



## The Effect of BI-Rate, Net Interest Margin (NIM), and BOPO on Non-Performing Loans (NPL) in Conventional Banks Listed on the Indonesia Stock Exchange (IDX) in 2021-2024

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### ABSTRACT

This research seeks to examine how the BI Rate, NIM, and the BOPO shape the level of NPLs among conventional banks quoted on the IDX over the 2021–2024 window. Adopting a quantitative design, the analysis draws upon panel datasets compiled from published bank financial reports alongside relevant macroeconomic indicators. The sample was selected using purposive sampling in conventional foreign exchange banks. The analysis was carried out by regression of panel data using the REM model. The results showed that BI-Rate had a significant effect on NPLs in a negative direction, NIM had a significant effect on NPLs, while BOPO did not have a significant effect partially. Simultaneously, all three variables have a significant effect on NPLs. These findings confirm that banking credit risk is influenced by macro factors and the bank's internal performance.

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## INTRODUCTION

In this era of globalization, many companies compete to get the most profits through sound corporate management. The company's management must be careful in terms of lending policies because it will pose a credit risk for the company. Moreover, the company is required to carefully manage its liabilities, especially its liquidity standing, to remain solvent and sustain the trust of its creditors. Variations in profitability among banking firms can be attributed to several underlying factors, particularly exposure to credit risk and the adequacy of liquidity positions. (Krisna Aji & Suria Manda, 2021).

Embedded within the national financial architecture, banks function primarily as financial intermediaries, channeling funds gathered from the public back into the economy through lending activities. This intermediary capacity places them at the heart of economic expansion, as credit distribution stimulates investment and consumption. However, such a pivotal role inevitably subjects banking institutions to a spectrum of risks, with credit risk standing out as the most pronounced. Credit risk is commonly proxied by the NPL ratio, which measures the share of impaired loans relative to total lending. An elevated NPL ratio signals a deterioration in asset quality, thereby weakening the bank's financial position and potentially undermining overall banking system stability. (Mishkin, 2019).

One of the external factors that is suspected to affect the NPL rate is the BI-Rate. The BI-Rate is used by Bank Indonesia as a monetary policy signal to influence money market interest rates and banking interest rates. The change in the BI-Rate will affect the credit interest rate which ultimately has an impact on the ability of the debtor to meet the sum lent and interest accrued payment obligations of the loan (Bank Indonesia, 2023). An upward adjustment in credit interest rates can exert additional financial pressure on debtors, which in turn elevates default risk and contributes to a higher NPL ratio.

In addition to external factors, internal bank factors likewise contributes substantially to influencing NPL levels. An index of the bank's internal functioning is the NIM, which illustrates the bank's capability in managing earning assets to produce net interest revenue. (Financial Services Authority, 2022) explained that NIM constitutes a crucial metric for assessing the effectiveness of a bank's intermediation function as well as its capacity to generate profit. A high NIM reflect the bank's capacity to handle income-generating assets optimally, but under certain conditions it can also reflect high lending interest rates which have the tendency to intensify risk of defaulting of debtors.

In addition to credit risk, operational efficiency is also an internal factor that affects the level of NPLs. A bank's management efficiency can be analyzed through the ratio of BOPO, where a high BOPO ratio indicates a low level of efficiency due to high operating expenses compared to the revenue generated. These inefficiencies can limit banks' capacity to implement credit risk management effectively, which, in the long run, can elevate NPL risk. (Dendawijaya, 2019).

Empirical evidence from the OJK suggests that the quality of banking credit is under pressure during the economic recovery period. (Financial Services Authority, 2024) noted that the banking's gross NPL ratio increased to 2.35% in January 2024, compared to the December 2023 position of 2.19%, while the net NPL ratio also increased from 0.71% to 0.79%. This condition indicates an increase in credit risk amid domestic and global economic dynamics. Base on data from the OJK, it is noted that the ratio of NPL banking will increase in early 2024. In January 2024, the NPL ratio *gross* increased to 2.35%, up 16 basis points from 2.19% in December 2023. Meanwhile, NPLs *net* It also increased from 0.71% to 0.79% (Burhan, 2024).

The increase in NPLs also occurred in a number of large conventional banks, such as Bank Rakyat Indonesia which recorded NPLs of 3.08% as of September 2024, an increase from 2.90% in September 2024, and State Savings Banks with NPLs of 3.4%, up from 3.2% over the same timeframe a year earlier. The deterioration in credit quality has prompted banks to significantly increase their reserve burden (CKPN) as a risk mitigation measure. A similar phenomenon was also experienced by Bank Mandiri, whose NPL increased from 1.13% to 1.19%. (Adrianus Octaviano, 2024).

