Regression Analysis of CAR, NPL-Net, LDR on Increasing Return on Asset (Case Study on Banking Companies Listed on IDX in 2018-2020)

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Abstract: Banking is a financial institution tasked with collecting funds from the public and then channeling them back to obtain income. The bank’s performance can be seen by comparing the ratio figures in the annual financial statements that the bank has achieved. Therefore, this study aims to determine the CAR, NPL-Net, and LDR, which affect bank profitability or Return on Assets. This research method uses Multiple Linear Regression Analysis with secondary data and a ratio measurement scale, and the number of samples is 90 samples from 30 banking companies during the 2018-2020 period. This data is sourced from the Indonesia Stock Exchange, with the Judgment Sampling technique. The sample was reduced to 84 by the outlier test due to abnormal data. Based on the results of the analysis, it is known that CAR and LDR have no significant effect on Return on Assets, otherwise, NPL-Net has a significant effect on Return on Assets, and CAR, NPL-Net, LDR simultaneously have a significant effect on Return on Assets.

Keywords: Multiple Linear Regression, Banking, Return on Asset, Capital Adequacy Ratio, Non-Performing Loan.

1. Introduction

Banks are financial institutions that are very important in a country’s economy, namely as intermediary institutions between surplus units and deficit units where the funds come from the people so that they must be channeled back to the community in the form of credit [12]. In Indonesia, banks control 80% of the market share in the entire existing financial system [4].

Given the large influence of banks on the economy in Indonesia, it does not mean that banks do not have problems. One of the problems faced by banks is bank performance. Performance appraisal is carried out based on the achievements that have been achieved and can be seen from the profitability or Return on Assets (ROA) generated. Banks need to maintain a high ROA, distribute dividends appropriately, and comply with prudential banking regulations so that their performance is considered good [6].

Bank financial statements are the main source for assessing bank performance. Based on the financial statements, financial ratios can be calculated as the basis for bank valuation [1]. This ratio is one of the tools used by decision-makers both internally and externally to determine the next policy [7].
Capital Adequacy Ratio (CAR), Non-Performing Loan (NPL), and Loan to Deposits Ratio (LDR) are several ratios commonly used to measure profitability or Return on Assets (ROA). It is important for banks to maintain stability or increase Return on Assets (ROA) to attract investors and increase public confidence to keep their money in banks.

Based on this description, this study will analyze the effect of the Capital Adequacy Ratio, Non-Performing Loan - Net, and Loan to Deposits Ratio on the Return on Assets of banking.

2. Methods and Material

2.1. Banking

Banking is the company collects funds from the public in the form of savings and distributes them to people in the form of credit and/or other conditions. This fund-raising activity is carried out in the form of demand deposits, savings, and time deposits. Deposits from the public often receive attractive rewards, such as interest and other gifts. Activities to channel funds are carried out in the form of providing loans to the public. Meanwhile, other banking services are provided to assist the main activities in collecting and distributing public funds [11].

In the banking industry, performance measurement is very necessary in an effort to assess activities that have been carried out for a certain time. In the capital sector, the measurement is carried out on the capital ratio commonly used to measure the health of a bank, namely the Capital Adequacy Ratio (CAR) which is based on the ratio of capital to Risk-Weighted Assets (RWA), as regulated in Bank Indonesia Regulation Number 3/21/PBI/2001 concerning the Minimum Capital Adequacy Requirement for Commercial Banks.

Banking liquidity also has an important role in managing banking performance. This is related to the Central Bank’s policy regarding the resolution of reserve requirements in the form of withdrawals of funds by depositors and debtors as well as payment of maturing obligations. One of the measures for calculating Bank Liquidity is using the Loan to Deposit Ratio (LDR) which is determined in accordance with BI Regulation Number 5/15/PBI/2013.

Bank performance can also be measured by looking at Non-Performing Loans (NPLs), which are loan conditions in which the debtor fails to make payments scheduled for a certain period of time. In banking, credit status can be categorized as NPL if the condition of the loan with an interest rate of 90 days has been capitalized, refinanced, or postponed due to an agreement or amendment to the original agreement.

