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Determinants Non-Performing Loans in Indonesia

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A B S T R A C T

Non-performing loans (NPLs) are a typical sign of stress testing from financial institutions and may be used to measure the financial system's health. The critical criterion for achieving financial system stability is macroeconomic stability. Instability in the financial system (financial crisis) impairs a bank's liquidity and might lead to more problematic loans, impacting other industries. The association between NPL and numerous macroeconomic variables, including Interest Rate Spreads, Inflation, Percentage of Open Disruption, and Amount of Foreign Exchange Reserves in Indonesia, is examined in this paper. The study used the Vector Error Correction Model (VECM) method to estimate data for a sample period of 2000 to 2020. In the long run, inflation factors, the number of open jobless, and the number of foreign exchange reserves all substantially impacted the ratio of non-performing loans, according to the findings. However, no variables influenced the percentage of non-performing loans in the short run.

Keywords: *NPL, Interest Rate Spread, Inflation, Open Unemployment Percentage, amount of foreign exchange reserves, VECM.*
JEL Classification Code: B22, E50, G21

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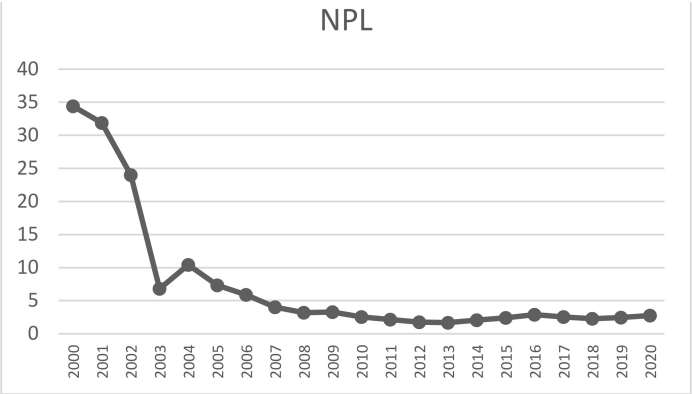
INTRODUCTION

Over the last three decades, Indonesia has undergone three significant financial crises. The first crisis struck Indonesia in 1997-1998, causing a disruption in the balance of payments, rising poverty owing to layoffs, and a halt in economic progress. The second crisis in 2008 began with the housing-related debt crisis in the United States. It spread to several European countries, causing interest rates in almost all of them to plummet. The Covid-19 virus was causes the third crisis in 2020. In this crisis the country's finances are distorted due to health conditions that threaten to create the threat of recession and economic capacity decline. The emergence of the financial crisis provides valuable lessons on the importance of policies that can affect individual institutions and focus on individual protection and the relationship between macroeconomics and the economic sector as a whole.

Because of the lack of market discipline and regulation and supervision of the primary components of the financial system (institutions, markets, and infrastructure), systemic risks resulting from crises cannot be avoided (Beau et al., 2012). Systemic risk disrupts financial system activity, which can severely affect the financial system's overall stability and pose real-world hazards to the economy. To mitigate the impact of these systemic risks, an international regulatory framework was established to ensure the overall stability of the financial system, not simply the strength of a single financial institution. Macroprudential policy is the name given to this type of regulation (Beau et al., 2012)

A macroprudential policy attempts to keep the risks and costs of a systemic crisis to a minimum (Gadanecz & Jayaram, 2015). Systemic risk indicators, such as the Non-Performing Loan Ratio, can be used to assess macroprudential oversight (NPL). The NPL ratio is a Financial Soundness Indicators (FSIs) that represent risks in the financial system in the economy (BI Institute, 2020). It can be used as an indicator of the financial system's health and is commonly associated with stress testing from financial institutions (BI Institute, 2020). Non-Performing Loans (NPLs) represent the credit quality of a country's banking loans as a whole and offer an overview of the credit quality of a bank's loan portfolio (Prasetyo, 2020). Credit expansion must be tempered with proper prudential standards to avoid a rise in non-performing loans (NPLs). The percentage of problematic credit, such as questionable, non-current, or poor credit, to total credit channeled, is known as the non-performing loan (NPL). Companies with unacceptable levels of bad credit can stymie money flow inside financial institutions, making it difficult for them to transfer cash to other parties and putting banks at risk (Barus & Lu, 2013).