Previous research has shown that the increase in non-performing loans is a pivotal determinant contributing to the banking crisis (Khan et al., 2020). Increasing demand for loans and banks' willingness to take greater risks to meet that demand can turn loans into bad loans (Erdas & Ezanoglu, 2022).

One of the phenomenon of NPL in banking practices can be seen from a case involving Bank OCBC NISP and debtors PT Hair Star Indonesia (HIS). Bank OCBC NISP filed a lawsuit and confiscated the collateral for the credit facility provided to PT Hair Star Indonesia due to the debtor's inability to fulfill credit payment obligations. The value of the non-performing loans reportedly reached around IDR 232 billion, coupled with non-physical liabilities of significant value. This condition reflects the occurrence of NPL with the propensity to enhance the NPL ratio within the relevant bank and shapes on the evaluation of the bank's asset soundness and credibility by the banking supervisory authority. This phenomenon shows that the failure of debtors to meet credit obligations can have has a direct bearing on the growth of in credit risk and the quality of banking performance (Ellis, 2023).

The increase in NPLs was largely due to a decrease in the ability of existing debtors to pay, especially debtors who previously obtained credit restructuring during the Covid-19 pandemic, as well as pressure on the MSME and retail segments. This condition is exacerbated by global economic uncertainty, monetary policy direction, and the recovery of domestic purchasing power that has not been fully stable. This phenomenon shows that banking credit risk is not only influenced by the quality of new credit disbursement, but also by macroeconomic conditions and the institution's proficiency in mitigating risk.

Although research on the factors affecting NPLs has been carried out, prior research suggests that inconsistent findings, especially related to the influence of BI-Rate, NIM, and BOPO on NPLs. Some studies have found that BI-Rate plays a statistically meaningful role in shaping NPLs, while other studies

have shown a significant effect. The same thing also happens with the NIM and BOPO variables, where the results of previous studies still show differences in empirical findings.

In addition, most of the previous research still focused on the pre-pandemic period or the beginning of the Covid-19 pandemic, while studies that specifically examined the post-pandemic period with the conditions of BI-Rate increase and the end of credit restructuring are still relatively limited. These differences in economic and policy conditions have the potential to produce different relationships between BI-Rate, NIM, BOPO, and NPL compared to the previous period.

The research gap calls for further scholarly exploration that re-examines the influence of BI-Rate, Net Interest Margin (NIM), and BOPO on NPLs in the context of Indonesian banking in the 2021–2024 period. Therefore, this study takes the title "The Effect of BI-Rate, *Net Interest Margin* (NIM), and BOPO on *Non-Performing Loans* (NPL) in Conventional Banks Listed on the Indonesia Stock Exchange (IDX) in 2021-2024"

## **THEORETICAL REVIEW**

### *Theoretical Studies*

#### **Financial Intermediation Theory**

The theory posits that banks operate as pivotal channels within the financial system, reallocating resources from units with surplus capital to units with financing gaps in need of capital. (deficit units). In carrying out this function, banks face various risks, especially credit risks. The performance of financial intermediation is contingent upon broader macroeconomic conditions, regulatory and monetary policy frameworks, as well as the bank's internal competence in overseeing productive asset allocation. Changes in policy interest rates such as the BI-Rate will affect the cost of funds, credit interest rates, and credit demand, which ultimately impacts the credit quality of banks.

#### **Credit Risk Theory**

Is a potential loss due to the debtor's inability to service its debt according to the agreement. In the banking industry, credit risk is measured using the NPL ratio. This ratio captures the proportion of NPL to the total loans granted. High NPLs reflect the weak quality of banks' productive assets and can reduce the level of banking health. Credit risk is driven by external determinants, including economic conditions and interest rates, as well as internal factors such as credit policies, quality of risk management, and operational efficiency.

#### **Definition of Financial Ratios**

According to the OJK, Financial Ratio is a measurement calculated from accounts or components in financial statements to evaluate financial performance and make comparisons between periods or between companies. ([www.data.ojk.go.id](http://www.data.ojk.go.id))

### **Definition of BI Rate**

The BI Rate represents the benchmark policy interest rate employed as a primary monetary instrument by Bank Indonesia. It signals the central bank's prevailing monetary stance, reflecting its response to macroeconomic conditions such as inflation, exchange rate stability, and overall economic growth, and is formally communicated to the public to guide financial market expectations. (Bank Indonesia, 2023) BI Interest Rate or commonly known as BI Rate is a reference for interest costs where it is controlled BI base on the results of the Board of Gov Meeting every month. The BI Rate will be reported to the general public as a source of perspective for the benchmark lending rate (Triuspitorini, 2020)

### **Definition of Net Interest Margin (NIM)**

NIM is an indicator used to assess the bank's proficiency in converting productive assets into net interest earnings the financial intermediation activities it runs. NIM management that is not balanced with the implementation of adequate credit risk management could raise the probability of NPL, especially if the determination of lending interest rates is too high so as to burden the debtor's ability to pay. These conditions can have a negative impact on the quality of bank credit (Fiqih & Ardiansyah, 2025)

