DETERMINANTS OF REGIONAL DEVELOPMENT BANK PERFORMANCE WITH OPERATIONAL EFFICIENCY AS AN INTERVENING VARIABLE

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ABSTRACT

This study investigates the effects of capital adequacy, liquidity, and credit risk on the financial performance of conventional Regional Development Banks (RDBs) in Indonesia, with operational efficiency examined as a mediating variable. Capital adequacy, liquidity, and credit risk are proxied by the Capital Adequacy Ratio (CAR), Loan to Deposit Ratio (LDR), and Non-Performing Loan (NPL) ratio, respectively, while operational efficiency and financial performance are measured using the Operating Expenses to Operating Income ratio (BOPO) and Return on Assets (ROA). The study utilizes secondary data derived from the financial statements of 24 conventional RDBs over the 2019–2024 period, generating panel observations for analysis. Panel data regression with a Random Effects Model is employed, and the mediating role of operational efficiency is examined using the Sobel test. The findings reveal that capital adequacy and liquidity exert positive but insignificant effects on financial performance, whereas credit risk has a significant negative effect. Operational efficiency does not mediate the relationship between capital adequacy and liquidity and financial performance but significantly mediates the effect of credit risk on financial performance. These results underscore the importance of effective credit risk management and cost efficiency in enhancing bank profitability and ensuring sustainable financial performance.

Keywords: *Performance; Capital Adequacy; Liquidity; Credit Risk; Operational Efficiency*

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INTRODUCTION

The banking sector in Indonesia plays a strategic role in promoting national economic growth (Otoritas Jasa Keuangan [OJK], 2023). Law No. 10 of 1998 defines banks as institutions that collect funds from the public in the form of deposits and redistribute them in the form of credit or other financing instruments to improve societal welfare. In line with this definition, Kasmir (2012) states that banks function as financial intermediaries that manage public funds while providing various financial services. The high complexity of banking operations requires banks to continuously maintain sound financial performance in order to sustain public trust. Public confidence is a critical factor, as it directly affects the growth of third-party funds, credit distribution, and the long-term sustainability of banking operations (Mishkin, 2016).

One of the main indicators used to assess banking performance is profitability (Mishkin, 2016). The Financial Services Authority (Otoritas Jasa Keuangan) through Circular Letter No. 14/SE.OJK/2017 emphasizes that profitability ratios are an essential component in evaluating a bank's soundness. Return on Assets (ROA) is used as a proxy for profitability because it reflects management's effectiveness in utilizing total assets to generate profits (Dewi et al., 2017). A higher ROA indicates a stronger ability of banks to generate earnings from their assets.

In the context of regional banking, Regional Development Banks (Bank Pembangunan Daerah—BPDs) play an important role in supporting regional economic development, particularly through financing productive sectors, micro, small, and medium enterprises (MSMEs), and managing local government finances. Data from the Financial Services Authority show that the profitability of BPDs during the 2011–2024 period remained relatively stable and comparable to that of state-owned banks, although it experienced pressure during the COVID-19 pandemic. This condition suggests that BPDs possess relatively strong resilience, yet they continue to face challenges in maintaining sustainable profitability.

Bank profitability is influenced by various internal factors, including capital adequacy, liquidity, credit risk, and operational efficiency (Mishkin, 2016). The Capital Adequacy Ratio (CAR) reflects a bank's ability to provide sufficient capital to absorb potential losses arising from risk exposure (Otoritas Jasa Keuangan [OJK], 2016). However, a high CAR does not necessarily lead to higher profitability if the capital is not utilized productively.

Similarly, liquidity is commonly measured using the Loan-to-Deposit Ratio (LDR) (Kasmir, 2018). In this study, liquidity is proxied by the inverse of LDR (1/LDR) to align the interpretation of the liquidity variable, where a higher ratio represents better liquidity conditions. This transformation is applied because LDR is conceptually inversely related to liquidity; therefore, inverting the ratio facilitates consistent interpretation of the results in accordance with theoretical expectations. A higher value of 1/LDR indicates greater availability of liquid funds to meet short-term obligations, whereas a lower value reflects limited liquidity, which may force banks to seek alternative and higher-cost funding sources, potentially reducing profitability and increasing financial risk (Dewi, 2017). Meanwhile, the Non-Performing Loan (NPL) ratio reflects the level of credit risk, where an increase in problem loans reduces interest income and raises loan loss provisioning expenses (Kasmir, 2018).

