

The Influence of Inflation, Gross Regional Domestic Product, Unemployment, And Income Inequality on Non-Performing Loans of Commercial Banks in 33 Provinces of Indonesia for the Period 2013-2024

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ABSTRACT: This study aims to analyze the influence of macroeconomic factors on Non-Performing Loans (NPL) of commercial banks in 33 provinces of Indonesia during the 2013-2024 period. The independent variables used include inflation, Regional Gross Domestic Product (RGDP), open unemployment rate, and income inequality proxied by the Gini coefficient. The analytical method used is panel data regression with the Common Effect Model, Fixed Effect Model, and Random Effect Model approaches. The best model selection was conducted through the Chow Test, Hausman Test, and Lagrange Multiplier Test. The test results indicate that the Random Effect Model is the most suitable. Partially, the open unemployment rate has a positive and significant influence on NPL, while inflation, RGDP growth, and the Gini coefficient do not show a significant influence. However, simultaneously, all independent variables have a significant influence on NPL, indicating that non-performing loans are a phenomenon influenced by the interaction of various macroeconomic factors. These findings confirm the role of labor market conditions as a key indicator of credit risk at the regional level. Practically, the results of this study provide important implications for regulators and the banking sector in formulating more contextual and regionally-based credit risk management policies.

KEYWORDS: Non-Performing Loans, Panel Data, Unemployment, RGDP, Inflation, Income Inequality.

I. INTRODUCTION

The banking sector plays a crucial role as a financial intermediary in supporting national economic growth by channeling funds from surplus parties to those in need (Nasir, Oktaviani, & Andriyani, 2022). Banking stability is a prerequisite for the overall stability of the financial system, where intermediation performance, primarily through credit distribution, depends on risk management capabilities (Giammanco, Gitto, & Ofria, 2023). A key indicator in credit risk management is Non-Performing Loans (NPL), where a high NPL ratio reflects problems with bank asset quality and can disrupt the health of the banking system (Golitsis, Khudoykulov, & Palanov, 2022; Gashi, Tafa, & Bajram, 2022). Therefore, maintaining NPL at a healthy level is a fundamental expectation for the sustainability of financial intermediation and economic stability.

In reality, the credit performance of Indonesian banks shows vulnerability to macroeconomic dynamics. Data from the Financial Services Authority (OJK) for the period 2013-2024 reveals fluctuations in commercial bank NPL, which peaked at 3.06% in 2020, driven by the global economic slowdown and the COVID-19 pandemic. Meanwhile, key macroeconomic indicators such as economic growth measured by Regional Gross Domestic Product (RGDP) also experienced volatility, with a national contraction of -2.07% in 2020 (Central Statistics Agency, 2024). Analysis at the provincial level reveals significant disparities. For example, the average NPL for the 2013-2024 period in East Kalimantan reached 4.57%, much higher than Central Kalimantan at only 1.20%. Similar variations are seen in RGDP growth, open unemployment rates, and inter-provincial Gini ratios. Interesting phenomena emerge, such as high NPL in Central Java (3.42%) despite relatively good RGDP growth and income equality, or controlled NPL in Banten (1.99%) despite an unemployment rate of 8.74%. These paradoxical patterns suggest that the relationship between macroeconomic factors and NPL is complex and contextual, not always linear as often assumed in aggregate national analysis (Foglia, 2022; Ahmed, Majeed, Thalassinou, & Thalassinou, 2021).

A research gap arises because the majority of previous studies on the determinants of NPL, both in Indonesia (Shonhadji, 2020) and cross-country (Foglia, 2022; Kjosewski & Petkovski, 2021), were conducted at the national aggregate level, thereby obscuring sub-national disparities. Some studies integrating income inequality find a positive relationship between the Gini Index and NPL

The Influence of Inflation, Gross Regional Domestic Product, Unemployment, And Income Inequality on Non-Performing Loans of Commercial Banks in 33 Provinces of Indonesia for the Period 2013-2024

(Giammanco & Gitto, 2023; Kalimoldayev, Popova, Černiševs, & Popovs, 2025). However, research that simultaneously analyzes the influence of four key macroeconomic variables—RGDP, inflation, unemployment, and income inequality (Gini)—on NPL at the regional level in Indonesia is still very limited. The absence of provincial-level analysis, coupled with the finding of paradoxical phenomena in Indonesian empirical data, indicates the need for more comprehensive research to reveal specific dynamics not visible in aggregate analysis.

Based on the identification of this gap, this study aims to analyze the influence of inflation, RGDP, unemployment rate, and income inequality on Non-Performing Loans of Commercial Banks in 33 provinces of Indonesia for the 2013-2024 period. The research questions raised are: (1) What is the partial influence of each independent variable on NPL? (2) What is the simultaneous influence of these four variables on NPL? (3) Which variable is the most dominant influence on NPL? Theoretically, this research is expected to enrich the literature on the determinants of NPL with a regional perspective and a dimension of inequality. Practically, the research results can be a consideration for regulators and banking industry players in formulating more effective and contextual credit risk management policies, to support the stability of regional and national financial systems.

