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NON-PERFORMING LOAN MODERATED by RISK: SPEED ADJUSTMENT

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Abstract: This Research aims to explore determinant of Non-Performing Loan using internal and external variable and it also investigate speed adjustment in Non-Performing Loan. This research used Model Panel Data to estimate and to test their relationship with period data of 2014 to 2018. The Research Result is that Non-Performing Loan Lag one, Loan Deposit Ratio, Capital Adequacy Ratio, market Power were significant to affect current Non-Performing Loan. Non-Performing Loan achieve equilibrium value within 13 months, 11 days. These Oil Price and Fed Rate Variable variables of external factor are significant to affect current Non-Performing Loan. Only Loan Deposit ratio variable was supported by Risk as moderating variable to affect current Non-Performing Loan.

Index Terms - Non-Performing Loan, Loan Deposits Ratio, Risk, Market Power, Capital Adequacy Ratio, Oil Price, Fed Rate, Moderating Variable, Speed Adjustment.

I. INTRODUCTION

Non-Performing Loan is a bank indicator that Central Bank give attention to it which is how the management of bank could control the loan and deposits. Shahzad et.al (2019) investigated lending growth affecting riskiness especially to non-performing loan. Nikolov and Popovska-Kamnar (2016) examined determinants of NPL growth in Macedonia. Louzis et.al (2012) studied effect macroeconomic to consumer loan portfolios. Hutahayan et.al (2020) examined determinant Non-Performing Loan in Indonesia. Research on this topic is still limited especially in Indonesia and why this research has this topic.

Research said that there are some factors to affect the non-performing loan which is called internal factor and external factor company. Loan to Deposits Ratio (LDR) is a measurement intermediary of a bank. Practitioners and Regulator expected this ratio nearly to 85% (Hutahayan et.al 2020), because Central bank ask bank to provide reserve requirement and bank also provide funding for currency trading. Chou and Buchdadi (2016) discussed Loan for Rural Bank in Indonesia. Rengsamy (2014) explore LDR in Malaysia Bank. This variable includes in this research.

Capital Adequacy Ratio is a ratio that shows the capability of a bank in term to provide risk. Raharjo et.al (2014) examined CAR for State Owned Bank in Indonesia. Abusharba et.al (2013) examined CAR affecting Islamic Bank performance in Indonesia. Garcia (2019) investigated Effect Macroeconomics to Bank Capital. Nguyen (2020) and Thoa and Anh (2017) discussed CAR of Bank in Vietnam. Usman et.al (2019) investigated CAR of Bank in Indonesia. This CAR Variable include in this research.

Market Power is a factor to affect Non-Performing Loan. Market power is measured by ratio credit of the bank and all total credit of bank in Indonesia. Ariss (2010) explored implication of Market Power in Banking of Developing Countries. Cubilas and Suarez (2013) investigated market power bank after a banking crisis in some international countries. Ryan et.al (2014) studies bank market power affecting SME financing constraints. Manurung and Hutahayan (2020) examined market power in Indonesia bank.

Macroeconomic policy has high impact to bank performance. Macroeconomic Variable become external factor to bank performance. Oil price become a big tension for special research to investigate the contribution to bank performance in Indonesia. Bank performance is Non-performing Loan in this research. El-Chaarani, H. (2019) studied the Impact of oil Prices on the Financial Performance of Banking Sector in Middle East Region. Lee and Lee (2019) investigated bank performance and oil price in China. Effendi (2019) examined the Oil Prices

and Macroeconomic on the Islamic Banking Performance in OPEC Member Countries. Darko and Kruger (2017) explored Determinants of Oil Price Influence on Profitability Performance Measure of Oil and Gas Companies. Osuma et.al (2019) examined Effects of Global Decline in Oil Price on the Financial Performance in Nigeria bank. This Oil Price includes in this research.

Fed Rate is a macroeconomic variable and external factor in a research that company is unit analysis. Fed Rate is policy rate in USA even some countries use it as also policy rate. Ahmed et.al (2018) examined Interest Rate and Financial Performance of Banks in Pakistan. Borio et.al (2017) studied the influence of monetary policy on bank profitability. Genay and Podjasek (2014) and Malik et.al (2014) investigated impact interest rate to bank profitability. This research also discusses cointegration of Fed rate to Bank performance.

This research considers risk of bank to become moderating variable. The moderating variable could be stated to strong or to weak relationship between dependent variable and independent variable (Manurung, 2019, Muigai and Muriith, 2017). Manurung et.al (2020) used size as moderating variable in Probability of Bankruptcy of Coal Mining in Indonesia. Hasan et.al. (2020) examined Asset as moderating variable affect bank performance. Hutahayan et.al (2020) used Asset as moderating variable to Determine Non-Performing Loan.