Operational efficiency serves as a key factor linking capital adequacy, liquidity, and credit risk to profitability. Operational efficiency is proxied by the Operating Expenses to Operating Income ratio (BOPO) (Kasmir, 2018). A higher BOPO indicates greater operating costs incurred to generate income, thereby reducing profitability

(Anindiansyah et al., 2018). Bank Indonesia stipulates that an ideal BOPO ratio ranges between 50% and 75%, while a BOPO above 85% indicates operational inefficiency. Therefore, BOPO not only directly affects ROA but also potentially acts as a mediating mechanism through which CAR, LDR, and NPL influence bank profitability (Berger & DeYoung, 1997; Anindiansyah et al., 2020).

Several previous studies have found that BOPO has a significant effect on ROA (Dewi et al., 2017; Pratama et al., 2023). Other studies indicate that CAR and LDR do not always have a direct impact on profitability but may influence operating costs (Hidayati et al., 2023; Anindiansyah et al., 2020). In addition, NPL has been shown to increase operating expenses and reduce bank profits (Riadi et al., 2023). However, most existing studies treat BOPO as an independent variable rather than as an intervening variable.

Based on this research gap, the present study positions operational efficiency (BOPO) as an intervening variable that mediates the relationship between capital adequacy, liquidity, credit risk, and profitability. The focus is placed on conventional Regional Development Banks, considering that BPDs differ from national commercial banks in terms of capital structure, scale of operations, and regional service orientation.

Accordingly, this study aims to analyze the effects of the Capital Adequacy Ratio (CAR), Loan-to-Deposit Ratio (LDR), and Non-Performing Loan (NPL) on Return on Assets (ROA), both directly and indirectly through operational efficiency (BOPO), in conventional Regional Development Banks during the 2019–2024 period

LITERATURE REVIEW, RESEARCH FRAMEWORK, AND HYPOTHESES

Effect of Capital Adequacy on Financial Performance

Capital adequacy is a fundamental factor in maintaining the stability and sustainability of banking operations (Mishkin, 2016). The Capital Adequacy Ratio (CAR) reflects a bank's ability to absorb potential losses arising from financing and operational activities (Mishkin, 2016). Banks with higher CAR levels have greater risk resilience, enhance depositor and investor confidence, and gain broader access to funding sources at lower costs. These conditions ultimately contribute to improved profitability, as reflected in Return on Assets (ROA) (Firmansyah et al., 2023). The calculation of the Capital Adequacy Ratio (OJK, 2016) is as follows:

$$\text{CAR} = \text{Total Capital} / \text{Risk-Weighted Assets (RWA)}$$

Empirically, studies by Firmansyah et al. (2023), Heliani et al. (2023), and Pratama et al. (2023) find that CAR has a positive and significant effect on ROA. However, Dewi (2017),-Anindiansyah et al. (2020), Fidyani et al. (2023), and Firmanila (2023) report that CAR does not have a significant effect on ROA. These mixed findings indicate the presence of a research gap, suggesting that the relationship between capital adequacy and financial performance warrants further investigation, particularly in the context of Regional Development Banks. Based on the theoretical argument and prior empirical evidence, it can be argued that stronger capital adequacy enhances a bank's ability to absorb potential losses, maintain stability, and support profitability. Therefore, this study proposes the following hypothesis.

H1: Capital adequacy (CAR) has an effect on bank financial performance (ROA) of Regional Development Banks in Indonesia.

Effect of Liquidity on Financial Performance

Liquidity reflects a bank's ability to meet its short-term obligations, particularly in responding to customer withdrawals (Mishkin, 2016). In this study, liquidity is measured using the inverse of the Loan-to-Deposit Ratio (1/LDR), which represents the amount of third-party funds available for each unit of credit extended (Anindiansyah et al., 2020). A higher value of 1/LDR indicates greater availability of liquid funds, thereby enhancing the bank's ability to maintain operational stability and fulfill short-term obligations. This condition may support increased interest income and ultimately improve bank profitability (Abbas & Ullah, 2024).

Dewi (2017) states that an improvement in a bank's liquidity management capability has the potential to increase Return on Assets (ROA). This finding is supported by studies conducted by Firmansyah et al. (2023), Heliani et al. (2023), and Pratama et al. (2023), which show that liquidity has a positive and significant effect on ROA. However, contrasting results are reported by Setyaningsih et al. (2023) and Hidayati et al. (2023), who find that liquidity does not have a significant effect on ROA. These mixed empirical findings indicate that the impact of liquidity on bank financial performance remains inconclusive and may depend on fund management practices and internal bank policies. Based on the theoretical argument and prior empirical evidence, it can be argued that effective liquidity management enhances a bank's ability to meet short-term obligations and maintain operational stability, which supports profitability. Therefore, this study proposes the following hypothesis.

