used to evaluate financial performance because it demonstrates management's effectiveness in utilizing assets to generate profits (Aisy et al., 2026).

Mai and Tien (2026) found that ROA has a negative effect on non-performing loans. Similarly, Nathan, Ibrahim, and Tom (2020) found that higher ROA is associated with lower levels of non-performing loans. Kjosovski and Petkovski (2020) also reported a negative relationship between ROA and NPLs. Ozili (2025) identified profitability as one of the main factors influencing NPLs in the banking sector. Bank profitability has an inverse relationship with the NPL ratio, whereby an increase in profitability tends to be followed by a decrease in

non-performing loans (Mai & Tien, 2026). This suggests that banks with higher ROA tend to have better asset utilization and credit risk management, resulting in lower levels of non-performing loans.

Capital Ratio (CAP)

The Capital Ratio (CAP) is a ratio that reflects the extent to which bank assets are financed through the bank's own capital (Harimurti et al., 2022). Capital ratio measures the proportion of shareholders' equity relative to total bank assets and reflects the bank's ability to absorb potential losses and maintain financial stability (Berger & Bouwman, 2013). Keeton & Morris (1987) found that excessive loss rates tend to occur among banks with relatively low equity ratios.

Mai and Tien (2026) found that CAP has a positive effect on non-performing loans, indicating that higher CAP is associated with higher levels of non-performing loans. In contrast, Louzis, Vouldis, and Metaxas (2012) found that inadequate bank capitalization can lead to an increase in non-performing loans. This condition may be associated with moral hazard incentives among bank managers, who may be more inclined to increase the risk level of their credit portfolios when the bank has relatively low capitalization. Therefore, the relationship between capital adequacy and NPLs may depend on how banks use their capital buffers and manage credit risk.

Credit Growth

Credit growth refers to an increase in the amount of credit extended based on an agreement between creditors and debtors, under which debtors are required to repay the principal and interest within a period agreed upon by both parties (Majeed, 2025). Credit growth is an important indicator reflecting banks' lending behavior, while bank capital has been found to have a relatively limited effect on credit growth (Kim & Sohn, 2017). Altman (2024) stated that disproportionate credit growth directed toward certain sectors, such as construction and non-bank financial institutions, has a strong relationship with the occurrence of financial crises.

In addition, recovery from financial crises tends to be slower following substantial increases in corporate debt, particularly when such debt is supported by procyclical collateral values. An increase in lending volume may allow banks to reduce interest rate spreads and offer lower lending rates, thereby increasing their competitiveness in providing financing services to customers. Tunçay & Grzegorzczak-Akın (2025) found that the relationship between NPLs and credit growth is primarily influenced by firm-specific factors, including changes in business conditions, profitability, investment opportunities, and declining credit demand. After adequately controlling for demand-side factors, bank lending behavior or credit growth was found to have no significant effect on the NPL ratio.

Nevertheless, Mai and Tien (2026) found that credit growth has a negative effect on non-performing loans. Ashraf & Qian (2026) demonstrated that economic uncertainty can affect credit growth and increase credit risk in the banking sector. Luh (2026) explained that banks extend credit using funds obtained from public deposits, while rapid credit growth may potentially deteriorate asset quality through increased loan loss provisions. Arhinful et al. (2025) also stated that banking risk may increase as a result of high credit growth, particularly when such growth is not supported by adequate risk management. An increase in the NPL ratio may subsequently cause banks to tighten their credit assessment and lending processes, reducing credit availability and slowing credit growth (Kalimoldayev et al., 2025).

Bank Size

Bank size refers to the scale of a bank, indicating whether a bank is relatively large or small. Bank size is commonly measured using the natural logarithm of total bank assets (Muhindi, 2023). When a commercial bank has greater total assets, it may benefit from economies of scale and possess greater capacity to increase its market share, which may subsequently improve its performance. Commercial banks generally seek to increase their size to improve operational performance, achieve greater resource-use efficiency, and reduce costs. Larger banks may also have greater opportunities to diversify their sources of income, allocate risks more effectively, and strengthen their resilience to financial risks (Nhu, 2025). Arhinful et al. (2025) found that bank size plays an important role in determining the impact of non-performing loans on banking growth.

