

Do Macroeconomics and Bank-Specific Factors Influence Non-Performing Loans?

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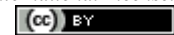
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Abstract

This study aims to analyze the effects of inflation, Gross Domestic Product, Loan to Deposit Ratio, and bank size on the NPLs of Conventional Rural Banks in Central Java, both individually and simultaneously. This research employed a quantitative approach with a descriptive research design. The sample consisted of 69 Conventional BPRs in Central Java selected through purposive sampling. Secondary data were collected from BPR published financial reports, the Financial Services Authority, Statistics Indonesia, and the official websites of the respective BPRs. Panel data regression analysis was conducted using E-Views 13, preceded by classical assumption tests, including normality, heteroscedasticity, multicollinearity, and autocorrelation tests. The results indicate that inflation, LDR, and bank size have negative but statistically insignificant effects on NPLs, while GDP has a positive and statistically significant effect on NPLs. These findings suggest that during the observation period Q4, stable inflation, liquidity management, and bank size were not the primary determinants of changes in NPLs. In contrast, higher GDP was associated with an increase in NPLs, indicating that stronger economic growth may have encouraged more aggressive lending activities, thereby increasing credit risk. Simultaneously, inflation, GDP, LDR, and bank size were found to have a significant effect on NPLs in Conventional Rural Banks in Central Java.

Keywords: Non-Performing Loans, Inflation, Gross Domestic Product, Loan to Deposit Ratio, Bank Size.

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1. Introduction

The banking sector has a vital role in the economy as an intermediary institution that connects parties who have excess funds with those who need funds through the financial intermediation function. One of the banking sectors in Indonesia is BPR. In the past, BPR stood for "People's Credit Bank". However, after POJK 7 of 2024 was passed, the name of BPR changed to "People's Economy Bank". This change aims to strengthen the role of BPR in driving the community's economy and supporting the expansion and strengthening of BPR businesses. Bank Perkreditan Rakyat (BPR) has a strategic role in the Indonesian economy as a financial institution that focuses on serving micro, small, and medium enterprises (MSMEs) and communities that have not been reached by conventional banking [1]. The existence of BPR is vital in supporting financial inclusivity and regional economic growth, especially in Central Java, which is one of the provinces with the largest number of BPRs in Indonesia. However, in carrying out its function as a financial intermediary, BPRs face serious challenges related to credit risk management as reflected in the level of Non-Performing Loans (NPLs).

NPLs are crucial indicators that describe the health and stability of the banking sector. High NPLs not only threaten the profitability and survival of banks, but can also hinder the function of financial intermediation which ultimately impacts regional economic growth [2]. Research [3] shows that NPLs are influenced by

the complexity of macroeconomic factors such as GDP growth, unemployment rates, and inflation. Meanwhile, the study of [5] confirms that internal factors such as credit diversification and bank size also play a significant role in determining NPL levels.

Indonesia's macroeconomic conditions after the COVID-19 pandemic show interesting dynamics to be studied. Inflation, which had reached a high level in mid-2022, is a form of responsiveness to global conditions, creating a challenging operational environment for BPRs [6]. The findings of the study confirm that macroeconomic variables such as inflation show diverse effects depending on the country's economic context [7] [8]. Several studies that occurred during COVID-19, research conducted by Ahmed et al., (2021) were conducted during political turmoil, and research conducted [9] when economic conditions were stable resulted in different studies.

The Loan to Deposit Ratio (LDR) as an indicator of bank liquidity has also shown controversial results in various studies. Research [8] found that LDR negatively affects NPLs in the short term, [10] show the opposite. The size of banks as a proxy for operational efficiency and risk diversification capabilities also shows mixed findings, where large banks tend to have better risk management capabilities, but can be more vulnerable to political pressure [11].

The uniqueness of BPRs as financial institutions with specific market segments and operational characteristics requires a separate analysis. In contrast

to commercial banks, BPRs have limitations in product and geographical diversification, relatively homogeneous customer coverage, and limited risk management capacity. Research on Village Credit Institutions (LPD) in Bali shows that factors such as CAR, LDR, and operational efficiency have a different influence on microfinance institutions than conventional banks [12]. Judging from previous research, the average research was conducted on conventional banks, both national and international scale, with company sizes that are considered large, while for small and medium-sized scales there is still minimal in research, even though for Indonesia itself, MSMEs are one of the important economic drivers [13]. Therefore, research is needed to see the extent to which MSMEs are affected by macroeconomic factors in a region.