H2: Liquidity (LDR) has an effect on bank financial performance (ROA) of Regional Development Banks in Indonesia.

Effect of Credit Risk on Financial Performance

Credit risk arises from a borrower's failure to fulfill principal and interest payment obligations (Mishkin, 2016). Net Non-Performing Loans (Net NPL) are used as an indicator of the quality of a bank's earning assets (Kasmir, 2018). An increase in NPL leads to a decline in interest income, higher loan loss provisions (Allowance for Impairment Losses/CKPN), and a reduction in public confidence in the bank. These conditions ultimately result in lower profitability and weaker financial performance (Mishkin, 2016). The Net NPL formula is:

Net NPL = (Total Non-Performing Loans − Loan Loss Provisions) / Total Loans

Empirical studies by Dewi (2017), Anindiansyah et al. (2020), and Firmansyah et al. (2023) provide evidence that NPL has a negative and significant effect on ROA. This implies that higher credit risk is associated with lower bank financial performance. Based on the theoretical argument and prior empirical evidence, it can be argued that higher credit risk, as indicated by Non-Performing Loans (NPL), reduces bank profitability. Therefore, this study proposes the following hypothesis.

H3: Credit risk (NPL) has an effect on bank financial performance (ROA) of Regional Development Banks in Indonesia.

Effect of Operational Efficiency on Financial Performance

Operational efficiency reflects a bank's ability to manage operating costs in order to generate optimal income (Subramanyam, 2014; Kasmir, 2018; Munawir, 2007). The Operating Expenses to Operating Income ratio (BOPO) is used to measure the level of

operational efficiency. A lower BOPO indicates greater efficiency in bank operations, which leads to higher profits and improved financial performance (Kasmir, 2018; Subramanyam, 2014; Anindiansyah et al., 2020). The calculation of BOPO is as follows:

BOPO = Operating Expenses / Operating Income

Empirical studies by Kinanti (2017), Anindiansyah et al. (2020), and Firmansyah et al. (2023) find that BOPO has a negative and significant effect on ROA. This evidence confirms that operational efficiency is a critical factor in maintaining bank profitability. Based on the theoretical argument and prior empirical evidence, it can be argued that greater operational efficiency, as reflected in a lower BOPO ratio, enhances bank profitability. Therefore, this study proposes the following hypothesis.

H4: Operational efficiency (BOPO) has an effect on bank financial performance (ROA) of Regional Development Banks in Indonesia.

Effect of Capital Adequacy on Operational Efficiency

Banks with higher Capital Adequacy Ratios (CAR) have greater flexibility to invest in technology, service digitalization, and the strengthening of operational infrastructure (Mishkin, 2016; Bank Indonesia, 2013). These investments help reduce operating costs and improve productivity, thereby enhancing operational efficiency, as reflected in a lower BOPO ratio. Studies by Heliani et al. (2023) and Firmansyah et al. (2023) find that CAR has a significant effect on banks' operational efficiency. Based on the theoretical argument and prior empirical evidence, it can be argued that stronger capital adequacy enables banks to operate more efficiently. Therefore, this study proposes the following hypothesis.

H5: Capital adequacy (CAR) has an effect on operational efficiency (BOPO) of Regional Development Banks in Indonesia.

Effect of Liquidity on Operational Efficiency

Optimally managed liquidity enables banks to meet their obligations without incurring excessive funding costs (Mishkin, 2016). Conversely, liquidity pressure forces banks to seek high-cost funding sources, which increases operating expenses. Therefore, liquidity plays an important role in influencing operational efficiency (Mishkin, 2016). Studies by Setyaningsih et al. (2023) and Heliani et al. (2023) show that liquidity has a significant effect on banks' operational efficiency. Based on the theoretical explanation of liquidity management and prior empirical findings, liquidity conditions are expected to influence banks' cost efficiency. Therefore, this study proposes the following hypothesis.

H6: Liquidity (LDR) has an effect on operational efficiency (BOPO) of Regional Development Banks in Indonesia.