II. Literature Review

Bank is an intermediary financial institution in a country that manage by some professional to get profit for its operation. Bank is a heavy regulated of institutions and the government has big tension to the bank. Bank, they collected fund or money from the surplus unit or household and distribute to deficit units or company, and the bank get margin as a return. Bank has four tasks to transform which is value, time, risk and liquidity (Manurung, 2017). Bank needs the high capital to operate it as requirement the banking regulator or central bank of a nation. The Capital of Bank will grow as much as profit that bank be gotten it. Then, the capital of bank could be arranged as follows:

$$E_1 = E_0 + \pi_1 \quad (1)$$

$$E_n = E_0 + \{\pi_1 + \pi_2 + \dots + \pi_n\}$$

$$E_2 = E_1 + \pi_2 = E_0 + \{\pi_1 + \pi_2\}$$

E_1 is capital bank on year – 1 and grow from on year – 0 by profit (π_1) then it grow again by profit on year – 2 (π_2), so total Capital become E_2 as mention in equation (1).

Bank could increase their capital through profit ($\pi_1, \pi_2, \dots, \pi_n$) and issue shares to other people or public (Svitek, 2001), and also issue long term debt is known Subordinate Debts (Kleff dan Weber, 2008). Profit of the bank could be calculated with assumptions that r, i, ρ are constant as follows:

$$\pi = (1 - T)(r * L - i * D - \rho L) \quad (2)$$

T = tax

L = Loan

D = Deposits

r = rate of Loan

i = rate of deposits

ρ = rate of Non-Performing Loan

If $L = (1 - \alpha) * D + E$, which is α as reserve requirement by central bank that it provide by bank (Jiang, 2010). Then, equation (2) could be rewrite as follows:

$$\pi = (1 - T) * [r * \{(1 - \alpha) * D + E\} - i * D - \rho \{(1 - \alpha) * D + E\}] \quad (3)$$

$$\frac{\pi}{E} = (1 - T) * [(r + \rho) + \{(1 - \alpha) * (r - \rho) - i\} * \frac{D}{E}] \quad (4)$$

(π / E) is known as Return on Equity (RoE). If we want to make equation (4) to become (π / A) , is known as return on asset (RoA), Equation (3) could be rewrite as follows:

$$\frac{\pi}{A} = (1 - T) * [(r + \rho) * \frac{E}{A} + \{(1 - \alpha) * (r - \rho) - i\} * \frac{D}{A}] \quad (5)$$

If $E = A - D$, so Equation (4) could be rewritten as follows:

$$\frac{\pi}{A} = (1 - T) * [(r + \rho) + \{\alpha * (\rho - r) - i\} * \frac{D}{A}] \quad (6)$$

Equation (4) dan (6) are first indicator to see bank of financial performance for practitioners, academicians and Regulator. If we want to maximize for each RoA and RoE, then we could derive first order for equation (4) with (D/E) and equation (6) with (D/A).

Then, this research discusses Non-Performing Loan (NPL) in bank, so Equation (3) could be arranged as follows:

$$\rho = \frac{r * E + \{(1 - \alpha) * r - i\} D - \pi}{E - (1 - \alpha) * D} \quad (7)$$

Equation (7) has a requirement that $\rho \geq 0$ which is $r > i > \rho$.

This Equation said that supervisory financial institution could be determined the rate of Non-Performing Loan as maximum rate to make flexibility this ratio in a bank.

III. Methodology and Data

Based on the previous explanation, this research wants to explore internal and external factor to determine Non-performing Loan of bank and there is risk variable putting as moderating variable. The Figure 1 will explain as follows:

