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The Effects of LAR, LDR, NPL, CAR, and MRR on the Profitability of Banks Listed on the IDX with Bopo as a Control Variable

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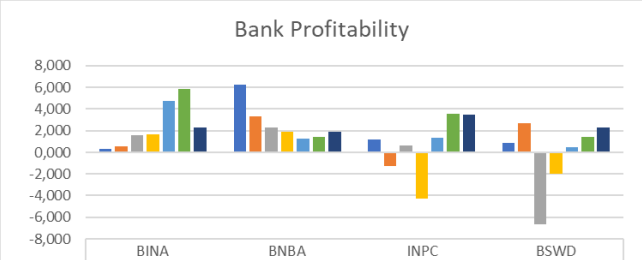
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Abstract: This study uses BOPO as a control variable to examine how the profitability of conventional banks listed on the Indonesia Stock Exchange (IDX) is affected by the Loan-to-Asset Ratio (LAR), Loan-to-Deposit Ratio (LDR), Non-Performing Loans (NPL), Capital Adequacy Ratio (CAR), and Minimum Reserve Requirement. Using data from bank annual reports for 2018–2024 and a purposive sampling technique, profitability is determined by return on equity (ROE). Multiple linear regression was used in the analysis. The findings of statistical tests show that the independent factors greatly impact profitability simultaneously. In part, LDR has a positive impact, NPL and the Minimum Reserve Requirement have no effect, while LAR and CAR have a negative impact. The Adjusted R^2 value sees the independent factors' contribution to profitability of 39.7%.

Keywords: Loan to Asset Ratio, Loan to Deposit Ratio, Non Performing Loan, Capital Adequacy Ratio, Minimum Reserve Requirement, Profitability, BOPO.

INTRODUCTION

The banking industry is crucial in driving economic growth through its financial intermediation function, channeling funds from surplus to deficit sectors. This fund distribution can be effective if banks have adequate resources, including assets, third-party funds, and revenue. Revenue that can increase profit margins is a primary goal for banks, enabling them to achieve sustainable profitability. This profitability enables banks to maintain operational continuity, strengthen capital, increase trust from external and internal parties, and better manage financial risks. Positive profitability also facilitates bank expansion and innovation in banking products and services. The following is profitability data from several banks used as a sample.



	BINA	BNBA	INPC	BSWD
2018	0,327	6,215	1,169	0,874
2019	0,583	3,358	-1,286	2,661
2020	1,592	2,305	0,600	-6,673
2021	1,675	1,904	-4,251	-2,008
2022	4,776	1,266	1,373	0,498
2023	5,846	1,421	3,518	1,445
2024	2,265	1,928	3,513	2,278

Figure 1. Bank Profitability Graph
Source: Processed data

Figure 1 shows differences in profitability between several banks in the sample, with different change trends between banks. BINA experienced a continuous increase in profitability from 2019 to 2023, then decreased drastically in 2024. The pattern of changes in BINA's profitability is the opposite of that of BNBA; BNBA consistently experienced a decline from 2019 to 2022, then increased again in 2023 and 2024. INPC 2019 decreased from 1.169 in 2018 to -1.286 in 2019, then increased again in 2020. In 2021, INPC experienced a significant loss, which caused a fairly extreme decline in profitability in that year. However, INPC managed to increase profitability in 2022, continued to do so in 2023, and experienced a slight decline in 2024. Changes in profitability at BSWD were quite fluctuating, where in 2019 there was a fairly good increase, namely from 0.874 to 2.661, then decreased drastically in 2020 to -6.673 and increased slightly in 2021, namely -2,008. This increase will continue until 2024.

Profitability is crucial in assessing a bank's financial performance, as it reflects its ability to utilize assets to generate profits (Putri et al., 2023). High profitability indicates effective resource management, while low profitability may indicate problems in bank management. Banks will more easily finance operations and undertake business expansion by maintaining stable profitability. As a result, banks must monitor the Loan-to-Asset Ratio (LAR), Loan-to-Deposit Ratio (LDR), Non-Performing Loans (NPL), Capital Adequacy Ratio (CAR), and Minimum Reserve Requirement (MRR) as they can all have an impact on profitability.

LAR reflects the extent of a bank's assets allocated to credit. A LAR that is too high or too low can negatively impact profitability. A low LAR indicates that the bank is not optimally utilizing its assets for lending, resulting in unproductive assets. Therefore, banks must establish appropriate policies to convert assets into productive assets to increase profitability. Similarly, LDR also influences fluctuations in profitability. Banks can profit from interest if third-party funds can be allocated to productive loans. However, an excessively high LDR without proper management can increase the risk of non-performing loans (NPLs). High NPLs lead to decreased interest income and increased costs for handling non-performing loans, ultimately reducing profitability. Banks must maintain an adequate capital adequacy ratio (CAR) to mitigate this risk. The higher the CAR, the greater the bank's financial reserves to absorb potential losses from non-performing loans, helping maintain stable profitability.