This ratio may be derived using the following equation:

$$NIM = \frac{\text{Pendapatan Bunga Bersih}}{\text{Aktiva Produktif}} \times 100 \%$$

### **Definition of Operating Costs to Operating Income (BOPO)**

The BOPO ratio serves as an indicator for evaluating how effectively bank management regulates operational expenditure relative to operating revenue. It assesses managerial efficiency in maintaining cost discipline, ensuring that expenses remain proportionate to income generated from core banking activities and overall institutional performance. (Fadhilah & Suprayogi, 2019) The formula used to calculate the ratio is as follows:

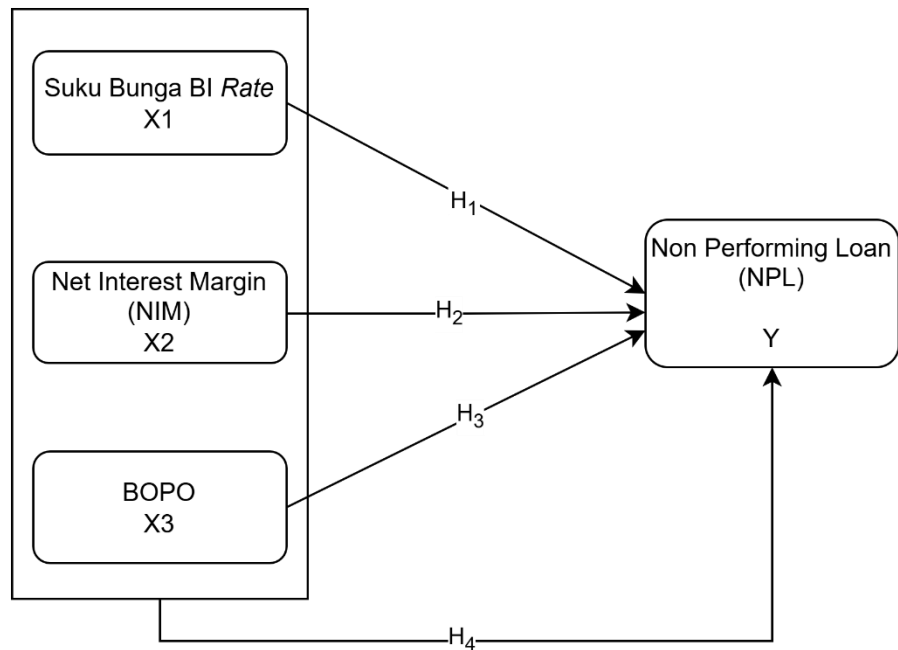
$$BOPO = \frac{\text{Beban Operasional}}{\text{Total Pendapatan Operasional}} \times 100 \%$$

### **Definition of Net Performing Loan (NPL)**

NPL is a ratio that shows the proportion of non-performing loans to the total loans disbursed by banks. This ratio is used as the main indicator in assessing asset quality and banking credit risk (Financial Services Authority, 2022). Overall, the limit on the value obtained by the bank at this ratio can be below 5% consistent with the predetermined guidelines by BI related to the NPL ratio. According to SE No. 13/30/DPNP dated Dec 16, 2011, the amount of NPL is determined using the equation:

$$NPL = \frac{\text{Kredit Bermasalah}}{\text{Total Kredit}} \times 100 \%$$

## Frame of Mind



## Research Hypothesis

### Hypothesis 1

$H_{0_1}$  : The BI Rate variable has no effect on NPLs in banks  
Conventional listed on the IDX in 2021 - 2024

$H_{a_1}$  : BI Rate Variable Rate affects NPLs in Banks  
Conventional listed on the IDX in 2021 - 2024

### Hypothesis 2

$H_{0_2}$  : The NIM variable has no effect on NPLs in conventional banks  
listed on the IDX in 2021 - 2024

$H_{a_2}$  : NIM variables affect NPLs in conventional banks  
listed on the IDX in 2021 - 2024

### Hypothesis 3

$H_{0_3}$  : BOPO variables have no effect on NPLs in conventional banks  
listed on the IDX in 2021 - 2024

$H_{a_3}$ : BOPO variables affect NPLs in conventional banks  
listed on the IDX in 2021 - 2024

### Hypothesis 4

$H_4$  : BI-Rate, NIM, and BOPO interest rates simultaneously affect NPL in  
conventional banks listed on the IDX for the 2021–2024 period.

