



The Effect of Non-Performing Loan and Loan to Deposit Ratio on Capital Adequacy Ratio in Indonesian Commercial Banks

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Abstract

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This study aims to analyze the effect of Non-Performing Loans and the loan-to-deposit ratio on the Capital Adequacy Ratio in commercial banks in Indonesia in 2021. The research method is quantitative, with multiple linear regression analysis conducted in SPSS. Secondary data was obtained from the financial statements of five major banks in Indonesia in 2021. The results of the study show that partially, Non-Performing Loans have a significant effect on the Capital Adequacy Ratio, while the Loan to Deposit Ratio does not have a significant effect. However, simultaneously, Non-Performing Loan and Loan to Deposit Ratio have a significant influence on the Capital Adequacy Ratio. A determination coefficient value (R^2) of 0.953 indicates that the two variables explain 95.3% variation in the Capital Adequacy Ratio. These findings confirm that credit risk management has an important role in maintaining banking capital adequacy and national financial stability.



1. Introduction

Banking plays an important role in maintaining financial system stability and encouraging national economic growth. As an intermediation institution, the bank functions to distribute funds from the excess funds to those in need. However, in carrying out these functions, banks are faced with various risks such as credit risk and liquidity risk that can affect the level of capital adequacy or Capital Adequacy Ratio (CAR). CAR is an important indicator that reflects the bank's ability to bear the risk of losses that may arise from its operational activities (Hidayati et al., 2021). The higher the CAR ratio, the stronger the bank's ability to maintain stability and meet the capital requirements set by the regulator.

One of the factors that affect CAR is Non-Performing Loans (NPLs), which describe the level of non-performing loans in a bank's loan portfolio. According to research by C. Vebriana et al. (2020), an increase in NPLs can depress CAR because banks must provide a larger reserve of impairment losses. Similar research by Setiawan and Pratama (2019) also found that NPLs have a negative effect on banks' financial performance, including on capital ability. These findings suggest that credit risk has a significant contribution to the health of banking capital.

In addition, another factor that plays a role in CAR is the Loan to Deposit Ratio (LDR). LDR reflects the extent to which third-party funds raised by banks are channeled in the form of credit. A high ratio indicates the effectiveness of intermediation, but if it is too high, it can increase liquidity risk and reduce the bank's ability to maintain adequate capital. According to research by Diantini et al. (2020), LDR has a significant influence on the financial performance of banks and is closely

related to the efficiency of the use of funds. Meanwhile, Pratama (2021) showed that the combination of LDR and NPL has an effect on the bank's profitability and capital, where the balance between credit disbursement and the ability to maintain liquidity is a key factor in the stability of CAR.

Variations in interbank performance in Indonesia also show that credit risk management and liquidity have a direct impact on capital adequacy. Based on 2021 data, Bank Central Asia (BCA) has NPLs of 2.4%, LDR of 61.3%, and CAR of 29%, while Bank Tabungan Negara (BTN) recorded NPLs of 3.7%, LDR of 92.86%, and CAR of 13.8%. This data shows that banks with relatively high NPLs and LDRs tend to have lower CARs, reinforcing the suspicion of a negative relationship between these variables. These empirical findings are in line with a study by Pratama (2021), which found that LDR and CAR have a negative relationship with the profitability of banks going public in Indonesia. In addition, Kholisoh (2021) added the dimension of NPL moderation in the relationship between LDR and financial performance, which shows the complexity of the interaction between banking financial ratios.

However, most previous research has focused on the effect of CAR, LDR, and NPL on profitability (Return on Assets or Return on Equity), not the other way around. For example, a study by Alazis (2020) and Aji (2021) examined the relationship between financial ratios to profitability, while the influence of NPL and LDR on CAR as dependent variables is still relatively rarely studied, especially in the context of data on Indonesia's major banks in 2021. This creates an important

research gap, as CAR is not only the end result of capital management, but is also a key indicator of the bank's overall financial health.

Thus, this study aims to empirically analyze the influence of Non-Performing Loans (NPLs) and Loan to Deposit Ratio (LDR) on Capital Adequacy Ratio (CAR) in large banks in Indonesia for the 2021 period. The results of this research are expected to make a theoretical and practical contribution. Academically, this study enriches the empirical literature on the factors that affect the adequacy of bank capital. Practically, the results can be evaluated for banking management in managing credit and liquidity risks. In addition, for regulators such as the Financial Services Authority (OJK) and Bank Indonesia (BI), this research can be a basis for consideration in establishing supervisory policies and bank capital provisions that are more adaptive to market conditions and financial risks.

