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**Modelling Non-performing Loans (NPL) for Small Banks in Indonesia: Are Macroeconomic Matter?**

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**Abstract**

This study aims to analyze the effect of macroeconomic and internal bank variables on NPL (Non-Performing Loans) in Non-Foreign Exchange Private Banks. This study uses secondary data obtained through the official FSA covering 18 small Banks in Indonesia. We apply annual data from 2016 to 2021 and use multiple linear regression techniques. The main factors that influence NPL are internal bank or company management factors, while external factors (macro variables) do not affect NPL in this study, namely, factors caused by economic conditions such as inflation and interest rates. In general, the results show that macro economic variables has no significant effect on NPL. However, internal bank data such as Bank Size and CAR have a significant negative effect on NP. LDR has no significant positive effect on NPL and efficiency (BOPO) has a significant positive effect against NPL.

**Keywords:** NPL, Inflation, Interest Rate (BI Rate), Bank Size, CAR, LDR, BOPO

**1. Introduction**

Banks are financial institutions whose job is to collect funds, distribute funds and offer other financial services to the public. Law No. 10 of 1998 explains that banking is a business institution whose job is to collect funds from the public in the form of savings, then channel them back to the community in the form of credit or otherwise to improve people's lives. The function of the bank for the community is as a Financial Intermediary (financial intermediary), Agent of Trust, Agent Of Development, and Agent Of Service.

Banking is known as a controller of the financial system which has an important role in economic development. This important role can be seen in the financial intermediation process, namely the flow of funds from savers and channeling them back to borrowers. The intermediation process is necessary to be able to support economic activities, whether increasing business capital, purchasing goods or services, and so on. With an increase in the economy or an increase in the economy in a country, it will be able to encourage people's welfare. According to Blaschke et al. (2001), credit risk is the risk of loss associated with the possibility of failure of

the counterparty to fulfill its obligations or the risk experienced by the bank if a debtor fails to repay his loan. The greater the credit risk experienced by a bank, the greater the potential for failure that will be faced by the bank.

In the development of Non-Performing Loans ( NPL ) for Non-Foreign Exchange Private Commercial Banks in 2016 – 2021 it has an average value of 3.177 with a maximum of 15.75. In previous studies, there were several differences of opinion related to the effect of bank macro and internal variables on NPL. Conclusion results some consistent and some inconsistent. Economic growth generally produces positive and significant conclusions indicating the occurrence of procyclicality. For inflation, the conclusion is positive, which means that the higher the inflation, the NPL will tend to rise. LDR generally produces inconsistent conclusions as according to Puspitasari, Sudarsono & Napitupulu (2021) stated a significant positive while Indrajati, Yuvita, Princess, Rismawati, and Puspitasari (2020) state that negative is not significant. For CAR, it produces consistent conclusions, namely, it has a positive and significant influence, according to Supriyadi, Arief, and Nugraha (2019) and Handayani, Tubastuvi, and Vitriati (2019). Meanwhile, according to Indrajati, Yuvita, Putri, Rismawati, and Puspitasari (2020) produced a negative but not significant. BOPO in this study generally produces positive and significant conclusions indicating a close relationship between inefficiency and credit risk. This proves the validity of the bad management hypothesis, meaning that when a bank is bad it can be characterized by poor efficiency or rising or high BOPO usually followed by high credit risk.

The problem in this study is whether inflation, interest rates (BI rate), bank size, CAR, LDR, and BOPO affect NPLs. The research aims to provide an assessment of whether the variables of Inflation, Interest Rate (BI Rate), Bank Size, CAR, LDR, and BOPO affect NPL or not in Indonesian banking. It is hoped that this research can provide information to bank management about the influence of bank macro and internal variables on NPL.

### *1.1 Previous Research*

Riko Setya Wijaya (2019), with the title "The Influence of Macroeconomic Factors on Problem Credit at Commercial Banks in Indonesia". The study aimed to determine the effect of macroeconomic factors on the NPL of commercial banks in Indonesia. The independent variables used are foreign exchange rates, interest rates, inflation rates, and the NPL dependent variable. This study uses Multiple Linear Regression. The results of the study, namely the Foreign Exchange Rate, the BI Rate Interest Rate, and the Inflation Rate simultaneously have a significant effect. While partially, variables, Foreign Exchange Rates, and Inflation Rates have no significant effect.

