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## RESEARCH ARTICLE

published:31 July 2024  
doi: 10.21070/jas.v8i2.1840

# Non-Performing Loans and Operating Expenses Impact on Capital Adequacy Ratio

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**General Background:** Banks are pivotal to economic development, serving as financial intermediaries that facilitate capital flow between savers and borrowers. Their financial health is often assessed using ratios like the Capital Adequacy Ratio (CAR), Non-Performing Loans (NPL), and Operating Expenses to Operating Income (OEOI). **Specific Background:** The CAR indicates a bank's ability to withstand potential losses, making it a critical measure of financial stability. The relationship between NPL, OEOI, and CAR, with Return on Equity (ROE) as a moderating variable, remains underexplored, particularly in the context of Indonesian commercial banks. **Knowledge Gap:** Previous studies have inadequately addressed how ROE moderates the effects of NPL and OEOI on CAR. **Aims:** This study aims to examine the interactions between NPL and OEOI on CAR, moderated by ROE, using data from 30 commercial banks listed on the Indonesian Stock Exchange from 2018 to 2020. **Results:** The findings reveal that NPL significantly negatively impacts CAR, while OEOI's effect is negative but insignificant. ROE moderates the impact of OEOI on CAR significantly but not NPL. **Novelty:** This study introduces ROE as a moderating variable, providing a nuanced understanding of its differential effects on CAR in the Indonesian banking sector. **Implications:** The results offer practical insights for bank management to optimize financial performance and contribute theoretically to the literature on banking stability and profitability. These findings can inform future research and decision-making in the financial industry.

## OPEN ACCESS

ISSN 2548-3501 (online)

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Received: 23 April 2024

Accepted: 20 July 2024

Published: 31 July 2024

Citation:

Estiasih, Noerchoidah, Nurdina,  
and Putra (2024) *Non-Performing  
Loans and Operating Expenses  
Impact on Capital Adequacy Ratio***Keywords:** Return on Equity, Non-Performing Loans, Operating Expenses, Capital Adequacy Ratio



## INTRODUCTION

As a financial institution, banks play an important role in developing a country's economy. This is because they mainly serve the function of a financial intermediary. This means they can bridge two parties. In this case, one party has more funds, and the other needs it. Another function of a bank is to collect funds from society in deposits and distribute them back to the community as loans. This is in line with [Ismail \(2010\)](#), [Tricahyanti and Muniarti \(2022\)](#), who state that the main functions of banks as financial institutions are to (1) gather funds from society, (2) distribute them back to the public and (3) provide banking services.

As an institution that serves a financial intermediary function, it is imperative for banks to earn the trust of their customers and support and facilitate the activities they carry out. In turn, this will provide welfare to stockholders and increase company value ([Sukarno, 2006](#)).

Like any other profit-driven entity, in running their business, banks aim at getting maximum profit to maintain their existence. This is because the very existence of profit is an indication that the banks have a good prospect ([Haneef et al., 2012](#)). Therefore, the bank's ability to produce profits, or simply their profitability, can be used to maintain the public and investors' confidence in the bank's performance and financial healthiness.

Since profitability affects the extent of public and investor confidence in the bank, it is important to measure its level. One of the methods available to determine this level uses some ratios, including Return on Equity (ROE). It is a ratio that measures the bank's ability to manage capital to earn net earnings ([Kasmir, 2020](#)). The greater the ROE, the higher the profit obtained by the bank. Eventually, this will result in the bank's better position in terms of its capital management. In addition, this will increase the dividends distributed to or reinvested by shareholders as retained earnings ([Kuncoro and Suhardjono, 2002](#)). Regarding this ROE, Bank Indonesia has set forth in its [Circular Letter No. 6/23/DPNP dated 31 May 2004](#) that the amount of ROE shall be 5%-12.5%.

Other than profitability level, it is also important to discover whether or not banks have sufficient capital. One way to figure it out is by using the so-called Capital Adequacy Ratio (CAR). CAR is a bank performance-related financial ratio that measures whether the capital that banks own is enough to support their assets that possibly have or produce risk ([Dendawijaya, 2009](#)). As per the [Circular Letter of Bank Indonesia No. 6/23/DPNP Year 2004](#), to be the holder of monetary authority in banking in Indonesia, commercial banks are required to have a minimum of 8% CAR. If a bank has less than what Bank Indonesia has set forth, then the bank is considered unhealthy and would be under the special supervision of Bank Indonesia (BI), making it hard for it to survive.