Large banks tend to possess greater resources and more sophisticated risk management systems, enabling them to control credit risk more effectively and reduce the negative consequences associated with increasing NPLs. Larger bank size may also reflect broader operational coverage, greater market reach, and stronger resource capacity. Consequently, larger banks may benefit from higher operational efficiency, stronger risk diversification, improved profitability, and greater financial stability (Maulida, Husna, & Lestari, 2025). However, Mai and Tien (2026) found that bank size has no significant effect on non-performing loans.

Hakimi et al. (2025), in their study of the banking sector in the MENA region, found that bank size influences NPL levels because larger banks tend to have more efficient systems for monitoring and managing credit quality than smaller banks. Larger banks also have broader resources and market access, allowing them to diversify risks across various types of assets and manage complex financial regulations more efficiently (Kamau & Simo-Kengne, 2025).

GDP Growth Rate

GDP growth is an economic indicator officially used to assess the development of a country's economy. Gross Domestic Product (GDP) represents the total market value of all

goods and services produced by economic units within a country's territory during a specific period (Adam & Alzuman, 2024). The GDP growth rate is measured as the annual percentage change in a country's gross domestic product (Ashraf & Qian, 2026). Louzis et al. (2012) found that GDP growth has a negative effect on non-performing loans. When economic growth increases, household and corporate incomes tend to improve, strengthening borrowers' ability to repay their loans and reducing the NPL ratio.

However, Mai and Tien (2026) found that GDP growth has no significant effect on non-performing loans. The annual percentage change in real GDP is particularly relevant as an indicator of economic growth because it accounts for the effects of inflation on economic activity. GDP growth at constant market prices reflects the average percentage change in GDP measured in constant local currency at market prices (Santos, Serrano, & Pigao, 2022). Chand, Kumar, and Stauvermann (2023) explained that increasing economic activity can improve borrowers' repayment capacity and consequently reduce the risk of non-performing loans. Therefore, economic growth is an important factor in determining the persistence of NPLs in the banking sector (Ozili, 2025).

Inflation Rate

According to Statistics Indonesia (Badan Pusat Statistik/BPS), inflation refers to the general increase in the prices of goods and services consumed by society. In traditional monetary theory, inflation is associated with a decline in the value of money and household purchasing power. Inflation can increase the cost of living without a corresponding increase in income, thereby reducing borrowers' ability to repay their loans. Under such conditions, higher inflation may place greater pressure on household consumption and savings (Rehman, Ahsan, Asghar, Alshebami, Alzain, & Seraj, 2026). From the perspective of corporate finance theory, inflation increases production factor costs, creates distortions in relative prices, and reduces corporate profit margins, particularly in imperfectly competitive markets (Frésard & Phillips, 2024).

Companies with long-term contracts may be unable to adjust their product prices proportionally to rising costs, resulting in lower real income and greater difficulty in servicing debt (Miao, Ma, Huo, 2026). Inflation may also generate information asymmetry and price uncertainty, potentially reducing banks' ability to accurately assess credit risk (Madani, Hernawan, & Haryanti, 2025). Mai and Tien (2026) found that inflation has a positive effect on non-performing loans. Similarly, Chand et al. (2023) demonstrated that macroeconomic factors such as inflation contribute to an increase in non-performing loans. Hakimi and Saidi (2025) further explained that high inflation can increase financial pressure on borrowers and consequently increase the risk of non-performing loans in the banking sector.

Hypothesis Development

The Effect of Lagged Non-Performing Loans on Non-Performing Loans in Indonesian Banks

Mai and Tien (2026) found that lagged NPL has a positive effect on current NPL, indicating that non-performing loans have a persistent nature. Reigl (2025) and Hakimi et al. (2025) similarly found that previous-period NPL positively affects current NPL, as credit problems may continue into subsequent periods due to the long-term nature of bank lending. Ozili (2025) also identified lagged NPL as a positive determinant of NPL. Therefore, the following hypothesis is proposed:

H1: Lagged NPL has a positive effect on non-performing loans in Indonesian banks.