The increase in NPL can be triggered by several factors in both the financial and non-financial systems, including rising inflation, increasing fuel prices, falling commodity prices, interest rates, and household purchasing power. In general, figure 1 shows that the period 2000-2020 shows the development of the banking industry's NPL ratio in Indonesia which improved with an NPL ratio of 6.8% in 2003 where in previous years the NPL ratio showed very bad numbers of 34.4%, 31.9%, and 24% consecutively during the 2000-2002 period of recovery after the 1998 monetary crisis. In 2013-2020 the NPL ratio in Indonesia tends to be stable with the curve continuing to hit.



Source: World Bank. 2021. World Development Indicators

Figure 1
Non-Performing Loan Ratio in Indonesia 2000-2020 (% per year)

The financial system is critical to the economy. As part of the economic system, the financial system distributes monies from those who have surpluses to those who have deficits. The allocation of funds will not operate correctly if the financial system is unstable and does not work efficiently, stifling economic progress. Experience has shown that rescuing an unstable financial system, mainly if it results in a crisis, comes at a very high cost (Otoritas Jasa Keuangan, 2021).

According to (Julius R. Latumaerissa, 2017), financial system stability is described as the situation in which the financial system efficiently supports the transfer of resources over time, from depositors to investors, as well as the distribution of economic resources in general. Financial system stability also allows for the assessment, identification, and management of financial risks and the ability to absorb financial and economic instability. In general, financial system stability refers to the financial system's capacity to withstand economic shocks while maintaining intermediation, payment systems, and risk dispersion functions.

A strong and resilient financial system can withstand a variety of economic shocks. It can still act as an intermediator, process payments, and disperse risks appropriately. Various factors and turmoil can cause instability in the financial system. It is often a mix of market failures owing to structural and behavioral reasons. Market failure can be caused by both external (international) and internal (domestic) factors (domestic). Credit, liquidity, market, and operational risk are risks that frequently accompany financial system activities (Otoritas Jasa Keuangan, 2021).

The formation of a growing ratio of non-performing loans is one of the dangers of banking activities becoming more sophisticated (NPL). The NPL percentage of commercial banks is one of the financial indicators that the banking sector pays close attention to worldwide. One of the causes of the financial crisis was a high NPL percentage (Belgrave, 2012). In both developed and developing nations, the NPL ratio has been frequently used to assess asset quality in lending institutions with failures and financial difficulties (Guy, 2011). Non-Performing Loans (NPL) is a ratio that reflects the likelihood of banks experiencing credit problems due to money funneled to the general population. If credit is appropriately handled such that problem credit (NPL) is kept to a minimum, the bank's interest revenue will increase, and the business will thrive. The macroeconomic impact of this will foster

economic development and a more fair distribution of earnings (Firdaus, 2009).

Credit interest is the bank's most significant source of revenue, but it's also the biggest source of operational risk. Banks face a massive challenge with lousy credit. Problematic credit reduces bank profits and depletes operating finances and financial liquidity, causing bank health to deteriorate and depositors to suffer (Usanti, 2013). Increased credit growth will improve access to the financial sector, allowing for more investment and economic development. On the other side, a reduction in lending standards, excessive leverage, and asset price inflation can all contribute to financial sector vulnerabilities.

Balogh (2012) found a relationship between macroeconomic trends and financial health indicators of banking in the European Banking System, which is characterized by a strong correlation relationship between NPL ratio and unemployment rate in Europe, using an empirical approach to identify macroeconomic variables that influence NPL. NPL levels have a detrimental impact on the economy, the state budget, and lending interest rates. Prasetyo (2020) finds that numerous macroeconomic variables, such as economic growth, credit interest rates, inflation, and unemployment, substantially impact non-performing loans (NPL) in ASEAN institutions. This research might uncover various points of view on macroeconomic parameters that influence NPL. The disparity between earlier theoretical studies and published data circumstances highlights the necessity for statistical analysis of macroeconomic and NPL indicator linkages.