II. LITERATURE REVIEW the Relationship Between Inflation and NPL

Inflation, as a sustained increase in the general price level (Mankiw, 2021), affects NPL through several channels. Theoretically, high inflation can erode the real income of debtors, reduce purchasing power, and ultimately weaken their capacity to repay loans. However, the empirical relationship is complex and varied. Some studies support a positive relationship. Staehr & Uuskula (2021) found in EU countries that an increase in inflation correlates with an increase in NPL eight quarters ahead. Similar findings were reported in the Baltic region (Kjosevski & Petkovski, 2021) and the Middle East-North Africa (MENA) region (Alnabusi, Kozarević & Hakimi, 2022), where inflation suppresses customers' real capacity and increases credit risk.

On the other hand, several studies yield different findings. Arham et al. (2020) found a negative influence of inflation on NPL in Emerging Asian countries, indicating that controlled inflation and prudential supervision can dampen pressure on credit quality. Some studies even find an insignificant relationship (Nor et al., 2021) or one that is dynamic depending on the lag, as in India where the effect of inflation on NPA (non-performing assets) is positive at the first lag but negative at the second lag (Mishra et al., 2021). The Indonesian context also shows complexity, where Shonhadji (2020) found inflation to be insignificant during periods of low inflation, while Fakhrunnas et al. (2022) identified an asymmetric relationship between inflation and NPL before the pandemic.

The Relationship Between Economic Growth (GRDP/GDP) and NPL

Economic growth, measured through national GDP or regional GRDP, theoretically has a negative (counter-cyclical) relationship with NPL. An expanding economy generally increases debtor income and profitability, thereby reducing defaults. Many studies support this theory. GDP growth has been proven to have a significant negative impact on NPL in EU countries (Staehr & Uuskula, 2021), the Baltics (Kjosevski & Petkovski, 2021), Italy (Foglia, 2022), and several Asian countries (Giammanco & Gitto, 2023; Kalimoldayev et al., 2025). The mechanism is the increase in economic activity that enhances debtor repayment capacity.

However, there is contrary evidence. Some studies actually find a positive relationship, suspected to be due to excessive credit expansion and loosening standards when the economy improves, eventually triggering NPL in subsequent periods, as found in the MENA region (Alnabusi & Kozarević, 2022) and Pakistan (Ahmed et al., 2021). In Indonesia, results are varied: Nasir & Oktaviani (2022) found a negative influence, while Shonhadji (2020) reported no significant influence, and a study in the Western Balkans found a positive but insignificant influence (Gashi & Tafa, 2022). This indicates that the relationship between economic growth and NPL is highly influenced by institutional context, banking behavior, and economic structure.

The Relationship Between Unemployment and NPL

The unemployment rate theoretically and empirically consistently shows a positive relationship with NPL. The main mechanism is through decreased household income and weakened demand and company profitability, which together jeopardize debt repayment capacity (Foglia, 2022; Kjosevski & Petkovski, 2021). Empirical evidence from various regions strongly supports this relationship. Studies in Italy (Foglia, 2022), the Western Balkans (Gashi & Tafa, 2022), the Baltic states (Kjosevski & Petkovski, 2021), Emerging Asia (Arham et al., 2020), the European Union (Staehr & Uuskula, 2021), MENA (Alnabusi & Kozarević, 2022), and Asia (Giammanco & Gitto, 2023) consistently find significant positive coefficients. Unemployment often functions as a leading indicator for the future deterioration of credit quality. This finding confirms that employment conditions are a key macroeconomic variable in predicting pressure on bank credit portfolios.

The Influence of Inflation, Gross Regional Domestic Product, Unemployment, And Income Inequality on Non-Performing Loans of Commercial Banks in 33 Provinces of Indonesia for the Period 2013-2024

The Relationship Between Income Inequality (Gini Index) and NPL

Income inequality, measured by the Gini index, is a socio-economic variable relatively newly explored in NPL determinant studies. Theoretically, high inequality indicates the concentration of income and assets among a few groups, while the majority of the low-income population is more vulnerable to economic shocks. This vulnerability can lead to a high probability of default among that segment of society, thus driving an increase in aggregate NPL (Kalimoldayev et al., 2025; Giammanco & Gitto, 2023).

Empirical studies specifically testing this variable are still limited, but initial findings support a positive relationship. Research in Kazakhstan (Kalimoldayev et al., 2025) and analysis across 31 Asian countries (Giammanco & Gitto, 2023) both find that a higher Gini index correlates with higher NPL levels. Interestingly, Kalimoldayev et al. (2025) also found that when social variables (including Gini) act as mediators, they can amplify the negative impact of economic growth on NPL. This implies that noninclusive economic growth, where its benefits are not enjoyed equally, can reduce its positive impact on lowering NPL.