Central Java Province with its economic characteristics dominated by the manufacturing, agriculture, and MSME industry sectors creates a unique credit risk profile for BPRs. Regional economic conditions that are vulnerable to global economic turmoil, debtor structures dominated by small businesses with limited access to financial information, and competitive dynamics between BPRs require an in-depth understanding of the factors affecting NPLs. The research period Q4 2024 to Q2 2025 was chosen to capture the current dynamics of the post-economic recovery, where monetary and fiscal policies have undergone adjustments, and macroeconomic conditions show stabilization. Recent research [14] [15], using advanced methodologies such as deep learning shows that the understanding of NPL determinants is constantly evolving and requires specific contextual analysis.

The importance of this research lies in the urgency to understand the dynamics of BPR NPLs in the digital and post-pandemic era of the digital economy, where debtor behavior patterns, macroeconomic conditions, and bank management strategies have undergone significant transformation. The findings of the study are expected to provide insight for regulators in formulating appropriate policies, for BPR management in optimizing risk management strategies, and for academics in developing more accurate theories and models of NPL predictions. Through a comprehensive analysis of the influence of macroeconomic factors (inflation and GDP) and bank-specific factors (LDR and bank size) on BPR NPLs in Central Java, this study is expected to fill the gap in the literature on credit risk management in microfinance institutions in Indonesia, as well as provide practical recommendations to improve the stability and effectiveness of BPR in supporting inclusive economic growth. Next Conceptual Framework on Figure 1.

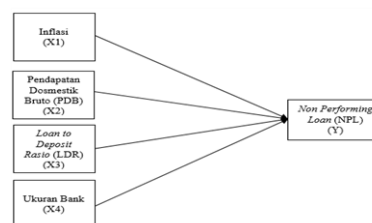


Figure 1. Conceptual Framework

2. Research Method

This study uses a descriptive method with a quantitative, analyze the influence of macroeconomic factors and bank-specific factors on Non-Performing Loans (NPLs) in Conventional People's Economic Banks (BPR) in Central Java. The object of the study is Conventional BPRs in Central Java which are registered with the Financial Services Authority (OJK) and publish complete financial statements during the period of the fourth quarter of 2024 to the second quarter of 2025. The research focuses on four independent variables, namely inflation, Gross Domestic Product (GDP), Loan to Deposit Ratio (LDR), and bank size, with NPLs as dependent variables. The research population includes all Conventional BPRs in Indonesia registered with the OJK in the 2024–2025 period as many as 1,338 BPRs, while the sample was determined using purposive sampling techniques based on the following criteria: (1) Conventional BPRs operating in Central Java and registered with the OJK during the study period; (2) Publishing complete and accessible financial statements; and (3) Not experiencing mergers, acquisitions, or significant changes in legal status during the research period.

Based on these criteria, 69 BPRs were obtained as research samples. The data used were secondary data sourced from financial statements published by BPR, OJK, and the Central Statistics Agency (BPS). Data analysis was carried out using panel data regression with the help of STATA software, which began with classical assumption testing including normality, multicollinearity, heteroscedasticity, and autocorrelation tests to ensure the validity of the research model [4].

3. Result and Discussion

The descriptive analysis in this study obtained the results that the initial steps of this study were the determination of minimum and maximum values to determine the data range and detect unusual values, the calculation of the average as the point of distribution equilibrium, and the measurement of standard deviation to see the level of distribution or variation of the data from the average [16] This analysis includes the presentation of minimum, maximum, mean values, standard deviation, skewness, and kurtosis, in order to understand the characteristics of the data before further testing. Next Data Description on Table 1.

Table 1. Data Description

Variabel	Minimal	Maksimal	Mean	Standar Deviasi
Inflasi (X1)	0,75	2,2	1,54	0,600
PDB (X2)	4,96	5,28	5,07	0,14
LDR (X3)	8,09	230,13	96,73	28,42
Ukuran	14.403.	2.510.426.	333.162.	418.696.
Bank (X4)	348.495	556.000	468.280	843.398
NPL (Y)	0,71	56,15	15,13	11,03

Based on the results of descriptive statistical analysis, macroeconomic variables showed relatively stable conditions during the study period. Inflation had an average value of 1.54% with a standard deviation of 0.60, which indicates that the inflation rate tends to be controlled and does not experience large fluctuations. Similarly, Gross Domestic Product (GDP) growth averaged 5.07% with a standard deviation of 0.14, which indicates that economic growth in Central Java is relatively consistent. In contrast to these two variables, the Loan to Deposit Ratio (LDR) has an average of 96.73% with a standard deviation of 28.42, reflecting a fairly high variation in the ability of BPRs to channel third-party funds into credit. Meanwhile, the size of the bank measured based on total assets also shows a large disparity between BPRs, which illustrates the heterogeneity of BPR operational scales in Central Java.