The minimum reserve requirement also influences profitability. The MRR reflects a bank's compliance with Bank Indonesia regulations. This compliance sends a positive signal to customers, increasing trust and the fundraising potential. However, excessive allocation of funds to the central bank's minimum reserve requirement can reduce productive funds, negatively impacting profitability.

Furthermore, this study uses the Operating Costs to Operating Income (BOPO) ratio as a control variable. This aims to reduce potential bias in the analysis and ensure that the influence on profitability stems from the independent variables studied.

Empirical studies have shown that the Loan-to-Asset Ratio positively impacts bank profitability (Khalaf & Awad, 2024; Nguyen, 2024; Suputra, 2021). However, Hastasari & Suharini (2024) and Mijoč et al. (2025) argue that LAR negatively correlates with profitability. Meanwhile, Budiharjo & Supriatiningsih (2021) and Istaiteyeh et al. (2024) show that LAR does not affect profitability.

Astuti et al. (2023), Cahyani et al. (2024), Hastasari & Suharini (2024), Maulana et al. (2021);0, Mustafa & Sulistyowati (2022), Siagian et al. (2021), and Sunaryo et al. (2021) argue that the Loan-to-Deposit Ratio does not impact bank profitability. This study contradicts research conducted by Hasmiana et al. (2022), Bortoluzzo et al. (2024), Meliza et al. (2024), and Haris et al. (2024) which showed a positive impact on profitability for LDR. Meanwhile, , Ross et al. (2021) and Putra (2020) found a negative impact on profitability for LDR. Non-Performing Loans positively impact profitability (Madugu et al., 2020). Other researchers have proven that NPLs do not impact profitability (Anh & Huong, 2024; Sayari, 2024; Sunaryo et al., 2021). Budiharjo & Supriatiningsih (2021), Suputra (2021), Lilhidayah & Kurniasari (2022), Nguyen (2024), Jalloh (2024), Horobet et al. (2021), Al-Sharkas & Al-Sharkas (2022), Khalaf & Awad (2024), Cahyani et al. (2024), Jigeer & Koroleva (2023), Mustafa & Sulistyowati (2022), Hasmiana et al., (2022) and Maulana et al. (2021) argue that NPLs negatively impact on profitability.

Research on the effect of the Capital Adequacy Ratio on profitability has been conducted frequently, with varying results. Nguyen (2024), Aviana & Pratama (2023), La Difa et al. (2022), Hasmiana et al. (2022), Jalloh (2024), Khalaf & Awad (2024), Jigeer & Koroleva (2023), dan Putra (2020) explain that CAR has a positive impact on profitability. Meanwhile, Lufianda & Syafri (2023), Bortoluzzo et al. (2024), Al-Sharkas & Al-Sharkas (2022), Madugu et al. (2020), and Meliza et al. (2024) explain that CAR has a negative impact on bank profitability. Other studies have shown that CAR has no impact on profitability (Amalia & Diana, 2022; Anggraeni & Siahaan, 2021; Astuti, 2022; Maulana et al., 2021; Mustafa & Sulistyowati, 2022; Suputra, 2021).

The minimum reserve requirement positively impacts bank profitability (Aviana & Pratama, 2023; Elvira et al., 2020; Hasibuan et al., 2023; Lilhidayah & Kurniasari, 2022). These research findings differ from those of Anggraeni & Siahaan (2021), Kornitasari et al. (2023), Ross et al. (2021) and Pratiwi (2020) which found that the minimum reserve requirement had no impact on profitability. However, Mia et al. (2023) and Hoque et al. (2020) argued that the minimum reserve requirement negatively impacted bank profitability.

Meliza et al. (2024) previously researched liquidity's effect on profitability. In that study, liquidity was measured only in its measurement; LDR and CAR act as moderating variables. This prompted the authors to re-examine the effect of bank liquidity on profitability by adding LAR as a measure of liquidity and CAR as an independent variable. Furthermore, profitability is an important indicator in assessing a bank's financial performance, reflecting the effectiveness of using assets and liabilities in generating profits. Factors such as LAR, LDR, NPL, CAR, and Minimum Reserve Requirement are believed to influence profitability. However, previous research results have shown inconsistencies. For example, the effect of LAR on profitability was stated as positive by Nguyen (2024) but negative by Mijoč et al. (2025).

Meanwhile, Istaiteyeh et al. (2024) stated that LAR did not affect profitability. Therefore, this study is important to re-examine the influence of these five variables on the profitability of banks listed on the IDX, using the latest data from 2020 to 2024 and a quantitative approach.