The Effect of Return on Assets on Non-Performing Loans in Indonesian Banks

Mai and Tien (2026) found that ROA has a negative effect on non-performing loans, indicating that higher profitability is associated with lower NPL levels. This finding is supported by Kalkan (2025) and Pardosi et al. (2024), who reported a negative relationship between ROA and NPLs. However, Niroula & Singh (2024) and (Giannoulakis, 2025) found no significant effect of ROA on NPLs. These inconsistent findings provide a basis for further examination. Therefore, the following hypothesis is proposed:

H2: Return on Assets (ROA) has an effect on non-performing loans in Indonesian banks.

The Effect of Capital Ratio on Non-Performing Loans in Indonesian Banks

Mai and Tien (2026) found that CAP has a positive effect on non-performing loans, whereas Makri et al. (2014) and Berger and DeYoung (1997) found a negative relationship between CAP and NPLs. These differences indicate that the relationship between bank capitalization and non-performing loans remains inconclusive. Nevertheless, stronger capitalization is generally expected to improve banks' ability to absorb credit losses and manage risk. Therefore, the following hypothesis is proposed:

H3: Capital Ratio (CAP) has a negative effect on non-performing loans in Indonesian banks.

The Effect of Credit Growth on Non-Performing Loans in Indonesian Banks

Mai and Tien (2026) and Harimurti et al. (2022) found that credit growth has a negative effect on non-performing loans. However, Erdas and Ezanoglu (2022) found a positive effect, while Dwitama and Hasanudin (2024) found no significant effect. Giannoulakis (2025) also showed that the relationship between credit growth and NPLs may differ across economic conditions. These inconsistent findings indicate the need for further examination. Therefore, the following hypothesis is proposed:

H4: Credit growth has an effect on non-performing loans in Indonesian banks.

The Effect of Bank Size on Non-Performing Loans in Indonesian Banks

Mai and Tien (2026) found that bank size has no significant effect on NPLs, while Arhinful et al. (2025) and Ozili (2025) found a negative effect, suggesting that larger banks may have better resources and risk management capabilities. In contrast, Salas et al. (2024) found a positive relationship between bank size and NPLs. The inconsistency of these findings indicates that the effect of bank size on non-performing loans remains uncertain. Therefore, the following hypothesis is proposed:

H5: Bank size has an effect on non-performing loans in Indonesian banks.

The Effect of GDP Growth on Non-Performing Loans in Indonesian Banks

Mai and Tien (2026) found that GDP growth has no significant effect on non-performing loans. However, Erdas and Ezanoglu (2022) and Milenković et al. (2024) found a negative relationship between GDP growth and NPLs, indicating that improved economic conditions strengthen borrowers' repayment capacity and reduce credit risk. Therefore, higher economic growth is expected to reduce non-performing loans. Based on these findings, the following hypothesis is proposed:

H6: GDP growth has a negative effect on non-performing loans in Indonesian banks.

The Effect of Inflation Rate on Non-Performing Loans in Indonesian Banks

Mai and Tien (2026) found that the inflation rate has a positive effect on non-performing loans, as higher inflation may increase borrowers' financial burdens and weaken their repayment capacity. This finding is supported by Msomi (2022), who reported a positive relationship between inflation and non-performing loans. However, Abidi & Sastradipraja (2023) found that inflation has no significant effect on NPLs. Despite these differences, higher inflation is generally expected to increase credit risk. Therefore, the following hypothesis is proposed:

H7: Inflation rate has a positive effect on non-performing loans in Indonesian banks.