## METHODOLOGY

### Research Methods

This research employs a quantitative methodological approach due to its primary objective of systematically analyzing and empirically testing the causal and correlational relationships between selected independent variables and the dependent variable. Specifically, the study focuses on BI-Rate, NIM, and the BOPO, examining their respective impacts on NPLs as the dependent variable. The analysis is conducted within the context of conventional banks listed on the IDX over the period spanning 2021 to 2024, allowing for a comprehensive assessment of how macroeconomic policy instruments, financial performance indicators, and internal operational efficiency collectively influence credit risk levels in the Indonesian banking sector. By adopting this approach, the study aims not only to identify significant determinants of NPL fluctuations but also to provide actionable insights for bank management and regulatory authorities seeking to optimize risk management strategies and ensure sustainable financial stability.

Quantitative methodology derives from positivist philosophical foundations and is applied to examine defined populations or selected samples. It relies on structured measurement tools for systematic data gathering and employs statistical techniques to interpret numerical findings, ultimately seeking to verify hypotheses formulated prior to empirical investigation. (Scott, 2020).

This approach was chosen because the data used in the form of numerical data and the relationships between variables were analyzed using a panel data regression model with the help of EViews 12.

### Variable Operations

Variable operationalization is necessary to explain in detail how a variable is measured so that it can be observed and tested empirically. According to (Sekaran & Bougie, 2016) states that variable operationalisation entails defining abstract notions in terms of empirical metrics forms so that statistical testing can be carried out.

- **BI-Rate ( $X_1$ )**

The BI Rate represents the benchmark interest rate established by Bank Indonesia as a principal instrument of monetary control, signalling the central bank's prevailing policy direction within the broader macroeconomic framework. Starting December 21, 2023, Bank Indonesia will again use the term BI-Rate as the policy rate, replacing Bank Indonesia's policy rate, without changing the monetary policy mechanism (Bank Indonesia, 2023).

- **Net Interest Margin (NIM) ( $X_2$ )**

NIM functions as a key profitability metric, reflecting the bank's effectiveness in transforming interest-bearing assets into net interest earnings. NIM reflects the bank's intermediation performance and profitability. (Financial Services Authority, 2022).

A higher NIM provides greater earnings capacity to offset potential credit impairments, which theoretically mitigates the likelihood of an increase in NPL levels.

- **Operating Expenses to BOPO Operating Income ( $X_3$ )**

The BOPO ratio serves as a measure of operational efficiency, assessing the bank's effectiveness in controlling expenditure in proportion to revenue derived from its primary banking functions. This ratio describes the extent to which the bank's operating income is able to cover the operating expenses incurred. The greater the value of BOPO, the lower the level of operational efficiency of the bank. (Dendawijaya, 2019).

- **Non-Performing Loan (NPL) ( $Y$ )**

NPL ratio functions as a measure of asset quality, capturing the share of loans classified as non-performing compared with the bank's overall lending portfolio. High NPL rates reflect high credit risk and lower levels of bank health (Financial Services Authority, 2022).

### **Population and Sample**

Excerpted from the book (Siyoto & Sodik, 2015) a population refers to the entire set of units, whether individuals, groups, or entities, that possess defined attributes established by the investigator for analytical purposes. From this comprehensive domain, observations are examined and inferences are systematically derived.

The target population of this study encompasses all listed commercial banks on the IDX in the 2021–2024 period as many as 43 banks.

One of the criteria used in this study is a conventional bank with the status of a foreign exchange bank. The selection of foreign exchange banks as a research sample is based on the consideration that foreign exchange banks have relatively homogeneous operational characteristics, especially in terms of intermediation activities, exposure to credit risks, and the relationship with interest rate policies and macroeconomic conditions. Foreign exchange banks also have a license to conduct foreign exchange transactions and generally have a more complex business scale and credit portfolio than non-foreign exchange banks (Financial Services Authority, 2023).

The study employs purposive sampling, a non-probability technique in which participants are intentionally chosen based on predetermined characteristics relevant to the research aims. Purposive sampling is used when the researcher has special considerations in determining the sample to match the characteristics of the research conducted (Turner, 2020).

### **Data Types and Sources**

This case use secondary data, namely data that has been available and published by other parties and can be reused by researchers for specific analysis purposes. This study relies on secondary data derived from the annual financial reports of conventional banks list on the IDX for the 2021–2024. These reports were obtained directly from the official web of the IDX ([www.idx.co.id](http://www.idx.co.id)).

### **Data Collection Techniques**

Data were gathered through a documentation approach, involving a careful review and extraction of information from written sources. The materials examined included published financial reports, formal records, and other authorised documents relevant to the subject under investigation.

According to (Scott, 2020), the doc method is a data collection technique that is carried out by collecting data through written documents, images, or reports that have been available. In this study, the data collected included financial information used to calculate the variables of BI-Rate, NIM, BOPO, and NPL.