Ready Dwi Putra (2018), with the title "Macroeconomic Effects on NPLs of National Private Banks". The purpose of this study was to analyze the effect of NPL on the tenth small private banks based on capital in Indonesia from 2009-2015. The independent variables used are GDP, INF, IRCI, and the dependent variable NPL. This study uses Panel Regression. The results of this study are that GDP has no significant negative effect, INF has a significant negative effect and IRCI has no significant positive effect.

Kamila, Amin, and Riski (2019) with the title "The Effect of Macroeconomic and Fundamental

Banks on Non-Performing Loans ". This study aims to be able to test empirically the effect of macroeconomic and bank fundamentals on NPLs at banks. The independent variables used are the Exchange Rate, GDP Interest Rate, LDR, ROA, Credit Growth, Loan loss provision, and the NPL dependent variable. This research uses panel data regression. The results of this study are that the exchange rate (ER) and GDP have no significant positive effect, the interest rate (BI rate) and LLP have a significant positive effect, LDR has no significant negative effect, ROA and credit growth (LOANS) have a significant negative effect.

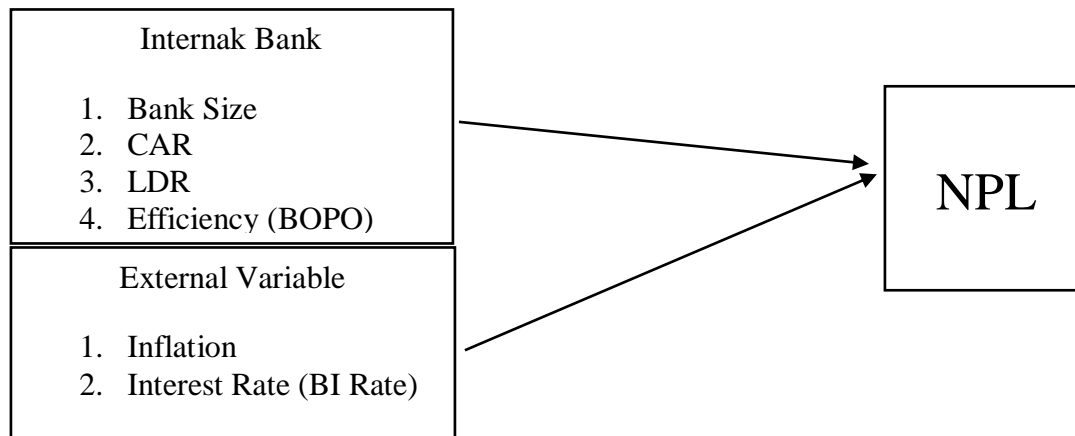
Nyimas Aisyah Permatasari (2019), with the title "The Influence of Bank Size, CAR, BOPO and LDR on NPL with Moderating Inflation in Banking on the IDX". The purpose of this study is to analyze the effect of Bank Size, CAR, BOPO, and LDR on NPL by using Inflation as a moderating variable. The independent variables used are Bank Size, CAR, BOPO, LDR, and the NPL dependent variable. The sampling technique uses purposive sampling with secondary data and using data analysis techniques Moderates Regression Analysis. The results of this study are that CAR affects NPL while LDR, BOPO, and Bank Size have no effect at all and Inflation can moderate CAR on NPL but cannot moderate LDR, BOPO, and Bank Size. BOPO has a significant positive effect on NPL.

Wulandari, Khetrin & Seviyani (2021), with the title "The Effect of Loan to Deposit Ratio (LDR), Operating Costs, Operating Income (Bopo), Exchange Rates, Capital Adequacy Ratio, Bank Size and Inflation on Non-Performing Loans (NPL) in Registered Banking Companies on the IDX". The purpose of this research is to test and analyze the effect of LDR, BOPO, Exchange Rate, CAR, Bank Size, and Inflation on NPL in banking companies listed on the IDX. The independent variables used are LDR, BOPO, Exchange Rate, CAR, Bank Size and Inflation, and the NPL dependent variable. This research is explanatory, the data is collected using documentation. The results of this study are LDR, BOPO, Exchange Rate, CAR, Bank Size and Inflation have no simultaneous and partial effect on NPL in banking companies listed on the IDX. In this study, to examine the determinants of non-performing loans ( NPLs ), an approach was carried out that was slightly different from previous research. The first step is to create a model based on an econometric approach to determine credit risk or NPL at Private Non-Foreign Exchange Commercial Banks registered with OJK. In this approach, the macro variables economic and internal are regressed by the NPL value of Indonesian banking. In the estimation process, data variability is minimized through various processes such as the use of logarithms and transformations to produce data that meets the requirements for modeling. Modeling is used not to produce the best model but to achieve a low level of forecast deviation. This shows that econometric models are adopted to produce forecasts that are under existing data, even though there may be discrepancies with current econometric standards.

