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Function of Non-Performing Loans in the Capital Adequacy Ratio Model of the Banking Sector

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A B S T R A C T
Research is being done in order to address the discrepancies in the findings of earlier investigations as well as the phenomenon of non-performing loans (NPL), which cannot account for the effect it has on the CARR. As a result, the researchers used different time series and cross-sectional data in their subsequent studies. Using multiple regression analysis, this type of descriptive quantitative research examines panel data from 22 samples of banking sector firms over a seven-year period. This formula uses the research object, which are companies in the banking sector listed on the Indonesia Stock Exchange, and uses NPL as an intervening variable to maximize the CAR value. Two research models are combined in one model, and each model is subjected to the Chow Test, Hausman Test, Lagrange Multiplier Test, and model selection test stages. Findings in the first model indicate that LDR's negative connection with NPL can be used to explain its impact. These outcomes differ from the relevant theory. Similar to the first study model, where the results are not as relevant as the theory, the results in the second model are also just LDR and may directly explain its effect on CAR with a negative association. It is hoped that these findings would give banking sector managers the best possible direction

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INTRODUCTION

The purpose of the capital adequacy ratio (CAR) is to account for the potential loss risk that the bank may encounter. The bank's capacity to absorb the risk of any hazardous credit or productive assets is indicated by the higher the CAR.

Non-Performing Loans (NPL) are loans that are immediately declared default, because the lender no longer receives a return on their investment (Szarowska, 2018). Barseghyan (2010) stated that NPLs are financial pollution and the beginning of a banking crisis, because the increase in NPLs indicates a deterioration in the quality of bank portfolios and credit, which in turn has the potential to cause loan losses in the future and impact the erosion of banking business capital. Therefore, examining For regulatory agencies concerned with financial stability and bank management, the factors influencing ex-post credit (NPL) risk are crucial (Louzis et al., 2012). Ghosh (2015) elucidates the significance of reducing non-performing loans (NPLs) in order to fortify the banking sector and foster economic stability.

Several previous studies have proven that the macroeconomic environment plays the most important role as a determinant of credit risk. For example: Lee et al. (2019); Ozili (2018); Szarowska (2018). Staehr & Uusküla (2020) research concludes that higher Gross Domestic Product (GDP) Three major leading indications point to a reduced non-performing loan ratio in the future: growth, lower inflation, and lower debt. According to Szarowska's (2018) research, the unemployment rate, interest rate, and inflation are the macroeconomic factors that can affect the quality of bank credit. Three macroeconomic parameters are examined in this study: GDP growth, unemployment, and rate and inflation as determinants of the NPL ratio.

With regard to bank-specific factors, several previous studies presented the following results: Ozili's (2018) research using The stability of the banking industry in Africa is significantly influenced by the efficiency and size of the banks, according to a sample of 48 African banks from 1996 to 2015; Research by Kumar et al. (2018) in the Fijian banking sector for the period 2000 to 2013 concluded that market share determined by assets, return on equity, and capital adequacy criteria all had a negative and substantial association with the NPL ratio. Research by Koju et al. (2018) on 30 Nepalese commercial banks for the period 2003 to 2015 reported that NPL is positively and significantly related to bank inefficiency and size. According to the corpus of available information, this study looks at three bank-specific factors: return on equity, inefficiency, and bank size.

Research by Upadhyaya and Roy (2017) concluded that GDP growth, changes in exchange rates and global volatility had a major influence on the NPL level of the Indian banking sector. Meanwhile, research by Szarowska (2018) found that unemployment as a result of high interest rates as the most important macroeconomic factor for NPLs, a detrimental effect on non-performing loans (NPLs) in the banking industry of nations in Central and Eastern Europe. The moral hazard hypothesis—which holds that a rise in the non-performing loan (NPL) ratio is indicative of a rise in risky loans, which may lead to a deterioration

in loan quality and additional financial system instability—is supported by Zhang et al. (2016)'s research findings in the Chinese banking industry. According to research conducted in the Turkish banking industry by Kjosevski et al. (2019), ineffective management was a major contributing factor to the rise in non-performing loans (NPLs). Additionally, they disclosed that ownership structure affects efficiency, which has ramifications for Turkey's banking industry. Tarchouna et al.'s (2018) study of the US banking industry found that possess strong corporate governance frameworks that enable them to cut down on bad loans. However, notably during the global financial crisis, corporate governance was unable to stop US mid- and large-sized commercial banks from taking excessive risks that lowered the quality of their loans and even resulted in significant losses.