### **Data Analysis Techniques**

This study employs panel regression as its primary analytical method. Panel data integrate longitudinal observations with cross-sectional information, enabling the researcher to track fluctuations in variables across different periods while simultaneously capturing variations in characteristics among individual entities.

In this case, panel data regression analysis was used to examine the influence of independent variables including BI-Rate, NIM, and BOPO on the dependent variable, namely NPL. Panel regression was deemed appropriate as it accommodates unobserved heterogeneity across entities while simultaneously analysing variations over time, leading to more efficient and consistent parameter estimates. (unobserved heterogeneity), so that the potential for estimation bias can be minimized (Gujarati et al., 2015) The panel data regression model used in this study consisted of:

1. Common Effect Model (CEM)
2. Fixed Effect Model (FEM)
3. Random Effect Model (REM)

#### **• Model Selection Test**

The model selection test was carried out to determine the panel data regression model that best suits the characteristics of the research data.

Excerpted from the book (Drs. Algifari, 2021) There are provisions in the test for selecting the model used by the research including:

1. Chow test, If the probability value  $> 0.05$  then the decision chosen by CEM. If the probability value is  $< 0.05$ , the FEM decision
2. Hausman test, If the probability value  $> 0.05$ , then the decision chosen is REM. If the probability value is  $< 0.05$ , the FEM decision
3. Lagrange Multiplier (LM) test, If the probability value  $> 0.05$  then the decision chosen by CEM. If the probability scores  $< 0.05$  the result is REM

#### **• Classic Assumption Test**

The purpose of classical diagnostic testing is to confirm that the regression specification adheres to the fundamental assumptions of the linear model, so that the parameter estimates obtained remain unbiased, efficient, and consistent under the BLUE criteria.

#### **• Regression equations**

When a model seeks to estimate the simultaneous influence of several explanatory variables on one outcome variable, the technique applied is

known as multiple regression. The functional form of the model can be written as follows:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \dots + \varepsilon$$

Description :

$Y$  = NPL

$\beta_0$  = Constant

$\beta_1$  = Koefisien Regresi Suku Bunga BI *Rate*

$\beta_2$  = Koefisien Regresi NIM

$\beta_3$  = Koefisien Regresi BOPO

$H_1$  = BI *Interest Rate*

$H_2$  = NIM

$H_3$  = BOPO

$\varepsilon$  = Error

Excerpted from the book (Drs. Algifari, 2021)

- **Hypothesis Test (t-Test)**

Within regression analysis, the t-test serves as a statistical procedure to evaluate the proposed hypotheses. It is employed to assess the individual effect of each independent variable on the dependent variable. A significance scores below 0.05 indicates that the variable exerts a statistically significant influence, leading to the rejection of the null hypothesis and acceptance of the alternative hypothesis. If the sig scores  $> 0.05$ , then  $H_a$  is rejected and accepted.  $H_a H_0 H_0$

- **Test F**

The F-test is applied to evaluate whether all independent variables incorporated within the regression model jointly contribute to explaining variation in the dependent variable. Through this procedure, it can be determined whether the explanatory variables, taken together, exert a statistically significant simultaneous effect on the outcome variable.

- **Hypothesis Test ( $R^2$ )**

The magnitude of the determination coefficient from 0 to 1. A lower  $R^2$ , particularly one approaching zero, indicates that the independent variables included in the regression model possess limited explanatory power in accounting for variations in the dependent variable. Conversely, a higher  $R^2$  scores signifies a stronger collective ability of the explanatory variables to explain fluctuations in the outcome variable. In general, a well-specified regression model is characterised by a substantial  $R^2$ , reflecting meaningful explanatory capacity (Drs. Algifari, 2021)

## RESEARCH RESULTS

### *Analysis Overview*

This study utilises panel data to examine the effect of BI Rate, NIM, and BOPO on NPL in conventional foreign exchange banks. Analysis was performed using panel regression in EViews 12, including model selection, hypothesis testing, and assessment of explanatory power.

**Model Selection Test**

- **Chow Test**

According to (Savitri et al., 2021) The Chow test is carried out with the aim of choosing the best model between *CEM* and *FEM*, with the following hypothesis:

$H_0$  : Choosing using CEM estimation

$H_a$  : Choosing to use FEM estimation

For the selection of models between *CEM* and *REM*, it can be seen through a significant p-values  $< 0.05$  of the model selected by *FEM*, on the other hand, if the significant p-values is  $> 0.05$ , then the selected *CEM*

**Table 4.1  
 Chow Test Results**

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

Effects Test	Statistic	d.f.	Prob.
Cross-section F	29.472553	(20,60)	0.0000
Cross-section Chi-square	200.069766	20	0.0000

Source : Data Processed with Eviews 12

Based on the results of the Chow test, a probability scores of  $0.0000 < 0.05$  was obtained. Thus,  $H_0$  is rejected and accepts  $H_a$ , so it can be concluded that *the FEM* is chosen.

