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Analysis of the Effect of Credit Expansion, Operational Efficiency Rate, Lending Interest Rate, NPL of the Previous Period and Capital Adequacy Ratio (CAR) on Non-Performing Loans Based on the Generalized Method of Moment

Dinah Purnamasari* & Fatchan Achyani

Economics and Business Faculty, Universitas Muhammadiyah Surakarta, Surakarta, Indonesia

Abstract

This study aims to determine the effect of credit expansion, operational efficiency, lending interest rate, NPL in the previous period and Capital Adequacy Ratio (CAR) on Non-Performing Loans (NPL). This type of research was quantitative and used secondary data from annual reports. This study used a sample of 20 conventional commercial banks registered on the IDX in 2017-2019 with sample determination using the purposive sampling method. The technique for analyzing data in this study used the Generalized Method of Moment (GMM) with data processing using the help of the Eviews 9 application. Based on the Generalized Method of Moment (GMM) analysis, it was obtained that credit expansion as measured by loan to deposit ratio and lending interest rate did not significantly affect non-performing loans. The level of operational efficiency as measured by Operating Expenses on Operating Income (BOPO), NPL of the previous period, and Capital Adequacy Ratio (CAR) significantly affected non-performing loans.

Keywords: loan to deposit ratio; operating expenses on operating income; lending interest rate; capital adequacy ratio; non-performing loan; generalized method of moment.

1. Introduction

Economic activities and the needs of the people in Indonesia are increasing due to the continuous development of the population from one year to the next. Economic development directly affects the progress activities of the business world. For this reason, to enhance each person's income and address economic and social problems, the growth of financial movements must be coordinated. A financial institution like a bank will truly need to control the smooth operation of the economy for complicated and unavoidable economic advancement to occur (Wati et al., 2018).

Banks' role in today's society and the economy is important. Banks may be compared to the core of an economy and the links between different economic actors, making them a sector that must be watched out for to increase efficiency. The management team's capacity to run the bank is a key factor in the effectiveness of the company. Management will get incentives if they successfully manage the banking industry (Rinofah & Nugraha, 2014). Banks are considered to have potential problems that can threaten business continuity when the percentage of non-performing loans (NPLs) on a net basis exceeds 5% of total loans (Bank Indonesia, 2013). According to Riyadi et al. (2015), if the NPL is above 5%, it will affect the bank's integrity assessment. The higher the level of non-performing loans, the less professional the bank will control the provision of loans. The higher the level of non-performing loans (NPLs), the higher the risk of providing credit to banks.

According to Maryandi et al. (2016), a high percentage of NPLs can harm the financial and non-financial condition of a bank. The high level of non-performing loans (NPLs) is frequently caused by poor debtor quality and rapid and unpredictable economic changes. Several factors are likely to affect NPLs. Based on several previous studies on non-performing loans (NPLs), such as Maryandi et al. (2015), Maryandi et al. (2016), Palupi & Azmi (2019), Riyadi et al. (2015), and Sarita & Zubadi (2018), these studies used independent variables that were likely to affect non-performing

* Corresponding author.
E-mail address: dinahpurnamasari.dp@gmail.com

loans, namely credit expansion, operational efficiency rate, lending interest rate, NPL previous period, and capital adequacy ratio (CAR).

2. Literature Review

2.1. Signaling Theory

Signalling theory describes the actions taken by the company's management to provide guidance to report to users or investors on how management views the company's prospects (Putri et al., 2020). According to Wicaksono & Adiwibowo, (2017), Signaling Theory reveals how companies provide information to users of reports. Signalling theory provides information and explanations of what the agent has done to the principals and users of the report. The information in question is activity managers carry out during a period that helps increase profits and identify risks that may arise from the company's business activities. In addition, signalling theory explains that companies use financial statements to give users of reports a positive or negative signal.