Corporate governance was introduced with the intention of making company management more transparent and accountable in every aspect, because management works for maximum utilization of shareholder investments. Several empirical studies such as It has been demonstrated by Tarchouna et al. (2018), Love & Rachinsky (2015), O'Sullivan et al. (2016), and Liang et al. (2013) that bank corporate governance affects the performance and quality of loans. Effective corporate governance standards are crucial for the banking industry because they prevent serious banking instability and substantial losses caused by excessive risk-taking and weak corporate governance (Zagorchev & Gao, 2015; Zhang et al., 2016; Tarchouna et al.., 2018). As a result, a substantial body of research has been done on the subject of corporate governance's efficacy in financial institutions during the crisis. According to Tarchouna et al. (2018), there are two methods you can use to assess the caliber of corporate governance. First, it makes use of a variety of ownership and monitoring arrangements, including share ownership and board features. Secondly, employing just one corporate governance tool that assesses the corporate governance framework as a whole. In this study, the first option—using ownership structure and board characteristics—is used to assess the caliber of bank corporate governance. The size of the board of directors, the percentage of independent boards, and the percentage of female board directors serve as stand-ins for key board characteristics. Institutional ownership serves as a stand-in for the share ownership structure of the various banking sector companies, each will have different policies when managing risk and have different systems for distributing credit, because basically banks implement strategies that are adapted to the conditions of each bank. These differences in conditions mean that the credit risk borne by the bank is not the same, this can be assessed from the operational activities carried out by the bank. Until now, Bank Indonesia as the central bank has established regulations that bank performance is considered good if the Non-Performing Loan ratio does not exceed 5%. If the Non-Performing Loan exceeds the predetermined limit, the bank is considered to have poor performance, especially in credit management. The rise and fall and high ratio of Non-Performing Loans can be influenced by internal bank factors including institutional ownership, operational performance such as BOPO and loan to deposit ratio (LDR).

In previous studies and data in the field, there are inconsistencies such as in the research of Akwaa-Sekyi (2016), Mensah et al (2015), Rehman et al (2016), Bussoli (2015), Chaibi and Ftiti (2014), Kumar (2015), Rahman and Hossin (2017), Akwaa-sekyi and Gené (2016). Therefore, it is necessary to carry out research again regarding the factors that can influence Non-Performing Loans and Capital Adequacy Ratio (CAR).

LITERATURE REVIEW

The level of bank efficiency (BOPO) has a significant effect and a positive correlation to NPL, according to research by Koju et al. (2018) with commercial banks in Nepal as the research object. This means that the NPL ratio will decrease the more efficiently you manage your banking business, or the lower the BOPO level. The same results were also found in Ekanayake and Azeez (2015), Iksan Adisaputra (2012).

H_1: There is an influence of BOPO on Non-Performing Loans (NPL).

Studies by Juniarmita A. S. and Salam S. (2023) demonstrate that non-performing loans (NPL) are significantly impacted by the loan to deposit ratio (LDR). According to various research findings by Dewi and Ramantha (2015) and Malik, A. (2020), there is little correlation between the Loan to Deposit Ratio (LDR) and Non-Performing Loans (NPL).

H_2: There is an influence of the Loan to Deposit Ratio (LDR) on Non-Performing Loans (NPL).

According to research by Bukian & Sudiartha (2016), bank efficiency (BOPO) significantly affects CAR and has a negative link with it. The results of the opposing studies, by Chiu et al. (2008) and Ismaulina et al. (2020), demonstrate that bank efficiency (BOPO) has a positive association with CAR and a significant impact. Aside from the aforementioned second finding, Fitrianto and Mawardi's (2006) research indicates that bank efficiency (BOPO) has no bearing on CAR.