Identification of Research Gaps and Study Contribution

The synthesis of the above literature reveals several research gaps:

1. Focus on National/Cross-Country Level Analysis: The majority of studies focus on country-level analysis or cross-country comparisons. This ignores the diversity of economic, social, and institutional conditions between regions within a country, which may have a significant influence on NPL dynamics.
2. Limited Exploration of Social Variables: The income inequality variable (Gini Index) is still rarely comprehensively integrated into NPL determinant models, especially in the context of regional studies in developing countries.
3. Inconsistent Results: Findings regarding the influence of inflation and economic growth on NPL are still inconclusive and highly context-dependent. Further testing is needed in specific empirical settings, such as regional banking in Indonesia, to provide more relevant evidence

Based on these gaps, this research is designed to contribute by analyzing the simultaneous influence of the four variables—inflation, GRDP, unemployment, and income inequality (Gini) on commercial bank NPL. The analysis is conducted at the granular level of 33 provinces in Indonesia over the period 2013-2024 using a panel data approach. Thus, this study is expected to provide a deeper and more contextual understanding of NPL dynamics at the regional level, as well as valuable input for the formulation of more targeted credit risk management policies.

III. METHODOLOGY Object and Data Sources

This study analyzes the influence on Non-Performing Loans (NPL) of commercial banks across 33 provinces in Indonesia. The research period covers 2013 to 2024 to capture recent economic dynamics. The data used is secondary data accessed from official sources, namely banking statistics from the Financial Services Authority (OJK) and macroeconomic indicators from the Central Statistics Agency (BPS).

Definition and Measurement of Variabels

There is one dependent variable and four independent variables in this study, measured quantitatively. The operational definition of each variable is presented in Table 1.

Tabel 1. Operational Definitions

Variable	Symbol	Operational Definition	Scale	Source
Non-Performing Loans	NPL	The ratio of problem loans (Substandard + Doubtful + Loss) to total loans disbursed.	Ratio (%)	OJK
Inflation	INFL	Annual growth of the provincial Consumer Price Index (CPI), calculating consumer price changes.	Ratio (%)	BPS
Gross Regional Domestic Product	PDRB	Annual growth of Gross Regional Domestic Product at constant prices, indicating real economic expansion.	Ratio (%)	BPS

The Influence of Inflation, Gross Regional Domestic Product, Unemployment, And Income Inequality on Non-Performing Loans of Commercial Banks in 33 Provinces of Indonesia for the Period 2013-2024

Unemployment	TPT	The proportion of the labor force that is not working and is seeking work to the total labor force.	Ratio (%)	BPS
Income Inequality	GINI	The Gini coefficient based on per capita expenditure, measuring income distribution (0 = equal, 1 = unequal).	Index (0-1)	BPS

Conceptual Framework

The relationship between the independent and dependent variables in this study is illustrated in the following conceptual framework:

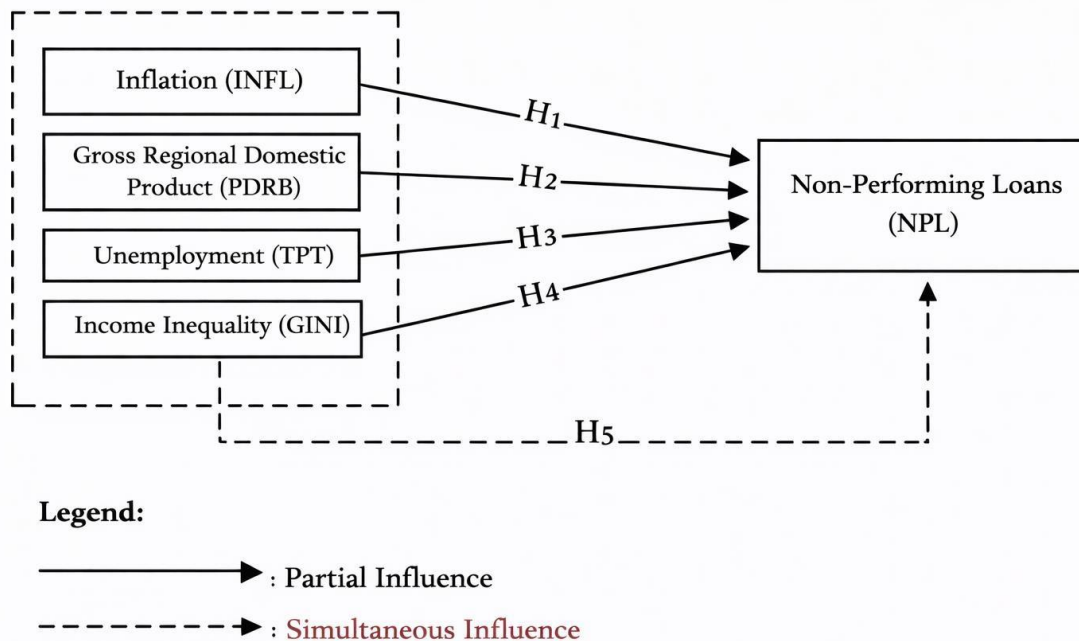


Figure 1. Conceptual Framework

Based on the description in the literature review, this research will test the following hypotheses:

1. H1: Inflation has a positive and significant influence on the level of Non-Performing Loans (NPL).
2. H2: Gross Regional Domestic Product (GRDP) has a negative and significant influence on the level of Non-Performing Loans (NPL).
3. H3: The Unemployment Rate has a positive and significant influence on the level of Non-Performing Loans (NPL).
4. H4: Income Inequality (Gini Index) has a positive and significant influence on the level of Non-Performing Loans (NPL).
5. H5: Inflation, GRDP, Unemployment Rate, and Income Inequality simultaneously have a significant influence on the level of Non-Performing Loans (NPL).

Analysis Method

Data analysis was conducted using a panel data regression approach. Panel data was chosen because it can accommodate two dimensions, namely cross-section (33 provinces) and time-series (12 years), thereby producing more efficient estimates and allowing control for unobserved individual heterogeneity (Baltagi, 2021). The stages of panel data analysis in this research are explained in the following flowchart:

The Influence of Inflation, Gross Regional Domestic Product, Unemployment, And Income Inequality on Non-Performing Loans of Commercial Banks in 33 Provinces of Indonesia for the Period 2013-2024

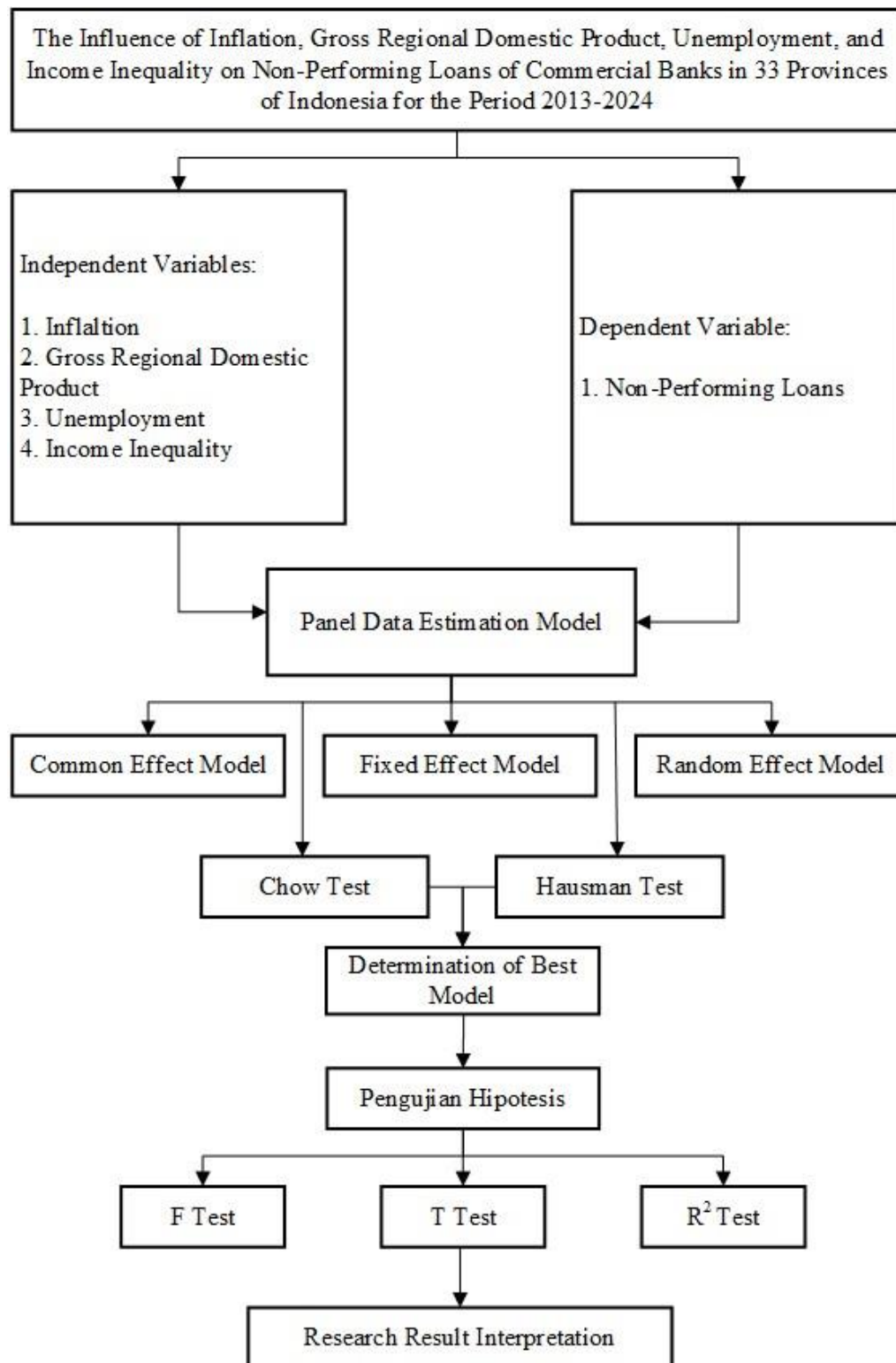


Figure 2. Analysis Method

The analysis flow begins by performing estimation using three models: Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM). The best model selection is done through two test stages. First, the Chow Test to choose between CEM and FEM. Second, the Hausman Test to compare FEM and REM. After the model is selected, hypothesis testing is conducted, including the F Test, t Test, and the Coefficient of Determination (R^2) Test.

Research Model

The causal relationship between variables is estimated with the following panel data regression model:

$$NPL_{it} = \beta_0 + \beta_1 INF_{it} + \beta_2 PDRB_{it} + \beta_3 TPT_{it} + \beta_4 GINI_{it} + \varepsilon_{it}$$

Keterangan:

The Influence of Inflation, Gross Regional Domestic Product, Unemployment, And Income Inequality on Non-Performing Loans of Commercial Banks in 33 Provinces of Indonesia for the Period 2013-2024

- i represents the i -th province
- t represents the t -th year
- β_0 is the constant
- β_1 to β_4 are the regression coefficients to be estimated
- ε_{it} is the error term.

Panel Data Estimation Model

Panel data, or often called longitudinal data, is a form of data that combines two dimensions: cross-section dimension (between individual units) and time-series dimension (between time periods) (Greene, 2020). The estimation models are as follows:

1. **Pooled/Common Effect Model (PEM/CEM):** This model essentially ignores the panel data structure. All observations from various units and times are treated as if from one large random sample, then entered into one standard regression model.
2. **Fixed Effect Model (FEM):** This model accommodates individual heterogeneity by allowing different intercepts for each cross-sectional unit.
3. **Random Effect Model (REM):** The random effects model is a method of treating individual heterogeneity as a random component in the error term.