2.2. Data Acquisition and Exploration

This research data is quantitative data with secondary data in the form of Capital Adequacy Ratio, Non-Performing Loan - Net, Loan to Deposits Ratio, and Return on Assets which are attached to the Annual Reports of 47 banking companies listed on the Indonesia Stock Exchange website during the 2018-2020 period.

2.3. Multiple Linear Regression

Multiple linear regression is a form of analysis where the independent variable is more than one. This analysis is used to measure the effectiveness of an independent variable on the dependent variable [16]. The general equation is:

\[ Y = a + b_1X_1 + b_2X_2 + \cdots + b_nX_n \]

Where \( Y \) is the target data (dependent variable) while \( X \) is the data attribute (independent variable). The value of \( a \) is the intercept of the regression equation and \( b \) is the slope of the resulting data against the regression model [13].
2.4. Assumption Test

2.4.1. Normality Test

A normality test is a test to measure whether our data is normally distributed so that it can be used in parametric statistics or not [2]. Generally, for data more than 50, the normality test is carried out using the Kolmogorov-Smirnov [3]. Normality test can be known by looking for the value of Chi-Square $\chi^2$. Decision making for data that is normally distributed or not by comparing the Chi-Square calculated value $\chi^2_{\text{count}}$ with the Chi-Square value in the table $\chi^2_{\text{table}}$. If the value of $\chi^2_{\text{count}} < \chi^2_{\text{table}}$, then the data is normally distributed, otherwise $\chi^2_{\text{count}} > \chi^2_{\text{table}}$, then the data is said to be not normally distributed.

2.4.2. Heteroscedasticity Test

Heteroscedasticity test is a test that assesses whether there is an inequality of variance from the residuals for all observations in the linear regression model. Good data for the regression model is data that does not have symptoms of heteroscedasticity, or in other words the data must be Homoscedasticity. Heteroscedasticity of a data can also be proven by comparing the Chi-square value of the data with the table, as well as the Normal Test. Because the normal condition is also the data Homoscedasticity. In addition, the heteroscedasticity test can be detected by looking at the scatterplot graph pattern [5]. The basis for decision making is as follows: (1) If there is a certain pattern, such as the existing points forming a certain regular pattern, heteroscedasticity occurs, and (2) If there is no clear pattern, the points are spread out. Then there is no heteroscedasticity. The purpose of this test is to see if there is an inequality of variance from the residuals for all observations in the linear regression model [14].

2.4.3. Autocorrelation Test

Autocorrelation test is a technique used to determine the correlation of variables in the prediction model with changes in time. The Durbin Watson test is the method used in the autocorrelation test by assessing the presence or absence of autocorrelation in the residuals by comparing the Durbin Watson (DW) value with Durbin Upper (DU) and Durbin Lower (DL) [10]. The test data is said to have no autocorrelation if the Durbin Watson value meets the $DL < DW > DU$ equation with the following detection criteria:

- $DW < DL : There is a positive autocorrelation.$
- $(4 - DW) < DL : There is a negative autocorrelation.$
- $DL < DW < DU : The autocorrelation test cannot be concluded$

2.4.4. Multicollinearity Test

Multicollinearity test is a test method to determine whether or not there is intercorrelation or collinearity between independent variables in a regression model. A good regression model should not have a correlation between independent variables. The multicollinearity test can be done by comparing the VIF and Tolerance values. To detect the presence or absence of multicollinearity in the regression model, if the Variance Inflation Factor (VIF) value is less than 10 and the Tolerance value is more than 0.01 [9].

2.5. Hypothesis Test

Hypothesis testing is a decision-making method based on data analysis to test how much influence the variable X (dependent) has with the variable Y (independent) [15].

2.5.1. Coefficient of Determination

The coefficient of determination ($R^2$) is a testing technique to see how big the percentage of variable X (dependent) can explain variable Y (independent). Variable X is said to be able to explain variable Y if the value of "Adjusted $R^2$" is close to 1 [15].

