JURNAL AKUNTANSI, MANAJEMEN DAN EKONOMI
Vol.24, No. 1, 2022, pp. 18 - 23
Published online in http://jos.unsoed.ac.id/index.php/jame
ISSN: 1410-9336 / E-ISSN: 2620-8482

Financial System Stability Affected by Monetary, Macroprudential Policies and Systemic Risks

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Abstract

This study aims to analyze the effect of monetary and macroprudential policies issued by Bank Indonesia and systemic risk in banks on Financial System Stability in Indonesia. The variables used in this study are Non-Performing Loan, Statutory Reserves, BI Rate, Loan to Value, Capital Adequacy Ratio, and Return On Assets.

The data is taken from the data provided by Bank Indonesia, OJK, etc. the data taken are monthly from 2012 to 2020. This study used the Ordinary Least Square (OLS) equation method which must fill up the Best Linear Unbiased Estimator (BLUE) assumption so that the results of the t-test and F-test are unbiased.

The results of this study indicate that the relationship between Reserve and LTV on NPL is positive and not significant. Then the relationship between BI Rate and ROA on NPL is negative and not significant and then the relationship between CAR and NPL is positive and significant. Furthermore, the results of the study also show that together monetary policy, macroprudential policy, and systemic risk affect up to 95% of changes on NPL in Indonesia.

Keywords

Financial System Stability; Non-Performing Loan; Statutory Reserves; Capital Adequacy Ratio; Return On Assets

INTRODUCTION

Bank Indonesia issued monetary and macroprudential policies to fulfill the objectives of Bank Indonesia, namely to safeguard the financial system. Macroprudential policy is useful to assist monetary policy, microprudential and fiscal policy in maintaining the financial system that occurred and preventing the monetary crisis in 2008.

The main instruments of the monetary policy are open market operations, reverse repo rate, bank rate, statutory liquidity ratio, cash reserve ratio, and tight credit policies. The macroprudential policy has different types of risk, namely capital, liquidity, and credit-related.

Systemic risk is the result of macroprudential policies. Therefore, systemic risk is indicated by indicators of banking performance such as Capital Adequacy Ratio (CAR), Return on Assets (ROA), Loan to Deposit Ratio (LDR), and Net Interest Margin (NIM).

In 2012 LTV began to be enforced, causing bad credit that occurred in Indonesia to decline. In 2018, the LTV value increased so that the coverage of the collateral was higher, thus increasing the CAR value, which means that the level of protection for depositors' assets is improving. In the results of the research by Yugita, Anis, and Satrianto (2017) the relationship between LTV and financial system stability is positive which is not following the implementation of macroprudential policies on LTV indicators.

Furthermore, the result of research from Madi and Ahmadi (2019) as well as Campos (2019) stated that the relationship between ROA and NPL is significantly negative because when the ROA value is high, there are skills in managing credit so that the NPL value is low. This is different from the research by Jusmansyah and Sriyanto (2017) which results that ROA is positively related to NPL.

Financial system stability is a condition in which the national financial system functions effectively and efficiently and is capable of being used to withstand internal and external vulnerabilities. According to Priyono (2017) that financial system stability is formed from variables that represent the banking, money market, and capital market groups. Financial system stability can be demonstrated by Non-Performing Loan (NPL). According to

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Received: 21 December 2021
Accepted: 6 February 2022
Published: 30 March 2022

Syaputra and Adry (2019), many researchers have used the NPL as an indicator of financial system stability because it can identify future financial problems. If the value of the NPL is high, then the non-performing loans that occur are also high so that the stability of the financial system is low.

This study analyzes the effect of monetary policy, macroprudential policy, and systemic risk on financial system stability. This financial system stability uses indicators from Non-Performing Loans.

Non-Performing Loan Theory

According to Hariyani (2010), Non-Performing loans are classified into several types of credit, namely current loans, doubtful loans, and bad loans. Meanwhile, according to Ismail (2010), Non-Performing Loan is a condition of the debtor who is unable to pay his obligations to the bank.