According to (Wood & Skinner, 2018), the particular reasons for NPL come from two sources, namely the banking sector and the macroeconomic sector, based on his research in Barbados from 1991 to 2015. Return on equity, return on assets, capital adequacy ratio, and loan-to-deposit ratio are all variables that impact NPL in the banking sector. On the other hand, GDP growth, unemployment, and interest rates are macroeconomic factors that have an impact.

Credit risk evaluation is an essential part of the macroprudential analysis, with aggregate nonperforming loan ratios providing a proxy for the likelihood of a global banking sector failure. The findings show that, over time, economic expansion has a negative and considerable impact on problem credit. Unemployment, private sector credit, and currency rates, on the other hand, have a favorable effect on NPL in Nigeria. There are no critical variables impacting them in a short time (Akinlo & Emmanuel, 2014).

The study's framework of thought is centered on the execution of macroprudential policies in Indonesia and how such policies are affected by Indonesia's macroeconomic conditions. Variables such as the consumer price index, GDP growth, interest rate spreads, loan interest rates, and foreign currency reserves represent macroeconomic indicators in the research. At the same time, NPL ratio variables are used to indicate macroprudential indicators. The GDP growth variable measures Indonesia's economic growth, whereas the Consumer Price Index reflects the country's inflation rate. Interest rate spreads can reveal a bank's efficiency and performance in a specific jurisdiction. On the other hand, lending rates reflect the profitability of banks and the role of banking intermediation in moving the real economy. Foreign currency reserves reflect economic success in the real world and are a critical economy component.

METHODOLOGY

The methodology used in this research is quantitative. The method used in this study is the Vector Error Correction Model (VECM) method to reconcile the behaviour of short-term economic variables

with long-term economic variables. VECM is a Vector Auto Regression (VAR) designed to be used on data series that are not stationary and known to have a cointegration relationship. The econometric analysis was carried out through several stages. The first thing to be tested is using the Root Test Unit to check the condition of the data. The second step is to determine the optimal lag and test the cointegration. The next stage examines the direction of the relationship of a variable with other variables: Granger Causality Test, Impulse Response Function (IRF), and Variance Decomposition (VD).

Before estimation is carried out, a stationarity test is first carried out on all variables to avoid spurious regression problems. Time series data is considered stationary if the information data does not contain unit roots with the mean, variance, and covariant constant over time. The unit root test was carried out using the Augmented Dickey-Fuller (ADF) method by comparing the statistical ADF value with the Mackinnon Critical Value of 1%, 5%, and 10%. This test is carried out at the level and first difference level. In a VAR system, determining the optimal lag is very important because choosing the optimal lag is useful for eliminating autocorrelation and heteroscedasticity problems. In addition, determining the optimal lag is useful for showing how long a variable reacts to other variables. Determination of the amount of lag in the VAR model is determined by the information criteria recommended by the Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Criterion (SC), and Hannan-Quinn (HQ). The asterisk indicates the optimal lag recommended by the criteria above.

After the optimal lag determination test, cointegration testing is carried out to obtain a long-term relationship between variables that meet the requirements during the integration process, where all variables are stationary at the same degree. Cointegrated variables will show that these variables have the same stochastic trend and direction of movement in the long term. The cointegration relationship in a system of equations indicates that an error correction model consistently describes dynamics quickly with the long-term relationship.