2.5.2. Simultaneous Test
Simultaneous test is a test method to see how the influence of the X (dependent) variable simultaneously or simultaneously affects the Y (independent) variable by comparing the F table value with the calculated F [15]. The hypotheses obtained for the F test are as follows:

\[ H_0 : \text{Variable X simultaneously has no significant effect on variable Y.} \]
\[ H_1 : \text{Variable X simultaneously has a significant effect on variable Y.} \]

2.5.3. Partial Test

Partial test is a testing technique to see the effect of each variable X (dependent) on variable Y (independent) by comparing the value of t table with t count [15]. The hypothesis obtained in the t-test is as follows:

\[ H_0 : \text{Variable X partially has no significant effect on variable Y.} \]
\[ H_1 : \text{Variable X partially has a significant effect on variable Y.} \]

3. Experiment Result and Analysis

3.1. Dataset Construction

The sampling method used in this research is Judgment Sampling. This method was chosen because certain criteria were needed in this study so that the samples taken could be in accordance with the research objectives. The criteria needed in this study can be seen as follows: (1) All banking companies listed on the Indonesia Stock Exchange until 2022, (2) Banking companies that have published their financial statements during the 2018-2020 period, and (3) Have completeness of the data required by the researcher. Based on these criteria, a sample of 30 banking companies was obtained during the 2018-2020 period.

3.2. Multi Linear Regression Model

Table 1 Multiple Linear Regression Model

<table>
<thead>
<tr>
<th>Model</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-1.929</td>
</tr>
<tr>
<td>CAR</td>
<td>0.105</td>
</tr>
<tr>
<td>NPL_Net</td>
<td>-0.505</td>
</tr>
<tr>
<td>LDR</td>
<td>0.647</td>
</tr>
</tbody>
</table>

Based on table 1, the following multiple linear regression equation is obtained:

\[ Y = -1.929 + 0.105\text{CAR} - 0.505\text{NPL_Net} + 0.647\text{LDR} \]

This means that if the CAR, NPL-Net, and LDR are 0, the Return on Assets in banking is -1,929. CAR is positive, which is 0.105. This means that if the CAR value increases by 1 unit, the Return on Assets will increase by 0.105 and vice versa. NPL-Net is negative, which is -0.505. This means that if the NPL-Net value increases by 1 unit, the Return on Assets will decrease by 0.505 and vice versa. LDR is positive, which is 0.647. This means that if the LDR value increases by 1 unit, the Return on Assets will increase by 0.647 and vice versa.

3.3. Assumption Test Result

3.3.1. Normality Test

Table 2 Normality Test

<table>
<thead>
<tr>
<th>Residual</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
</tr>
<tr>
<td>Significance</td>
</tr>
</tbody>
</table>
The normality test results can be seen in table 2, where the significance value is smaller than alpha, which is 0.000 > 0.05. So, it can be concluded that the data studied are not normally distributed.

The problem of normality test, which is not normally distributed, can be solved by removing outlier data. Outlier data is unique data that displays extreme values and greatly affects the test. Outlier detection can be done by determining the Z-Score value because the sample data is more than 80, the Z-Score used in this study is not more than 3 and not less than -3.

Based on the outlier test, 6 abnormal data samples were found. The research data will be re-tested using sample data after removing or eliminating outliers, which is as many as 84 samples to be tested.

Table 3 Normality Test after Outlier elimination

<table>
<thead>
<tr>
<th>Residual</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>84</td>
</tr>
<tr>
<td>Significance</td>
<td>0.069</td>
</tr>
</tbody>
</table>

The normality test results can be seen in table 3, where the significance value is greater than alpha, which is 0.069 > 0.05. So, it can be concluded that the data studied are normally distributed and can be used for further analysis.