How much a bank owns as its capital will have an impact on its capability to efficiently perform its activities ([Pratiwi, 2016](#)). When this capital can evade inevitable losses, it will allow the bank to manage its activities in an efficient manner. Furthermore, the bank's wealth will increase ([Muljono, 2009](#)). From this explanation, it can be said that CAR has a positive correlation with ROE.

Another ratio that holds an important place in this regard is the non-performing loan (NPL) ratio. It measures the extent of loans that do not perform well at a bank. As its name suggests, the NPL ratio should be kept to a minimum ([Ihsana et al., 2021](#)). Thus, when this ratio gets bigger, the management should be concerned. This is because an increase in non-performing loans has the potential to put the bank's health in jeopardy. Article 4, paragraph (1) of [BI Regulation Number 15/2/PBI/2013](#) elaborates on some criteria that if a bank meets one or more of them, they will find themselves in trouble to survive. One of them is that the NPL ratio shall not be over 5% of their total loans. The greater the NPL level, the more unprofessional the bank is in managing its credit.

The NPL ratio reflects credit risk, where high NPLs will increase costs. These costs include the one for procuring productive assets and the miscellaneous ones. Both costs will reduce the CAR value. From this explanation, it can be seen that NPL has a significant negative effect on CAR ([Pastory et al., 2013](#)).

The Operating Expenses to Operating Income (OEOI) ratio, frequently called the efficiency ratio, can be employed to figure out the bank management's capacity to control their operating expenses against their operating income ([Hariyani, 2010](#)). It can also be utilized to quantify how efficient and capable banks are in carrying out their activities. The greater the OEOI, the more incapable the banks are of managing their operating expenses properly. Thus, its financial performance is more likely to decrease. Bank Indonesia has stated in its circular letter that banks are required to keep their OEOI ratio at 94%-96%. A large OEOI ratio will reduce CAR and vice versa. States that the effect of the OEOI ratio on CAR is significant.

Taking the commercial banks listed in IDX as its population, this study aims to test and analyze the effects of 1) NPL on CAR, 2) OEOI on CAR, and 3) NPL and OEOI on CAR as moderated by ROE.

In previous studies, there appears to be a research gap, namely, a gap in conducting research related to the variables studied. The novelty of this study is the moderation variable using Return on Equity, which indicates the effectiveness of management in utilizing capital to generate profits in the context of the financial industry. This study was conducted in an effort to determine the impact of each NPL and BOPO variable on CAR with ROE moderation. Thus, this study is expected to provide practical and theoretical contributions to investment decisions and can also be used as a reference for future researchers.

### Capital Adequacy Ratio (CAR)

CAR is a ratio that compares the amount of bank capital to the number of assets that have or produce risks, including loans. It is used to quantify capital and write-off reserves in bearing credit, especially risks that occur due to failed interest ([Kasmir, 2020](#)).

When a bank's CAR is high, its capital reserve will also be high. Yet, if its CAR is too high, it is possible that its funds will be idle, meaning much of the funds it holds cannot be utilized ([Septiani, 2016](#)).

[Sudirman \(2013\)](#) states that CAR is a ratio calculated by dividing a bank's capital by its risk-weighted assets (RWA).

The latter is the sum of assets recorded in the balance sheet and administrative assets (Dendawijaya, 2009). Borrowing from Sudirman (2013), to calculate CAR, the following formula is used:

$$\text{CAR} = \frac{\text{Capital}}{\text{Risk Weighted Assets}} \times 100\%$$

### Non Performing Loan (NPL)

This type of loan occurs when a customer fails to pay part or all of their obligations to the bank (Kuncoro and Suhardjono, 2002). Meanwhile, according to Darmawi (2014), Ozili (2019), NPL can be an indication of the bank's business risk ratio, as shown by the extent of non-performing credit existing in it. To sum it up, a non-performing loan (NPL) is a ratio that displays the bank's ability to manage bad credit.

The higher the NPL ratio, the more likely it is for the bank to be declared unhealthy. This is because NPL affects the profit that the bank should obtain. In other words, high NPLs cause a decrease in profits and will result in reduced dividends to be distributed. Clearence et al. (2021) research on financial ratios to the financial performance of commercial banks states that NPL has an effect on ROA, and to reduce NPL, fee-based income has an important role. This means the bank's financial performance has decreased. Finally, to calculate this NPL, the formula offered by (Kasmir, 2020) below can be used.

$$\text{NPL} = \frac{\text{Non - performing Loans}}{\text{Total outstanding loans}} \times 100\%$$

### Operating Expenses and Operating Income (OEOI)

The OEOI ratio, or simply the efficiency ratio, is a ratio that can be used to discover the efficiency of a business run by a bank or to measure the amount of bank costs incurred to obtain income from assets (Yuniari and Badjra, 2019). (Dendawijaya, 2009) also states that to determine how efficient and capable a bank is in performing its operations, OEOI or operational efficiency ratio can be used.