Shock to the variable does not only directly affect the nth variable but is also transmitted to all other estimation variables through the VAR's dynamic (lag) structure. Impulse response analysis was carried out to see the response of an endogenous variable to the shocks of other variables in the model. Impulse response also describes the rate of the shock of one variable on another variable in a specific period range so that it can be seen how long the effect of the shock of a variable on other variables is until the mark disappears or returns to the balance point. The final test is the Variance decomposition which separates the variations from several estimated variables into shock components or innovation variables. Variance decomposition will provide information about the proportion of the movement of the impact of a shock on a variable to the surprise of other variables in the current and future periods. This test can be used to find out how much the contribution of each variable in the model is to the endogenous variable being observed.

World Development Indicators and the Bank of Indonesia provided secondary data for this study. Considering data availability, this study examines data for the annual period from 2000 to 2020. There are two types of operational variables: dependent and independent. Nonperforming Loans (NPLs) are defined as a type of dependent variable. Interest rate spread (SR), inflation (INF), open percentage breakdown (UN), and total foreign exchange reserves (DEV) are all described as independent variables at the same time.The equation model used to

determine the variables affecting NPL in Indonesia during 2000-2020 is as follows:

$$NPL = \beta 0 + \beta 1SR + \beta 2INF + \beta 3UN + \beta 4lnDEV + e$$

Where :
NPL = Non-Performing Loan Indonesia(%)
SR = Interest rate spread (%)
INF = Inflation Rate (%)
UN = Ratio of Number of Open Evictions (%)
lnDEV = Amount of Foreign Exchange Reserves (Million USD) by being converted into Natural logarithms (Ln)

RESULT AND DISCUSSION

The vector error correction model (VECM) approach was applied in this investigation. Interest rate spreads, inflation, the open eviction amount ratio, and foreign exchange reserves all had a varying influence on non-performing loans, according to the study (NPLs). The data stationarity test should be performed first, followed by root unit testing. To avoid misleading regression, stationarity testing is done to test data stationarity. The coefficients in the model will be valid if each variable is stationary. At the level and first difference, the Dickey-Fuller Augmented Stationary (ADF) test was performed (trend and intercept).

Table 1
Stationary Test Results at Level and First Difference

	Variable	ADF	Probability	Mac Kinnon Critical Value	Information
		t-statistic		5%	
Level	NPL	-3.777366	0.0107	3.020686	Stationary
	DEV	-0.951173	0.7496	-3.020686	Not stationary
	SR	-2.861636	0.0678	-3.020686	Not stationary
	INF	-1.603876	0.4613	-3.029970	Not stationary
	UN	-0.601201	0.8495	-3.020686	Not stationary
First Difference	D(NPL)	-4.281347	0.0050	-3.081002	Stationary
	D(DEV)	-4.179614	0.0048	-3.029970	Stationary
	D(SR)	-5.838395	0.0003	-3.065585	Stationary
	D(INF)	-5.809191	0.0002	-3.029970	Stationary
	D(UN)	-3.753580	0.0118	-3.029970	Stationary

Source: Estimated results using EViews 10

Table 1 shows that most variables are not stationary at the level, based on the results of the stationarity test. The t-statistical ADF values of those variables, which are less than their Mackinnon Critical Value value at a 5 percent error, can be used to determine variable stationarity. Variable stationarity can also be found in probability values less than 5%. If one variable is not stationary at the level, it is essential to test the root unit at the next level, namely the first difference, in the stationary test.

The findings of stationarity testing of all variables at the first difference (trend and intercept) level under model

circumstances can be utilized for later regression testing. Table 2 shows that all requirements provide the same optimal lag reference, which is lag 1, based on the results of optimal lag tests that follow the criteria of the likelihood ratio (LR), final prediction error (FPE), Akaike information criterion (AIC), Schwarz information criterion (SC), and Hannah-quin criterion (HQ). The desired outcome is lag 1. The optimal lag specifies how long it takes for a variable to feel the effects of a government decision.