H_3: There is an influence of BOPO on the Capital Adequacy Ratio (CAR).

According to Ansary & Hafez's (2015) research findings, there is a favorable association and a noteworthy impact between the Loan to Deposit Ratio (LDR) and the Capital Adequacy Ratio (CAR). The findings from the same study in Yokoyama & Mahardika (2019), Rianto & Salim (2020), and Andini & Yunita (2015). Putri & Dana (2018) found quite different research results, indicating that the Capital Adequacy Ratio (CAR) was not significantly impacted by the Loan to Deposit Ratio (LDR).

H_4: There is an influence of the Loan to Deposit Ratio (LDR) on the Capital Adequacy Ratio (CAR).

According to Romdhane (2012), the second study model's exogenous variable, non-performing loans (NPL), explains the research findings showing a substantial positive association between NPL and the capital adequacy ratio (CAR). Septiani & Lestari (2016) found different outcomes. Swandewi & Purnawati (2021) found that NPL has a substantial effect and a negative association with CAR, which is another research outcome with differing results.

Other studies show that NPL has a negligible impact on CAR (Murtiyanti et al., 2015; Nugroho et al., 2021).

H_5 : There is an influence of Non Performing Loans (NPL) on the Capital Adequacy Ratio (CAR).

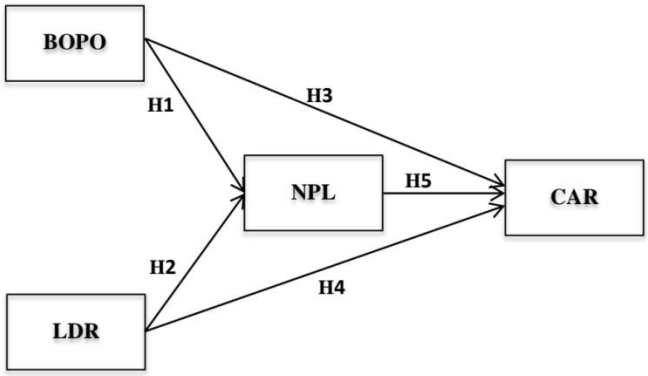


Figure 1. Research Model Framework

METHODOLOGY

The descriptive, qualitative, and quantitative methodologies of this study make use of time series and cross-section data. The analysis method used is panel data regression, which integrates cross-section data from publicly traded banks on the Indonesia Stock Exchange (IDX).

With time series data for the period 2015 to 2021, or for 7 years. Purposive sampling and the criteria for selecting the research sample will be used to take the population size as a research sample.

Two research models employ four research variables conceptually which are divided into the first model using the endogenous variable Non Performing Loan (NPL) and the second model using the endogenous variable Capital Adequacy Ratio (CAR). By using the purposive sampling method as a research sampling method, 22 banking sector companies were produced as research samples.

Table 1. Operational Variables

No	Variables	Notation	Formulas
1	Loan to Deposit Ratio	LDR_{it}	$\frac{\text{Total Credit Distribution}}{\text{Total Third Party Funds}} x100\%$
2	Bank Efficiency	BOPO it	$\frac{\text{Operating Expenses}}{\text{Operating Income}} x100\%$
3	Non-Performing Loan	NPL it	$\frac{\text{Non Performing Loans}}{\text{Total Portfolio}} x100\%$
4	Capital Adequacy Ratio	CAR it	$\frac{\text{Tier 1 Capital} + \text{Tier 2 Capital}}{\text{Risk Weighted Assets}} x100\%$

Panel Data Multiple Regression Estimation

Utilizing analysis is one method for estimating panel data multiple regression, which combines cross-sectional and time series data:

1. Common Effect Model (CEM)
2. Fixed Effect Model (FEM)
3. Random Effect Model (REM)

Model Selection Test

Then, utilizing the three fundamental analyses mentioned above, you may do the following three model appropriateness testing processes to choose the optimal panel data multiple regression model:

Chow Test

In this test, F-statistics are used to choose between the Fixed Effect Model (FEM) and the Common Effect Model (CEM). Acceptance or rejection of the hypothesis depends on the level α = 5% in the null hypothesis (H_0) and alternative hypothesis (H_a). In technical terms, based on these two models, it can be concluded that the null hypothesis (H_0) can be accepted and the alternative hypothesis (H_a) can be rejected if the test findings have a probability level of more than or equal to 5%. This situation calls for the application of the Common Effect Model (CEM), which states that the null hypothesis (H_0) will be rejected in the event that the test results have a probability level of less than or equal to 5%.