Selection and Determination of Panel Data Model

Model selection tests in the context of panel data analysis refer to a series of statistical procedures used to identify the model most suitable for the analyzed data. The following are important points regarding model selection tests:

1. **Chow Test:** This test aims to determine which model is more appropriate between common effect and fixed effect.

Ho: Common Effect Model Ha: Fixed Effect Model

Criteria: If the probability level > 0.05 or α , then H_0 is accepted. If the probability level < 0.05 or α , then H_a is accepted.

2. **Hausman Test:** This test is conducted to determine which model is better between random effect and fixed effect.

Ho: Random Effect Model Ha: Fixed Effect Model

Kriteria: If the probability value > 0.05 or α , then H_0 is accepted. If the probability value < 0.05 or α , then H_a is accepted.

3. **Lagrange Multiplier Test:** This test is performed to determine which model is more appropriate between the common effect model and the random effect model. It serves as the initial step in the model selection procedure. Ho: Common Effect Model

Ha: Random Effect Model

Criteria: If the probability value > 0.05 or α , then H_0 is accepted, indicating the Common Effect Model is appropriate. If the p -value < 0.05 or α , then H_a is accepted, indicating the Random Effect Model is appropriate

Statistical Tests

1. **T Test:** The t test is used to test the partial influence of each independent variable on the dependent variable (Paramita & Rizal, 2021). If the significance value $t < 0.05$, then H_0 is rejected and H_a is accepted. If the significance value $t > 0.05$, then H_0 is accepted and H_a is rejected.
2. **F Test:** The F test is used to test whether all independent variables together have a significant influence on the dependent variable. If $F_{\text{calculated}} > F_{\text{table}}$ or the significance value < 0.05 , then H_0 is rejected. If $F_{\text{calculated}} < F_{\text{table}}$ or the significance value > 0.05 , then H_0 is accepted.
3. **Coefficient of Determination (R^2 Test):** The coefficient of determination (R^2) is a statistical value that describes how well a regression model can explain the variation or change occurring in the dependent variable (Ferdinand, 2008, as cited in Paramita & Rizal, 2021). In the research context, the R^2 value provides an initial overview of the model's goodness-of-fit. However, the use of R^2 has limitations. The addition of any independent variable, even if insignificant, will tend to increase the R^2 value. To overcome this weakness, Adjusted R^2 is used.

Descriptive Statistical Analysis

Descriptive statistics is a form of analysis used to describe or illustrate the overall data of the variables selected in the research. This analysis serves to provide an empirical picture of the collected data, such as frequency distribution, average value, highest value, lowest value, and data spread (Paramita & Rizal, 2021). All stages of data processing and analysis in this research were conducted using RStudio software.