Table 2
Optimal Lag Test Results

Lag	LogL	LR	FPE	AIC	SC	HQ
1	-117.4620	NA	2.386966*	14.99600*	16.23869*	15.20632*

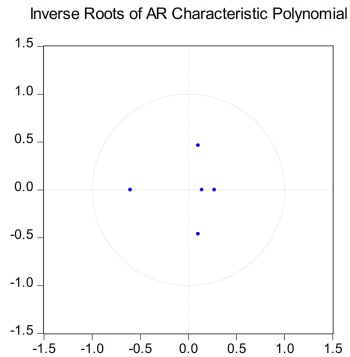
Source: Estimated results using EViews 10

Table 3 shows that if the root in the var model has a modulus value less than one, the model is stable. The inverse point of a characteristic polynomial in the circle similarly shows the results, indicating that the var estimate is stable.

Table 3
Roots of Characteristic Polynomial Test Results

Root	Modulus
-0.601191	0.601191
0.102848 - 0.463426i	0.474701
0.102848 + 0.463426i	0.474701
0.272368	0.272368
0.143169	0.143169

Source: Estimated results using EViews 10



Source: Estimated results using EViews 10

Figure 2
Inverse Roots

Table 4 displays the trace and maximum Eigenvalue statistics for lag 1 of the variables SR, INF, UN, and DEV, as well as the results of the cointegration test. According to the cointegration test findings in table 4, the trace statistical value is more

than the crucial value of 5%. The max-eigenvalue is also more significant than the critical value of 5%. The information might be classified as integrated. This result shows a long-term relationship between the NPL, SR, INF, UN, and DEV variables. When using the VECM technique, the data integration in this investigation reveals the proper signal.

Table 4
Johansen Cointegration Test Results (Trace Statistic) and (Maximum Eigen Value)

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.958803	57.40916	33.87687	0.0000
At most 1 *	0.852939	34.50429	27.58434	0.0055
At most 2 *	0.733636	23.81202	21.13162	0.0205
At most 3 *	0.503625	12.60761	14.26460	0.0899
At most 4 *	0.317100	6.865330	3.841466	0.0088
Trace test indicates 5 cointegrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.958803	57.40916	33.87687	0.0000
At most 1 *	0.852939	34.50429	27.58434	0.0055
At most 2 *	0.733636	23.81202	21.13162	0.0205
At most 3	0.503625	12.60761	14.26460	0.0899
At most 4 *	0.317100	6.865330	3.841466	0.0088
Max-eigenvalue test indicates 3 cointegrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				

Source: Estimated results using EViews 10

Vecm test estimates reveal links between variables in both the long and short term. Long-term and short-term equations can be written as follows based on these findings.

Table 5
VECM Estimates

Long-term			
Variable	**Coefficient**	**t-statistic**	**Information**
C	-0.565590	-	-
NPL(-1)	1.000000	-	-
SR(-1)	0.481155	1.62892	Insignificant
INF(-1)	-0.449723	-3.89934	Significant
UN(-1)	5.166870	9.22802	Significant
DEV(-1)	30.45667	12.6116	Significant
Short- term			
Variable	**Coefficient**	**t-statistic**	**Information**
CointEq1	-0.499377	-1.13798	Significant
D(NPL(-1))	-0.216612	-0.71929	Insignificant
D(SR(-1))	0.728184	0.78433	Insignificant
D(INF(-1))	0.014985	0.07547	Insignificant
D(UN(-1))	-0.205979	-0.07780	Insignificant

Source: Estimated results using EViews 10

Information : t-tabel 5%=2.0796; 10% = 1.720743
F-tabel 5%=2,61; 10%=2,09

$$NPL_t = -0.565590 + 0.481155\ SR_{t-1} - 0.449723\ INF_{t-1} + 5.166870\ UN_{t-1} + 30.45667\ LnDEV_{t-1}$$

Vecm analysis of the long-term variable Inflation (INF) in lag 1 reveals that NPL, 0.44, is negatively and substantially influenced. NPL will fall by 0.44 percent if inflation rises by 1% from the previous year. The number of open unemployed (UN), a variable ratio, has a favorable and strong influence on the NPL, 5.16. The PMA will grow by 5.16 percent if the number of open unemployed (UN) ratio rises by 1%. This implies that if the unemployment rate continues to climb in a negative direction, the risk of problem credit will increase. The same pattern demonstrates that the variable amount of foreign exchange (DEV) has a positive and significant effect on the NPL, with a coefficient of 30.45. With every one unit rise in DEV, the NPL will increase by 30.45 units. In the short run, Table 5 provides the findings of VECM analysis. It can thus be concluded that no variable satisfies or has a significant influence in a short time.