- **Hausman Test**

According to (Savitri et al., 2021) The Hausman test is carried out with the aim of selecting the best model between *REM* and *FEM* with the following hypothesis:

$H_0$  : Choosing to use REM estimation

$H_a$  : Choosing to use FEM estimation

For the selection of models between *REM* and *FEM* , it can be seen through a significant p-values  $< 0.05$  of the model selected *FEM*, on the other hand, if the significant p-values is  $> 0.05$ , then the *REM* is selected.

**Table 4.2. Hausman Test**

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

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	6.273458	3	0.0990

Source : Data Processed with Eviews 12

The determination of the appropriate panel data specification was conducted using both the Chow test, which compares the CEM against the FEM, and the Hausman test, which contrasts FEM with the REM. The Hausman test produced a probability scores of 0.0990, exceeding the 0.05 threshold, indicating that the REM is preferable. Supporting this choice, the Lagrange Multiplier test yielded a probability of 0.0000, confirming the presence of random effects and demonstrating that REM provides a more reliable estimation than the pooled model.

• **Multiplied Langrange Test (LM)**

According to (Savitri et al., 2021) The Hausman test is carried out with the aim of selecting the best model between REM and FEM with the following hypothesis:

$H_0$  : Choosing using CEM estimation

$H_a$  : Choosing to use REM model estimation

For the selection of models between CEM and REM, it can be seen through a significant p-values > 0.05 of the selected model CEM, on the other hand, if the significant p-values is < 0.05, REM is selected.

**Table 4.3 Langrange Multiplie (LM) Test Results**

Lagrange Multiplier Tests for Random Effects

Null hypotheses: No effects

Alternative hypotheses: Two-sided (Breusch-Pagan) and one-sided (all others) alternatives

	Test Hypothesis		
	Cross-section	Time	Both
Breusch-Pagan	78.91037 (0.0000)	1.826341 (0.1766)	80.73671 (0.0000)
Honda	8.883151 (0.0000)	-1.351422 (0.9117)	5.325737 (0.0000)
King-Wu	8.883151 (0.0000)	-1.351422 (0.9117)	1.948010 (0.0257)
Standardized Honda	9.425131 (0.0000)	-0.893171 (0.8141)	2.841671 (0.0022)
Standardized King-Wu	9.425131 (0.0000)	-0.893171 (0.8141)	-0.006472 (0.5026)
Gourieroux, et al.	--	--	78.91037 (0.0000)

Source : Data Processed with Eviews 12

Base on the results of the Langrange Multiplie (LM) test, a probability scores of  $0.0000 < 0.05$  was obtained. Thus,  $H_0$  is rejected and  $H_a$  is accepted, so it can be concluded that the REM was chosen.

**Classical Assumption Test Results**

Base on the table 4.3, the model used in this study is the REM. Therefore, before hypothesis testing is carried out, the regression model needs to meet the relevant classical assumptions. Standard assumption diagnostics, including examinations of multicollinearity and heteroscedasticity, were applied as advised in econometric studies. (Basuki & Imamudin Yuliadi, 2014)

• **Multicollinearity Test**

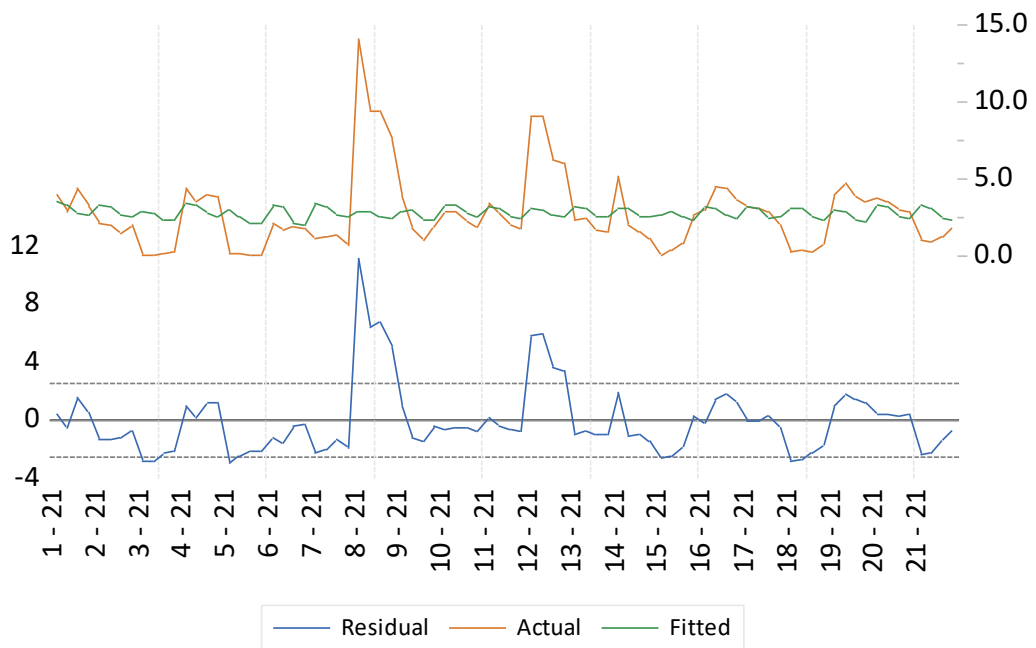
**Table 4.4. Multicollinearity Test Results**