Effect of Credit Risk on Operational Efficiency

An increase in Non-Performing Loans (NPL) leads to higher loan loss provisioning costs and additional expenses related to the management of problem loans (Berger & DeYoung, 1997; Basel Committee on Banking Supervision, 2011; Mishkin, 2016). These conditions raise the BOPO ratio and reduce banks' operational efficiency. Studies by Gladis Anindiansyah et al. (2020) and Heliani et al. (2023) indicate that credit risk has a negative effect on operational efficiency. Based on the theoretical explanation of credit risk and

prior empirical findings, higher levels of Non-Performing Loans (NPL) are expected to increase operating costs and weaken cost efficiency. Therefore, this study proposes the following hypothesis.

H7: Credit risk (NPL) has an effect on operational efficiency (BOPO) of Regional Development Banks in Indonesia.

Effect of Capital Adequacy on Financial Performance through Operational Efficiency
A higher Capital Adequacy Ratio (CAR) enhances operational efficiency through lower funding costs and improved operational quality (Basel Committee on Banking Supervision, 2011; Mishkin, 2016). This increased efficiency subsequently leads to higher bank profitability. Accordingly, operational efficiency mediates the relationship between capital adequacy and financial performance. Studies by Firmansyah et al. (2023) and Heliani et al. (2023) support the role of BOPO as a mediating variable in this relationship. Based on this theoretical and empirical evidence, this study hypothesizes that operational efficiency (BOPO) mediates the effect of CAR on bank financial performance (ROA).

H8: Operational efficiency (BOPO) mediates the effect of capital adequacy (CAR) on financial performance (ROA) of Regional Development Banks in Indonesia.

Effect of Liquidity on Financial Performance through Operational Efficiency
Healthy liquidity conditions reduce funding costs and improve operational efficiency. This efficiency subsequently contributes to higher bank profitability (Setyaningsih et al., 2023; Heliani et al., 2023; Firmanila, 2023). Accordingly, operational efficiency (BOPO) mediates the relationship between liquidity and financial performance. Studies by Setyaningsih et al. (2023) and Heliani et al. (2023) confirm the mediating role of operational efficiency in this relationship. Based on theoretical reasoning and prior empirical evidence, it can be argued that healthier liquidity improves operational efficiency, which in turn enhances bank profitability. Therefore, this study proposes the following hypothesis.

H9: Operational efficiency (BOPO) mediates the effect of liquidity (LDR) on financial performance (ROA) of Regional Development Banks in Indonesia.

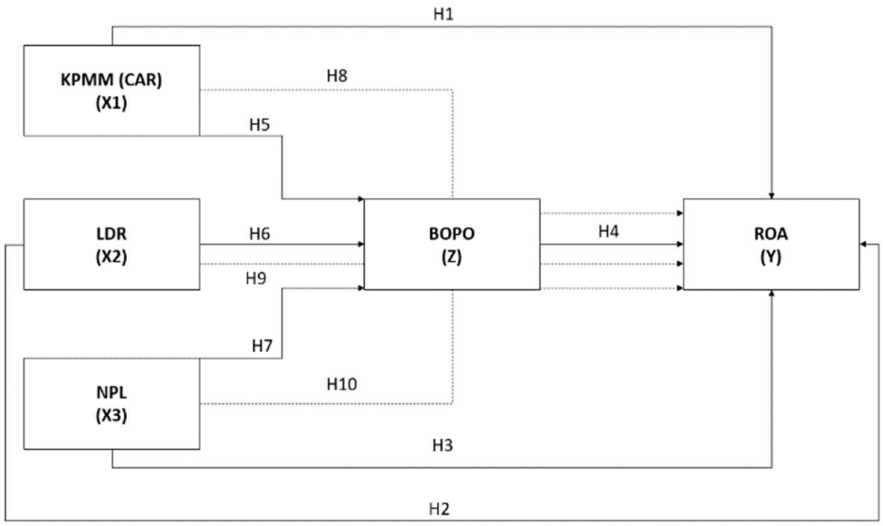
Effect of Credit Risk on Financial Performance through Operational Efficiency
An increase in Non-Performing Loans (NPL) raises operating expenses, increases the BOPO ratio, and reduces operational efficiency. This decline in efficiency subsequently suppresses bank profitability. Therefore, operational efficiency (BOPO) serves as a mediating mechanism between credit risk and financial performance. Studies by Anindiansyah et al. (2020) and Firmansyah et al. (2023) support this relationship. Based on theoretical reasoning and prior empirical evidence, it can be argued that an increase in Non-Performing Loans (NPL) raises operating expenses and reduces operational efficiency (BOPO), which in turn suppresses bank profitability. Therefore, this study proposes the following hypothesis.