2.2. Effect of Credit Expansion on Non-Performing Loans

Credit expansion was measured using a Loan to Deposit Ratio (LDR), which was found to have a positive and significant effect on non-performing loans (NPL) (Rosita & Musdholifah, 2016); (Astrini et al., 2018); (Suryani & Africa, 2021); (Nazwir, 2021); (Palupi & Azmi, 2019). Meanwhile, according to research by Kusuma & Haryanto (2016) and Ahmadi et al. (2019), the Loan to Deposit Ratio (LDR) has an insignificant negative effect on Non-Performing Loans (NPLs). In Sarita & Zubadi's research loan-to-deposit ratio (LDR) has a negative and significant effect on non-performing loans (NPLs) (Sarita & Zubadi, 2018). Based on the description above, the hypothesis can be formulated as follows:

H1: Credit Expansion affects Non-Performing Loans

2.3. Effect of Operational Efficiency Rate on Non-Performing Loans

According to Nazwir, (2021), the level of operational efficiency used the BOPO indicator to measure the ability of bank management to manage operating expenses to generate operating income. It was explained in a study by Nazwir, (2021) and Sarita & Zubadi, (2018) that the ratio of BOPO has a positive effect on NPL, but it is not significant. On the other hand, Palupi & Azmi's (2019) research states that BOPO has a positive effect on NPLs. Meanwhile, another study, namely by Kusuma & Haryanto (2016), stated that BOPO significantly negatively affected non-performing loans (NPLs). Based on the description above, the hypothesis can be formulated as follows:

H2: The Level of Operational Efficiency affects Non-Performing Loans

2.4. Effect of Lending interest rate on Non-Performing Loans

According to Ahmadi et al. (2019), interest rates are a percentage of capital payments borrowed from other parties. Interest rate decisions in Indonesia regarding funding costs and lending rates refer to the BI Rate. The BI rate is Bank Indonesia's publicly available interest rate policy and reflects its monetary policy stance. The variable lending interest rate (BI rate) was found to have a significant positive effect on NPLs (Ahmadi et al., 2019); (Maryandi et al., 2016); (Maryandi et al., 2015); (Palupi & Azmi, 2019). Based on the description above, the hypothesis can be formulated as follows:

H3: Lending interest rate affects Non-Performing Loans

2.5. Effect of NPL previous period on non-performing loans

The high number of non-performing loans in the previous period often resulted in increased operating costs because banks could not cope with non-performing loans in the previous period resulting in an increase in NPLs in the next period (Maryandi et al., 2015). According to Maryandi et al. (2016) and Maryandi et al. (2015), NPL in the previous period positively affected NPL. Meanwhile, the NPL of the previous two periods was negatively affected the NPL. Based on the description above, the hypothesis can be formulated as follows:

H4: NPL Previous Period affects Non-Performing Loans

2.6. Effect of Capital Adequacy Ratio (CAR) on Non-Performing Loans

The bank funds for business development purposes and considers the risk of capital loss incurred by the bank's business, known as the CAR (Capital Adequacy Ratio). In a study conducted by Riyadi et al. (2015) and Sarita & Zubadi, (2018), it was revealed that the CAR ratio has a positive and significant effect on non-performing loans (NPLs). Meanwhile, research by Kusuma & Haryanto (2016) and Putri et al. (2020) stated that the Capital Adequacy Ratio (CAR) negatively affects bank risk (NPL). Therefore, based on the description above, the hypothesis can be formulated as follows:

H5: Capital Adequacy Ratio (CAR) affects Non-Performing Loans

3. Methods

3.1. Sample

The sample used in this study was 20 banks from all conventional commercial banks listed on the Indonesia Stock Exchange from 2017–2019. The sample determination was using the purposive sampling method. There were certain criteria in the selection of samples. The criteria used to select the sample are:

- Conventional Commercial Banks in Indonesia were listed on the IDX in 2017-2019.
- Conventional Commercial Banks in Indonesia provided consecutive financial statements from 2017-2019.
- Conventional Commercial Banks in Indonesia did not carry out mergers and acquisitions during the research period.
- Conventional Commercial Banks in Indonesia had complete data according to the variables studied during the research period.