Bank Indonesia classifies non-performing loans into three groups, namely: (1) Substandard, which has the criteria that principal and interest installments are not paid for more than 90 days and there are indications of financial problems with the debtors; (2) Doubtful, which has the criteria that the principal and interest installments are not paid for more than 180 days and there is interest capitalization; (3) Loss, which has the criteria that the principal and interest are not paid beyond 270 days and operating losses are covered with new loans.

RESEARCH METHODS

This research uses quantitative descriptive methods that describe events factually, systematically, and accurately because it uses numbers. Quantitative methods are used to test monetary policy, macroprudential policy, and systemic risk on financial system stability. The data used in this study uses times series data from 2012 to 2020 with monthly data.

Variables and Operational Definitions of Research Variables

The research variables used in this study are:
Dependent variable
The dependent variable in this is Non-Performing Loan (Y). one of the risk indicators in the financial sector is Non-Performing Loan. A non-Performing Loan can be used as an indicator of financial system stability because se Non-Performing Loan can indicate the health of a bank. The Non-Performing Loan value is obtained from the comparison between the number of bad loans and the total loans granted to debtors.

Independent Variable
In this study the independent variables consisted of:

a. Statutory Reserves (X1)

The statutory reserve is a general fund or general deposit that must be owned by banks at Bank Indonesia in the form of a current account balance. Bank Indonesia determines the number of statutory reserves based on the percentage of supreme audit institutions collected by the bank. Statutory reserves are used to regulate the money supply and it directly affects inflations.

b. BI Rate (X2)

BI Rate is the reference interest rate determined by Bank Indonesia. This interest rate is issued by Bank Indonesia through the management of liquidity in the money market to achieve the operational targets of monetary policy. In 2016, Bank Indonesia strengthened the monetary operating framework by implementing the benchmark interest rate to become the BI-7 Day Reserve Repo Rate.

c. Loan to Value (X3)

Loan to Value is used to compare the ability of banks to provide credit loans to customers for homeownership. The policy to determine Loan to Value was issued by Bank Indonesia because the property sector is one of the sectors that people are interested. this policy starts with a ratio of 70% for houses of type over 70 and then developed according to the type of house. The Loan to Value issued by Bank Indonesia is the maximum limit for the Loan to Value policy for banks. In the circular letter of Bank Indonesia number 15/40/DKMP, the relationship between Loan to Value and Non-Performing Loan is negative because this policy is used to assist the community in owning a property with credit assistance so that large expenditures are not required at one time.

d. Capital Adequacy Ratio (X4)

The Capital Adequacy ratio will show the ability of the capital adequacy of a bank to be used to overcome potential losses. This ratio has a safe limit of at least 8%, which is less than that, the ability to face the risk of loss is bad. This ratio is obtained by comparing total capital to risk-weighted assets.

e. Return On Assets (X5)

Return On Assets is a type of profitability ratio that is used to assess a company's ability

to earn a profit from the assets used. All company assets obtained from their capital are converted into several assets so that the company continues to operate properly. Return On Assets is obtained by comparing net income with total assets.

Data Analysis

This research uses Ordinary Least Square (OLS) method. The Ordinary Least Square method is a method used to estimate a regression line by finding the minimum value for the sum of the squares of error between the predicted value and the actual value. This linear method must be the Best Linear Unbiased Estimator (BLUE) which means that decision making is through the F test and the t-test is unbiased. Three assumptions must be fulfilled in BLUE assumptions, that's it: (1) There is no autocorrelation; (2) No multicollinearity; and (3) No heteroscedasticity. If any of the three assumptions are not fulfilled, then the results of the regression equation can not be called BLUE, so that decision-making through the F test and t-test is biased.