H10: Operational efficiency (BOPO) mediates the effect of credit risk (NPL) on financial performance (ROA) of Regional Development Banks in Indonesia.

Research Framework

The variables in this study consist of capital adequacy proxied by the Capital Adequacy Ratio (CAR), liquidity proxied by the Loan to Deposit Ratio (LDR), and credit risk proxied by the Non-Performing Loan (NPL) ratio as independent variables. Financial performance is proxied by Return on Assets (ROA) as the dependent variable, while operational efficiency proxied by the Operating Expenses to Operating Income ratio (BOPO) serves as the intervening variable.

The research framework explains that capital adequacy, liquidity, and credit risk are expected to influence financial performance both directly and indirectly through operational efficiency. The conceptual framework is illustrated in Figure 1.



Source: Data managed by the researcher, 2026

Figure 1
Research Framework

METHOD

This study employs a quantitative research design using secondary data in the form of panel data (Sugiyono, 2013; Sarmanu, 2019). The observation period covers 2019 to 2024. The population of this study includes all Regional Development Banks (RDBs) operating in Indonesia. The sample is determined using a purposive sampling technique with the following criteria (Sugiyono, 2013; Sarmanu, 2019): (1) RDBs operating under conventional banking systems, and (2) RDBs that publish complete annual financial statements consistently during the 2019–2024 period. Based on these criteria, 24 conventional RDBs are selected as the research sample, resulting in a total of 144 panel data observations.

The data used in this study are secondary data obtained from the annual financial reports of each bank and official publications of the Financial Services Authority (Otoritas Jasa Keuangan – OJK). The variables examined include the Capital Adequacy Ratio (CAR) as a proxy for capital adequacy, the Loan to Deposit Ratio (LDR) as a proxy for liquidity, the Non-Performing Loan (NPL) ratio as a proxy for credit risk, the Operating Expenses to Operating Income ratio (BOPO) as a proxy for operational efficiency, and Return on Assets (ROA) as a proxy for financial performance. All variables are measured using financial ratios in accordance with banking regulatory provisions.

The data analysis method applied in this study is panel data regression using EViews software. The selection of the most appropriate panel regression model is conducted through the Chow test, Hausman test, and Lagrange Multiplier test to determine whether the Common Effect Model, Fixed Effect Model, or Random Effect Model is the best fit (Gujarati & Porter, 2009; Wooldridge, 2013). After identifying the optimal model, hypothesis testing is performed using the F-test to examine simultaneous effects and the t-test to examine partial effects among variables at a 5 percent significance level. The model's explanatory power is assessed using the coefficient of determination (R^2).

To examine the role of operational efficiency as an intervening variable, a two-stage regression analysis is conducted. The first stage analyzes the effects of capital adequacy, liquidity, and credit risk on operational efficiency. The second stage analyzes the effect of operational efficiency on financial performance (Hair et al., 2017). Furthermore, the mediating effect is tested using the Sobel test to determine the significance of indirect effects of independent variables on financial performance through operational efficiency (Sobel, 1982; Hayes, 2013).

RESULT AND DISCUSSION

Descriptive Statistical Analysis

The descriptive statistical analysis of this study is presented in Table 1.

Table 1
Results of Descriptive Statistics

Variable	N	Minimum	Maximum	Mean	Std. Deviation
CAR	144	0.0018	0.4572	0.2525	0.0692
LDR	144	0.0068	0.0203	0.0119	0.0020
NPL	144	0.0000	0.0451	0.0090	0.0079
BOPO	144	0.6058	16.490	0.7923	0.1432
ROA	144	-0.0380	0.1650	0.0225	0.0189

Source: data managed by the researcher, 2026

Based on Table 1, conventional Regional Development Banks (RDBs) during the 2019–2024 period generally exhibit strong capital adequacy, with an average Capital Adequacy Ratio (CAR) of 25.25 percent. This value is well above the regulatory minimum requirement, indicating that most RDBs have sufficient capital capacity to absorb potential risks.

Liquidity, proxied by the Loan-to-Deposit Ratio (LDR), has an average value of 0.0119, equivalent to 1.19 percent. This value indicates that banks' ability to provide liquid funds to support credit expansion remains limited, suggesting that the potential for credit growth has not been fully optimized. Such conditions may adversely affect bank performance, particularly in terms of profitability, if they are not accompanied by effective asset management.