3.2. Data and Data Sources

This study used secondary data, namely data obtained through existing data sources or data recorded by other parties. The data used in this study was in the form of annual financial reports of conventional commercial banks in Indonesia listed on the IDX from 2017–2019. The research data needed from the annual financial statements consisted of variables such as credit expansion (LDR), operational efficiency rate (BOPO), lending interest rate, NPL for the previous period, and capital adequacy ratio (CAR). The data was obtained from the official websites of the Indonesia Stock Exchange (https://www.idx.co.id/), the Financial Services Authority (www.ojk.go.id) and the official websites of each bank. The data used was panel data, a combination of cross-section and time-series data during the 2017–2019 period.

3.3. Research Variables and Their Measurements

Table 1. Operational Definition of Research

Variables	Concept	Reference
NPL Gross	$\text{NPL} = \frac{\text{Non} - \text{Performing Loans}}{\text{Total Loans Disbursed}} \times 100\%$	Maryandi et al. (2016) Palupi & Azmi, (2019)
LDR	$\text{LDR} = \frac{\text{Total Credits}}{\text{Third Party Funds}} \text{ x } 100\%$	Palupi & Azmi, (2019)
BOPO	$\text{BOPO} = \frac{\text{Total Operating Expenses}}{\text{Total Operating Income}} \text{ X } 100\%$	Maryandi et al. (2016)
Lending Interest Rates	The interest rate is referred to as the BI rate, where the interest rate is the percentage of capital payments borrowed from other parties.	Financial Services Authority (OJK)
NPL Gross Previous Period	Credit that was classified as default in the previous period. This variable was used to measure the effect of past non-performing loans on the NPL of the next period.	Maryandi et al. (2016)

Variables	Concept	Reference
CAR	$\text{CAR} = \frac{\text{Bank Capital}}{\text{Total ATMR}} \text{ X } 100\%$	Putri et al. (2020)

3.4. Data Analysis Techniques

This study analyzed the Generalized Method of Moment using the Eviews 9 program. This analytical technique was used to measure the dynamics of independent variables (Credit Expansion, Operational Efficiency Rate, Lending Interest Rate, NPL of the Previous Period, and Capital Adequacy Ratio) against dependent variables (NPLs). The Generalized Method of Moment (GMM) is a dynamic panel model characterized by the lag of dependent variables between independent variables. It is a refinement of the instrumental method of variables. The data quality tests include root unit tests, co-integration tests, instrument validity tests, and autocorrelation tests.

4. Results and Discussion

A descriptive statistical analysis was an overview that shows variables from the minimum value, maximum value, mean value, and standard deviation. The results of this test explain an overview of the effect of credit expansion, operational efficiency, lending interest rate, NPL for the previous period and Capital Adequacy Ratio (CAR) on Non-Performing Loans.

Table 2. Descriptive Statistics

Variable	N	*Minimum*	*Maximum*	*Mean*	*Std. Deviation*
NPL	60	0.000462	0.157525	0.033477	0.025481
LDR	60	0.506113	1.122311	0.878098	0.132373
BOPO	60	-0.049170	2.437490	0.407977	0.453206
SBDK	60	0.088720	0.178200	0.122348	0.018963
NPLt-1	60	0.000000	0.158211	0.034366	0.029729
CAR	60	0.105233	0.458526	0.219055	0.067220

Table 3. Root Unit Test

Augmented Dickey-Fuller			
Variable	t-Statistic	Prob.	Desc
NPL	-4.545259	0.0005	Stationer
LDR	-4.386330	0.0008	Stationer
BOPO	-6.156271	0.0000	Stationer
SBDK	-5.623293	0.0000	Stationer
NPLt-1	-6.049583	0.0000	Stationer
CAR	-4.180791	0.0016	Stationer

The results of the root unit test using the Augmented Dickey-Fuller approach can be concluded that the variables Non-Performing Loan (NPL), Loan to Deposit Ratio (LDR), Operating Expenses on Operating Income, Lending interest rate, NPL of the previous period, and Capital Adequacy Ratio (CAR) show a probability level of less than 0.05, which means that the data does not contain root units or the data is stationary.