RESEARCH METHOD

Method is a method of work that can be used to obtain something. While the research method can be interpreted as a work procedure in the research process, both in searching for data or disclosing existing phenomena (Zulkarnaen, W., et al., 2020). This study employs a quantitative research approach aimed at examining the effects of independent variables on the dependent variable. The research sample was selected using purposive sampling, resulting in 44 banks from a total of 47 banking companies listed on the Indonesia Stock Exchange (IDX) during the five-year period from 2021 to 2025. The sample was determined using purposive sampling based on three criteria: (1) banking companies listed on the IDX throughout the 2021–2025 observation period; (2) banks that published complete and consistent annual reports during the observation period; and (3) banks with complete data for all

variables included in the research model. Based on these criteria, three banks were excluded from the sample because they did not meet the specified sampling requirements. Consequently, 44 banks were retained as the final sample, resulting in 220 firm-year observations. The panel dataset is balanced because each of the 44 sampled banks has observations for all five years from 2021 to 2025. The study applies dynamic panel data regression to examine the effects of lagged Non-Performing Loans (NPL), Return on Assets (ROA), Capital Ratio (CAP), Credit Growth, Bank Size, GDP Growth Rate, and Inflation Rate on non-performing loans. The hypotheses were developed based on previous theoretical and empirical studies.

The analysis was conducted using the Generalized Method of Moments (GMM) estimation method with EViews software. The study uses one dependent variable, namely the Non-Performing Loan (NPL) ratio, and seven independent variables consisting of lagged NPL, ROA, CAP, Credit Growth, Bank Size, GDP Growth Rate, and Inflation Rate. Each variable is measured using indicators adopted from previous studies, particularly Mai and Tien (2026). Secondary data were collected from the Indonesia Stock Exchange (IDX) website and the official websites of the respective banks for the 2021–2025 period. The data were obtained from publicly available annual reports and financial statements. Using purposive sampling, the sample was determined based on the following criteria: banking companies listed on the IDX throughout 2021–2025, banks that published complete and consistent annual reports during the study period, and banks with complete data for all research variables.

The data were analyzed using dynamic panel data regression estimated through the Generalized Method of Moments (GMM). The model was selected because the dependent variable is influenced by its previous-period value (lagged dependent variable). In addition, the use of GMM is motivated by potential endogeneity and reverse causality among several bank-specific variables. GMM also allows the estimation to account for unobserved bank-specific effects that may influence non-performing loans but cannot be directly observed or adequately measured. This study employs the Difference GMM estimator developed by Arellano and Bond. Several specification and diagnostic tests were conducted, including the Arellano-Bond test for serial correlation, the Sargan test for instrument validity, and the unbiasedness test by comparing the GMM, Fixed Effects Model (FEM), and Pooled Least Squares (PLS) estimators. The Wald test was used to examine the simultaneous effect of the independent variables, while individual hypothesis testing was conducted using the t-test.

The estimated model is specified as

$$NPL_{it} = \beta_1 NPL_{it-1} + \beta_2 ROA_{it} + \beta_3 CAP_{it} + \beta_4 LG_{it} + \beta_5 SIZE_{it} + \beta_6 GDP_{it} + \beta_7 INF_{it} + \varepsilon_{it}$$

A significance level of 5% was applied, whereby a p-value below 0.05 indicates a statistically significant effect of the respective independent variable on non-performing loans.

RESULT AND DISCUSSION

Results of the Testing

Descriptive Statistical

Analysis Descriptive statistics are used to provide an overview of the characteristics of the research data based on the minimum, maximum, mean, median, and standard deviation values. The results of the descriptive statistical analysis for each research variable are presented in Table 1.