The model of the relationship between monetary policy, macroprudential policy, and systemic risk with the dependent variable is arranged in the following function or equation:

$$Y = \beta0 + \beta1X1 + \beta2X2 + \beta3X3 + \beta4X4 + \beta5X5 + e$$

Information:
Y = Non-Performing Loan
β0 = Constant
X1 = Statutory Reserves
X2 = BI Rate
X3 = Loan to Value
X4 = Capital Adequacy Ratio
X5 = Return On Assets
βn = Coefficient of Xn
e = Standard error

Hypothesis Test

The statistical t-test is used to show how influential the independent variable individually has on the dependent variable. Using the 5% significance level, the hypotheses are:

a. For the variable of statutory reserves
   H_0: β1 = 0, Statutory Reserves does not affect on Non-Performing Loan
   H_1: β1 > 0, Statutory Reserves has a positive effect on Non-Performing Loan

b. For the variable of BI Rate
   H_0: β2 = 0, BI Rate does not affect Non-Performing Loan
   H_1: β2 > 0, BI Rate has a positive effect on Non-Performing Loan

c. For the variable of Loan to Value
   H_0: β3 = 0, Loan to Value does not affect Non-Performing Loan
   H_1: β3 < 0, Loan to Value has a negative effect on Non-Performing Loan

d. For the variable of Capital Adequacy Ratio
   H_0: β4 = 0, Capital Adequacy Ratio does not affect Non-Performing Loan
   H_1: β4 > 0, Capital Adequacy Ratio has a positive effect on Non-Performing Loan

e. For the variable of Return On Assets
   H_0: β5 = 0, Return On Assets does not affect Non-Performing Loan
   H_1: β5 < 0, Return On Assets has a negative effect on Non-Performing Loan

RESULTS AND DISCUSSION

1. Autocorrelation Test

The autocorrelation test is used to determine the correlation of variables in the function model with changes in time. This model must do this test if the data used is time series. The tool used for this test is the Durbin Watson test which the result is the Durbin Watson value of the model (0,363) is less than its dL (1,591). It means that the estimation is inefficient, the results of the F test and t-test are biased. Therefore, it is necessary to improve the autocorrelation using the Cochrane-Orcutt method by obtaining an unknown ρ (rho) value.

According to Pindyck and Rubinfeld (1998) that the Cochrane-Orcutt method uses the estimated residual value of equation (e_t) to obtain the value of ρ (rho). It is assumed that the residual (e_t) follows this autoregressive (AR) pattern:

$$e_t = \rho e_{t-1} + v_t$$

after re-regressing with AR(1) and AR(2) to eliminate the correlation between errors, the equation becomes;

$$Y = 0{,}252 + 0{,}010X1 - 0{,}073X2 + 0{,}010X3 + 0{,}098X4 - 0{,}050X5 + e_t$$

Where the e_t value is;

$$e_t = 0{,}824e_{t-1} + 0{,}094e_{t-2} + v$$

In the new equation, the Durbin Watson value is 1,998. According to the number of independent variables and samples in this equation are 5 variables and 108 samples, then the value of dL and dU contained in the Durbin Watson table are 1,591 and 1,784. So in conclusion, in the new equation, there is no autocorrelation because the DW is above the dU.

2. Multicollinearity Test

The multicollinearity test was used to see if there was a correlation between the independent variables in the multiple linear regression model. The tool that is usually used is the Variance Inflation Factor (VIF). If the VIF value is less than 10 then there is no multicollinearity.

Table 1. Multicollinearity Test Results

Variable	VIF	Conclusion
Statutory Reserves	1,370	No Multicollinearity
BI Rate	1,214	No Multicollinearity
LTV	1,391	No Multicollinearity
CAR	1,387	No Multicollinearity
ROA	2,331	No Multicollinearity

Source: Secondary data processed, 2021

So it can be concluded that the equation does not have multicollinearity between the independent variables.

3. Heteroscedasticity Test

The heteroscedasticity test is used to sess the variance inequality of the residuals of one model with another model. If the model has the same variance from one residual model and another, then the model can be used. The heteroskedasticity test was carried out using the Breusch-Godfrey test which got the results that can be seen in Table 2 (using the 5% significance level).