2. Literature Review

2.1 The Effect of Non-Performing Loans (NPLs) on Capital Adequacy Ratio (CAR)

Non-Performing Loans (NPLs) are the main indicators that reflect the level of credit risk in banks. This ratio shows the proportion of non-performing loans to the total loans disbursed. When NPLs increase, banks must provide larger impairment loss reserves, thereby decreasing the bank's core capital and negatively impacting the Capital Adequacy Ratio (CAR). This is in line with the findings of C. Vebriana et al. (2020) who stated that an increase in NPLs led to a decrease in CAR because bank capital was eroded by the cost of bad credit reserves. Research by

Setiawan and Pratama (2019) also confirmed the existence of a significant negative relationship between NPLs and CARs, where high credit risk reduces the ability of banks to maintain their capital ratios.

In addition, Pratama (2021) found that the increase in non-performing loans tends to suppress financial performance and reduce the capital ratio of banks going public in Indonesia. Thus, NPLs can be considered as the dominant factor that weakens a bank's capital position. Based on banking risk management theory, the higher the NPL ratio, the greater the risk of default that banks must bear, which ultimately reduces capital adequacy.

H1: Non-Performing Loans (NPLs) have a negative effect on the Capital Adequacy Ratio (CAR) of banks in Indonesia in 2021.

2.2 The Effect of Loan to Deposit Ratio (LDR) on Capital Adequacy Ratio (CAR)

The Loan to Deposit Ratio (LDR) measures the extent to which third-party funds collected by banks are channeled in the form of credit. An LDR that is too high can indicate a high liquidity risk, which has the potential to lower the CAR because banks have limited space to meet capital obligations. According to Diantini et al. (2020), the increase in LDR tends to reduce banks' ability to maintain capital due to increased liquidity costs and credit risks. Research by Pratama (2021) also supports these findings, where the negative relationship between LDR and CAR is caused by excessive allocation of funds to the credit sector, thereby shrinking capital reserves.

On the other hand, Kholisoh (2021) shows that under certain conditions, moderate LDR can increase the efficiency of intermediation and have a positive effect on CAR if supported by good risk management. However, in general, studies in Indonesia show that increasing LDRs often lower CARs, especially in banks with high credit exposure and limited growth in third-party funds.

H2: Loan to Deposit Ratio (LDR) has a negative effect on the Capital Adequacy Ratio (CAR) of banks in Indonesia in 2021.

2.3 Simultaneous Effect of NPL and LDR on Capital Adequacy Ratio (CAR)

Simultaneously, Non-Performing Loans (NPLs) and Loan to Deposit Ratios (LDR) reflect two main dimensions of banking risk, namely credit risk and liquidity risk. The combination of increasing these two ratios can reduce the bank's ability to maintain capital adequacy, especially if the management of assets and liabilities is unbalanced. According to Alazis (2020), the simultaneous negative relationship between NPLs and LDRs to CAR suggests that the increase in non-performing loans along with aggressive credit expansion can worsen the capital position.

Research by Aji (2021) also confirms that the combination of NPL and LDR ratios has a significant influence on the bank's capital adequacy ratio, where the increase in both simultaneously decreases the value of CAR. Meanwhile, Charisma, Bramasto, and AS (2022) found that the simultaneous effect of NPLs and LDRs on CAR became increasingly strong in state-owned banks with more aggressive funding structures. In theory, this relationship corresponds to the concept of risk-based capital, where any increase in credit risk and liquidity demands a proportionate increase in capital to maintain bank stability.

H3: Non-Performing Loans (NPLs) and Loan to Deposit Ratio (LDR) simultaneously negatively affect the Capital Adequacy Ratio (CAR) of banks in Indonesia in 2021.