Greater OEOI shows that the bank's financial performance declines. Therefore, it can be said that the bank is inefficient in its operation. This is because of the greater operational expenses that the bank should bear compared to its income. In other words, the greater the OEOI is, the lower the CAR would be. Meanwhile, research by (Pua & Jibrail, 2024) related to BOPO shows that there is a negative influence on ROE.

Bank Indonesia has set the OEOI ratio of any bank to be less than 94%. This is because any bank with an OEOI ratio larger than 96% can be deemed inefficient in carrying out its activities. Meanwhile, OEOI can be calculated using the formula:

$$\text{OEOI} = \frac{\text{Operational Expenses}}{\text{Operating Income}} \times 100\%$$

### Return on Equity (ROE)

To quantify the level of profitability, investors commonly use ROE in making their investment decisions. According to Hanafi and Halim (2016), ROE measures a company's profitability based on specific share capital. Meanwhile, according to (Kasmir, 2020), it is a ratio that measures the bank's capital management in order to earn net income.

In this study, profitability was quantified using ROE. The considerations taken were because ROE had been commonly used to assess the extent of return on share capital invested in the bank and to measure the profit generated from the bank's own capital. For banks that have gone public, profit generation is not only focused on the growth of bank assets but also on the dividend distribution. Thus, this makes ROE, i.e., the net earnings for shareholders divided by their total equity, the most important ratio (Brigham & Houston, 2019). ROE can be calculated using the following formula.

$$\text{ROE} = \frac{\text{Profit after Tax}}{\text{Own capital}} \times 100\%$$

## RESEARCH FRAMEWORK

[Figure 1 about here.]

Using this research framework as a framework, the research hypotheses were formulated as follows: 1) NPL has a negative and significant effect on the CAR of commercial banks, 2) OEOI has a significant negative effect on the CAR of commercial banks, and 3) ROE moderates the effect of NPL and OEOI on the CAR of commercial banks. In accordance with the literature review and research framework that has been explained, the hypothesis in the study is as follows:

H1: Non-Performing Loan (NPL) has a positive and significant effect on the Capital Adequacy Ratio (CAR) of Commercial Banks.

H2: Operating Costs and Operating Income (BOPO) have a positive and significant effect on the Capital Adequacy Ratio (CAR) of Commercial Banks.

H3: Return On Equity (ROE) moderates the effect of Non-Performing Loans (NPL) and Operating Costs and Operating Income (BOPO) on the Capital Adequacy Ratio (CAR) of Commercial Banks

## METHODS

This study used a quantitative approach, and its data were secondary ones obtained from the annual financial statements of IDX-listed commercial banks for the 2018-2020 period, making a total of 42 banks the research population. Using the ownership of complete financial statements for 2018-2020 and the relevant data as the criteria, this study managed to sample 30 commercial banks purposively (www.idx.co.id). The dependent variable in this study was CAR. Meanwhile, its independent variables were NPL and OEOI. Finally, ROE served as its moderating variable.

The data were analyzed using Multiple Regression Analysis and Moderating Regression Analysis (MRA). This analysis aimed to see the variables that affected the relationship between the independent and dependent variables (Sugiyono, 2019). The moderating variable was used to see

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whether it strengthened or weakened the independent variable's effect on the dependent variable.

The following equations were used:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \varepsilon \dots\dots\dots (1)$$

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_1 * Z_1 + \beta_4 X_2 * Z_2 + \varepsilon \dots\dots\dots (2)$$

- Where : Y = CAR
- α = Constant value
- β = Variable Coefficient
- X1 = NPL
- X2 = OEOI
- Z = ROE
- (X\*Z)= Moderating Variable (Interaction between X and Z)

### Multiple Regression Analysis

The first and second hypotheses were tested using the multiple regression analysis aided with SPSS 22.0 application programme. The result is presented in [Table 1](#).

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[\[Table 1 about here.\]](#)

From [Table 1](#) the following regression equation was obtained:

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$$Y = 32.827 - 0.203 X_1 - 0.059 X_2$$

### NPL (X1) to CAR (Y)

The results showed that the NPL Regression coefficient was -0.203, meaning that the relationship between NPL (X1) and CAR (Y) was inverse. In terms of significance, 0.046 was lower than 0.05, meaning that NPL (X1) contributed significantly to CAR (Y). It was, therefore, safe to say NPL's (X1) effect on CAR (Y) was negative and significant.

