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The impact of variables of macroeconomic and bank-specifics on non-performing loan in banking industry in Indonesia

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ABSTRACT: The purpose of this study is to analyze the effect of macroeconomic variables and bank-specific variables to non-performing loans in the banking industry in Indonesia. The data used in this study is quarterly secondary data from 2015:01-2017:04 across 106 commercial banks. The analysis used is dynamic Generalized Method-of-Moment (GMM). The result of this research is that real Gross Domestic Product (GDP) growth, Return on Asset (ROA) and efficiency (BOPO) have a positive impact on the NPL. Inflation and Return on Equity (ROE) have a negative impact on the NPL and interest rate has no effect on the NPL. The Sargan test failure to reject the null hypothesis. It implies that the instruments are valid and the serial correlation test for the second order is higher than alpha by 5%, which means the model has no autocorrelation.

Keywords: macroeconomics variables, bank specifics variables, non-performing loan, dynamic GMM

1 INTRODUCTION

In recent years, banking activities have become very complex. In addition to the intermediary institutions, the stability of the banking system has become very important because the failure to maintain banking stability. It will adversely affect macroeconomic conditions and even social aspects of society and, in the event of a crisis, it will require a very large amount of money to cope with the crisis (Claessens et al., 2013).

Banks always confront credit or Non-Performing Loan (NPL) risks because of its main task as an intermediary institution. However, the NPL issue is not only a measure of bank performance but is also very important for the monetary authority in determining the direction of its policy, as it can dictate the state of the economy of a country.

In Indonesia, there are 116 banks consisting of Bank Persero, Foreign Exchange BUSN Bank, Non-Foreign Exchange BUSN, BPD, Joint Bank and Foreign Bank. This study explores the NPL of each bank. Research on NPLs has been done extensively from various countries (Mondal, 2016) (Karahanoglu, 2015) (Abrebese, 2016) (Parab, 2018) (Anjom, 2015) and (Janvisloo, 2013).

The Basel Committee for Banking Supervision (2001) defines NPL as a probability of losing either part or all of the loan balance due to credit default events. In general, the performance of a bank can be affected by two things: the influences of the internal and the external. Unpredictable global economic conditions leading to the selection of macroeconomic variables becomes very important so the obtained results become more comprehensive.

A high NPL level will let the bank act more selectively toward new debtors and causes it to be difficult to disburse credit. This needs to be done so that the bank is able to maintain the confidence of depositors and that they should always keep the NPL level at a low

point to encourage economic growth and maintain the stability of the country's economic system.

As mentioned earlier, there are internal and external factors that affect the NPL. There have been many studies using either internal or external factors and even both. This study sees the importance of using these two factors to test NPL in Indonesia.

2 LITERATURE REVIEW

Non-Performing Loan (NPL) is an anomaly that is always confronted by every bank. Measurements of distributed credit quality will always be linked to any credit risk or NPL that the bank earns. The NPL amount in the bank depends on its ability to assess the credit risk of the loan proposed by an applicant where its normally measured using default probability, loss given default and default exposure (Mileris, 2014).

Many researchers conducted a study to build the factors affecting the NPL. However many obstacles were encountered in the determination of the right variables. Differences in cross-country economic conditions and diverse studies can measure the determinants of different NPLs, and those variables indicate different relationships.

A study by Parab and Patil (2018) employed panel data model approach and specific bank variables and macroeconomic variables in India. The results showed that the use of these two variable factors gave exposure to the relationship with NPL up to 55%. Specific bank variables, such as ROA, ROE, channelled credit, inefficiency operations, CAR and bank size had an inverse relation to NPL while loan growth variable positively affected NPL. The macroeconomic variables used in the research were GDP growth, lending rates, unemployment and inflation, which had significant inverted linkage on NPL in India.

In contrast to research conducted by Mondal (2016), it only used macroeconomic variables such as GDP, inflation, interest rates and unemployment rate against NPL in the banking industry in Bangladesh with least square and Granger causality test methods. The results showed that inflation and interest rates had a negative effect on NPL, but GDP and unemployment rates had a positive relationship with NPL. GDP growth would lead to an increase in people's incomes and ultimately help the economy keep NPL at a low point.

According Ofori-Abebrese et al (2016) with the research using macroeconomic variables (inflation, exchange rate, money supply M2, GDP and treasury bill) on NPL at commercial banks in Ghana with the Autoregressive Distributed Lag (ARDL) method approach showed that inflation and treasury bill significantly influenced the NPL so that uncertainty on macroeconomic conditions would directly affect the performance of banks. It required policymakers whose policies were able to manage the economy well so that NPL would stay fixed at low point.