	BI RATE	NIM	BOPO
BI RATE	1.000000	0.096834	-0.234261
NIM	0.096834	1.000000	-0.531842
BOPO	-0.234261	-0.531842	1.000000

Source : Data Processed with Eviews 12

The correlation coefficient of X1 and X2 is  $0.096834 < 0.85$  ; X1 and X3 -  $0.234261 < 0.85$  ; X2 and X3  $-0.531842 < 0.85$ . Hence, it can be determined that the data is free from multicollinearity and successfully meets the multicollinearity test. (Napitupulu, R.B. et al., 2021)

**Heterokedasticity Test**



Examination of the residual plot, represented in blue, indicates that all scores remain within the boundaries of 500 and -500, suggesting consistent variance across observations. This pattern demonstrates that the residuals do not exhibit heteroscedasticity, implying that the assumption of constant variance is satisfied. Therefore, it can be concluded that the model passes the heteroscedasticity test, and no evidence of variance irregularities is present in the dataset. (Napitupulu, R.B. et al., 2021)

**Panel Data Regression Equation**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	7.331497	1.174809	6.240586	0.0000
BI_RATE	-0.271382	0.095545	-2.840368	0.0057
NIM	-0.519601	0.142461	-3.647328	0.0005
BOPO	-0.007287	0.005739	-1.269745	0.2079

$$Y = 7.331 - 0.271 X_1 - 0.519 X_2 - 0.007 X_3$$

Description :

- Y = NPL
- X<sub>1</sub> = BI-Rate
- X<sub>2</sub> = NIM
- X<sub>3</sub> = BOPO

**Hypothesis Test Results**

**Test Results t**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	7.331497	1.174809	6.240586	0.0000
BI RATE	-0.271382	0.095545	-2.840368	0.0057
NIM	-0.519601	0.142461	-3.647328	0.0005
BOPO	-0.007287	0.005739	-1.269745	0.2079

- The first independent variable, X<sub>1</sub>, yielded a t-statistic of -2.840 with an associated probability scores of 0.0057, which falls below the 0.05 significance threshold. This indicates that X<sub>1</sub> has a statistically significant negative effect on the dependent variable Y, suggesting that as X<sub>1</sub> increases, Y tends to decrease in a meaningful way.
- The second variable, X<sub>2</sub>, produced a t-statistic of -3.647 with a probability score of 0.0005, also below the 0.05 benchmark. This confirms a significant negative influence of X<sub>2</sub> on Y, highlighting that changes in X<sub>2</sub> are strongly associated with variations in the dependent variable
- For the third variable, X<sub>3</sub>, the t-statistic was -1.269 with a probability score of 0.2079, exceeding the 0.05 significance level. Consequently, X<sub>3</sub> does not exhibit a statistically significant effect on Y, indicating that fluctuations in X<sub>3</sub> are not meaningfully linked to changes in the dependent variable.

• **Test F**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	7.331497	1.174809	6.240586	0.0000
BI RATE	-0.271382	0.095545	-2.840368	0.0057
NIM	-0.519601	0.142461	-3.647328	0.0005
BOPO	-0.007287	0.005739	-1.269745	0.2079

Effects Specification		S.D.	Rho
Cross-section random		2.361590	0.8761
Idiosyncratic random		0.888128	0.1239

Weighted Statistics			
R-squared	0.237162	Mean dependent var	0.607939
Adjusted R-squared	0.208556	S.D. dependent var	1.024627
S.E. of regression	0.911540	Sum squared resid	66.47243
F-statistic	8.290527	Durbin-Watson stat	1.464738
Prob(F-statistic)	0.000072		

Source : Data Processed with Eviews 12

The F-statistic scores is 8.290527 with a Prob score of 0.000072 < 0.05, so the conclusion is that the Independent (X) BI-Rate, NIM and BOPO variables have a simultaneously on the Dep (Y) NPL variables

- **Determination Coefficient Test ( $R^2$ )**

R-squared	0.237162	Mean dependent var	0.607939
Adjusted R-squared	0.208556	S.D. dependent var	1.024627
S.E. of regression	0.911540	Sum squared resid	66.47243
F-statistic	8.290527	Durbin-Watson stat	1.464738
Prob(F-statistic)	0.000072		

Source : Data Processed with Eviews 12

The Adjusted R-Squared score is 0.208, so the conclusion is that the contribution of the influence of the Independent on the Dependent simultaneously (simultaneously) is 20.8% while the remaining 79.2% is represented by factors outside the model.