3.3.2. Heteroscedasticity Test

Table 4 Heteroscedasticity Test

<table>
<thead>
<tr>
<th>B</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CAR</td>
<td>0.000</td>
</tr>
<tr>
<td>NPL-Net</td>
<td>0.012</td>
</tr>
<tr>
<td>LDR</td>
<td>0.283</td>
</tr>
</tbody>
</table>

The results of the heteroscedasticity test using the glejser method in table 5 show the symptoms of heteroscedasticity. This happened because the significance value of CAR (X1) and NPL (X2) was less than alpha, namely 0.000 < 0.05 and 0.012 < 0.05, so it can be concluded that the research data experienced symptoms of heteroscedasticity. The results of the heteroscedasticity test can also be seen in Figure 1 below:

Figure 1 Scatterplot Heteroscedasticity Test
In Figure 1, there are points that deviate. Based on these results, it can be concluded that there are symptoms of heteroscedasticity in the research data. This problem can be solved using the natural logarithm data transformation method. So that the result is:

Table 5 Heteroscedasticity Test after Data Transformation

<table>
<thead>
<tr>
<th></th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAR</td>
<td>0.791</td>
</tr>
<tr>
<td>NPL-Net</td>
<td>0.993</td>
</tr>
<tr>
<td>LDR</td>
<td>0.101</td>
</tr>
</tbody>
</table>

From the data that has been transformed with natural logarithms, it is obtained based on table 3 the significance values of CAR (X1), NPL (X2), and LDR (X3) are more than alpha, namely 0.791 > 0.05, 0.993 > 0.05, and 0.101 > 0.05. Thus, it can be concluded that the research data does not show symptoms of heteroscedasticity. The results of the heteroscedasticity test can also be seen in Figure below:

Figure 2 Scatterplot Heteroscedasticity Test after Data Transformation

In Figure 2, the dots spread randomly. Based on these results, it can be concluded that the research data do not experience symptoms of heteroscedasticity, and the model can be used for further analysis.

3.3.3. Autocorrelation Test

Table 6 Autocorrelation Test

<table>
<thead>
<tr>
<th>Model</th>
<th>Durbin-Watson</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.298</td>
</tr>
</tbody>
</table>

In table 6, the Durbin-Watson (DW) value is 1.298, with a total sample of 84. The number of independent variables is 3. So, the DL and DU values based on the DW table are 1.59691 and 1.69424. Based on the DL < DW > DU equation, the value is 1.59691 < 1.298 > 1.69424. Because this study does not meet the Durbin-Watson equation, it can be concluded that the research model has autocorrelation.

This autocorrelation can be overcome by using the Cochrane-Orcutt method. The method is carried out with Lag transformation to get the B coefficient value which can be seen as follows:
Table 7 Coefficient B

<table>
<thead>
<tr>
<th>Coefficient B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residual Lag Transform</td>
</tr>
</tbody>
</table>

After the coefficient B is obtained, it is continued by calculating the following equation:

\[ \text{Variable } a = a - (\text{Coefficient } B \times \text{LAG}(a)) \]

Where \( a \) is each variable in the study. After the value of each variable is obtained, the Durbin-Watson test can then be repeated.

Table 8 Autocorrelation test with Cochrane-Orcutt method

<table>
<thead>
<tr>
<th>Model</th>
<th>Durbin-Watson</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2.028</td>
</tr>
</tbody>
</table>

In table 8, the value of Durbin-Watson (DW) obtained after data transformation using the Cochrane-Orcutt method is 2.028. Based on the equation \( DL < DW > DU \), the value is \( 1.59691 < 2.028 > 1.69424 \). The DW value has met the equation, and it can be concluded that the research model does not experience autocorrelation.

3.3.4. Multicollinearity Test

Table 9 Multicollinearity Test

<table>
<thead>
<tr>
<th>Model</th>
<th>Tolerance</th>
<th>VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAR</td>
<td>0.912</td>
<td>1.097</td>
</tr>
<tr>
<td>NPL-Net</td>
<td>0.913</td>
<td>1.095</td>
</tr>
<tr>
<td>LDR</td>
<td>0.989</td>
<td>1.011</td>
</tr>
</tbody>
</table>

As can be seen in the table 9, the CAR, NPL, and LDR Tolerance values are more than 0.01, namely 0.912, 0.913, and 0.989 or the VIF CAR, NPL, and LDR values are less than 10, which are 1.097, 1.095, and 1.011 so that there is no multicollinearity in the research model.