Research conducted by Anjom & Karim (2016) using macroeconomic variables and specific bank variables examined the relationship between these two factors to NPL in the banking industry in Bangladesh. The correlation approach was used to measure the causality between macroeconomic variables and bank-specific variables to NPL in which the results showed that in Bangladesh, GDP growth and total assets had a positive correlation to NPL, whereas inflation, loan to asset ratio and Loan to Deposit Ratio (LDR) had a negative correlation on NPL. Domestic debt variable as a macroeconomic variable and positively affected the NPL, thus increasing domestic debt would lead to an increase in Bangladesh's NPL.

Janvisloo et al., (2013) investigated the relationship between the macroeconomic and NPL in commercial banks in Malaysia. Observations on 23 commercial banks and more than 250 data observations indicated that FDI-net outflow (% GDP) was a variable that positively affected

NPL and there was a negative relationship to the NPL of the GDP variable with the robust of the time influence on lags 2. Inflation and domestic credit growth had a positive and negative relationship and the influence of these two variables that specifically lasted up to two years.

This study examines how macroeconomic variables and specific bank variables affect the NPL of commercial banks in Indonesia. This study employ macroeconomic variables that are GDP, inflation and interest rates, while the specific bank variables used are Return On Assets (ROA), Return On Equity (ROE) and efficiency for operational cost. Dynamic panel data approach is used because it combines cross-section data of 106 commercial banks in Indonesia and time series using quarter data from 2015: 01 – 2017: 04 with total 1272 observation.

3 RESEARCH METHODS

3.1 *Data and data sources*

This research uses a quantitative approach. The quantitative method is a scientific approach that views a reality to be classified, concreted, observable and measurable, and the relationship of variables are causal where the research data is in the form of numbers. This study focuses on the explanation of the relationship between the NPL as the dependent variable and GDP, inflation and interest rates, ROA, ROE and BOPO as independent variables. The type of data used in this study is secondary data as obtained from the Bank Indonesia (BI), the Financial Services Authority (OJK) and the Central Bureau of Statistics (BPS).

3.2 *Definition of operational variables*

These variables are grouped into two, namely the dependent variable (restricted variable) and independent variable (free variable). Dependent variable used in this research is NPL in a commercial bank in Indonesia, while the independent variable used are GDP growth, inflation, interest rate, ROA, ROE and BOPO. The definition of variables used in this study is: first, Gross Domestic Product (GDP), which is the amount of gross value added by all producers in an economy plus taxes and minus subsidies that are not included in the value of a product. This study uses a percentage of quarterly GDP growth rate. GDP growth data on constant prices is accessed from the Bank Indonesia. Second, the Consumer Price Index (CPI) as a proxy of data inflation is accessed from the Indonesian Central Bureau of Statistics (BPS). Third, the interest rate (IR) as a policy tool used by the monetary authorities to influence the amount of credit disbursed and the money supply in a country. All three variables are grouped as macroeconomic variables.

The bank-specific variables in this study are; first ROA, which is a ratio that measures the ability of banks in generating profit or profit, which is measured base on how effective banks in using their assets in generating revenue. Second, ROE, which is the profitability ratio that compares the net profit of the bank with its net assets (equity or capital). This ratio uses the relationship between profit after tax with the used and owned capital. Third, BOPO as a measure of efficiency and operational effectiveness of a company/banking. The lower BOPO means the more efficient the bank is in controlling its operational costs with the efficiency of the cost of the profits obtained by the bank will be greater. The use of both internal and external factors as independent variables is considered important to see the effect on NPL in the banking industry in Indonesia. All specific bank variables are accessed from OJK.