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### OEOI (X2) to CAR (Y)

[Table 1](#) also showed that the OEOI regression coefficient was -0.059, meaning that OEOI (X2) and CAR (Y) had an inverse relationship. Meanwhile, the significance value was found at 0.572 > 0.05, meaning that OEOI (X2) did not contribute significantly to CAR (Y). For this reason, it can be said that OEOI (X2) affected CAR (Y) negatively and insignificantly.

### Moderating Regression Analysis (MRA)

To test the third hypothesis, MRA was used to discover the relationship between NPL (X1) and OEOI (X2) on CAR (Y) as moderated by ROE (Z). In other words, ROE (Z) could make the effect of NPL (X1) and OEOI (X2) on CAR (Y) stronger or weaker.

[\[Table 2 about here.\]](#)

From [table 2](#), the moderation regression equation is as follows:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_1 * Z_1 + \beta_4 X_2 * Z_2 + \varepsilon$$
$$Y = 58,126 - 638 X_1 - 0,249 X_2 + 0,409 X_1 * Z_1 - 0,572 X_2 * Z_2$$

### NPL (X1) to CAR (Y) which is moderated by ROE (Z)

[Table 2](#) showed that, being moderated by ROE (Z), the regression coefficient value of NPL (X1) on CAR (Y) was 0.409. Regarding its significance, the value was found at

0.565 > 0.05, meaning that, when moderated by ROE (Z), NPL's (X1) effect on CAR (Y) was insignificant.

Taking the insignificant effect of NPL (X1), when moderated by ROE (Z), on CAR (Y) into consideration, it could be said that ROE failed in moderating the effect of NPL (X1) on CAR (Y).

### OEOI (X2) to CAR (Y) as moderated by ROE (Z)

For the relationship between OEOI (X2) on CAR (Y) as moderated by ROE (Z), table 2 showed that the regression coefficient value was -0.572. Meanwhile, its significance was found at 0.002. This meant that, when moderated by ROE (Z), the OEOI's (X2) effect on CAR (Y) was significant and negative. For this reason, it could be said that ROE could moderate the OEOI's (X2) effect on CAR (Y).

## RESULTS AND DISCUSSION

### NPL's (X1) Effect on CAR (Y)

The results showed that the effect of NPL on CAR was negative and significant. Since NPL was a ratio to quantify a bank's credit risk, when the NPL (X1) was low, it was likely that the bank's management of its credit was less optimal, even if the credit risk that the bank bore was low. In addition to the ratio of non-performing loans to total loans, NPL was also one key indicator of how a bank performed its functions ([Rahadian and Permana, 2021](#)). Among the functions that the bank served was to act as an intermediary between two parties. One party had more funds, and the other needed more funds. The higher the NPL ratio is, the lower the quality of bank credit would be. This means that more loans would be not performing. In addition, high interest rates can also cause low NPL, leading to lower interest from debtors when taking credit. Reduced credit by debtors would cause many bank assets to be idle, forcing the bank to spend some funds to address the risk as a result of the many idle assets. This could affect the capital owned by the bank. It should be noted that too much capital can reduce asset productivity. In other words, banks need to know the capital capacity they need to carry out their investment activities.

This study confirmed what the research conducted by [Buyuksalvarci and Hasan \(2011\)](#), [Margaretha and Diana \(2011\)](#), [Tracey \(2011\)](#) found. Their studies found that the NPL's effect on CAR was negative and significant. However, [Anjani and Purnawati \(2014\)](#), [Shingjergji \(2015\)](#), and [Andreani and Erick \(2016\)](#) found otherwise. They found the NPL's effect on CAR was negative and insignificant.

### Effect of OEOI (X2) on CAR (Y)

This study found that the OEOI's (X2) effect on CAR (Y) was negative and insignificant. As an efficiency ratio, OEOI could be used to quantify the extent to which a bank management controls its operating expenses against its operating income ([Dendawijaya, 2009](#)), ([Rifansa and Pulungan, 2022](#)). This shows that how much the OEOI that a bank has does not directly influence the CAR. A bank can be deemed healthy if its OEOI ratio is lower than 93.52%. This was also in compliance with what Bank Indonesia had set forth. When a bank controls its operating expense less

efficiently than its operating income, it might hinder the generation of income that should be useful for increasing its capital. The increase in OEOI will reduce the bank's CAR value and vice versa. This study confirmed [Puspa et al. \(2015\)](#), [Fitrianto and Marwadi's \(2006\)](#), and [Shitawati \(2006\)](#) study, which found that the OEOI's effect on CAR was negative. Yet, it contradicted what [Chatarine \(2014\)](#) found. She suggested that the OEOI's effect on CAR was significant and positive.