In the dependent variable, Non-Performing Loans (NPLs) have an average value of 15.13% with a standard deviation of 11.03, which shows the high variation in non-performing loan levels between BPRs. The average NPL value is far above the maximum limit of 5% set by the Financial Services Authority (OJK), indicating that in general BPRs in Central Java still face considerable challenges in credit risk management. The high variety of NPLs also shows that there are differences in the quality of credit management between banks, where some BPRs are able to maintain credit quality at a very good level, while others still experience relatively high levels of non-performing loans. This condition shows that credit risk management is still one of the important issues in maintaining the health and stability of BPRs in Central Java.

The inferential analysis in this study can be seen from the selection of the best models from the three main approaches to panel data regression, namely Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM), carried out through three phased tests, namely the Chow Test, the Hausman Test, and the Lagrange Multiplier Test (LM Test). This test compares alternative models to determine the approach that provides the most valid and accurate analysis results. Next Chow Test on Table 2.

Table 2. Chow Test

Redundant Fixed Effects Tests
Equation: Untitled
Test cross-section fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	50.947632	(68,134)	0.0000
Cross-section Chi-square	681.116033	68	0.0000

Based on the test results, a Probability Cross-section Chi-square value of 0.0000 (< 0.05) was obtained, so that H_1 was accepted. It can be concluded that the Fixed Effect Model (FEM) is more appropriate to be used than the Common Effect Model (CEM). Furthermore, the selection of the model is continued with the Hausman Test. Next Hausman Test Results on Table 3.

Table 3. Hausman Test Results

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	12.8451	4	0.0157

Based on the test results, a Random Cross-section Probability value of 0.0157 (< 0.05) was obtained, so that H_1 was accepted. It can be concluded that the Fixed Effect Model (FEM) is more appropriate than the Random Effect Model (REM). Based on the results of the Chow Test and the Hausman Test, the best model used is the Fixed Effect Model (FEM). In accordance with the opinion [18] if the two tests show a Fixed Effect Model (FEM), then the Lagrange Multiplier (LM) Test is not required. Therefore, the next analysis is carried out using the Fixed Effect Model (FEM) approach. Next Panel Data Regression Test Results on Table 4.

Table 4. Panel Data Regression Test Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2.687081	2.596103	-1.035044	0.3025
X1	-0.204743	0.128912	-1.588239	0.1146
X2	3.940652	1.023347	3.850750	0.0002
X3	-0.033170	0.043189	-0.768018	0.4438
X4	-4.04E-06	2.41E-06	-1.677035	0.0959
Effects Specification				
Cross-section fixed (dummy variables)				
Root MSE	0.253476	R-squared		0.967443
Mean dependent var	3.627710	Adjusted R-squared		0.949949
S.D. dependent var	1.408198	S.E. of regression		0.315043
Akaike info criterion	0.798220	Sum squared resid		13.29978
Schwarz criterion	1.973526	Log likelihood		-9.615737
Hannan-Quinn criter.	1.273503	F-statistic		55.30286
Durbin-Watson stat	1.924589	Prob(F-statistic)		0.000000

Based on the test results, an F-calculation value of 55.39 with a probability of 0.000 (< 0.05) was obtained, so it can be concluded that together the variables of inflation, Gross Domestic Product (GDP), Loan to Deposit Ratio (LDR), and bank size had a significant effect on Non-Performing Loans (NPLs) in Conventional BPRs in Central Java. The results of the t-test showed that only partially the GDP variable had a positive and significant effect on NPLs ($\beta = 3.940$; $p = 0.0002$). The variables inflation ($\beta = -0.2047$; $p = 0.114$), LDR ($\beta = -0.033$; $p = 0.4438$), and bank size (β

= -4.04; $p = 0.095$) had a negative influence on NPLs, but were not statistically significant. Thus, the increase in GDP during the study period was followed by an increase in NPLs, while inflation, LDR, and bank size have not been proven to be significant determinants of changes in NPLs.