Common models of dynamic data panels are:

$$Y_{it} - Y_{it-1} = (1-\alpha)Y_{it-1} + \beta_1 X_{it} + \beta_k X_{it} + \eta_i + \varepsilon_{it} \quad (1)$$

Dynamic model panel data is:

$$Y_{it} = \alpha Y_{it-1} + \beta_1 GDP_{it} + \beta_2 CPI_{it} + \beta_3 IR_{it} + \beta_4 ROA_{it} + \beta_5 ROE_{it} + \beta_6 BOPO_{it} + \eta_i + \varepsilon_{it} \quad (2)$$

Explanation:

Y = Non-performing loan;
GDP = GDP growth rate;
CPI = Consumer Price Index;
IR = Interest Rate;
ROA = Return On Asset;
ROE = Return On Equity;
BOPO = Operation Expenses to Operation Income;
η_i = Unobserved banks-specific effect term
ε = Error term

ε_{it} = Error term
i = Cross-section on bank's index
t = Time index

The econometric method is used by estimation of the GMM dynamic panel, suggested by Arellano & Bond (1991) and developed by Blundell & Bond (1998). This method is applied because of the need to overcome the bias in the models and effects of any banking industry. To eliminate the specific market effect problems, in the Arellano & Bond models (1991), it is suggested transforming the model to first-difference Eq. (2) and use lag at the level in regression to eliminate the bias in the model. Prudence is required in applying the model, as it may lead to erroneous conclusions caused by persistent independent variables. To solve the problem, Blundell & Bond (1998) suggest applying the GMM system estimator at both level and first-difference. This model can reduce the bias and inaccuracy associated with the difference in estimation.

This research utilize the GMM system because the estimation result is consistent and free from bias compared with Ordinary Least Square (OLS), fixed effect, and different GMM. The GMM system is able to overcome the problem of endogeneity because it produces an efficient estimation of the difference of GMM or fixed effect. The GMM system has two estimations, one-step estimation and two-step estimation. Theoretically, the estimation with two-step the GMM system is more efficient than using one-step estimation because it uses optimal weighting. This research model applies the GMM system with two-step estimator to test the effect of macroeconomic variables and bank-specific variables on NPL in the banking industry in Indonesia. The consistency of the GMM system result depends on approximately two specification tests, i.e. the Sargan test to state that the model is valid and correct, and an autocorrelation test (AR2) to eliminate time-series problems in the model.

4 RESULTS AND DISCUSSION

The model estimation in this study uses a data panel combining cross-section data with 106 data industry banks in Indonesia and time series that form with quarter data from 2015: 01 – 2017: 04. Industry banks recorded on OJK is counted to 116. The selection of up to 106 banks is due to several banks not having published reports and occurrence of bank mergers, so there is no recent report validated. Additional information that the sample in the model shows is that cross-section N data is larger than the time series data T (N > T), so it is suggested to use the GMM panel data model analysis.

Based on Table 1, it is known that the variable NPL, GDP growth and ROA have a standard deviation value greater than the average. It indicates that there is heterogeneity in the data in the period of observation. The greater the value of the standard deviation, the greater the average distance of each unit of data is against the average value of the count. Inflation, interest rate, ROE and BOPO variables have a standard deviation value below the average value of the count, not indicating that the data is homogeneous. However, the degree of heterogeneity is no greater than the previous variable. The total observation data is 1,272, and the maximum value of the NPL touches 95.95 as occurred in 2016 in the third quarter of the state pension savings bank. This study focuses after the crisis of 2008, and the application of

Table 1. Statistic descriptive.

Variable	Obs	Mean	Std deviation	Min	Max

NPL	1272	3.00967	3.480428	0	95.95
GDP Growth	1272	1.207459	2.302919	−1.802197	3.852051
Inflation	1272	0.385	0.3110215	−0.05	0.96
Interest Rate	1272	5.916667	1.340355	4.25	7.5
Return On Asset	1272	2.093687	2.561783	0	81.34
Return On Equity	1272	12.6251	10.14594	0.02	89.26
BOPO	1272	85.07987	16.78725	0.86	195.7

Source: Stata 13

banking in maintaining financial stability, one of them by keeping the NPL value at a low point. The next step is the GMM panel data estimation, as follows:

Table 2 shows the result of fixed effect panel data estimation, two-step GMM difference panel and two-step GMM System. The probability value of lagged dependent is significant, which indicates that the GMM panel model is appropriately used. Both results in the table show consistent value and interest rate variable have negative coefficient value to NPL, but no significant effect. This is in accordance with Anjom & Karim's (2015) research that interest rate has no significant effect on NPL. GDP growth positively affects the NPL, indicating that the increase in GDP will affect the increase in NPL. The behaviour of a bank that follows its business cycle will increase the risk as proven by the research of Mondal (2016), which states a correlation between GDP growth and NPL.

The inflation variable shows a probability value smaller than the alpha of 5%, which means that inflation affects the NPL. However, the coefficient of inflation is negative and the rise in inflation will decrease the NPL level in Indonesian banks. The rise in inflation is reflected in rising prices of goods so that people tend to reduce their demand for credit due to the greater risk of default. These findings are supported by Mondal (2016). The three macroeconomic variables show the determination of different NPL.