## **2. Method**

In this study, to examine the determinants of non-performing loans ( NPLs ), an approach was carried out that was slightly different from previous research. The first step is to create a model based on an econometric approach to determine credit risk or NPL at Private Non-Foreign Exchange Commercial Banks registered with OJK. In this approach, the macro variables economic and internal are regressed by the NPL value of Indonesian banking. In the estimation process, data variability is minimized through various processes such as the use of logarithms

and transformations to produce data that meets the requirements for modeling. Modeling is used not to produce the best model but to achieve a low level of forecast deviation. This shows that econometric models are adopted to produce forecasts that are under existing data, even though there may be discrepancies with current econometric standards.



Frame 1: Reseach Fraework

Table 1.1 Identification and measurement of variables

Variables	definition	Measurements	Sources
NPL (Y)	Non Performing Loans	$NPL = \frac{\text{Total kredit bermasalah}}{\text{Total kredit}} \times 100 \%$	FSA
Inflation (X1)	Consumer Price Index	Annual General Price	BPS
Interest Rate/BI Rate (X2)	Discount Rate/ Policy Rate	Interest on Central Bank Certificate	BI
Bank Size (X3)	BankSize	Total assets	FSA
CAR (X4)	Capital Equity Ratio	$CAR = \frac{\text{Modal}}{\text{Aktiva tertimbang menurut risiko}} \times 100 \%$	FSA
LDR (X5)	Loan to Deposit Ratio	$LDR = \frac{\text{Kredit}}{\text{Dana pihak ketiga}} \times 100 \%$	FSA
BOPO (X6)	Operating Costs to Operating Income	$BOPO = \frac{\text{Total Biaya Operasional}}{\text{Total Pendapatan Operasional}} \times 100 \%$	FSA

Source: FSA= Financial Service Authority (OJK), Bank Indonesia (BI) Statistics Office ( BPS)

### 2.1 Operational Definition and Effect of Variables

Based on the variables above to make it easier to analyze the data in this study with operational definitions and variable measurements as follows :

#### 1. Inflation

Inflation is a condition in which the general trend of rising prices for both goods and services is continuous. The inflation data used is annual data taken at the end of the per period December 2016 to December 2021 at [www.bps.go.id](http://www.bps.go.id).

## **2. Interest Rate (BI Rate)**

The interest rate (BI Rate) is the central bank's policy rate. The interest rate data (BI Rate) used is annual data taken at the end of the period December 2016 to December 2021 on [www.bi.go.id](http://www.bi.go.id).

## **3. Bank Size**

Bank Size is a ratio used to see how much total assets are owned and then compared to other banks owned by Non-Foreign Exchange Private Commercial Banks during the 2016 - 2021 period. Bank Size measurement uses the formula according to (Dahlia Wati M. Agus Salim 2018).

## **4. CAR (Capital Adequacy Ratio)**

CAR (Capital Adequacy Ratio) is a ratio to measure the adequacy of capital or funds owned by a bank to be able to minimize assets that contain the risk of bank losses resulting from bank operations or generating sources of funds from outside the bank owned by Non-Foreign Exchange Private Commercial Banks during the 2016 period - The year 2021. CAR measurement uses the formula according to SEOJK No.14/SEOJK.3/2017.

## **5. LDR (Loan to Deposit Ratio )**

LDR (Loan to Deposit Ratio) is a ratio that compares the composition of total credit to third-party funds owned by Private Non-Foreign Exchange Banks during the period 2016 - 2021. LDR measurement uses the formula according to SEOJK No.14/SEOJK.3/2017.

## **6. BOPO (Operating Costs to Operating Income)**

BOPO (Operating Costs to Operating Income) is a ratio that equates operating expenses with operating income owned by Non-Foreign Private Commercial Banks during 2016 - 2021. BOPO measurement uses the formula according to SEOJK No.14/SEOJK.3/2017.

## **7. NPL (Non Performing Loans)**

NPL (Non-Performing Loan) is a ratio that compares loans of non-performing credit owned by Non-Foreign Exchange Private Commercial Banks from the Year 2016 – The year 2021. Measurements use the formula according to SEOJK No.14/SEOJK.3/2017.