Based on the descriptive statistical analysis results, the characteristics of each research variable can be interpreted as follows:

1. Problem loans (NPL) have a mean value of 2.9879% and a standard deviation of 2.3302%. The minimum value is 0%, recorded by Bank Capital Indonesia (BACA) in 2021, while the maximum value is 14.0853%, recorded by Bank Pembangunan Daerah Banten (BEKS) in 2021.
2. Lagged non-performing loans (NPL) have a mean value of 3.0972% and a standard deviation of 2.5900%. The minimum value is 0.0000%, recorded by Bank Jago (ARTO) in 2021 and Bank Capital Indonesia (BACA) in 2022, while the maximum value is 22.2658%, recorded by Bank Pembangunan Daerah Banten (BEKS) in 2021.
3. Return on Assets (ROA) has a mean value of 0.7729% and a standard deviation of 2.4455%. The minimum value is -18.0580%, recorded by Bank Raya Indonesia (AGRO) in 2021, while the maximum value is 0.84093%, recorded by Bank BTPN Syariah (BTPS) in 2022.
4. Capital Ratio (CAP) has a mean value of 23.126% and a standard deviation of 14.745%. The minimum value is 5.757%, recorded by Bank Tabungan Negara (BBTN) in 2021, while the maximum value is 92.508%, recorded by Krom Bank Indonesia (BBSI) in 2022.
5. Credit growth (LG) has a mean value of 16.322% and a standard deviation of 44.006%. The minimum value is -64.092%, recorded by Bank QNB Indonesia (BKSW) in 2021, while the maximum value is 491.323%, recorded by Bank Jago (ARTO) in 2021.
6. Bank size (SIZE) has a mean value of 31.53381 and a standard deviation of 1.655124. The minimum value is 28.53829, recorded by Krom Bank Indonesia (BBSI) in 2021, while the maximum value is 35.57903, recorded by Bank Mandiri (BMRI) in 2025.
7. GDP growth has a mean value of 0.048399 and a standard deviation of 0.005730. The minimum value is 0.037030, recorded in 2021, while the maximum value is 0.052270, recorded in 2022.
8. Inflation rate (INF) has a mean value of 0.028974 and a standard deviation of 0.013966. The minimum value is 0.015690, recorded in 2024, while the maximum value is 0.055080, recorded in 2022.

Dynamic Panel Data Regression Analysis

The data analysis in this study employs dynamic panel data regression to examine the effects of the independent variables, namely lagged NPL, return on assets (ROA), capital ratio (CAP), credit growth (LG), bank size (SIZE), GDP growth rate (GDP), and inflation rate (INF), on the dependent variable, namely non-performing loans (NPL) as a measure of problem loans. The regression equation obtained from the analysis is as follows:

$$\text{NPL}_{it} = 0,553404\text{NPL}_{t-1} + 0,547386\text{ROA}_{it} + 0,029772\text{CAP}_{it} - 0,003935\text{LG}_{it} + 0,015901\text{SIZE}_{it} + 1,444627\text{GDP}_{it} - 0,013630\text{INF}_{it}$$

T-Test Results

The T-test (individual test) is used to determine whether each independent variable, namely lagged NPL, return on assets, capital ratio, credit growth, bank size, GDP growth rate, and inflation rate, has a significant effect on the dependent variable, namely non-performing loans (NPL).

Based on the results of the T-test, the findings can be interpreted as follows:

1. Lagged NPL has a coefficient of 0.553404 and a probability value of $0.0384 < 0.05$; therefore, H_0 is rejected. This result indicates that lagged NPL has a positive effect on problem loans. The higher the lagged NPL, the higher the level of problem loans.
2. Return on Assets (ROA) has a coefficient of 0.547386 and a probability value of $0.0138 < 0.05$; therefore, H_0 is rejected. This result indicates that ROA has a positive effect on problem loans. The higher the ROA, the higher the level of problem loans.
3. Capital Ratio (CAP) has a coefficient of 0.029772 and a probability value of $0.7137 > 0.05$; therefore, H_0 is not rejected. This result indicates that CAP has no significant effect on problem loans.
4. Credit Growth (LG) has a coefficient of -0.003935 and a probability value of $0.6115 > 0.05$; therefore, H_0 is not rejected. This result indicates that credit growth has no significant effect on problem loans.
5. Bank Size (SIZE) has a coefficient of 0.015901 and a probability value of $0.1831 > 0.05$; therefore, H_0 is not rejected. This result indicates that bank size has no significant effect on problem loans.
6. Gross Domestic Product (GDP) has a coefficient of 1.444627 and a probability value of $0.6427 > 0.05$; therefore, H_0 is not rejected. This result indicates that GDP growth has no significant effect on problem loans.
7. Inflation Rate (INF) has a coefficient of -0.013630 and a probability value of $0.9335 > 0.05$; therefore, H_0 is not rejected. This result indicates that the inflation rate has no significant effect on problem loans.