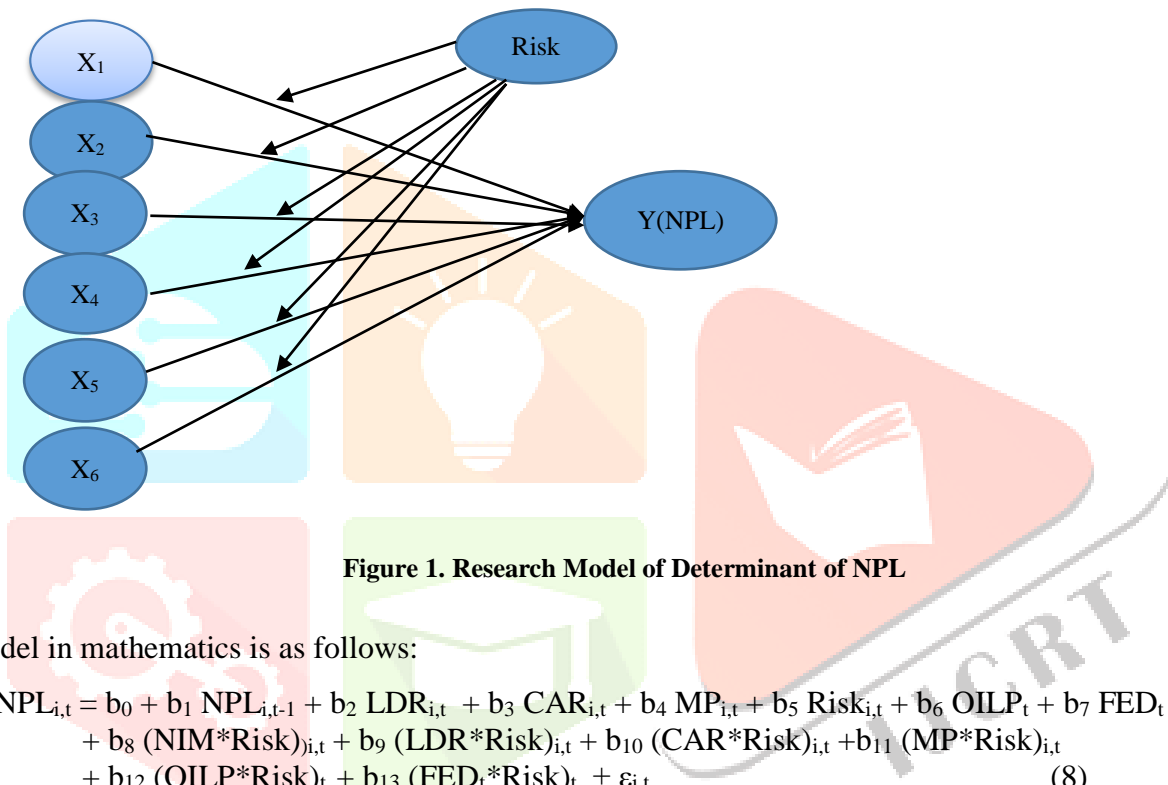


Figure 1. Research Model of Determinant of NPL

The Model in mathematics is as follows:

$$\begin{aligned} NPL_{i,t} = & b_0 + b_1 NPL_{i,t-1} + b_2 LDR_{i,t} + b_3 CAR_{i,t} + b_4 MP_{i,t} + b_5 Risk_{i,t} + b_6 OILP_t + b_7 FED_t \\ & + b_8 (NIM * Risk)_{i,t} + b_9 (LDR * Risk)_{i,t} + b_{10} (CAR * Risk)_{i,t} + b_{11} (MP * Risk)_{i,t} \\ & + b_{12} (OILP * Risk)_t + b_{13} (FED_t * Risk)_t + \epsilon_{i,t} \end{aligned} \quad (8)$$

NPL = Non-Performing Loan

LDR = Loan to Deposits Ratio

CAR = Capital Adequacy Ratio

MP = Market Power

Risk = Risk of Bank

OILP = Oil Price

Fed = FED Rate

$b_0, b_1, b_2, \dots, b_{13}$ = coefficient of model

3.1 Estimation Model Using Panel Data

Model Panel Data

This research use Model data Panel to estimate relationship some independent variable to determine Non Performing Loan (NPL) as dependent variable and Net Interest Margin, Capital Adequacy Ratio (CAR), Market Power (MP), Loan to Deposits Ratio (LDR), Total Asset (TAS), Oil Price and Fed Rate as independent. This research also uses Oil Price and Fed Rate as external variable. Total Asset is used as moderating variable. Model Data Panel is appropriate for data small which short time series and small company as sample. Besides that, model data panel also show time and the cross-section as sample. Gujarati (2003), Wooldridge (2002), Greene (2008), Biorn (2017) and Sul (2019) stated model data panel is as follows:

a. Pooled Data Model

Pooled Data Model is model that data combine all together and the model is as follows:

$$Y_{i,t} = \beta_1 + \beta_2 X_{2i,t} + \beta_3 X_{3i,t} + \mu_{i,t} \quad (9)$$

$$i = 1, 2, \dots, k; \quad t = 1, 2, \dots, n$$

X's are non-stochastic and $E(\mu_{it}) \sim N(0, \sigma^2)$

b. Fixed Effect Model

FEM is a model that μ_i and X's are assumed correlated.