The acceptance of the alternative hypothesis (H_a). that the appropriate model that can be used is the Fixed Effect Model (FEM).In this test, F-statistics are used to choose between the Fixed Effect Model (FEM) and the Common Effect Model (CEM). Acceptance or rejection of the hypothesis depends on the level α = 5% in the null hypothesis (H_0) and alternative hypothesis (H_a). Theoretically, one may conclude from these two models that the alternative hypothesis (H_a) can be rejected and the null hypothesis (H_0) can be accepted if the test findings have a probability level of greater than 5%. In this instance, the Common Effect Model (CEM) is the suitable model to apply; should the test findings have a

The Fixed Effect Model (FEM) is the appropriate model to use since a probability level of less than 5%, on the other hand, will accept the alternative hypothesis (H_a) and reject the null hypothesis (H_0).

Test Criteria:

Probability level test results >5% = H_0 Accepted (CEM)

Probability level test results <5% = H_0 Rejected (FEM)

Hausman Test

Hausman testing will be used to decide between the Fixed Effect Model (FEM) and the Random Effect Model (REM). This Hausman test uses the Chi-Square statistical distribution with k degrees of freedom to identify the number of exogenous variables. Apply a probability level instead, which is established by the level α = 5%.

To assess the hypothesis, use the Hausman test. If the results are the opposite and you reject the alternative hypothesis (H_a) and accept the null hypothesis (H_0), the Random Effect Model (REM) will be applied. If the results are the opposite, however, the Fixed Effect Model (FEM) will be applied.

Test Criteria:
Probability level test results >5% = H_0 Accepted (REM)
Probability level test results <5% = H_0 Rejected (FEM)

Uji Lagrange Multiplier (LM)

Testing the Lagrange Multiplier (LM) aims to determine the optimal match between the Random Effect Model (REM) and the Common Effect Model (CEM). This LM test is based on the Chi-Squares distribution, which has a degree of freedom equal to the number of exogenous variables. This test needs to be carried out if the findings of the Hausman Test and the Chow Test lead to different conclusions.
In case the LM statistical value is greater than the critical value of the Chi-Squares statistic, the alternative hypothesis (H_a) will be accepted and the null hypothesis (H_0) will be rejected. This suggests that the Random Effect Model is being used in the fit estimate. On the other hand, if the LM statistic's value is below the critical threshold of The Since the Chi-Squares statistic will accept the null hypothesis (H_0) and reject the alternative hypothesis (H_a), the Common Effect Model should be utilized instead. Apply a probability level instead, which is established by the level α = 5%.

Test Criteria:
Probability level test results >5% = H_0 Accepted (REM)
Probability level test results <5% = H_0 Rejected (FEM)

Carrying out the model suitability test as explained above can be simplified by looking at Figure 2 below.

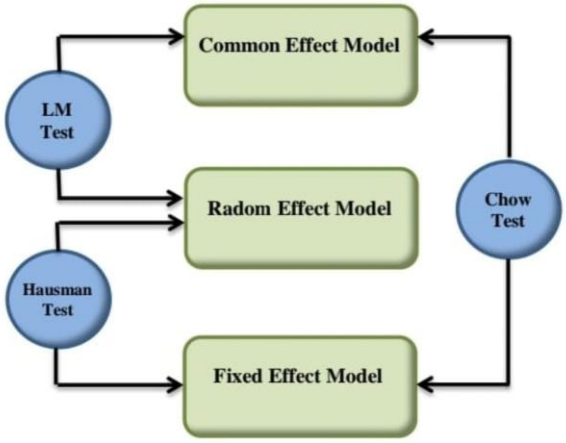


Figure 2. Model Fit Test

Panel Data Regression Model

First Research Model Structural Equation,

(1) $NPL_{it} = \alpha + \beta_1 BOPO_{it} + \beta_2 LDR_{it} + \varepsilon_{it}$;
$i = 1,2,\ldots\ldots, N$; $t = 1,2,\ldots\ldots T$