Table 4. Johansen Cointegration Test (Trace Statistic)

Hypothesized No. of CE (s)	Eigenvalue	Trace Statistic	0,05 Critical Value	Prob.
None *	0.624018	159.4618	95.75366	0.0000
At most 1 *	0.427442	102.7255	69.81889	0.0000
At most 2 *	0.381336	70.38223	47.85613	0.0001
At most 3 *	0.282576	42.53101	29.79707	0.0010
At most 4 *	0.229035	23.26990	15.49471	0.0028
At most 5 *	0.131591	8.183391	3.841465	0.0042

Based on the table 4, it can be seen that if the trace statistical value is greater than the critical value with a significance level of 0.05 or a probability value smaller than 0.05, then Ha was accepted. It means that there is a co-integration between variables.

Table 5. Instrument Validity Test

Method	Prob. (J-Statistic)
Null Hypothesis (Ho): Condition of Moment Valid	
Sargan Specification Test	4.82E-43

Based on table 5, it can be concluded that the variable has a probability above 0.05, namely 4.82E-43. This means that there are conditions of the moment (the instrument used is valid).

Table 6. Autocorrelation Test

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.610285	Prob. F (2,52)	0.5470
Obs*R-squared	1.376051	Prob. Chi-Square (2)	0.5026

Based on table 6 shows the value of Prob. Chi-Square (2) of 0.5026 is greater than 0.05, so it can be concluded that there is no autocorrelation problem.

Table 7. Analysis of Generalized Method of Moment result

Variable	Coefficient	t-Statistic	Prob.
LDR	0.014751	0.898776	0.3728
BOPO	0.016031	2.464547	0.0169
SBDK	0.295098	1.711338	0.0928
NPLt-1	0.343917	2.521153	0.0147
CAR	-0.121825	-2.106911	0.0398
R-squared	0.463078	*Mean* dependent var	0.033477
Adjusted R-squared	0.413363	S.D. dependent var	0.025481
SE of regression	0.019517	Sum squared resid	0.020569
Durbin-Watson stat	2.094447	J-statistic	4.82E-43
Instrument rank	6		

Based on table 7, it can be concluded that credit expansion, as measured by the Loan to Deposit Ratio, did not significantly affect non-performing loans. It can be seen from the probability value of the loan to deposit ratio, which is greater than 0.05, which is 0.3728. It means that the loan-to-deposit ratio does not significantly affect non-performing loans.

The level of operational efficiency as measured by the ratio of operating expenses to operating income significantly affected non-performing loans. This significant effect can be seen from the probability value of operating expenses on operating income, which is smaller than 0.05, namely 0.0169. It means that operating expenses on operating income significantly affect non-performing loans.

Lending interest rates did not have a significant effect on non-performing loans. It can be seen from the probability value of the lending interest rate, which is greater than 0.05, which is 0.0928. Therefore, the lending interest rate does not significantly affect non-performing loans.

Non-performing loans in the previous period (t-1) significantly affected non-performing loans. This significant effect can be seen from the probability value of non-performing loans in the previous period (t-1), which is smaller than 0.05, namely 0.0147. Therefore, it means that non-performing

The Capital Adequacy Ratio (CAR) significantly affects non-performing loans. This significant effect can be seen from the probability value of the Capital Adequacy Ratio (CAR), which is smaller than 0.05, which is 0.0398. Therefore, the Capital Adequacy Ratio (CAR) significantly affects non-performing loans.

The Variable Loan to Deposit Ratio has a probability value greater than 0.05, so it can be concluded that the Loan to Deposit Ratio (LDR) has no significant effect on non-performing loans. A probability value of less than 0.05 is obtained

in the Operating Expenses on Operating Income (BOPO) variable, namely 0.0169. This means that operating expenses on operating income significantly affect non-performing loans. In the lending interest rate variable, a probability value greater than 0.05 is 0.0928. Therefore, it can be concluded that the lending interest rate has no significant effect on non-performing loans. The non-performing loan variable in the previous period had a probability value smaller than 0.05, namely 0.0147, so it can be concluded that the non-performing loan in the previous period significantly affected non-performing loans. While in the Capital Adequacy Ratio (CAR) variable, a probability value smaller than 0.05 is 0.0398. Therefore, it can be concluded that the Capital Adequacy Ratio (CAR) significantly affects Non-Performing Loans.