### *2.2 Sample*

The sample used in this study is a small bank that uses all Non-Foreign Exchange Private Commercial Banks in Indonesia, totaling 18 (eighteen) banks used in this study, namely PT. AMAR INDONESIA BANK, PT. ARTOS INDONESIA , PT. INTERNATIONAL BUSINESS BANK, PT. NATIONAL PENSION SAVINGS BANK, PT. SAHABAT SAMPOERNA BANK, PT. PERDANA INA BANK, PT. BANK SERVICES JAKARTA, PT. BANK SEABANK INDONESIA, PT. FAMA INTERNATIONAL BANK, PT. BANK MAYORA, PT. MULTIARTA SENTOSA BANK, PT. NOBU NATIONAL BANK, PT. PRIMA MASTER BANK, PT. DIGITAL BANK BCA, PT. HARDA INTERNATIONAL BANK, PT. MANDIRI TASPEN BANK, PT. BANK VICTORIA INTERNASIONAL and PT. YUDA BHAKTI BANK.

*2.3 Statistic analysis*

In the statistical analysis, the measuring tool used is a multiple linear regression analysis used in this study as follows:

a. Multiple Linear Regression Analysis

Multiple Linear Regression Analysis was carried out to be able to determine the direction and magnitude of the influences on the independent variables on the dependent variable. The following is the multiple linear regression formula that can be used in determining the magnitude of the influence between variables, which can be seen as follows:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + e_i$$

b. F Test or Simultaneous Test

The F test is used to determine whether the independent variables have a significant or simultaneous effect on the dependent variable. This type of hypothesis testing is called the overall significance test of the observed regression line (Imam Ghozali, 2021: 148).

*2.4 Right Sided T Test*

The analysis is used to determine the independent variables that influence the dependent variable. The test steps are as follows:

1. Formulating Formulations or Testing Hypotheses
  - a.  $H_0: \beta_i \leq 0$ , then the partially positive effect is not significant.
  - b.  $H_1: \beta_i > 0$ , then partially has a significant positive effect.
2. Determine the significant level of  $\alpha$  of 5%
3. Determine the area of acceptance and rejection  $H_0$ .

*2.4 Left Sided T Test*

This analysis is used to test whether the independent variables affect the dependent variable. The test steps are as follows:

1. Formulating Formulations or Testing Hypotheses
  - a.  $H_0: \beta_i \geq 0$ , then the effect is not significantly negative.
  - b.  $H_1: \beta_i < 0$ , then partially has a significant negative effect.

**3. Results**

**Descriptive statistics**

Table 1.2 Statistical Descriptive Test

Variables	Obs	Means	std. Dev.	Min	Max
NPLs	108	3.177	2,580	0.05	15.75
INFLATION	108	2,672	0691	1.68	3.61
SBI	108	4,542	0.838	3.5	6
CAR	108	48,025	86140	10.95	820.88
LDR	108	99,319	97,349	0	971.65
BOPO	108	99,249	35,827	34.13	261.1
LASET	108	15,558	1,293	13,214	19,026

Source: Results of data that has been processed



Based on table 1.2 it can be seen that the average NPL is 3.177 with a standard deviation of 2.580, a minimum of 0.05, and a maximum of 15.75. Inflation produces an average of 2.672 with a standard deviation of 0.691, a minimum of 1.68, and a maximum of 3.61. Interest rate (BI Rate) produces an average of 4,542 with a standard deviation of 0.838, a minimum of 3.5, and a maximum of 6. CAR produces an average of 48.025 with a standard deviation of 86.140, a minimum of 10.95, and a maximum of 820.88. LDR produces an average of 99.319 with a standard deviation of 97.349, a minimum of 0, and a maximum of 971.65. BOPO produces 99.249 with a standard deviation of 35.827, a minimum of 34.13, and a maximum of 261.1. Bank Size (asset) produces 15,558 with a standard deviation of 1,293, a minimum of 13,214, and a maximum of 19,026.