3.4. Hypothesis Test Result

3.4.1. Coefficient of Determination

Table 10 Coefficient of Determination

<table>
<thead>
<tr>
<th>Model</th>
<th>Adjusted R Square</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.182</td>
</tr>
</tbody>
</table>

From the coefficient of determination results, it can be seen that the Adjust R Square value is 0.182 or 18.2%. It can be concluded that the variable \( X \) can only explain 18.2% of the \( Y \) variable, and other variables outside the model explain the remaining 81.8%.

3.4.2. Simultaneous Test

Table 11 Simultaneous Test

<table>
<thead>
<tr>
<th>Model</th>
<th>F</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>6.945</td>
<td>0.000</td>
</tr>
</tbody>
</table>

It can be seen in table 11 SPSS test results, F count is 6.945 with a significance value of 0.00. So with df1 of 3 and df2 of 80, the F table obtained is 2.719. Because \( F_{\text{count}} > F_{\text{table}} \) and significance value
< alpha, ie 6.945 > 2.719 and 0.00 < 0.05, it can be concluded that H0 is rejected, i.e. variable X simultaneously has a significant effect on variable Y.

3.4.3. Partial Test

<table>
<thead>
<tr>
<th>Model</th>
<th>t</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAR</td>
<td>0.272</td>
<td>0.787</td>
</tr>
<tr>
<td>NPL-Net</td>
<td>-4.165</td>
<td>0.000</td>
</tr>
<tr>
<td>LDR</td>
<td>1.437</td>
<td>0.155</td>
</tr>
</tbody>
</table>

Table 12 Partial Test

In the variable Capital Adequacy Ratio (CAR) (X1), the t-count value is 0.272. Based on the two-tail test, it was found that the t_count < t_table and significance > alpha, namely 0.272 < 1.989319 and 0.787 > 0.05. So it can be concluded that the CAR variable (X1) failed to reject H0 or the Capital Adequacy Ratio (CAR) (X1) variable had no significant effect on the Return On Assets (ROA) (Y) variable.

In the Non-Performing Loan (NPL) (X2) variable, the t-count value is -4.165. Because t count is negative, the results will be contradictory where the value of t_count < t_table and significance < alpha. Therefore, the t-test on the NPL variable (X2) will be carried out on a one-tailed basis using absolute values (negative/minus symbols are ignored). Then the value of t_count > t_table and significance < alpha, namely 4.165 > 1.663649 and 0.000 < 0.05. So it can be concluded that the NPL variable (X2) rejects H0 or the Non-Performing Loan (NPL) variable (X2) has a significant effect on the Return On Assets (ROA) (Y) variable.

In the Loan to Deposits Ratio (LDR) (X3) variable, the t_count value is 1.437. Based on the two-tail test, it was found that the t_count < t_table and significance > alpha, namely 1.437 < 1.989319 and 0.155 > 0.05. So it can be concluded that the LDR variable (X3) failed to reject H0 or the Loan to Deposits Ratio (LDR) (X3) variable had no significant effect on the Return On Assets (ROA) (Y) variable.

3.5. Discussion

Based on the results of the research described above, the suggestions for this research are as follows: (1) Banking companies are expected to maintain the amount of the company’s capital availability in their operational activities. With this, it is expected to maintain or even increase the company’s Return on Assets properly, and (2) Banking companies are expected to streamline and streamline the company’s operating expenses in carrying out their activities. The high NPL-Net ratio will cause a decrease in the value of the company’s Return on Assets. On the contrary, if the NPL-Net decreases, the company’s Return on Assets will increase.

4. Conclusions

Based on the data analysis that has been done using multiple linear regression with partial and simultaneous hypothesis testing, it can be concluded as follows: (1) The CAR variable (X1) does not significantly affect Return on Assets in banking companies listed on the Indonesia Stock Exchange, (2) The NPL-Net variable (X2) shows a significant effect on Return on Assets in banking companies listed on the Indonesia Stock Exchange, (3) The LDR variable (X3) does not significantly affect Return on Assets in banking companies listed on the Indonesia Stock Exchange, and (4) Variables CAR, NPL-Net, and LDR simultaneously significantly affect Return on Assets in banking companies listed on the Indonesia Stock Exchange.
References