Table 8. Partial Regression Coefficient Test (t-test)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LDR	0.014751	0.016413	0.898776	0.3728
BOPO	0.016031	0.006505	2.464547	0.0169
SBDK	0.295098	0.172437	1.711338	0.0928
NPLt-1	0.343917	0.136413	2.521153	0.0147
CAR	-0.121825	0.057822	-2.106911	0.0398

Table 9. Simultaneous Regression Coefficient Test (F-Test)

R-squared	0.234684	*Mean* dependent var	2.19E-05
Adjusted R-squared	0.221257	S.D. dependent var	0.065685
SE of regression	0.057965	Akaike info criterion	-2.824644
Sum squared resid	0.191517	Schwarz criterion	-2.754219
Log-likelihood	85.32699	Hannan-Quinn criter.	-2.797153
F-statistic	17.47902	Durbin-Watson stat	1.898786
Prob (F-statistic)	0.000101		

Based on the table 9, it can be seen that the probability value obtained is smaller than 0.05, which is 0.000101. Therefore, it means that there is a simultaneous effect between independent variables on dependent variables.

Table 10. Coefficient of Determination Test (Adjusted R2)

R-squared	0.463078	*Mean* dependent var	0.033477
Adjusted R-squared	0.413363	S.D. dependent var	0.025481
SE of regression	0.019517	Sum squared resid	0.020569
Durbin-Watson stat	2.094447	J-statistic	4.82E-43
Instrument rank	6		

Based on the table 10, it can be concluded that adjusted R2 obtained a value of 0.413363. It means that independent variables can explain the variation of the dependent variable by 41.3%, while the remaining 58.7% is explained by other variables not studied in this study.

4.1. The Effect of Credit Expansion on Non-Performing Loans

The results of the Generalized Method of Moment estimate for the credit expansion variable measured by the Loan to Deposit Ratio show that the Loan to Deposit Ratio coefficient was 0.014751, and the probability value was above 0.05, which was 0.3728. It means that the loan-to-deposit ratio does not significantly affect non-performing loans. The results of t-Statistics show that the Variable Loan to Deposit Ratio did not significantly affect non-performing loans. Although the effect was insignificant, the position of the regression coefficient was in a positive position. The Loan to Deposit Ratio to Non-Performing Loans in the Generalized Method of Moment Model shows that conventional commercial banks in Indonesia were still less selective in choosing prospective debtors to be given credit. It is proven that banks that have high liquidity tend to be aggressive in lending. However, the reality is that banks are less selective in choosing prospective debtors, so the credit problems that occur will increase. Therefore, the amount of the non-performing loan rate is very dependent on the number of funds distributed to debtors, which depends on the loan-to-deposit ratio. The results of this study are in line with research conducted by Kusuma & Haryanto (2016) and Nazwir (2021), which states that the Loan to Deposit Ratio (LDR) has an insignificant effect on Non-Performing Loans (NPLs).

4.2. Effect of Operational Efficiency Rate on Non-Performing Loans

The results of the Generalized Method of Moment estimate for the Variable Level of Operational Efficiency as measured by the ratio of Operating Expenses to Operating Income were known to have a coefficient value of 0.016031 and a probability value below 0.05, which was 0.0169. It means that operating expenses on operating income significantly affect non-performing loans. Based on the coefficient value of regression of operating expenses on operating income (BOPO), it is shown that BOPO had a unidirectional effect on non-performing loans, which means that the higher the BOPO ratio, the higher the bank's inefficiency in managing operational activity. If the BOPO ratio decreases, the bank can control its operating expenses. High operational expenses certainly affect the high level of non-performing loans, so banks must be more careful in controlling their operational activities. Therefore, the amount of non-performing loans is highly dependent on bank operational efficiency as measured by the ratio of operating expenses to operating income. The results of this study strengthen the results of previous research that has been carried out by Palupi & Azmi (2019), Maryandi et al. (2016), Maryandi et al. (2015), and Riyadi et al. (2015), which stated that Operating Expenses on Operating Income (BOPO) had a significant positive effect on Non-Performing Loans.