The results of the determination coefficient test showed an R-squared value of 0.967443 and an Adjusted R-squared of 0.949949. An Adjusted R^2 value of 94.99% indicates that the variation in NPL changes can be explained by the variables of inflation, GDP, LDR, and bank size of 94.99%, while the remaining 5.01% is influenced by other factors outside the research model. The Effect of Inflation on BPR's *Non-Performing Loans* (NPLs) in Central Java. Based on the results of the panel data regression analysis that has been carried out, the inflation variable (X_1) produces a regression coefficient of -0.2047 with a probability value of 0.1146. This shows that inflation has a negative effect on NPLs, but this effect is not statistically significant because the probability value is greater than the significance level of 0.05. This means that every increase in inflation by one unit will reduce the NPL rate by 0.2047 units, although this effect cannot be statistically generalized.

These findings contradict the initial hypothesis of the study that predicted that inflation has a positive effect on NPLs. This is in line with research conducted [16], which found that inflation increases NPLs in GCC countries, as well as research by Hamal et al., (2025) which confirms the significant positive effect of inflation on NPLs. Theoretically, high inflation should reduce people's purchasing power and increase the real burden of debtors in repaying loans, thereby increasing the likelihood of default. However, the results of this study actually show a negative, although not significant, relationship.

The results of this study support the findings [17] who found that inflation does not have a significant effect on NPLs in commercial banks, [18] also show that inflation can reduce NPLs through the effect of reducing real debt burden. When inflation increases, the real value of the debt that must be paid by debtors becomes lower, so that relatively the payment burden becomes lighter [19]. This phenomenon is known as the *Debt erosion effect* where inflation erodes the real value of debt obligations.

The Effect of Gross Domestic Product (GDP) on BPR *Non-Performing Loans* (NPLs) in Central Java. The results of the hypothesis test showed that GDP (X_2) had a positive regression coefficient of 3,940 with a probability value of 0.0002 ($p < 0.05$). These findings indicate that GDP has a positive and statistically significant effect on NPLs in BPR in Central Java. This means that every increase in GDP by one unit will increase the NPL level by 3,940 units. The results of this study are surprising because they contradict conventional economic theory and the majority of previous empirical studies that found a negative relationship between GDP growth and NPLs [20].

However, these findings are consistent with the results of a study [13] which found a positive influence of GDP on NPLs in Nepalese commercial banks. Other research such [21] states that GDP has a positive effect on the non-performing loans of conventional commercial banks both in the short and long term, but in the financing of Islamic commercial banks, GDP has no effect on the short term and has a positive effect on the long term [22].

There are several theoretical and contextual explanations why GDP has a positive effect on BPR NPLs in Central Java. According [12] it is explained that people's consumption depends directly on the level of income. When income increases, consumption also increases, although not as much as an increase in income (because some will be saved). Sometimes, this consumerist attitude of the community causes people to set aside their obligations as debtors, thus having an impact on the ability to make payments which causes an increase in NPLs. Another theory, namely the neo-classical growth theory brought by Sollow-Swan, also states that economic growth is characterized by output growth and the tendency to save from the community. The higher the amount of funds entering banks as a result of increasing public savings, will lead to higher credit offers. In the end, this can increase the risk of non-performing loans so that the NPL ratio will also increase.

The Effect of *Loan to Deposit Ratio* (LDR) on *Non-Performing Loans* (NPL) of BPRs in Central Java. The results of the hypothesis test showed that the LDR (X_3) had a positive regression coefficient of -0.033 with a probability value of 0.4438 ($p > 0.05$). This indicates that the LDR has a negative effect on NPLs, but the effect is not statistically significant. The direction of the negative relationship between LDR and NPLs is in line with the research hypothesis that predicts that LDR has a negative effect on NPLs. Theoretically, based on the Liquidity Transformation Theory developed [6], the balance between the funds raised and disbursed determines the stability of the bank. An optimal LDR indicates that the bank is able to manage liquidity well while performing the intermediation function effectively. When banks distribute credit efficiently and selectively, the quality of the credit portfolio tends to be better and the risk of non-performing loans is lower.

The results of this study are contrary to the research of [9] who found that LDR has a positive effect on NPLs in Village Credit Institutions (LPD) in Bali, as well as the findings [7], who found that LDR has a positive effect on NPLs in the banking industry 2021-2023. However, in line with the findings [2] who found that LDR has a negative effect on NPLs in the short term using the ARDL model in Indonesian banks. The study shows that efficient credit distribution actually suppresses non-performing loans. [12] also confirmed that LDRs have a negative effect on NPLs in commercial banks in South Sumatra. These findings indicate that banks with good intermediation rates, which is reflected in optimal LDRs, tend to have better

credit quality.