IV. RESULTS AND DISCUSSION Descriptive Statistics

Before hypothesis testing, descriptive statistical analysis was conducted to provide a general overview of the distribution and characteristics of the data used (Paramita & Rizal, 2021).

The Influence of Inflation, Gross Regional Domestic Product, Unemployment, And Income Inequality on Non-Performing Loans of Commercial Banks in 33 Provinces of Indonesia for the Period 2013-2024

	Mean	Median	Min	Max	SD	Q1	Q3
NPL	2.48	2.30	0.50	7.28	1.01	1.75	2.97
INFL	3.82	3.04	-0.79	11.58	2.44	2.08	5.34
PDRB	4.83	5.11	-15.74	22.94	3.50	4.16	5.89
TPT	5.18	4.78	1.40	10.95	1.86	3.83	6.30
GINI	0.36	0.36	0.24	0.46	0.04	0.33	0.39

Figure 3. Descriptive Statistics

Source: Processed Data, Rstudio

The analysis results show that the average NPL is 2.48% with a minimum value of 0.50% and a maximum of 7.28%, indicating significant variation in credit risk between provinces. The average inflation was recorded at 3.82% with fluctuations between 0.79% and 11.58%, showing relatively stable price levels during the research period. The average regional economic growth (GRDP) was 4.83%, but has a very wide range from -15.74% to 22.94%, reflecting the diversity of economic performance at the provincial level. The average open unemployment rate (TPT) was 5.18% with a range between 1.40% and 10.95%, while the average Gini coefficient was 0.36 with values between 0.24 and 0.46, indicating a moderate level of income inequality nationally but varying between regions.

Panel Model Selection

F statistic

```
data: NPL ~ INFL + PDRB + TPT + GINI
F = 9.5994, df1 = 32, df2 = 359, p-value < 2.2e-16
alternative hypothesis: unstability
```

Figure 4. Chow Test

Source: Processed Data, Rstudio

Hausman Test

```
data: NPL ~ INFL + PDRB + TPT + GINI
chisq = 4.5788, df = 4, p-value = 0.3333
alternative hypothesis: one model is inconsistent
```

Figure 5. Hausman Test

Source: Processed Data, Rstudio

Lagrange Multiplier Test - two-ways effects (Breusch-Pagan)

```
data: NPL ~ INFL + PDRB + TPT + GINI
chisq = 342.66, df = 2, p-value < 2.2e-16
alternative hypothesis: significant effects
```

```
> #Efek Individu/Cross section
> plmtest(rem, effect="individual", type="bp")
```

Lagrange Multiplier Test - (Breusch-Pagan)

```
data: NPL ~ INFL + PDRB + TPT + GINI
chisq = 342.44, df = 1, p-value < 2.2e-16
alternative hypothesis: significant effects
```

```
> #Efek waktu/Time
> plmtest(rem, effect="time", type="bp")
```

Lagrange Multiplier Test - time effects (Breusch-Pagan)

```
data: NPL ~ INFL + PDRB + TPT + GINI
chisq = 0.22029, df = 1, p-value = 0.6388
alternative hypothesis: significant effects
```

Figure 6. Lagrange Multiplier Test

Source: Processed Data, Rstudio

The Influence of Inflation, Gross Regional Domestic Product, Unemployment, And Income Inequality on Non-Performing Loans of Commercial Banks in 33 Provinces of Indonesia for the Period 2013-2024

The process of selecting the appropriate panel data model was conducted through a series of specification tests. The Chow Test was performed to choose between the Common Effect Model and the Fixed Effect Model. The test results show a p-value of 2.2e-16, which is smaller than the significance level of 0.05, so the null hypothesis is rejected and the Fixed Effect Model is selected. Next, the Hausman Test was conducted to compare the Fixed Effect Model with the Random Effect Model. The Hausman Test results yield a p-value of 0.3333, which is greater than 0.05, so the null hypothesis is accepted and the Random Effect Model is selected as the more efficient model. To confirm this choice, the Lagrange Multiplier Test was performed, showing that individual effects are statistically significant (p-value=2.2e-16) while time effects are not significant (pvalue=0.6388), thus confirming the Random Effect Model as the final model used in regression analysis.

RESULTS

```
coefficients:
              Estimate Std. Error z-value Pr(>|z|)
(Intercept)  1.225930   0.648852  1.8894  0.05884 .
INFL         -0.025704   0.017355 -1.4811  0.13858
PDRB         -0.012710   0.012985 -0.9788  0.32767
TPT           0.167481   0.037581  4.4566 8.329e-06 ***
GINI          1.525094   1.761708  0.8657  0.38666
---
signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Figure 7. Panel Data Regression Test Results

Source: Processed Data, Rstudio