Table 2. Heteroscedasticity Test Results

F-statistic	0,527	Prob. F	0,755
Obs*R-squared	2,720	Prob. Chi-Square	0,743
Scaled Explained SS	3,748	Prob. Chi-Square	0,586

Source: Secondary data processed, 2021

With the value of Prob. Chi-Square in Obs*R-Squared is 0,743 which is above the significance value (0,05), which means that the estimation of the equation model does not contain heteroscedasticity.

4. F-test

The F test was conducted to see whether the independent variables simultaneously had a significant effect on the dependent variable or not. By using a significance of 5%, the results of the F test can be seen in Table 3 that the significantly lower than 0,05.

Table 3. Statistical F Test Results

F Change	F Table	Sig. F Change
245,49	2,19	0,0000

Source: Secondary data processed, 2021

The results of the F value (245,49) are in Table 3 above the F table (2,19). So it can be concluded that the model used is correct.

5. R-Squared

R-Squared is an indicator that shows how much the model's ability to explain the effect of the independent variables on the dependent variable. The value of R-Squared ranges from zero (0) to one (1). If the value of R-Squared is close to one (1), it means that the model's ability to explain changes in the dependent variable is strong and vice versa.

Table 4. Model Assessment Test Results

R-Squared	Adjusted R-Square
0,952	0,948

Source: Secondary data processed, 2021

The coefficient of determination (R-Squared) value in the equation is 0,952. So it can be concluded that the variables of Statutory Reserves, BI Rate, Loan to Value, Capital Adequacy Ratio and Return On Assets have an effect of 95,2% on Non-Performing Loan while the remaining 4,8% is influenced by other variables not examined. Since the value of R-Squared is close to 1, the independent variables provide almost all the information needed to predict the dependent variable.

6. T-test

If the value of t is above the t table, then the independent variable has a contribution to the dependent variable and vice versa. The value of t whose results are positive or negative shows the relationship of the dependent variable which is in the same direction or opposite to the independent variable.

Table 5. OLS Regression Test Results

Variable	Coeff.	T-statistic	Sig.
Statutory Reserves	0,010	0,2873	0,7745
BI Rate	-0,073	-1,0361	0,3027
LTV	0,010	1,2443	0,2163
CAR	0,098	3,4125	0,0009
ROA	-0,050	-0,4568	0,6488

Source: Secondary data processed, 2021

From Table 5, it is known that the regression coefficient values of the Statutory Reserves, BI Rate, Loan to Value, Capital Adequacy Ratio, and Return On Assets are as follows:

a. Constants (β0)
   The constant value is 0,252 which means that if the five independent variables are considered constant, the Non-Performing Loan is 2,52%.

b. Statutory Reserves
   The Statutory Reserve coefficient value is 0,010 which means that every time there is an increase of the Statutory Reserves

by 1, it will increase the value of Non-Performing Loan by 0,010.

c. BI Rate
   BI Rate coefficient value is -0,073 which means that every time there is an increase of BI Rate by 1, it will decrease the value of Non-Performing Loan by 0,073.
d. Loan to Value
   The Loan to Value coefficient value is 0,010 which means that every time there is an increase of Loan to Value by 1, it will increase the value of Non-Performing Loan by 0,010.
e. Capital Adequacy Ratio
   Capital Adequacy Ratio coefficient value is 0,098 which means that every time there is an increase of Capital Adequacy Ratio by 1, it will increase the value of Non-Performing Loan by 0,098.
f. Return On Assets
   Return On Assets coefficient value is -0,050 which means that every time there is an increase of Return On Assets by 1, it will decrease the value of Non-Performing Loan by 0,050.