## DISCUSSION

### *The Effect of BI-Rate on Non-Performing Loans (NPL)*

Base on the results of the t-test on the REM model, the BI-Rate variable has a probability score of 0.0057 (< 0.05) with a regression coefficient of negative score. This shows that the BI-Rate Interest Rate has a significant effect on NPLs at conventional banks listed on the IDX during the 2021–2024 period.

The results are in line with the theory of monetary policy transmission, which states that changes in policy interest rates affect credit interest rates and banking lending behavior (Mishkin, 2019). The negative coefficient shows that in the study period, the increase in the BI-Rate was followed by a decrease in the NPL ratio. This condition indicates that Bank Indonesia's interest rate hike policy in the post-pandemic period has the potential to tighten credit disbursement, so that banks become more selective in providing credit and the risk of non-performing loans can be reduced.

### *The Effect of Net Interest Margin on Non-Performing Loans (NPL)*

The t-test results indicate that the NIM exhibits a probability scores of 0.0005, which is well below the 0.05 sig threshold, coupled with a negative regression coefficient. This suggests that NIM exerts a statistically significant inverse effect on NPLs, meaning that higher net interest margins are associated with lower levels of non-performing credit.

These results align with prior research conducted by (Erdas & Ezanoglu, 2022) and (Imelda, 2025) who similarly found that indicators of bank profitability, as reflected by NIM, negatively influence NPLs. Collectively, these findings reinforce the theoretical proposition that strong intermediation performance boosts a bank's competence in managing credit exposure, demonstrating that more efficient interest income generation contributes to improved asset quality and financial stability.

### ***The Effect of BOPO on Non-Performing Loans (NPL)***

Base on the t-test, the BOPO variable had a probability score of 0.2079 ( $> 0.05$ ), which indicates that BOPO did not have a significant effect on NPLs in conventional banks during the study period.

### ***The Effect of BI-Rate, NIM, and BOPO on NPLs Simultaneously***

The results of the F test show that the BI-Rate, NIM, and BOPO Interest Rate variables simultaneously have a significant effect on NPLs, with a probability score of 0.000 ( $< 0.05$ ). This shows that the combination of external and internal factors of banks together affects the level of banking credit risk.

## **CONCLUSIONS AND RECOMMENDATIONS**

Base on the results of the analysis and discussion, it can thus be summarized that:

- a. The BI-Rate Interest Rate has a significant effect on Non-Performing Loans (NPLs) at conventional banks listed on the IDX. These results show that the interest rate policy set by Bank Indonesia has an important role in influencing bank credit risk. The negative regression coefficient indicates that in the study period, the increase in the BI-Rate was followed by a decrease in NPLs, reflecting the bank's cautious attitude in disbursing loans when interest rates increased.
- b. Net Interest Margin (NIM) has a significant effect on Non-Performing Loans (NPLs).
- c. Operating Costs to Operating Income (BOPO) do not have a significant effect on Non-Performing Loans (NPLs). These findings suggest that the level of operational efficiency of banks did not directly affect credit risk in the study period. This condition can be caused by the strengthening of credit risk management, credit loss reserve policies, and credit restructuring that is still ongoing in the post-pandemic period.
- d. BI-Rate, Net Interest Margin (NIM), and BOPO simultaneously have a significant effect on Non-Performing Loans (NPLs). This shows that banking credit risk is influenced by a combination of external and internal factors of the bank together, although partially not all variables show a significant influence.
- e. The Adjusted R-Squared value of 0.208 indicates that the independent variables in this study were able to explain 20.8% of the NPL variation, while the remaining 79.2% was influenced by other factors outside the research model, such as credit management quality, real sector conditions, economic growth, and other macroeconomic variables.

Base on the limitations of the research, The recommendations are as follow:

1. Future studies could incorporate additional var such as LDR, CAR, credit growth, inflation, and economic growth to enhance the model's explanatory power for NPL fluctuations.
2. Subsequent research is also recommended to use a longer observation period so that credit risk dynamics can be analyzed more comprehensively in the long term.
3. In addition, further research can consider comparisons between foreign exchange banks and non-foreign exchange banks, or grouping banks based on

capital category (BUKU/Capital Group), in order to capture a more holistic picture of what drives of Non-Performing Loans (NPLs).

4. For banks, it is recommended to continue to fortify credit risk management and uphold a balance between profitability and the principle of prudence in credit disbursement.

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