Second Research Model Structural Equation,

(2) $CAR_{it} = \alpha + \beta_1 BOPO_{it} + \beta_2 LDR_{it} + \beta_3 NPL_{it} + \varepsilon_{it}$;
$i = 1,2,\ldots\ldots, N$; $t = 1,2,\ldots\ldots T$

Where:

BOPO	=	Bank Efficiency	β	=	Slope
LDR	=	Loan to Deposit Ratio	α	=	Intercept
NPL	=	Non-Performing Loan	N	=	Number of Observations
CAR	=	Capital Adequacy Ratio	T	=	Lots of time
ε	=	Error component	N x T	=	Number of Panel Data

RESULTS AND DISCUSSION

Descriptive Statistics

Table 2. Descriptive Statistics

	CAR	BOPO	LDR	NPL
Mean	0.243545	0.824565	0.288617	0.045351
Median	0.206000	0.856000	0.053000	0.046500
Maximum	1.203000	1.135000	1.135000	0.095000
Minimum	0.127000	0.242000	0.020000	0.004000
Std. Dev.	0.138481	0.138874	0.374769	0.021061
Observations	154	154	154	154

Source: Data Processed

Non-Performing Loan (NPL) and Capital Adequacy Ratio (CAR) as Endogenous Variables in Testing the Suitability of Research Models

Table 3. Chow Test

Research Model 1 Chow Test: Common Effect Vs Fixed Effect Endogenous Variable: NPL				**Research Model 2** Chow Test: Common Effect Vs Fixed Effect Endogenous Variable: CAR			
Effects Test	Statistic	d.f.	Prob.	Effects Test	Statistic	d.f.	Prob.
Cross-section F	3.190813	(21,130)	0.0000	Cross-section F	3.176596	(21,129)	0.0000
Cross-section Chi-square	64.018597	21	0.0000	Cross-section Chi-square	64.189349	21	0.0000

Source: Data Processed

Research Models 1 and 2's Chow-test results demonstrate that statistical hypotheses are generated by the F test statistics and chi-square test, which reject the null hypothesis (H_0) and accept the alternative hypothesis (Ha) at the α = 5% level. This could mean that the Fixed Effect Model will be applied more successfully than the Common Effect Model. (Table 3)

Table 4. Hausman Test

Research Model 1 Hausman Test: Fixed Effect Vs Random Effect Endogenous Variable: NPL				**Research Model 2** Hausman Test: Fixed Effect Vs Random Effect Endogenous Variable: CAR			
Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.	Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	2.165446	2	0.3387	Cross-section random	2.226270	3	0.5268

Source: Data Processed

There are differences in the Hausman-test results between Research Models I and 2. At the α = 5% level, the statistical hypotheses derived from the test findings of Model 2 are accepted for the null hypothesis (H_0) and rejected for the alternative hypothesis (Ha). Test results show that the Random Effect Model works better than the Fixed Effect Model (Table 4). The differences in the results between the Hausman and Chow tests prompted the use of the Lagrange Multiplier (LM) Tests.

Table 5. Lagrange Multiplier (LM) Tests

Research Model 1 LM Test: Common Effect Vs Random Effect Endogenous Variable: NPL				**Research Model 2** LM Test: Common Effect Vs Random Effect Endogenous Variable: CAR			
Test Hypothesis				Test Hypothesis			
	Cross-section	Time	Both		Cross-section	Time	Both
Breusch-Pagan	21.66314 (0.0000)	0.691728 (0.4056)	22.35486 (0.0000)	Breusch-Pagan	21.71969 (0.0000)	0.689174 (0.4064)	22.40886 (0.0000)

Source: Data Processed

The Lagrange Multiplier test (LM test) results for these two research models will reject the alternative hypothesis (Ha) and accept the null hypothesis (H_0) at the α = 5% level. Based on the results of the LM test, this suggests that the Random Effect Model is a preferable choice to the Common Effect Model. (Tabel 5).