The Effect of Bank Size on BPR Non-Performing Loans (NPLs) in Central Java. The results of the hypothesis test showed that the bank size (X4) had a negative regression coefficient of -4.04 with a probability value of 0.0959. These findings indicate that bank size has a negative effect on NPLs, but the effect is not statistically significant at a significance level of 5% ($\alpha = 0.05$), although it is close to significant at the level of 10%. This means that any increase in bank size will decrease the NPL rate, although this effect cannot be statistically robust. The direction of the negative relationship between bank size and NPLs is in line with the research hypothesis that predicts that bank size has a negative effect on NPLs. Theoretically, based on the Economic Scale Theory proposed [10], the larger the bank size, the more efficient it is operationally and the better the ability to diversify risks. Large banks have comparative advantages in terms of human resources, technology, management information systems, and the ability to spread risk across various credit portfolios. The results of this study are in line with the findings [16] who show that bank size has a negative effect on NPLs because large banks have better supervisory systems and higher diversification capabilities. Other research results also confirm that large banks are better at managing credit risk in Italy. These findings indicate that economies of scale in credit risk management do occur in the banking sector. The insignificance of the influence of bank size at the 5% level in this study requires a more in-depth explanation. *Economies of scale* in credit risk management [20]. The theory of scale efficiency from Panzar & Rosse (1987) explains that larger financial institutions can achieve lower average costs per unit of output. In the context of BPR credit risk management, *economies of scale* manifest in several forms: Simultaneous Influence of Macroeconomics (inflation and GDP) and Bank-Specific Factors (LDR and bank size) on BPR Non-Performing Loans (NPLs) in Central Java.

Macroeconomic variables consisting of inflation and Gross Domestic Product (GDP) together with bank-specific factors, namely *Loan to Deposit Ratio* (LDR) and bank size, have been proven to have a significant effect on *Non-Performing Loans* (NPLs) at People's Economic Banks (BPR) in Central Java. This is reflected in the results of simultaneous regression analysis (F-test), it is known that the F-statistical probability value is < 0.05 which means that the overall regression model is statistically significant. This result shows that the level of non-performing loans is not only influenced by the bank's internal policies, but also by macroeconomic conditions that affect the debtor's ability to pay.

The value of the determination coefficient (Adjusted R-squared) of 0.9499 or 94.99% indicates that the independent variable in the model is able to explain the variation in NPLs of 94.99%, while the remaining 5.01% is explained by other variables outside the

model. This very high value of the determination coefficient indicates that the model built is very good in explaining the variation in NPLs in BPRs in Central Java. This is an important finding that shows that the combination of macroeconomic factors and bank-specific factors is the main determinant in determining the level of non-performing loans.

The findings of this study are in line with various previous studies that show the importance of considering both external and internal factors simultaneously in analyzing the determinants of NPLs. [6] found that the combination of macroeconomic and country governance variables simultaneously had a significant effect on NPLs in Developing Asian countries. Using the GMM System showed that NPLs are influenced by a combination of internal factors of banks, ownership, and macroeconomic conditions simultaneously [19]. The combination of bank-specific and macroeconomic factors together determines the burden of NPLs on Italian banks [20]. Based on the System Theory put forward [16] banking is an open system that is influenced by various factors that interact with each other, both from the external environment (macroeconomics) and internal (bank characteristics and policies). NPLs as an indicator of credit risk cannot be explained from just one dimension, but are the result of a complex interaction between macroeconomic conditions that affect the debtor's ability to pay and the policies and internal characteristics of banks that determine the quality of credit disbursement and management [14].

4. Conclusion

Based on the results of the study, inflation had a negative but not significant effect on Non-Performing Loans (NPLs), which shows that the relatively stable inflation rate during the study period has not had a significant impact on the credit quality of BPRs. On the other hand, Gross Domestic Product (GDP) has a positive and significant effect on NPLs. These findings indicate that the increase in economic growth is followed by an increase in NPLs, which is suspected to be caused by more aggressive credit expansion during periods of economic growth, thereby increasing credit risk. Meanwhile, the Loan to Deposit Ratio (LDR) and bank size both have a negative but not significant effect on NPLs. This shows that liquidity management and the scale of bank assets have not been the main factors that determine the change in the level of non-performing loans in conventional BPRs in Central Java during the study period. Simultaneously, inflation, GDP, LDR, and bank size were shown to have a significant effect on NPLs, with an Adjusted R² value of 94.99%, which suggests that almost all variations in NPLs can be explained by the combination of these four variables. These results confirm that NPLs are a phenomenon influenced by the interaction between macroeconomic factors and bank-specific factors, so their management requires a comprehensive approach.

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