$$Y_{i,t} = \beta_{1i} + \beta_2 X_{1i,t} + \beta_3 X_{2i,t} + \mu_{i,t} \quad (10)$$

$$i = 1, 2, \dots, k; \quad t = 1, 2, \dots, n$$

c. Random Effect Model (REM)

REM is a model that ε_i and X's are assumed uncorrelated.

$$Y_{i,t} = \beta_{1i} + \beta_2 X_{1i,t} + \beta_3 X_{2i,t} + \mu_{i,t} \quad (11)$$

$$\beta_{1i} = \beta_1 + \varepsilon_i$$

$$i = 1, 2, \dots, k; \quad t = 1, 2, \dots, n$$

μ_i is a random error with a mean value of zero and variance of σ_ε^2 .

Judge (1982), Wooldridge (2002), Biorn (2017) and Sul (2019) stated that how we choose FEM or REM as follows:

1. When T (number of time series data) is large and N (the number of cross-sectional units) is small, FEM may be preferable.
2. When N is large and T is small, if we strongly believe that the individual, or cross-sectional, units in our sample are not random drawings from a larger sample, FEM is appropriate. If the cross-sectional units in the sample are regarded as random drawings, the REM is appropriate.
3. When individual error component ε_i and one or more regressors are correlated, FEM is an unbiased estimator.
4. REM estimators are more efficient than FEM Estimators, when N is large and T is small and if the assumptions underlying REM hold.

3.2 Data

Data for this research was collected from company website and newspaper which is publish by the company as mandatory requirement from government and Indonesia Stocks Exchange. Data is annually data that collected for period of 2014 to 2018 which is Non-Performing Loan, Capital Adequacy Ratio (CAR), Market Power, Loan to Deposits Ratio and Risk. Then, this research also uses Oil Price and Fed Rate as external variable. These economic data were collected from Bank Indonesia. Oil price are transformed to logarithm natural, while model run by Eviews Program.

IV. Discussion and Analysis Data

In this sub-section will discuss research results which divide into 2 groups. First explanation will discuss descriptive statistics. Then, the explanation will discuss to causality.

4.1 Descriptive Statistics

In this sub-section, it will discuss causality of Non-Performing Loan with other variables. Table 1 show the descriptive statistics for the research variable in this paper. Non-Performing Loan has minimum value of 0.08%, maximum of 8,9%, Average of 5,06% and Standard of Deviation of 1,45%. Central Bank of Indonesia ask all bank to maintain value of NPL below 2% from the credit distribution.

Table 1: Descriptive Statistics Banking Indicator

	NPL	LDR	CAR	MP	Risk	Oil Price	Fed Rate
Minimum	0.08%	50.61%	8.02%	0.04%	8.12%	37.04	0.50%
Maximum	8.90%	145.26%	42.64%	15.85%	142.62%	60.42	1.25%
Average	2.00%	85.41%	19.29%	2.83%	43.76%	49.28609	0.65%
STDEV	1.45%	12.74%	5.16%	4.21%	23.38%	1.208332	0.34%
Skewnes	1.394647	0.183399	1.285808	1.896252	1.508129	-0.87902	2.236068
Kurtosis	3.47849	4.025904	4.313067	2.462889	2.598106	0.29897	5

Loan Deposits Ratio (LDR) has minimum of 50,61%, Maximum of 145.26%, Average of 85.41% and Standard of deviations of 12,74%. This data showed that this ratio has varying value, because there is maximum more than

100% out of deposits. So, Financial Supervisory institutions should take care for some bank that bank has ratio of LDR more than 100%.

Capital Adequacy Ratio has minimum of 8.02%, maximum of 42.64%, average of 19.2% and standard of deviations of 5.16%. These figures have small varying, why standard of deviation is very small. Central Bank asked bank to maintain this figure minimum of 8%.

Market power has minimum of 0.04%, maximum of 15.85%, Average of 2.83% and standard of Deviations of 4.21%. These figures also showed that it is varying very small and it is likely to figure of car. Number of banks is more than 100 banks, that it is one factor to make the small figure for market power and also the standard of deviations.

Risk has minimum of 8.12%, maximum of 142.62%, average of 43.76% and standard of deviations of 23.38%. This figure stated that bank faced high risk to operate the bank. This data showed it as expected about bank.

Oil Price has minimum of US\$ 37.04 per barrel, maximum of US\$ 60.42 per barrel, average of US\$ 49.29 per barrel and standard of deviations of 1.208 during the period. This figure showed that oil price is not varying for period of research.