Discussion

The Effect of Lagged Non-Performing Loans on Problem Loans

Based on the regression results, lagged NPL has a positive effect on problem loans. This finding is consistent with Mai and Tien (2026), who found that higher lagged NPL leads to higher current NPL. Similarly, Olarewaju (2020) found a positive effect of lagged NPL, indicating that problem loans in the previous period directly influence current NPL. Erdiningrum & Satria (2025) also found a positive effect among Indonesian banks, indicating persistence in problem loans, whereby NPL cannot be eliminated immediately and continues to affect bank performance in subsequent periods. Gultom, Muchtar, and Sihombing (2025) further confirmed that higher NPL in the previous period tends to be followed by higher NPL in the subsequent period. Erdas and Ezanoglu (2022) also demonstrated a positive relationship, indicating that problem loans are persistent rather than static over time.

The Effect of Return on Assets (ROA) on Problem Loans

Based on the regression results, return on assets (ROA) has a positive effect on problem loans. This finding is inconsistent with Mai and Tien (2026), who found a negative relationship between ROA and problem loans, but is consistent with Dolinšek and Kovač (2024), who found a positive effect of ROA on NPL among major Islamic banks in the United Kingdom and Turkey. This result indicates that higher ROA is associated with higher problem loans. However, Khoirunisa and Karnasi (2023) found a negative relationship between ROA and problem loans. The positive effect found in this study may be explained by the tighter monetary policy implemented by Bank Indonesia during the research period, particularly through increases in the BI Rate from 3.05% in 2022 to 6.25% in 2024. Although higher interest rates increased banks' interest income, they also increased borrowers' debt-servicing burdens, potentially increasing credit risk and problem loans.

The Effect of Capital Ratio (CAP) on Problem Loans

Based on the regression results, capital ratio (CAP) does not have a significant effect on problem loans. This finding differs from Mai and Tien (2026), who found a positive relationship between CAP and problem loans, while Berger and DeYoung (1997) reported that CAP had no significant effect. Other studies have produced mixed findings, with Harimurti et al. (2022) finding a positive effect and Makri et al. (2014) finding a negative effect. The absence of a significant effect in this study may be because the Equity to Total Assets Ratio primarily reflects a bank's funding structure, whereas problem loans are more strongly determined by credit assessment quality, risk management practices, borrowers' repayment capacity, and economic conditions. Therefore, a higher proportion of equity does not necessarily result in lower NPL when credit management quality remains similar (Berger & Bouwman, 2013).

The Effect of Credit Growth (LG) on Problem Loans

The regression results indicate that credit growth does not have a significant effect on problem loans. This finding differs from Mai and Tien (2026), who found a negative effect, but is consistent with Dwitama and Hasanudin (2024), who found no significant effect of credit growth on problem loans among 28 Indonesian banks. This result suggests that credit expansion does not necessarily translate directly into higher or lower problem loans. One possible explanation is the role of strict regulation and supervision by the Financial Services Authority (OJK) and Bank Indonesia.

For example, OJK Regulation No. 32/POJK.03/2018 limits credit exposure to unrelated parties or groups to a maximum of 25% of bank capital and related parties to 10% of bank capital. In addition, OJK Regulation No. 40/POJK.03/2019 strengthens asset-quality supervision, while OJK Regulation No. 21 of 2025 requires banks to maintain specified financial ratios. These regulations may constrain excessive credit expansion, making credit growth less directly associated with problem loans.