```
chisq: 28.6509 on 4 DF, p-value: 9.2032e-06
```

Figure 8. F Test Results

Source: Processed Data, Rstudio

Based on the model selection results, estimation was performed using the Random Effect Model. The estimation results show that the open unemployment rate (TPT) variable has a positive and significant influence on NPL with a coefficient of 0.167481 and a p-value of 8.329e-06. This means that every one-unit increase in the unemployment rate will increase the NPL ratio by 0.167 units, assuming other variables remain constant. On the other hand, the inflation (INFL) variable, GRDP growth, and the Gini coefficient do not show a significant influence on NPL with p-values of 0.13858, 0.32767, and 0.38666, respectively. The resulting regression equation is $NPL = 1.2259 - 0.0257*INFL - 0.0127*GRDP + 0.1675*TPT + 1.5251*GINI$. The simultaneous test (F Test) yields a p-value of 9.2032e-06, indicating that the independent variables together have a significant influence on NPL. However, the coefficient of determination (Adjusted R^2) of 0.0587 indicates that the independent variables can only explain 5.87% of the variation in NPL, while the remaining 94.13% is explained by other factors outside the model.

DISCUSSION

The estimation results of the panel data regression model reveal the dynamics of the relationship between macroeconomic factors and Non-Performing Loans (NPL) of commercial banks in Indonesia. The findings show that only one of the four variables is statistically significant, while the other three do not show a significant influence. The following is an in-depth discussion of these results, integrating theoretical perspectives and previous empirical findings.

The influence of inflation on NPL is not statistically significant. This finding aligns with the results of Shonhadji's (2020) research on Indonesian banking, which concluded that inflation is not the most influential variable on NPL, suspected to be due to relatively low and stable inflation, balanced by strict supervision and the application of prudential principles by monetary authorities. The study by Nor & Ismail (2021) in nine Asian countries also reported similar results, where inflation did not significantly affect NPL, indicating that in the Asian region, other macroeconomic variables may be more dominant. Theoretically, inflation can affect debtor repayment capacity through two opposing channels. Unanticipated high inflation can reduce the real purchasing power of household and business income (Mankiw, 2021), potentially increasing the likelihood of default. However, low and stable inflation, or inflation that is anticipated and reflected in interest rates, can create a more predictable economic environment without directly burdening debtor repayment capacity. Thus, the insignificance of inflation in this study indicates that price fluctuations during the observation period played more of a background role, not as a major shock directly damaging credit quality.

The Influence of Inflation, Gross Regional Domestic Product, Unemployment, And Income Inequality on Non-Performing Loans of Commercial Banks in 33 Provinces of Indonesia for the Period 2013-2024

The growth of Gross Regional Domestic Product (GRDP) also does not show a significant influence on NPL. This result provides an additional perspective on the business cycle theoretical framework. Business cycle theory explains that the economy experiences short-term fluctuations characterized by expansion and contraction phases around long-term growth trends (Blanchard & Amighini, 2021). In the expansion phase, increased aggregate output is usually accompanied by increased income, decreased unemployment, and increased business profitability, which logically can strengthen debtor repayment capacity. However, the insignificance of this relationship in the present study indicates that the transmission mechanism from real economic growth to banking credit health may not work perfectly or is hampered by structural factors. The Real Business Cycle (RBC) Theory approach emphasizes that output fluctuations are primarily caused by technology and productivity shocks on the supply side (Blanchard & Amighini, 2021). If a province's GRDP growth is more driven by productivity increases in sectors that are not credit-intensive or have weak linkages with the domestic banking sector, then that output increase may not necessarily improve the overall quality of the bank's credit portfolio. Furthermore, the Financial Accelerator theory (Blanchard & Amighini, 2021) explains that the financial balance sheet conditions of economic actors can amplify cyclical fluctuations through the credit channel, but this requires the effective functioning of the credit channel. If financial intermediation is hindered or uneven in some regions, then an increase in GRDP does not automatically increase collateral value or improve the financial condition of existing debtors.

The Open Unemployment Rate (TPT) has been proven to have a positive and significant influence on NPL. This finding is consistent with the theoretical framework underlying the research, specifically the transmission mechanism through household and corporate channels. Theoretically, an increase in unemployment reduces household income and purchasing power, thereby weakening their capacity to meet debt installment obligations (Foglia, 2022). On the corporate side, high unemployment often reflects weakening aggregate demand, leading to decreased output and business profitability, thereby jeopardizing companies' ability to repay credit (Kjosevski & Petkovski, 2021). This finding is in line with the majority of previous studies. Studies in Italy (Foglia, 2022), the Baltic states (Kjosevski & Petkovski, 2021), the Emerging Asia region (Arham et al., 2020), and European Union countries (Staehr & Uuskula, 2021) consistently report a significant positive relationship between unemployment and NPL. Research in the Western Balkans (Gashi & Tafa, 2022) and the Middle East and North Africa region (Alnabulsi & Kozarević, 2022) also supports similar conclusions. The coherence of these findings indicates that the positive relationship between unemployment and NPL is a robust pattern across geographical contexts.