The specific variable of the bank shows that the three variables ROA, ROE and BOPO have effect on the level of 5% significance to NPL in Indonesia. The ROA and ROE variables have positive and negative coefficients, ROA and ROE demonstrate the level of bank efficiency in the use of equity and assets. However, higher asset utilization rates will have an impact on increasing NPL where, in this case, it indicates that the level of use of assets in the bank should be managed carefully and this applies equally to equity (Parab, 2018). BOPO has a positive effect on NPL so the higher BOPO will have an impact on the increase of NPL.

The consistency of GMM panel data depends on two things. First is the value of the Sargan Test; the results in Table 2 show that the Sargan test value shows a probability value above 5%, meaning that the model is free of excessive restriction problems or the model is said to be valid. Second is free of this autocorrelation problem as stated in Table 2 by identifying Arellano & Bond (1991) or AR2 values above from alpha 5%.

Table 2. Results of difference GMM two-step estimations and GMM two-step system.

Variabel	Difference GMM two-step system	GMM two-step model system
NPLt-1	0.003	0.002
	(0.000)***	(0.000)***
GDP Growth	0.042	0.056
	(0.000)***	(0.000)***
Inflation	–0.098	–0.080
	(0.000)***	(0.000)***
Interest Rate	–0.010	–0.0003
	(0.426)	(0.971)
Return On Asset	1.209	1.232
	(0.000)***	(0.000)***
Return On Equity	–0.130	–0.128
	(0.000)***	(0.000)***
BOPO	0.020	0.044
	(0.000)***	(0.000)***
Constanta	0.113	–1.843
	(0.370)	(0.000)***
Sargan Test	0.143	0.054
Arellano Bond Test (AR2)	0.118	0.594
Observation	1051	1160

Number of Banks	106	106

Sources: Stata 13.

5 CONCLUSION

Using data from 106 banks ranging from 2015: 01 – 2017: 04, this study examines macroeconomic variables and bank-specific variables on Non-Performing Loans (NPL) in the banking industry in Indonesia using the GMM panel data approach. Both factors have a very important role in maintaining banking stability in Indonesia. The role of regulators and stakeholders in actualizing a policy that is able to maintain stable macroeconomic conditions will have a very wide impact in economic conditions, especially in banking.

From the results above, it can be conclude:

1. The bank is procyclical, meaning that the behaviour of the bank follows its business cycle. The increase of GDP growth will affect when the level of demand for credit is increased and the policy of countercyclical and selective demand for credit must be applied accordingly so as not to repeat the crisis of 2008 caused by over-optimism from high economic growth.
2. Emphasizing the importance of bank efficiency in terms of asset, equity and operational efficiency, which will eventually minimize any risk.

REFERENCES

Anjom, W. & Karim, A.M. (2016). Relationship between non-performing loan and macroeconomic factors with bank specific factors: a case study on loan portofolio – SAARC countries, ELK Asia Pacific. Journal of Finance and Risk Management Vol 7 Issues 2.

Arellano, M. & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equation. *The Review of Economic Studies, 58*, 277–297.

Blundell, R. & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometric, 87*, 115–143.

Claessens, S., Ghosh, S.R. & Mijet, R. (2013). Macro-prudential policies to mitigate financial system vulnerabilities. *Journal of International Money and Finance, 39*, 153–185.

Herring, J. (1999). Credit risk and financial instability. *Oxford Review of Economic Policy, 91*, 401–419.

Janvisloo, A.M. & Muhammad, J. (2013)., Non-performing loans sensitivity to macro variables: panel evidence from Malaysian Commercial Banks. *American Journal of Economics, 3*, 16–21.

Kuncoro, M. (2013). Metode Riset untuk Bisnis dan Ekonomi: Bagaimana Meneliti dan Menulis Tesis? Erlangga, Jakarta.

Mankiw, N.G. (2003). *Teori Makroekonomi*. Jakarta: Penerbit Erlangga.

Minsky, H.P. (1982). The financial instability hypothesis. *Levy Economics Institute Working Paper, 74*.

Parab, C.R. & Patil, R. (2018). Sensitivity of credit risk to bank Specific and macroeconomic determinants: empirical evidence from Indian Banking Industry. *International Journal of Management Studies, 5*, 46–56.

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