Operational efficiency, measured by the BOPO ratio, has an average value of 79.23 percent. This suggests that, in general, RDBs have been able to manage operating costs relative to operating income effectively. Meanwhile, profitability, proxied by Return on Assets (ROA), has an average value of 2.25 percent, indicating that RDBs are generally capable of generating profits from their managed assets.

Overall, these descriptive statistics illustrate variations in financial performance among RDBs, influenced by differences in capital adequacy, liquidity, credit risk, and operational efficiency.

Model Selection

Before hypothesis testing, panel regression model selection was conducted to ensure that the estimation method used matched the characteristics of the data. The determination of the best model was carried out sequentially through the Chow test, Hausman test, and Lagrange Multiplier (LM) test (Baltagi, 2021). A summary of the model selection results is presented in Table 2.

Table 2
Panel Model Selection Results

Test	Significance	Conclusion	Best Model	Next Step
Chow Test	0,0000	Accept H_1	Fixed Effect Model	Hausman Test
Hausman Test	0,1653	Reject H_1	Random Effect Model	LM Test
LM Test	0,0000	Accept H_1	Random Effect Model	Hypothesis Testing

Source : Data Analyzed, 2026

The initial stage of model selection was conducted using the Chow Test to compare the Common Effect Model with the Fixed Effect Model (Baltagi, 2021). The test results showed a probability value of 0.0000, which is below the significance level of 0.05. Therefore, the alternative hypothesis was accepted, indicating that the Fixed Effect Model is more appropriate than the Common Effect Model.

Next, to determine the choice between the Fixed Effect Model and the Random Effect Model, the Hausman Test was performed (Baltagi, 2021). The results showed a significance value of 0.1653, which is greater than 0.05. This condition led to the rejection of the alternative hypothesis, implying that the Random Effect Model is more suitable than the Fixed Effect Model.

Since the Chow Test and Hausman Test produced different model preferences, a further test using the Lagrange Multiplier (LM) Test was required (Baltagi, 2021). This test aimed to select the most appropriate model between the Common Effect Model and the Random Effect Model (Baltagi, 2021; Wooldridge, 2015). The LM Test results showed a probability value of 0.0000, which is less than 0.05. Therefore, the alternative hypothesis was accepted, indicating that the Random Effect Model is superior to the Common Effect Model.

Based on the overall testing stages, it can be concluded that the Random Effect Model is the most appropriate panel data regression approach for this study. This model is subsequently applied in hypothesis testing for each structural equation in the research.

Results of Hypothesis Testing

The results of hypothesis testing for Sub-Structure I, examining the effect of capital adequacy, liquidity, and credit risk on financial performance, are presented in Table 3.

Table 3
Results of Structural Equation I Testing

Variable	Coef.	t Value	t Table	Sign	Conclusion		Notes
					H0	H1-H3	
CAR	-0.0202	-0.8729	1.977	0.384	Accepted	Rejected	Not Significant
LDR	0.6963	0.7773	1.977	0.438	Accepted	Rejected	Not Significant
NPL	-0.5436	-25.595	1.977	0.011	Rejected	Accepted	Significant

Source : Data Analyzed, 2026

Based on the t-test results, the CAR variable has a significance value of 0.3842 (> 0.05) and a calculated t-value (-0.8729) smaller than the t-table value (1.97705), indicating that CAR does not have a significant effect on the dependent variable. Therefore, Hypothesis H1, which states that CAR has a positive and significant effect, is rejected.

The LDR variable shows a significance value of 0.4383 (> 0.05) with a calculated t-value (0.7773) smaller than the t-table value (1.97705), indicating that LDR does not have a significant effect on the dependent variable. Thus, Hypothesis H2 is rejected.

Meanwhile, the NPL variable has a significance value of 0.0115 (< 0.05) and a calculated t-value (-2.5595) greater than the t-table value (1.97705), indicating that NPL has a significant effect on the dependent variable. The negative regression coefficient shows that NPL has a negative effect on the dependent variable. Therefore, Hypothesis H3 is accepted.

The results of hypothesis testing for Sub-Structure I, examining the effect of capital adequacy, liquidity, and credit risk on operational efficiency, are presented in Table 4.