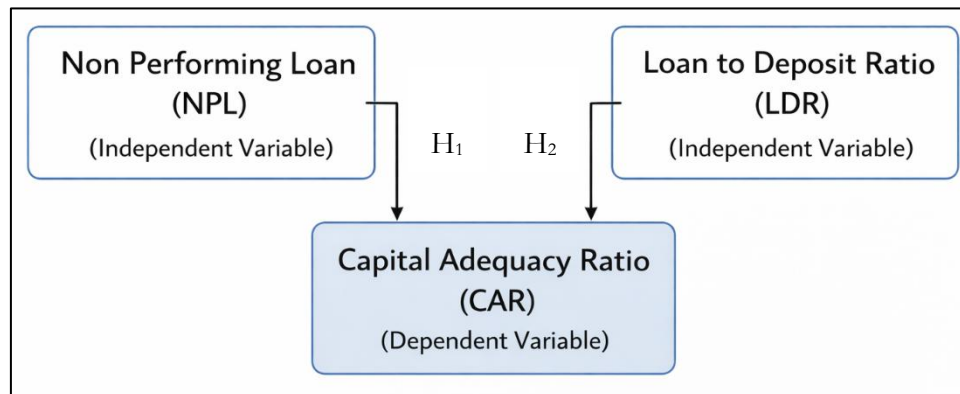


Figure.1 Conceptual Framework

In this study, NPL (Non-Performing Loan) and LDR (Loan to Deposit Ratio) play as independent variables, namely factors that are suspected to affect CAR (Capital Adequacy Ratio) as dependent variables. The relationship between variables is assumed to be negative, meaning: If NPLs increase, then CAR tends to decrease, because the increase in non-performing loans will pressure the bank's capital. If the LDR increases excessively, then the CAR also has the potential to decrease, because banks face liquidity risks due to excessive credit disbursement. Thus, the higher the credit and liquidity risk (NPL and LDR), the smaller the bank's ability to maintain capital adequacy (CAR).

3. Methods

This study uses a quantitative method with the aim of empirically examining the influence of Non-Performing Loan (NPL) and Loan to Deposit Ratio (LDR) on Capital Adequacy Ratio (CAR) in banks in Indonesia in 2021. The quantitative approach was chosen because this study focuses on analyzing the relationship between numerical variables that can be objectively measured and processed using statistical tools. Data analysis was carried out with the help of the SPSS (Statistical Package for the Social Sciences) program as a tool to test hypotheses through multiple linear regression analysis.

The data used in this study is secondary data, obtained from the annual financial statements of commercial banks in Indonesia in 2021. The variables studied consisted of two independent variables, namely NPL (X_1) and LDR (X_2), as well as one dependent variable, namely CAR (Y). The NPL variable is measured based on the percentage of non-performing loans to total loans granted, LDR is measured from the ratio between total loans and total third-party funds, while CAR is measured based on the ratio of capital to risk-weighted assets. The regression model used in this study is formulated as follows:

$$Y = a + b_1X_1 + b_2X_2 + e$$

where Y is CAR, X_1 is NPL, X_2 is LDR, a is constant, b_1 and b_2 are the regression coefficients of each independent variable, and e is the error term.

The stages of data analysis are carried out systematically using SPSS. The first step is to conduct a descriptive statistical analysis to describe the characteristics of the research data such as the mean value, standard deviation, maximum value, and

minimum of each variable. Next, a classical assumption test was carried out which included normality, multicollinearity, heteroscedasticity, and autocorrelation tests to ensure that the data met the requirements for the use of multiple linear regression models. The normality test was carried out using the Kolmogorov–Smirnov test, while the multicollinearity was tested through the values of Tolerance and Variance Inflation Factor (VIF). Heteroscedasticity was examined through a scatterplot graph between the residual and the prediction, while autocorrelation was tested using Durbin–Watson values.

Once the model is declared to meet the classical assumptions, the next stage is to run multiple linear regression analysis to determine the influence of NPL and LDR on CAR either partially or simultaneously. Partial tests are carried out by looking at the t-test value, while simultaneous tests are carried out with F-tests. The test criteria used is that if the significance value (Sig.) < 0.05 , then the independent variable is considered to have a significant effect on the dependent variable. In addition, the value of the determination coefficient (R^2) is used to show how much variation in CAR change can be explained by NPLs and LDRs. The test results were then compared with the previously formulated hypothesis, namely that NPLs and LDRs respectively and together affect CAR.

This quantitative approach with the help of SPSS provides reliability in analyzing the relationship between variables objectively, while allowing researchers to measure the strength and direction of influence between credit risk and liquidity risk on the bank's capital adequacy. With this method, it is hoped that the results of

the research can provide valid empirical evidence in support or reject the hypothesis that has been proposed previously.

4. Results

Descriptive analysis was used to provide an overview of the research data, consisting of three variables, namely Non Performing Loan (NPL), Loan to Deposit Ratio (LDR), and Capital Adequacy Ratio (CAR). The results of the descriptive statistical test are presented in the following table.