Effect of the Statutory Reserves on Non-Performing Loan

Based on the results of the t-test, it is known that the calculated t value on Statutory Reserves (X1) is 0,2873 while the t table is 1,9826. From this value, it is known that the calculated t value (0,2873) < t table (1,9826) with significance value is 0,7745 which means that Statutory Reserves have no significant effect on Non-Performing Loan. The relationship between Statutory Reserves and Non-Performing Loan is positive, which is following the theory that if the Statutory Reserve decrease, liquidity increases and decreases the value of the Non-Performing Loan.

Effect of BI Rate on Non-Performing Loan

Based on the results of the t-test, it is known that the calculated t value on BI Rate (X2) is 1,0360 while the t table is 1,9826. From this value, it is known that the calculated t value (1,0360) < t table (1,9826) with significance value is 0,3027 which means that BI Rate has no significant effect on Non-Performing Loan. The relationship between BI Rate and Non-Performing Loan as shown in the regression results is negative. BI Rate should have a positive correlation with Non-Performing Loan because the relationship between BI Rate and Statutory Reserves is the same, which is inverse to liquidity.

Effect of Loan to Value on Non-Performing Loan

Based on the results of the t-test, it is known that the calculated t value on Loan to Value (X3) is 1,2442 while the t table is 1,9826. From this value, it is known that the calculated t value (1,2442) < t table (1,9826) with significance value is 0,3027 which means that Loan to Value has no significant effect on Non-Performing Loan. The relationship between Loan to Value and Non-Performing Loan in the regression model results shows a positive relationship which is not following the circular letter of Bank Indonesia number 15/40/DKMP which is states that when Loan to Value increases, it can reduce the risk of bad loans.

Effect of Capital Adequacy ratio on Non-Performing Loan

Based on the results of the t-test, it is known that the calculated t value on Capital Adequacy Ratio (X4) is 3,4124 while the t table is 1,9826. From this value, it is known that the calculated t value (3,4124) > t table (1,9826) with significance value is 0,0009 which means that Capital Adequacy Ratio positive and significant effect on Non-Performing Loan. The relationship between Capital Adequacy Ratio and Non-Performing Loan is positive, which is following the theory that when the Capital Adequacy Ratio value is high, it indicates high risk, so the relationship between Capital Adequacy Ratio and Non-Performing Loan is positive.

Effect of Return On Assets on Non-Performing Loan

Based on the results of the t-test, it is known that the calculated t value on Return On Assets (X5) is 0,4567 while the t table is 1,9826. From this value, it is known that the calculated t value (0,4567) < t table (1,9826) with significance value is 0,6488 which means that Return On Assets has no significant effect on Non-Performing Loan. The relationship between Return On Assets and Non-Performing Loan shows a negative result which is also following the theory because when Return On Assets value increases, the profit earned by banks also increases so that credit risk decreases. However, the relationship between Return On Assets and Non-Performing Loan in this research was not significant.

CONCLUSION

The effect of the monetary policy of the Statutory Reserves indicator on Non-Performing Loan is unidirectional. While the effect of monetary policy on BI Rate indicator on Non-Performing Loan is opposite and both have no significant effect. So it can be said that the effect of the Statutory Reserves is opposite to financial system stability and the effect of the BI Rate is in line with financial system stability.

The effect of macroprudential policy on the Loan to Value indicator on Non-Performing Loan is in the same direction which is not following the theory and also its effect on Non-Performing Loan is not significant. So that the relationship between Loan to Value and financial system stability is in the opposite direction.

The effect of systemic risk on the Capital Adequacy Ratio indicator on Non-Performing Loan has a positive and significant effect following the theory. While the effect of systemic risk indicator Return On Assets on Non-Performing Loan has a negative and no significant effect. So that the relationship between Capital Adequacy Ratio and financial system stability is in the same direction and Return On Assets is in the opposite direction.

The R-Squared value in the equation model is 95,2%, which is close to 100%, it means that the independent variables provide almost all the information needed to predict the dependent variable namely Non-Performing Loan which is an indicator of financial system stability.

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