Table 4
Results of Structural Equation II Testing

Variable	Coef.	t Value	t Table	Sign	Conclusion		Notes
					H0	H1,H2,H3- Z	
CAR	0.0503	0.4429	1.977	0.658	Accepted	Rejected	Not Significance
LDR	-24.745	-0.5407	1.977	0.589	Accepted	Rejected	Not Significance
NPL	71.867	67.163	1.977	0.000	Rejected	Accepted	Significance

Source : Data Analyzed, 2026

The test results indicate that the Capital Adequacy Ratio (CAR) does not have a significant effect on BOPO (Z); therefore, hypothesis H1 is rejected. This finding suggests that the level of bank capital adequacy does not directly influence operational efficiency as proxied by BOPO. In contrast, the Loan-to-Deposit Ratio (LDR) has a negative but statistically insignificant effect on BOPO (Z), leading to the rejection of hypothesis H2. This result indicates that a higher level of funds mobilized relative to credit disbursement is associated with higher operating expenses borne by banks, thereby increasing the BOPO ratio.

Meanwhile, the Non-Performing Loan (NPL) ratio has a significant effect on BOPO (Z), and thus hypothesis H3 is accepted. This finding implies that the level of problem loans has a direct impact on banks' operational efficiency during the study period.

Intervening Test

The intervening test was conducted using the Sobel test to examine the role of operational efficiency as a mediating variable in the relationship between capital adequacy, liquidity, and credit risk on financial performance (Sobel, 1982). The test results indicate the magnitude of the indirect effect of each independent variable through operational efficiency on financial performance, as presented in Table 5 the following analysis results:

Table 5
Results of the Sobel Test

Variable X	Variable Z	t Count
CAR	BOPO	0,8665
LDR	BOPO	0.7711
NPL	BOPO	23.621

Source : Data Analyzed, 2026

The research results indicate that BOPO is not able to mediate the effect of CAR on ROA. This is evidenced by the calculated t-value being smaller than the t-table value, indicating that the indirect effect of CAR on ROA through BOPO is not significant. Therefore, the hypothesis stating that BOPO mediates the effect of CAR on ROA is rejected. Furthermore, BOPO is also unable to mediate the effect of LDR on ROA. This is shown by the calculated t-value being smaller than the t-table value, indicating that the indirect effect of LDR on ROA through BOPO is not significant. Thus, the mediation hypothesis of LDR on ROA through BOPO is rejected.

Meanwhile, BOPO is able to mediate the effect of NPL on ROA. This is proven by the calculated t-value being greater than the t-table value, indicating that the indirect effect of NPL on ROA through BOPO is significant. Therefore, the hypothesis stating that BOPO mediates the effect of NPL on ROA is accepted.

Discussion

Based on the testing of independent variables (CAR, LDR, and NPL) on the dependent variable of Company Performance (ROA), with BOPO serving as an intervening variable, the research findings are presented as follows.

Table 6
Research Findings

No.	Variable Relationship	Hyp	Theory	Result
1	Capital Adequacy → Performance	H1	Positive	Positive (Not Significant)
2	Liquidity → Performance	H2	Positive	Positive (Not Significant)
3	Credit Risk → Performance	H3	Negative	Negative (Significant)
4	Operational Efficiency → Performance	H4	Negative	Negative (Significant)
5	Capital Adequacy → Efficiency	H5	Positive	Positive (Not Significant)
6	Liquidity → Efficiency	H6	Positive	Negatif (Not Significant)
7	Credit Risk → Efficiency	H7	Positive	Positive (Significant)
8	Capital Adequacy → Efficiency → Performance	H8	Positive	Negative
9	Liquidity → Efficiency → Performance	H9	Positive	Negative
10	Credit Risk → Efficiency → Performance	H10	Positive	Positive (Significant)

Source : Data Analyzed, 2026

Based on the results presented in Table 5, each variable exhibits a distinct pattern of influence on bank performance as proxied by Return on Assets (ROA). Capital adequacy, proxied by the Capital Adequacy Ratio (CAR), is found to have a positive but statistically insignificant effect on bank performance. This finding indicates that increases in capital adequacy have not directly contributed to higher profitability in Regional Development Banks (BPDs). Conceptually, CAR primarily functions as a risk buffer to maintain banks' resilience against potential losses. However, a substantial portion of bank capital is allocated to meeting regulatory prudential requirements rather than being utilized for profit-generating business expansion. Consequently, although the direction of CAR's effect on ROA is positive, its role in enhancing financial performance is not statistically strong. This result is consistent with the findings of Dewi et al. (2017) and Hidayati et al. (2023), who also report that CAR does not significantly affect bank profitability.