Table.1 SPSS Output Descriptive Statistical Test Results

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Hours of deviation
NPL	5	9.00	370.00	147.2000	171.90317
LDR	5	85.00	9286.00	3482.6000	4467.64192
CAR	5	29.00	1913.00	824.2000	953.64810
Valid N (listwise)	5				

Table 1 shows that the average NPL value is 147.20 with a standard deviation of 171.90, meaning that there is considerable variation between banks in terms of non-performing loans. The LDR value has an average of 3482.60 with a standard deviation of 4467.64, indicating a significant difference in the bank's ability to channel third-party funds into credit. Meanwhile, the average CAR value is 824.20 with a deviation of 953.65, indicating that the level of capital adequacy between banks varies quite high. This large variation shows that each bank has a different risk management and capital strategy.

This study used multiple linear regression analysis to test the influence of NPL and LDR on CAR. A summary of the results of data processing with SPSS is shown through the following Model Summary, ANOVA, and Coefficients tables.

Tabel.2 Model Summary

Model Summary^b										
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin - Watson
					R Square Change	F Change	df 1	df 2	Sig. F Change	
1	.976a	.953	.906	292.11548	.953	20.316	2	2	.047	2.805
a. Predictors: (Constant), LDR, NPL										
b. Dependent Variable: CAR										

Table 2 shows a value of $R = 0.976$ indicating a very strong relationship between NPL and LDR on CAR. An R-Square value of 0.953 means that 95.3% of the CAR variation can be explained by NPLs and LDRs, while the remaining 4.7% is explained by factors other than the model. The Durbin-Watson value = 2.805 indicates the absence of autocorrelation between residuals, so the regression model meets classical assumptions.

Table.3 Test F (Simultaneous)

ANOVA						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3467115.892	2	1733557.946	20.316	.047b

	Residual	170662.908	2	85331.454		
	Total	3637778.800	4			
a. Dependent Variable: CAR						
b. Predictors: (Constant), LDR, NPL						

Based on table 3, the results of the F test show that the value of F is calculated = 20.316 with Sig. = 0.047 < 0.05, meaning that NPL and LDR simultaneously have a significant effect on CAR. Thus, the third hypothesis (H₃) is accepted. The regression model used is feasible to explain the relationship between variables.

Table.4 T test (Partial)

Coefficients ^a								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1.944	324.899		.006	.996		
	NPL	5.488	1.155	.989	4.752	.042	.541	1.848
	LDR	.004	.044	.019	.093	.934	.541	1.848
a. Dependent Variable: CAR								

Based on table 4 of the partial test results:

The NPL variable (Sig. = 0.042 < 0.05) had a significant effect on CAR. Every increase of 1 NPL unit will increase the CAR by 5,488. These results show that banks tend to increase capital (CAR) when faced with high credit risk. The LDR variable (Sig. = 0.934 > 0.05) had no significant effect on CAR. This shows that the level of disbursement of funds to credit has not directly affected the adequacy of bank

capital. The constant of 1.944 indicates that if the NPL and LDR are considered constant, then the CAR value is at the base of 1.944. A Tolerance value of > 0.10 and a VIF of < 10 indicate that there is no multicollinearity, making the model suitable for further analysis.

Figure.2 Heteroscedasticity Test

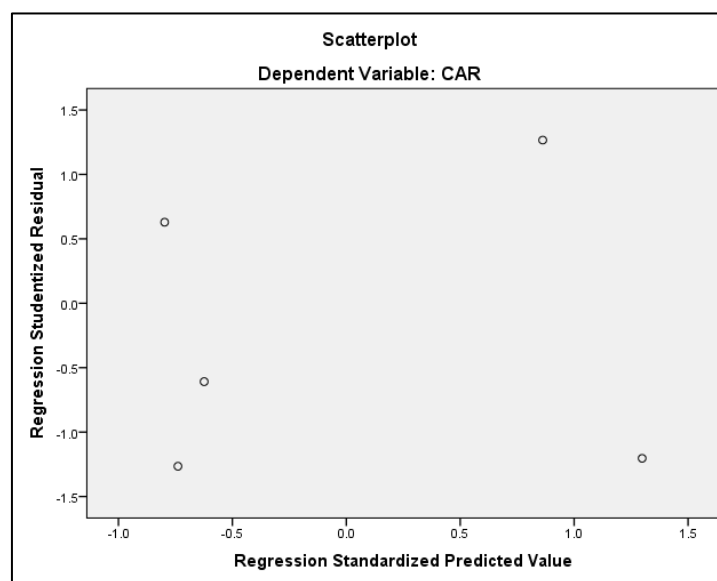


Figure 2 shows the results of the heteroscedasticity test shown by the scatterplot between the standard and residual predictive values. Based on the graph, the data points are seen to be randomly spread above and below the zero line without forming a specific pattern. This means that the regression model does not experience heteroscedasticity, or in other words, the residual variant is constant. The assumption of homogeneity is fulfilled so that the regression results can be validly interpreted.