The interest rate spread is the bank's principal source of income, and it determines the amount of the bank's net income. The spread is the difference (margin) between the interest rate on loans (cost of funds) and the interest rate on deposits (lending rate). The larger the spread or net margin that the bank can achieve, the higher its profit rate will be, allowing it to be more accessible in channeling its loan funds (Barus & Lu, 2013). In the long term, interest rate spreads have little influence on non-performing loans.

According to long-term estimates, inflation has a significant negative effect on NPL. In contrast to earlier research, Khan et al (2018) discovered that higher inflation might benefit NPL because inflation distorts the economy by lowering people's purchasing power, diminishing their capacity, and increasing the risk of financial default. The findings of the study remind us that inflation may be caused by a variety of factors, including demand-pull inflation. Because of the improving economic condition, inflation develops when aggregate demand rises faster than available supply (goods or services). Even when paired with growing prices, increased financial troubles may have a detrimental impact on NPL. This is because people's purchasing power might still rise. Banks have typically maintained a tight check on their clients' ability to repay the credit to keep the NPL percentage low.

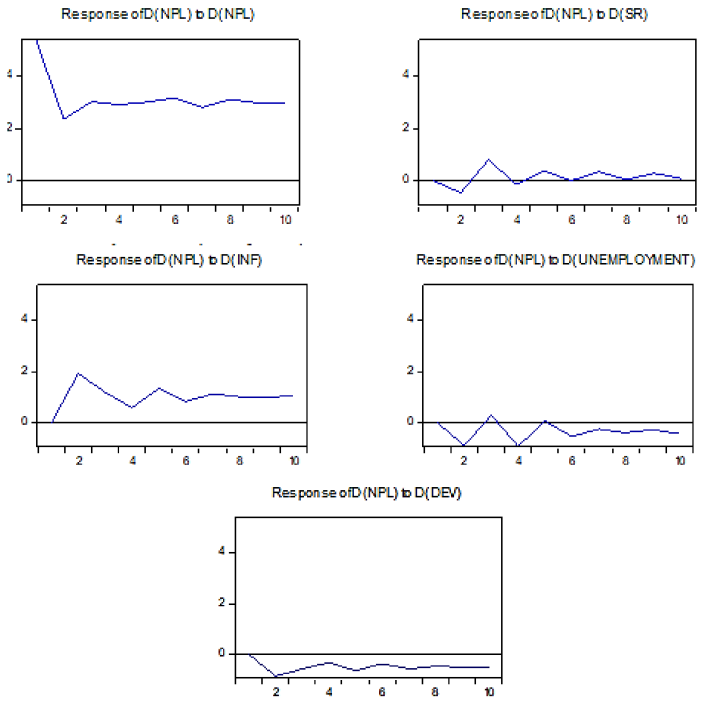
According to long-term estimations, the number of open invasions has a considerable beneficial influence on NPL. According to the study's findings, an increase in unemployment might lead to a rise in NPL. If evictions are not handled or increased, productivity, buying power, and societal well-being will suffer. If evictions continue to rise, the ratio of defaulted or non-performing loans (NPL) will also increase. The amount of foreign exchange reserves has a substantial favorable influence on the NPL in the long run. Several earlier studies revealed that various factors might alter the number of foreign currency reserves. Mildyanti & Triani (2019) used case studies of Indonesia and China to show how many variables might impact the number of foreign currency reserves. The study's findings revealed that net exports and investments had an impact on the level of foreign exchange reserves. Investment is essentially one of the aspects that might boost labor absorption to aid in the realization of the asset (Sulistiawati, 2012).