4.3. The Effect of Lending interest rate on Non-Performing Loans

The results of the Generalized Method of Moment estimate for the lending interest rate variable were known to have a coefficient value of 0.295098 and a probability value above 0.05, which was 0.0928. It means that the lending interest rate does not significantly affect non-performing loans. Banks that raise or lower their lending rates do not affect non-performing loans because they implement certain policies, namely increasing the interest rate on these loans to new customers. In addition, Bank Indonesia (BI) has established a policy to prevent non-performing loan risks when the lending interest rate rises. Banks recalculate the risks of each customer and calculate the impact of the increase in non-performing loans on reserve or provision costs. After that, the bank will then set aside a portion of its capital as a reserve fee to minimize the risk of bad debts. Therefore, the lending interest rate does not affect non-performing loans (NPLs). This study's results align with Martina & Prastiwi (2014) research, which states that the lending interest rate does not affect non-performing loans.

4.4. Effect of NPL in the Previous Period on Non-Performing Loans

The results of the Generalized Method of Moment estimates for the Non-Performing Loan variable one period earlier (t-1) showed that the Non-Performing Loan coefficient of the previous period (t-1) was valued at 0.343917 and the probability value was below 0.05, which was 0.0147. It means that the non-performing loan of the previous period (t-1) significantly affects non-performing loans. A non-performing loan one period earlier (t-1) was a non-performing loan that occurred one period earlier. It is called inaction/lag. Lag is the time it takes for a reaction or answer to an effect to arise. This study used a lag of t-1, which is one year. Non-performing loans in the previous period (t-1) often affect non-performing loans in the next period due to the bank's inability to overcome non-performing loans in the previous period, thus triggering an increase in bank operating expenses. Therefore, to maintain the condition of the cash ratio uninterrupted, the bank generally removes the book of non-current receivables from administrative accounts. Efforts to write off books on non-performing loans in the previous period may have negatively affected the non-performing loan ratio in the next period. The results of this study are in line with research conducted by Maryandi et al. (2016) and Maryandi et al. (2015), which stated that NPL had a positive effect one quarter earlier on changes in the NPL ratio for the next period.

4.5. Effect of Capital Adequacy Ratio (CAR) on Non-Performing Loans

The results of the Generalized Method of Moment estimate for the Capital Adequacy Ratio (CAR) variable were known to have a coefficient value of -0.121825 and a probability value below 0.05, which was 0.0398. The Capital Adequacy Ratio (CAR) significantly affects non-performing loans. Based on the regression coefficient value of the Capital Adequacy Ratio (CAR), which shows that CAR had the opposite effect on NPL, it means that the smaller the amount of capital available (CAR), the greater the non-performing loan (NPL) rate that occurs. Banks used the capital adequacy ratio to cover losses suffered by banks. When the bank has high capital, the bank will be more confident in lending. The higher the capital the bank provides, the greater the bank's ability to minimize the risk of high non-performing loans or non-performing loans will decrease. Therefore, non-performing loans will not be high if the capital adequacy ratio is met. This study's findings are consistent with previous research by Astrini et al. (2018) and Rosita & Musdholifah (2016), which found that the Capital Adequacy Ratio (CAR) had a negative and significant effect on non-performing loans.

5. Conclusion

Based on the results of the Generalized Method of Moment (GMM) analysis, the following conclusions can be drawn:

a) Credit expansion, as measured by the Loan to Deposit Ratio (LDR), has no significant effect on Non-Performing Loans.
b) The level of operational efficiency achieved by Operating Expenses on Operating Income (BOPO) has a significant effect on Non-Performing Loans.
c) The lending interest rate does not have a significant effect on Non-Performing Loans.
d) Non-Performing Loans in the previous period had a significant effect on Non-Performing Loans.
e) Capital Adequacy Ratio (CAR) has a significant effect on Non-Performing Loans.

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