#### NPL (X1) to CAR (Y) as moderated by ROE (Z)

While the NPL ratio is the one that shows the bank's ability to manage their non-performing loans ([Okoli et al., 2020](#)), the ROE obtained by banks is a commitment that could make a long-term contribution to investor confidence to continue to invest their funds in the bank. When the bank conveys information on the acquisition of shares to their investors, a good response from the recipient of information, especially investors, can positively affect both the investor's and bank users' trust. The level of investment received by the company will affect the bank's CAR. When the bank has adequate capital, public trust in the bank will be maintained, and people will believe in saving and borrowing funds at the bank. This can lead to an increase in the bank's stock price. Eventually, it will increase the bank's value. A variable can be a moderating variable when its coefficient value ( $\beta$ ) is significant at 0.05 or 0.10 ([Sugiyono, 2019](#)). The interaction test carried out in this study found that the significance of the interaction between NPL and ROE was 0.565. Since it was greater than  $\alpha = 5\%$ , it could be said that ROE did not moderate the effect of NPL on CAR.

#### OEOI (X2) to CAR (Y) as moderated by ROE (Z)

In theory, OEOI is a bank's efficiency ratio that quantifies its operating expenses against its operating income. The higher the OEOI value is, the more inefficient the bank's operations would be. Using this OEOI ratio, one can also see how capable the bank is of managing its operating expenses in order to reduce costs so as to increase its profits. OEOI is used to determine how capable the bank's management is of controlling its operating expenses against its operating income. It is often used by banks. Bank Indonesia establishes it to serve as a regulatory and supervisory tool for banking activities. CAR is important since it assesses a bank's capital. When the bank has high capital, it will be able to support its operational activities by lending money to its customers, and eventually, this will increase the bank's profitability. As financial institutions, banks' main activities involve (1) collecting funds from society, (2) distributing them back to society, and (3) providing other services within the banking realm or acting as intermediaries between those who have more funds and those who lack funds. Investors are one of the stakeholders who need to know how well a bank performs. This is because the better the bank performs, the more secure the invested funds will be. Financial ratios will enable investors to discover the bank's performance. This is because it produces more objective numbers. One of the financial ratios used by investors before making investment decisions is ROE. The interaction test results in this study showed that the significance value of OEOI with ROE was 0.002. This was less than  $\alpha = 0.05$ . This indicated that ROE moderated the effect of OEOI (X2) on

CAR. This study was conducted in an effort to determine the impact of each NPL and OEOI on CAR with ROE moderation. Theoretically, this study provides a significant contribution to the existing literature. The implications can be used as a reference for future researchers. Currently, there are many studies discussing the importance of NPL, OEOI, CAR, and ROE in the banking industry listed in the capital market. Empirically, the results of this study indicate that NPL has a negative and significant effect on CAR, and OEOI has a negative but insignificant effect on CAR. The ROE variable is unable to moderate the effect of NPL (X1) on CAR, while the ROE variable is able to moderate OEOI (X2) on CAR. The implications for the financial industry, the NPL, OEOI, and CAR variables can be used as guidelines for bank management in managing the financial industry so that it is classified as a healthy bank, while ROE is a contribution of equity in obtaining profits to improve the company's financial performance.

## CONCLUSION

Private banks are advised to pay more attention to their NPL, OEOI, CAR, and ROE. This study is limited to examining NPL, OEOI, CAR, and ROE as its variables. To expand this research, it is recommended that future researchers add other variables such as the level of credit extended, bank size, interest rates, third-party funds, and net foreign exchange positions that have not been included in this study. Furthermore, extending the research period and using panel data for research analysis can also develop the results of this study.

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10 **Conflict of Interest Statement:** The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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**TABLE 1 / Multiple Regression Test Results**

Model	Coefficients <sup>a</sup>					
	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	
	B	Std. Error	Beta			
1	(Constant)	32.827	7.931		4.139	.000
	NPL	-.347	.179	-.203	-1.936	.046
	OEOI	-.052	.093	-.059	-.567	.572

a. Dependent Variable: CAR

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**TABLE 2 / Moderation Regression test results**

Model		Coefficients <sup>a</sup>			t	Sig.
		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta		
1	(Constant)	58.126	9.230		6.298	.000
	NPL	-1.090	1.186	-.638	-.919	.361
	OEOI	-.220	.109	-.249	-2.014	.047
	Moderat1	.077	.132	.409	.578	.565
	Moderat2	-.017	.006	-.572	-3.163	.002

a. Dependent Variable: CAR

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Figure 1 / Research Framework