The absorption of labor boosts the community's economic activity, leading to increased economic growth. Indirect effects obtained from increasing foreign

exchange reserves to NPLs, namely when investment, productivity, and exports increase, and can make the amount of credit in a country increase, by increasing the amount of credit can affect the increase in the ratio of credit failure (NPL) itself by increasing the amount of credit. More study on the influence of the number of foreign exchange reserves on the NPL and portions that may be used as an input for the NPL is still needed.

The reaction of each variable to the shock of that variable and other endogenous variables reveals the VECM model's dynamic behavior. The direction of the link and the extent of the effect between endogenous variables in the model are determined by the Impulse Response Function (IRF). The reaction of NPL variables to the shock variable SR, inflation (INF), the ratio of open unemployment (UN), and the level of foreign exchange reserves were the subject of this study's impulse response debate (DEV). Figure 3 shows Impulse Reaction Function (IRF) estimates, which focus on the response of a variable to a change of one standard deviation from the variable and other variables in the VAR model.

Figure 3
NPL level of each variable's shocks



Source: Estimated results using EViews 10

Table 6 shows the results of a study of the NPL level of each variable's shocks, including itself. According to the study, shocks to themselves resulted in 84.45% fluctuations in NPL rates in the third quarter, shocks to interest rate spreads resulted in 1.66 percent fluctuations against NPLs, shocks to inflation resulted in 10.05 percent fluctuations against NPLs, shocks to open unemployment numbers resulted in 1.73 percent fluctuations in NPL levels, and shocks to total foreign exchange reserves resulted in 2.09 percent fluctuations in NPL levels. On the other hand, Shocks to themselves tend to vary higher in the long run, in the 10th quarter, than in the short

term, while shocks to other variables result in more significant oscillations in NPL levels. Variable shocks to the Interest Rate Spread (SR), Inflation (INF), Open Unemployment Ratio (UN), and Amount of Foreign Exchange Reserves (DEV) create modest adjustments at the NPL level.

Table 6
Shocks Estimates

Period	S.E.	D(NPL)	D(SR)	D(INF)	D(UNEMPLOYMENT)	D(DEV)
1	5.347948	100.0000	0.000000	0.000000	0.000000	0.000000
2	6.290046	86.13458	0.530467	9.433087	2.021505	1.880363
3	7.146362	84.45188	1.665999	10.05387	1.736508	2.091742
4	7.795838	84.80510	1.433805	9.024181	2.809659	1.927258
5	8.490389	83.87853	1.391540	10.14613	2.373266	2.210539
6	9.118678	84.69224	1.206406	9.612218	2.406965	2.082173
7	9.630581	84.36747	1.200777	9.980675	2.224999	2.226074
8	10.18569	84.67130	1.074761	9.916740	2.136921	2.200281
9	10.67729	84.79607	1.050941	9.926453	2.005270	2.221264
10	11.14682	84.85910	0.970531	9.946385	1.989032	2.234955

CONCLUSION

Non-performing loans (NPLs) are a typical sign of stress testing from financial institutions and may be used to measure the financial system's health. The critical criterion for achieving financial system stability is macroeconomic stability. Instability in the financial system (financial crisis) impairs a bank's liquidity and might lead to more problematic loans, impacting other industries. The association between NPL and numerous macroeconomic variables, including Interest Rate Spreads, Inflation, Percentage of Open Disruption, and Amount of Foreign Exchange Reserves in Indonesia. In the long run, inflation factors, the number of open jobless, and the number of foreign exchange reserves all substantially impacted the ratio of non-performing loans, according to the findings. However, no factors influenced the percentage of non-performing loans in the near term. The NPL variable itself, inflation, the amount of open unemployment, the number of foreign exchange reserves, and the variable interest rate spread are all critical variables for NPL shocks, according to the impulse response results of this study.

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