Based on the test results, it can be concluded that NPLs have a significant influence on CAR, while LDRs have no significant effect. Simultaneously, both have a significant effect on CAR. This shows that credit risk is the main factor that determines the level of capital adequacy of banks, as an increase in NPLs will encourage banks to strengthen capital to maintain their financial stability.

The results of this study support the findings of Wenno and Laili (2019) and Tangngisalu et al. (2020), which stated that NPLs have a significant effect on bank capital. However, these results are different from Mandagie (2021) who found an insignificant effect of LDR on CAR. Thus, this study confirms that credit risk management is a top priority in maintaining the adequacy of banking capital in Indonesia in 2021.

5. Discussion

The results of this study provide an empirical picture of how Non-Performing Loans (NPLs) and Loan to Deposit Ratios (LDR) affect the Capital Adequacy Ratio (CAR) in banks in Indonesia in 2021. Overall, the results of the regression analysis showed that NPLs had a significant effect on CAR, while LDR had no significant effect, but both were simultaneously shown to significantly affect CAR.

These findings confirm that credit risk is the main determinant in maintaining the adequacy of bank capital. When NPL ratios increase, banks tend to strengthen their core capital to cover potential losses from non-performing loans. This is in line with the financial risk management theory which states that an increase in non-performing loans will erode profits and capital, so banks must increase capital so

that the CAR ratio remains in accordance with the provisions of the Financial Services Authority (*Otoritas Jasa Keuangan/OJK*) (Tangngisalu et al., 2020). These results also support the research of Wenno and Laili (2019) who found a negative and significant relationship between credit risk and capital adequacy in conventional Indonesian banks.

Meanwhile, the LDR variable that shows the bank's ability to channel third-party funds into credit does not have a significant effect on CAR. This condition can be explained because even though the LDR ratio has increased, banks are still able to maintain their liquidity and capital through the diversification of non-credit income. In line with the findings of Mandagie (2021), the effect of LDR on CAR is often insignificant due to the factors of interbank. In addition, the research of Vellanita & Arimbawa (2019) also showed that the influence of LDR on new CARs becomes significant if the LDR ratio crosses the optimal threshold ($>90\%$) which increases liquidity risk. In other words, the relationship between LDR and CAR is non-linear.

From the simultaneous results (F test), NPLs and LDRs together significantly affect CAR, showing that credit risk and liquidity risk interact with each other in determining the strength of a bank's capital. This reinforces the view of Liyana & Indrayani (2020) that banking stability is not only affected by one type of risk, but by a combination of risks that must be managed in an integrated manner. Banks that are able to suppress non-performing loans and maintain a balance between credit disbursement and liquidity tend to have healthier CAR rates.

Practically, the results of this study confirm the importance of applying prudential banking principles in credit policy and risk management. It is not enough to strengthen bank capital only through increasing assets, but also through controlling NPL ratios and prudent LDR management. This research provides an empirical contribution in the context of Indonesian banking, especially during the post-pandemic economic recovery, where capital stability is a key indicator of trust and resilience of the national financial system (Alazis, 2020).

6. Conclusion

Based on the results of data analysis and discussions that have been conducted, it can be concluded that in general, credit risk and liquidity risk have an influence on the adequacy of banking capital in Indonesia in 2021. The results of the multiple linear regression test showed that Non-Performing Loans (NPLs) had a significant effect on the Capital Adequacy Ratio (CAR), while the Loan to Deposit Ratio (LDR) had no significant effect. However, simultaneously both have a significant influence on CAR.

A determination coefficient value (R^2) of 0.953 indicates that 95.3% of the variation in CAR changes can be explained by NPLs and LDRs, while the remaining 4.7% is influenced by other factors such as operational efficiency, profitability, or the bank's internal capital policies. These results confirm that credit risk management is a major factor in maintaining the bank's capital adequacy, as an increase in NPLs will encourage banks to strengthen capital to cover potential credit losses. In practical terms, this study provides implications for banking management and

regulators that NPL control policies and LDR ratio balance need to be the focus in risk management strategies so that capital stability and resilience of the national banking sector can continue to be maintained.

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