Table 6. Endogenous Variable: Non-Performing Loan (NPL) Method: Pooled EGLS (Cross-Section Random Effects) Total Pool (Balanced) Observations: 154

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.056144	0.003566	15.74261	0.0000
BOPO	-0.006567	0.009332	-0.703663	0.4827
LDR	**-0.031881**	**0.005538**	**-5.757204**	**0.0000**
Adjusted R-squared	0.170259			
F-statistic	16.69744			
Prob(F-statistic)	0.000000			

Source: Data Processed

Table 7. Endogenous Variable: Capital Adequacy Ratio (CAR) Method: Pooled EGLS (Cross-Section Random Effects) Total Pool (Balanced) Observations: 154

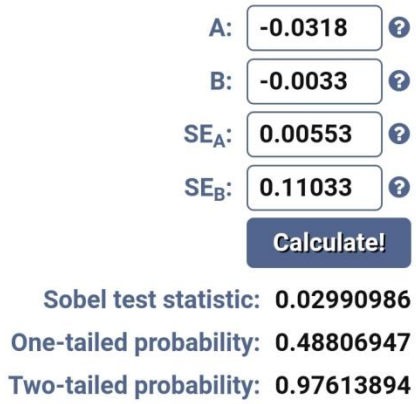
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.058992	0.010101	5.840323	0.0000
BOPO	-0.006665	0.009384	-0.710232	0.4787
LDR	**-0.032017**	**0.005732**	**-5.585290**	**0.0000**
NPL	-0.003377	0.011033	-0.306114	0.7599
Adjusted R-squared	0.159149			
F-statistic	10.65284			
Prob(F-statistic)	0.000002			

Source: Data Processed

Testing the Intervening Variable NPL Function

The Intervening Variable NPL is unable to act as a mediator between the Loan to Deposit Ratio (LDR) and the Capital Adequacy Ratio (CAR), which is 0.97613894 > 0.05, at the α = 5% level. (Refer to Table 8)

Table 8. Indirect Effect of LDR on CAR



Where:

A : LDR Regression Coefficient on NPL

B : Regression coefficient of NPL on CAR

SE_A: Std. LDR error against NPL

SE_B : Std. NPL error against CAR

1. Non-Performing Loans (NPL) are not significantly impacted by the BOPO variable. (Table of Contents)
2. There is a substantial relationship between Variable Loan to Deposit Ratio (LDR) and Non-Performing Loans (NPL), with a negative correlation. (Table of Contents)
3. The endogenous variable, NPL of 17.03%, may be explained by both exogenous factors in the first study model. (Table of Contents)
4. The first research model can be applied at the F-statistic level of 16.69744 and at the Prob level of 0.000000. (Table of Contents)
5. The Capital Adequacy Ratio (CAR) is not significantly impacted by the BOPO variable. (Table 7).
6. The Capital Adequacy Ratio (CAR) and the Variable Loan to Deposit Ratio (LDR) have a negative correlation and a considerable impact on each other. (Table 7).
7. The variable for non-performing loans (NPLs) has no impact on the Ratio of Capital Adequacy (CAR). (Table 7).
8. The three exogenous factors in the second research model may account for the endogenous variable, CAR of 15.92%. (Tabel 7).
9. 0.000002 with a level of F-statistic of 10.65284, the second research model should be applied at the probability level. (Tabel 7).
10. The intervening variable Non Performing Loan (NPL) has no bearing on the Loan to Deposit Ratio (LDR) or the Capital Adequacy Ratio (CAR). (Refer to Table 8)

CONCLUSIONS AND RECOMMENDATIONS

The results of this study show that the Loan to Deposit Ratio (LDR) is an exogenous variable that can directly explain the Capital Adequacy Ratio (CAR), in contrast to other exogenous factors. The results of the study provide more evidence that, although the LDR variable can function as an intervening variable to explain its influence on NPL, it is unable to mediate CAR or explain its influence on CAR indirectly.

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