Table 1.3 Correlation Test

Variables	NPL	INFLATION	SBI	CAR	LDR	BOPO	LASET
NPLs	1,000						
INFLATION	0.074	1,000					
SBI	0.118	0.612	1,000				
CAR	-0.200	-0.233	-0.187	1,000			
LDR	-0.086	0.038	0.079	0.155	1,000		
BOPO	0.241	-0.144	-0.070	-0.018	0.068	1,000	
LASET	-0.308	-0.231	-0.169	-0.164	-0.135	-0.147	1,000

Source: Results of Stata

Based on table 1.3, the results of the correlation between the dependent variable, namely NPL with the six independent variables used in this study, namely the first, inflation to NPL produces a correlation value of 0.074%. Interest Rate (BI Rate) on NPL with a correlation of 0.118%. CAR to NPL produces a negative value with a correlation of -0.200%. LDR to NPL produces a negative value with a correlation of -0.086%. BOPO to NPL produces a correlation value of 0.241% and Bank Size to NPL produces a negative value with a correlation of -0.308%. It can be seen from the results of the correlation values that three variables produce negative correlation values, namely CAR, LDR, and Bank Size and there are three that also produce positive values, namely Inflation, Interest Rate (BI Rate), and BOPO. A negative correlation means that each group of variables causes NPL to decrease.

**Coefficient of Determination (R<sup>2</sup>)**

Based on the level of closeness using Adjusted R-Square, it can be concluded that the Adjusted R-Square value is 0.164 and from the modeling results in it shows that the ANOVA value is for the degree of freedom 6 and the number observation 101 is 4.5, and significant at 1%. This means that this model can explain the relationship between NPL and the independent variables. The R -square d result is 0.21 indicating a less strong relationship between the independent variables and the NPL variable. R-squared 21 %, meansg that this model can generally explain a 21 % change in NPL.

Table 1.4 Multiple Linear Regression Test

NPLs	Coef.	std. Err.	Q	P>t
INFLATION	-0.309	0.438	-0.71	0.482
SBI	0.274	0.346	0.79	0.431
CAR	-0.007	0.003	-2.50	0.014
LDR	-0.003	0.002	-1.23	0.223
BOPO	0.014	0.007	2.06	0.042
LASET	-0.675	0.191	-3.53	0.001
CONS	12,553	3,806	3.30	0.001

Source: Results From Stata

Based on table 1.4 of the multiple linear regression analysis above, it can be seen that several variables have a significant effect and some others have an insignificant effect on NPL. The output results that have a significant effect are CAR, BOPO, and Bank Size. CAR has a significance value of  $0.014 < 0.05$  with a coefficient of  $-0.007$  meaning that CAR has a significant negative effect on NPL. BOPO has a significance value of  $0.042 < 0.05$  with a coefficient of  $0.014$  meaning that BOPO has a significant positive effect on NPL. Bank Size has a significance value of  $0.001 < 0.05$  with a coefficient of  $-0.675$  meaning that Bank Size has a significant negative effect on NPL. Output results that have no significant effect are inflation, interest rates (BI Rate), and LDR. Inflation has an insignificant value of  $0.482 > 0.05$  with a coefficient of  $-0.309$  meaning that inflation has no significant negative effect on NPL. The interest rate (BI rate) has an insignificant value of  $0.431 > 0.05$  with a coefficient of  $0.274$  meaning that the interest rate (BI rate) has an insignificant positive effect on NPL and LDR has an insignificant value of  $0.223 > 0.05$  with a coefficient of  $-0.003$  meaning, LDR has no significant negative effect on NPL.

#### 4. Discussion

##### **Inflation has no significant negative effect on NPL**

The results of the study show that inflation has no significant negative effect on NPL, where inflation has an insignificant value of  $0.482 > 0.05$  with a coefficient of  $-0.309$ . This means that the higher the inflation, the lower the credit risk or NPL, because debtors, especially those who have a business amidst high inflation, will increase the prices of goods so that they will be able to pay their installments, but not significantly. This research is in line with research according to Riko Setya (2019) and Wulandari, Khetrin & Seviyani (2021) which states that inflation has no significant negative effect on NPL. Meanwhile, research that is contrary to this research, namely research according to Nugroho, Sutanto & Riduwan (2021) states that inflation has a significant negative effect on NPL.

##### **The interest rate (BI rate) has no significant positive effect on NPL**

The results of this study indicate that the interest rate (BI rate) has no significant positive effect on NPL, where the interest rate (BI rate) has an insignificant value of  $0.431 > 0.05$  with a coefficient of  $0.274$ . This means that when interest rates rise, it means that NPL will tend to rise.



This is because if the interest rate (BI rate) rises, interest rates will also rise, thereby indirectly affecting market interest rates so that when interest rates rise, debtors cannot pay. This research is in line with research according to Yesica & Irene (2015) which states that the interest rate (BI rate) has no significant positive effect on NPL. Meanwhile, research that is contrary to this research, namely research according to Amalia, Iwan & Kristianingsih (2021) states that the Interest Rate (BI Rate) has a significant negative effect on NPL.