Fed Rate has minimum of 0.5%, maximum of 1.25%, average of 0.65% and standard of deviations of 0.34%. These figures showed that Government of USA maintain small interest to push economic growth.

4.2. Causal analysis

This sub-section will discuss relationship some variable to Non-Performing Loan. This research using Eviews tool to calculate model panel data as follows:

$$\begin{aligned}
 NPL_{i,t} = & 0.021 - 0.113 NPL(-1)_{i,t} - 0.051 LDR_{i,t} - 0.120 CAR_{i,t} - 0.144 MP_{i,t} \\
 & (0.176) \quad (0.002) \quad (0.00) \quad (0.0503) \\
 & + 0.018 Risk_{i,t} + 0.017 OilP_t + 0.620 FED_t - 0.016 (NPL(-1)_{i,t} * Risk_{i,t}) \\
 & (0.763) \quad (0.001) \quad (0.021) \quad (0.828) \\
 & + 0.071 (LDR_{i,t} * Risk_{i,t}) + 0.021 (CAR_{i,t} * Risk_{i,t}) - 0.044 (MP_{i,t} * Risk_{i,t}) \\
 & (0.003) \quad (0.612) \quad (0.291) \\
 & - 0.018 (OILP_t * Risk_{i,t}) - 0.694 (FED_t * Risk_{i,t}) \\
 & (0.175) \quad (0.396)
 \end{aligned}$$

$$R^2 = 96.16\%$$

$$F = 68.036$$

P=value in the brackets.

This model has coefficient of determinations (R^2) of 96.16%. It means, all data variation of independent variable could explain variation of Non-Performing Loan by 96.16% and the rest is by other variable. Using F-test, this model is good of fit for explanation relationship of all variable to determine Non-Performing Loan.

Then, this paper also investigated how long the Non-Performing Loan (NPL) to achieve equilibrium of NPL Ratio. Based on coefficient of Non-Performing Loan, the λ value of - 0.113 stated that Non-Performing loan achieve equilibrium value within 1.113 year (13 months, 11 days). This Non-performing Loan of Lag-one was significant to affect current Non-Performing Loan at level of Significant of 20%.

Loan Deposits Ratio is a measurement to see how the bank distribute third party fund. Loan Deposits Ratio has negative impact to NPL and statistically significant affect current NPL at level of significant of 1%. This result support the theory and previous research.

Capital Adequacy ratio is a measurement how the bank provide capital to operate bank. All Central bank has target ratio this figure that it should be more than 8%. CAR has negative impact to NPL and statistically significant affect current NPL at level of significant of 1%. This result support the theory and previous research.

Market Power is a measurement the capability bank to dominate market and how the bank compete to others bank. Market power has negative impact to NPL and statistically significant affect current NPL at level of significant of 10%. This result support the theory and previous research.

Oil price become variable that all businessman and government staff have big attention. Oil price has impact to economy and also government budget. Oil Price has positive impact to NPL and statistically significant affect current NPL at level of significant of 1%. This result support the theory and previous research.

Fed Rate is target rate for all emerging countries. Fed Rate become policy rate for emerging market countries. Fed Rate has positive impact to Non-Performing Loan and statistically significant affect current Non-Performing Loan at level of significant of 5%.

Risk as variable independent is also as moderating variable. As Moderating variable, Risk has significantly to strength relationship LDR with current Non-Performing Loan. Bankers should have attention to this ratio when they take decision for distribute the loan. Risk as independent variable has positive impact to current Non-Performance Loan and it does not significant affect NPL at 5%. Risk as moderating variable does not support to strength or weakness relationship between NPL Lag one, CAR, Market Power, Oil Price and Fed Rate.

V. Conclusion

Based on the previous explanation, this research has some conclusions which is first, Non-Performing Loan has minimum value of 0.08%, maximum of 8,9%, Average of 5,06% and Standard of Deviation of 1,45%. Non-Performing Loan achieve equilibrium value within 13 months, 11 days.

Second, this study also used internal factor to affect current Non-Performing Loan which is Non-Performing Loan Lag one, Loan Deposit Ratio, Capital Adequacy Ratio, market Power, Risk. Risk as independent variable did not has significant to affect current Non-Performing Loan, others variable were significant to affect current Non-Performing Loan.

Third, this study also used external factor to affect current Non-Performing Loan which is Oil Price and Fed Rate. These two variables of external factor are significant to affect current Non-Performing Loan.

Fourth, this research also investigated risk variable as moderating variable to affect current Non-Performing Loan. Only Loan Deposit ratio variable was supported by Risk as moderating variable to affect current Non-Performing Loan.

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