Liquidity, proxied by the inverse of the Loan-to-Deposit Ratio (1/LDR), shows a negative but insignificant effect on bank performance as measured by ROA. This result suggests that higher liquidity availability does not necessarily translate into increased profitability. It implies that improvements in financial performance depend not only on the level of liquidity but also on the effectiveness of fund utilization, particularly in productive and high-quality credit distribution. This finding is in line with the studies of Dewi et al. (2017) and Setyaningsih et al. (2023).

In contrast to the previous variables, credit risk, proxied by the Non-Performing Loan (NPL) ratio, has a negative and significant effect on bank performance. This indicates that an increase in problem loans significantly suppresses the profitability of BPDs. Theoretically, higher NPL levels reduce interest income while increasing loan loss provisions, thereby lowering bank profits. This finding underscores the importance of credit quality as a key determinant of banking stability and financial performance. The result is consistent with the findings of Dewi et al. (2017), Anindiansyah et al. (2020), and Hidayati et al. (2023).

Operational efficiency, proxied by the Operating Expenses to Operating Income ratio (BOPO), has a negative and significant effect on bank performance. This implies that higher BOPO ratios are associated with lower profitability. The result highlights the critical role of cost control in improving ROA. Banks that are able to manage operating expenses efficiently tend to achieve higher profits and stronger competitiveness. This finding aligns with prior studies by Dewi et al. (2017), Pratama et al. (2023), and Firmanila (2023).

In addition to the direct effects on ROA, this study also examines the relationships between the independent variables and operational efficiency. The estimation results show that CAR has a positive but insignificant effect on BOPO, indicating that capital adequacy serves more as a stabilizing buffer rather than as a driver of operational cost efficiency. Thus, banks with higher CAR levels are not necessarily more efficient in managing operating expenses.

Similarly, liquidity, proxied by the Loan-to-Deposit Ratio (LDR), does not have a significant effect on operational efficiency as measured by BOPO. This suggests that a bank's ability to maintain sufficient liquid funds to meet short-term obligations does not directly influence the magnitude of its operating costs.

In contrast, credit risk, proxied by the Non-Performing Loan (NPL) ratio, has a negative and significant effect on BOPO. An increase in problem loans leads to additional costs related to loan collection, credit restructuring, and the establishment of loan loss provisions, thereby increasing the BOPO ratio. This finding reinforces the notion that

credit risk management is crucial not only for profitability but also for maintaining operational efficiency.

Furthermore, the mediation test results indicate that operational efficiency does not mediate the effects of CAR and LDR on ROA. In other words, capital adequacy and liquidity do not influence bank performance through the operational efficiency channel. However, a different result is observed for credit risk, where BOPO is found to mediate the effect of NPL on ROA. This finding indicates that increased credit risk reduces profitability not only directly but also indirectly through higher operating costs, which ultimately weaken bank performance.

Overall, the results of this study suggest that the dominant factors determining the performance of Regional Development Banks are credit quality and the banks' ability to control operating costs. Meanwhile, capital adequacy and liquidity play more prominent roles in maintaining bank stability rather than serving as primary drivers of profitability. These findings strengthen empirical evidence that enhancing credit risk management and improving operational efficiency are key strategies for improving the financial performance of Regional Development Banks.

CONCLUSION AND SUGGESTION

Based on the results of the analysis and discussion presented in this study, it can be concluded that capital adequacy, liquidity, credit risk, and operational efficiency have different roles in influencing the financial performance of Regional Development Banks (BPD). Credit risk and operational efficiency are proven to have a significant effect on financial performance, while capital adequacy and liquidity do not show a significant influence. In addition, operational efficiency is able to mediate the effect of credit risk on financial performance, but it does not mediate the effects of capital adequacy and liquidity. These findings indicate that improvements in BPD financial performance are largely determined by the bank's ability to control non-performing loans and suppress operational costs rather than merely by the level of capital and liquidity.

The implications of these findings emphasize the importance of strengthening credit risk management and improving operational efficiency in maintaining the stability and profitability of Regional Development Banks. Bank management needs to prioritize the control of non-performing loans and the effective management of operational costs to enhance financial performance. On the other hand, regulators and local governments as shareholders are expected to continue encouraging the implementation of robust risk management and policies that support efficiency improvement and digital transformation to increase the competitiveness of BPDs.

The limitation of this study lies in the use of CAR, LDR, NPL, and BOPO as variables influencing financial performance. Therefore, future research is recommended to include additional variables such as Net Interest Margin, Third-Party Funds, bank size, and macroeconomic variables, as well as to extend the observation period in order to obtain more comprehensive results.

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