#### **Bank Size has a significant negative effect on NPL**

The results of this study indicate that Bank Size has a significant negative effect on NPL, where Bank Size has a significance value of  $0.001 < 0.05$  with a coefficient of  $-0.675$ . This means that the bigger the bank, the smaller the NPL. This is because large banks usually have diversified capabilities so that they can select productive assets including good credit. Moreover, big banks have better credit analysis systems. This research is in line with research according to Lestari & Sampurno (2022) stating that Bank Size has a significant negative effect on NPL. While research that has results that are contrary to this research is research according to Angel Deijeni (2022) states that Bank Size has no significant positive effect on NPL.

#### **CAR has a significant negative effect on NPL**

The results of this study indicate that CAR has a significant negative effect on NPL, where CAR has a significance value of  $0.014 < 0.05$  with a coefficient of  $-0.007$ . This means that the higher the CAR of a bank, the bank tends to be more careful so that credit risk tends to be lower. This research is in line with research according to Vita & Diah (2021) and Lestari & Sampurno (2022) stating that CAR has a significant negative effect on NPL. Meanwhile, research has results that are contrary to the results of this study, namely research according to Shandy & Irwan (2021) state that CAR has no significant negative effect on NPL.

#### **LDR has no significant negative effect on NPL**

The results of this study indicate that LDR has no significant negative effect on NPL, where LDR has an insignificant value of  $0.223 > 0.05$  with a coefficient of  $-0.003$ . This means that there is a tendency for banks with high LDR to have lower NPLs even though this result is not significant. This research is in line with research according to Kamila, Amin & Riski (2019) which states that LDR has an insignificant negative effect on NPL. Meanwhile, research that is contrary to this research, namely research according to Vita & Diah (2021) states that LDR has a significant positive effect on NPL.

#### **BOPO has a significant positive effect on NPL**

The results of this study indicate that BOPO has a significant positive effect on NPL, where BOPO has a significance value of  $0.042 < 0.05$  with a coefficient of  $0.014$ . This means that the more inefficient the bank tends not to have a higher NPL. This research is in line with research according to Azizzah, Setiawan & Kristianingsih (2021) state that BOPO has a significant positive effect on NPL. Meanwhile, research that is contrary to this research, namely research according to Shandy & Irwan (2021) and Nyimas (2019) states that BOPO has a negative and insignificant effect on NPL.

## **5. Conclusions**

This study examines the influence of internal and external factors or macroeconomics on the NPL of small banks in Indonesia. The purpose of this research is to see what factors affect credit risk (NPL) by combining bank internal and external factors. It is hoped that this credit risk determinant model can provide a more comprehensive picture of the sources of risk faced by banks. This study uses macroeconomic and internal bank data, namely where external banks (macroeconomics) use inflation and interest rates (BI Rate) and bank internal variables used in this study are Bank Size, CAR, LDR, and BOPO. In processing the data, it is checked whether the data is consistent or not. Data that is considered inappropriate is checked again to ensure that the data is correct. Linear regression is used to estimate the effect of bank internal and macroeconomic variables on NPL.

From the results of this study, it was found that economic factors relatively did not affect small banks in Indonesia, meaning that small banks were relatively insensitive to changes in macroeconomic factors. This could be due to the relatively small credit scale. Three variables have a significant effect on NPL, it is found that Bank Size has a negative and significant effect on NPL, meaning that larger banks tend to have lower credit risk. This is due to the ability to diversify. Banks that have large assets also tend to have lower credit risk. Meanwhile, CAR has a negative and significant effect, meaning that banks with good capital adequacy ratios tend to have lower credit risk. This shows that CAR is an indicator of a bank's prudential attitude. BOPO has a positive and significant effect, meaning that the more inefficient the bank tends to have a higher NPL. This proves that bank management in general, especially how the bank manages its business, which is characterized by efficiency, affects NPLs. This can also mean that poor management can increase credit risk. The impact of macroeconomic variables on credit risk for small banks are not matter. From this study, it can be seen that the macro variables of small banks are not sensitive to macroeconomics. It can be seen from the research results that inflation and interest rates (BI Rate) have no effect.

This research is expected to provide a scientific contribution to the government or policymakers in maintaining banking stability in Indonesia. Researchers recommend similar studies that are in line with this study to add a period and bank samples used so that the results obtained will be better and more accurate. The next researcher is expected to expand the analysis of the determinants that affect Non-Performing Loans (NPL) in depth by adding research variables that have not been discussed in this study.

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