The Gini coefficient as a proxy for income inequality does not show a significant influence on NPL. This finding provides nuance to the underlying theoretical framework. Todaro & Smith (2024) state that income inequality in developing countries is often structural and reflects unequal access to economic resources, public services, and opportunities. They highlight that high inequality is a characteristic of non-inclusive economic growth, where the benefits of growth are only enjoyed by a small segment of the population. Logically, this structural condition can create greater vulnerability among low-income groups, potentially leading to an inability to meet credit obligations. However, the empirical results of this study do not confirm this direct transmission channel in the context of commercial bank NPL in Indonesia. This insignificance also places the research findings in a different position from some international empirical evidence. As studies by Giammanco & Gitto (2023) in 31 Asian countries and Kalimoldayev et al. (2025) in Kazakhstan found a significant positive relationship between the Gini index and NPL, strengthening the structural vulnerability theory. This difference in results with the Indonesian context is suspected to be caused by mediating factors and specific policies.

The analysis of simultaneous influence shows that the four independent variables together have a significant influence on NPL. This finding aligns with the theoretical framework stating that NPL is a multidimensional phenomenon influenced by the complex interaction of various macroeconomic and social factors (Saunders & Cornett, 2024; Kjosevski & Petkovski, 2021). The disparity between the significant simultaneous test results and the mostly insignificant partial tests suggests the existence of interaction effects or mutual reinforcement between variables in influencing NPL. That is, the impact of inflation, economic growth, or inequality may only become significant when combined with certain conditions, such as a high unemployment rate. For example, high but non-inclusive GRDP growth can occur simultaneously with persistently high unemployment and inequality, creating fragile macroeconomic conditions that ultimately burden overall banking credit quality.

The analysis of the most dominant influence reveals that of the four variables, only the Open Unemployment Rate (TPT) shows a statistically significant influence. This strong finding regarding the influence of unemployment is consistent with the majority of previous studies. Studies by Kjosevski & Petkovski (2021) in the Baltic states, Staehr & Uuskula (2021) in the European Union, Foglia (2022) in Italy, and Arham et al. (2020) in Emerging Asian countries consistently report a significant positive relationship between unemployment and NPL. This confirms that unemployment is the most influential and consistent variable as a leading indicator of credit pressure in the banking system. The insignificance of the inflation variable can be interpreted in the context of relatively

The Influence of Inflation, Gross Regional Domestic Product, Unemployment, And Income Inequality on Non-Performing Loans of Commercial Banks in 33 Provinces of Indonesia for the Period 2013-2024

successful inflation control by Bank Indonesia during the research period (Shonhadji, 2020). The insignificance of GRDP is suspected to be due to the characteristics of Indonesia's economic growth, which is not always credit-intensive (Shonhadji, 2020), or due to a longer time lag between economic slowdown and an increase in NPL. This result differs from the strong findings of a negative relationship in many countries (Foglia, 2022; Staehr & Uuskula, 2021) but aligns with Msomi's (2022) study in West Africa, which also reported the insignificance of GRDP. As for the insignificance of the Gini Coefficient, it indicates that the impact of inequality on loan defaults is more indirect and moderated by other variables, such as access to credit or social safety mechanisms (Kalimoldayev et al., 2025).

V. CONCLUSION

Based on panel data analysis from 33 provinces in Indonesia during the period 2013-2024, this research reveals a significant relationship between macroeconomic factors and the Non-Performing Loan (NPL) level of commercial banks. Partially, only the Open Unemployment Rate (TPT) has a positive and significant influence on NPL, while inflation, GRDP growth, and the Gini coefficient do not show a significant influence. Simultaneously, these four variables together have a significant influence on NPL, confirming the multidimensional nature of problem loans. This finding confirms the central role of employment conditions as a leading indicator of credit risk at the regional level, shifting focus from conventional macroeconomic indicators such as output growth and inflation.

Theoretically, these results enrich the empirical literature by emphasizing the importance of transmission channels through debtor income and financial balance sheets, rather than business cycle or monetary mechanisms. This suggests that theoretical frameworks need to consider local specific structural and institutional factors that can moderate standard theoretical relationships.

The resulting policy implications include: (1) for the Financial Services Authority and Bank Indonesia, the need to make unemployment a key indicator in early warning systems and macroprudential stress testing; (2) for bank management, the importance of integrating regional employment data in credit risk assessment and portfolio diversification strategies; and (3) for the government, job creation policies and social safety nets not only impact equality but also contribute to financial sector stability.

This research has several limitations, including not yet incorporating bank-specific variables and credit interest rates, as well as the use of aggregate provincial data that may hide intra-provincial heterogeneity. For future research, it is recommended to adopt a dynamic panel approach with the GMM method to capture NPL persistence and endogeneity issues, and to add moderation variables such as financial inclusion or specific bank characteristics. Furthermore, more granular analysis based on economic clusters or dominant sectors can provide deeper insights into the mechanisms of credit risk transmission at the regional level.

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