The Effect of Bank Size on Problem Loans

The regression results show that bank size does not have a significant effect on problem loans. This finding is consistent with Mai and Tien (2026), Erdiningrum et al. (2025), and Awuor (2015), who also found no significant relationship between bank size and problem loans. This result may be explained by the requirement for all Indonesian banks, regardless of size, to implement the prudential banking principle and effective risk management in lending activities. OJK Regulation No. 18/POJK.03/2016 requires banks to implement risk management, including the identification, measurement, monitoring, and control of credit risk. However, this finding differs from Ozili (2025), Gulati, Goswami, and Kumar (2018), and Rana (2023), who found that larger banks tend to have lower NPL ratios because they generally have stronger resources, better risk diversification, and more effective credit risk management.

The Effect of GDP Growth on Problem Loans

The regression results indicate that GDP growth does not have a significant effect on problem loans. This finding is consistent with Mai and Tien (2026), Sun & Purwanto (2021), and Nargis et al., (2019) who also found no significant relationship between GDP growth and NPL. This result may be explained by various policies implemented by the Indonesian government and OJK during 2021–2025 to maintain banking sector stability. The National Economic Recovery Program under Government Regulation No. 23 of 2020 provided financing support, credit guarantees, and economic stimulus, while OJK Regulation No. 11/POJK.03/2020 facilitated credit restructuring for borrowers affected by the COVID-19 pandemic. These measures helped maintain borrowers' repayment capacity and credit quality, reducing the direct

effect of changes in GDP growth on problem loans. Nevertheless, previous studies have reported mixed findings, with Žunić et al. (2021) and Artenisa & Hyrije (2023) finding positive effects, while Erdas and Ezanoglu (2022) and Ozili (2025) reported negative effects.

The Effect of Inflation Rate on Problem Loans

Based on the regression results, the inflation rate does not have a significant effect on problem loans. This finding is inconsistent with Mai and Tien (2026), who found a positive effect of inflation on problem loans, but is consistent with Hada et al., (2020) and Kawakibi & Mustikowati (2025), who found no significant effect. This result indicates that changes in inflation do not necessarily directly affect problem loans. Other studies have reported different findings, including Kjosevski and Petkovski (2020), Ozili (2025), Hakimi and Saidi (2025), Niroula and Singh (2024), and Artenisa and Hyrije (2023), who generally found a negative relationship between inflation and NPL. These differences suggest that the relationship between inflation and problem loans may depend on borrowers' financial conditions, monetary policy responses, and banks' credit risk management practices.

CONCLUSION

Based on the results of the analysis and discussion, this study concludes that the determinants of non-performing loans (NPL) in Indonesian banking vary across the examined bank-specific and macroeconomic factors. Using a sample of 44 banks listed on the Indonesia Stock Exchange over the 2021–2025 period, the findings indicate that lagged NPL has a positive and significant effect on current NPL, demonstrating the persistence of credit risk from one period to the next. In addition, return on assets (ROA) has a positive and significant effect on NPL, indicating that higher profitability does not necessarily correspond to lower credit risk during the observation period. Meanwhile, capital ratio, credit growth, bank size, GDP growth, and inflation rate do not have a significant effect on NPL. These findings suggest that the dynamics of problematic loans in Indonesian banks are more strongly associated with the persistence of previous credit problems and bank profitability than with capital structure, credit expansion, bank size, or the selected macroeconomic indicators.

The findings provide several managerial implications for bank management and investors. For bank management, the significant effects of lagged NPL and ROA should be considered in developing credit policies and risk management strategies. The positive effect of lagged NPL highlights the importance of early identification, monitoring, restructuring, and resolution of problematic loans to prevent the accumulation of NPL from one period to another. Banks should strengthen debtor creditworthiness assessments, implement prudential banking principles, improve credit risk management systems, and maintain a balance between profitability and credit quality.

Although credit expansion and profitability may contribute to financial performance, banks should ensure that lending activities remain within applicable regulatory limits, including the Maximum Legal Lending Limit stipulated under POJK No. 32/POJK.03/2018. For investors, the significant effect of lagged NPL indicates that historical NPL trends can serve as an important indicator of credit risk persistence and bank stability. Investors should therefore evaluate ROA together with NPL trends and the effectiveness of a bank's credit risk management before making investment decisions, as higher profitability does not necessarily indicate better credit quality. This study also has several limitations that should be considered when interpreting the findings. First, the research does not distinguish banks based on the Bank Group Based on Core Capital (KBMI) classification, meaning that banks with different capital characteristics are analyzed in aggregate.

Second, the model incorporates only selected bank-specific and macroeconomic variables, while other factors may also contribute to variations in NPL. Therefore, future research is recommended to classify banks based on KBMI or focus on specific KBMI groups to obtain more detailed evidence regarding the determinants of NPL across different bank characteristics. Future studies may also incorporate additional variables, such as bank liquidity (Olawaju, 2020), as well as other relevant bank-specific, institutional, and macroeconomic factors. Expanding the observation period and applying alternative dynamic panel estimation approaches may further strengthen the robustness and comprehensiveness of future research on credit risk in the Indonesian banking sector.

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FIGURE AND TABLE

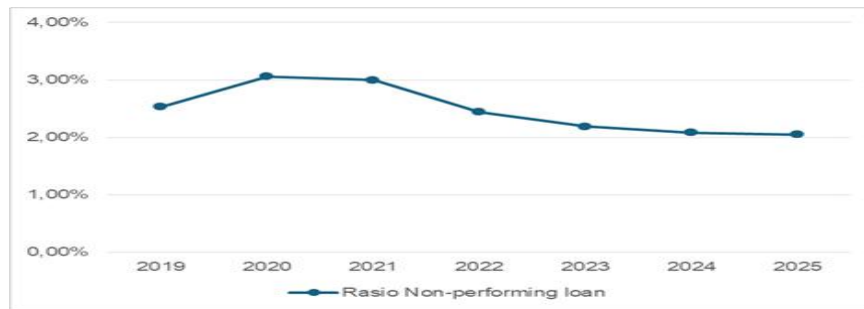


Figure 1. Graph of the Development of Non-Performing Loans in Indonesia, 2021–2025
Source: Financial Services Authority (Otoritas Jasa Keuangan/OJK)

Table 1. Descriptive Statistics

Variable	N	Mean	Median	Maximum	Minimum	Std. Dev.
NPL	220	2.9879%	2.5901%	14.0853%	0.0000%	2.3302%
NPLt-1	220	3.0972%	2.7493%	22.2658%	0.0000%	2.5900%
ROA	220	0.7729%	0.8475%	0.84093%	-	2.4455%
					18.0580%	
CAP	220	23.126%	17.779%	92.508%	5.757%	14.745%
LG	220	16.322%	9.2010%	491.323%	-64.092%	44.006%
SIZE	220	31.58118	30.95291	35.57903	28.53829	1.655124
GDP	220	0.048396	0.051080	0.052270	0.037030	0.005730
INF	220	0.028974	0.026150	0.055080	0.015690	0.013966

Source: EViews Output

Table 2. T-Test Results

Variable	Expected Sign	Coefficient	Prob. 2-tailed	Prob. 1-tailed	Decision
NPLt-1	Positive	0.553404	0.0384	0.0768	H ₀ rejected; positive effect
ROA	No expected sign	0.547386	0.0138	0.0276	H ₀ rejected; positive effect
CAP	Negative	0.029772	0.7137	1.4274	H ₀ not rejected; no effect
LG	No expected sign	-0.003935	0.6115	1.2230	H ₀ not rejected; no effect
SIZE	No expected sign	0.015901	0.1831	0.3662	H ₀ not rejected; no effect
GDP	Negative	1.444627	0.6427	1.2854	H ₀ not rejected; no effect
INF	Positive	-0.013630	0.9335	1.8670	H ₀ not rejected; no effect

Source: EViews Output