Thus, from the results of this study, banks can determine which variables most influence profitability to minimize the risk of declining profitability and maximize profits.

METHODS

This study uses quantitative research methods, using banks listed on the Indonesia Stock Exchange (IDX) in 2024 as the research object. This study measures the impact of the Loan to Asset Ratio (X1), Loan to Deposit Ratio (X2), Non-Performing Loan (X3), Capital Adequacy Ratio (X4), and Minimum Reserve Requirement (X5) on Profitability (Y) with BOPO as a control variable. LAR is measured by comparing total credit to total assets (Brigham & Houston, 2010). LDR is measured by comparing total credit to third-party funds (Taswan, 2019). NPL is measured by dividing total non-performing loans by total disbursed loans, multiplying by 100% (Taswan, 2019). CAR is measured by comparing bank capital to risk-weighted assets (Brigham & Houston, 2010). Minimum reserve requirement is a policy that requires banks to keep a portion of their third-party funds in the form of balances at the central bank. ROE formulates profitability. ROE is measured using the formula net profit divided by total equity (Hery, 2016). This study uses BOPO as a control variable in a multiple regression model. This aims to control for the effect of operational efficiency on profitability, allowing for a more objective analysis of variables such as the Loan-to-Asset Ratio, Loan-to-Deposit Ratio, Non-Performing Loans, Capital Adequacy Ratio, and Minimum Reserve Requirement.

Over seven years, 47 banks comprised the study population, yielding a sample of 329. Purposive sampling was employed as the sample selection method, and the criteria were conventional banks that published financial reports from 2018 to 2024 and were listed on the Indonesia Stock Exchange (IDX) in 2025. Of these, 41 banks remained after six Islamic institutions were disqualified for concentrating only on conventional banking. Sixteen banks were left after these 41 banks were further vetted using the Commercial Bank Business Group (BUKU) 1 classification. Five banks out of these sixteen were further omitted and classified as digital. As a result, 11 banks were used in this investigation. Consequently, 77 people across 7 years made up the entire sample size.

The average (mean), lowest, maximum, and standard deviation values were examined in this study to utilize descriptive analysis to describe each variable. The average (mean), lowest, maximum, and standard deviation values were examined in this study to utilize descriptive analysis to describe each variable. This study will conduct a classical assumption test before conducting multiple linear regression. The author will perform data transformation if problems occur with the classical assumption test. According to Gujarati & Porter (2015), data transformation, such as logarithm (ln), square root, or inverse, is recommended if the data does not meet traditional assumptions such as normality or homoscedasticity. Data transformation can improve the regression model if the data is abnormal or deviates from conventional assumptions. The following is the regression equation for this study. The following is the study's regression equation.

$$\mathbf{Y = a + b1X1 + b2X2 + b3X3 + b4X4 + b5X5 + b6Control+e}$$

The simultaneous effect is determined by examining the results of the F-test. If the significance value in the ANOVA table is <0.05, the independent variables are declared to impact the dependent variable simultaneously. Meanwhile, partial testing is conducted based on the T-test. The independent variable is declared to impact the dependent variable if the significance value is <0.05.

RESULTS AND DISCUSSION

Descriptive Analysis

Table 1. Descriptive Analysis

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
LAR (X1)	77	,104	,710	,49687	,123719
LDR (X2)	77	,124	1,468	,71822	,235112
NPL (X3)	77	,007	,223	,03951	,032194
CAR (X4)	77	,090	1,274	,36466	,243508
MRR (X5)	77	,031	,252	,08377	,043337
BOPO (Control)	77	,517	1,649	,94408	,193292
Profitability (Y)	77	-,250	,121	,00842	,071878
Valid N (listwise)	77				

Source: Data processed using statistical test tools

The descriptive analysis table above provides information that the total sample (N) used in this study was 77, with five independent variables (LAR, LDR, NPL, CAR, and Minimum Reserve Requirement), one control variable (BOPO), and one dependent variable (Profitability). LAR (Loan to Asset Ratio - X1) has a Minimum value of 0.104, Maximum: 0.710, Average (Mean): 0.49687, and Standard Deviation: 0.123719. LDR (Loan to Deposit Ratio - X2) Minimum value of 0.124, Maximum, 1.468, Average: 0.71822, and Standard Deviation 0.235112. NPL (Non Performing Loan - X3) Minimum value 0.007, Maximum 0.223, Average: 0.03951, Standard Deviation: 0.032194. CAR (Capital Adequacy Ratio - X4) Minimum 0.090, Maximum 1.274, Average 0.36466, Standard Deviation 0.243508. Minimum Reserve Requirement (X5), Minimum 0.031, Maximum 0.252, Average: 0.08377, and Standard Deviation: 0.043337. Operating Expenses to Operating Income (Control variable) Minimum value: 0.517, Maximum: 1.649, Average: 0.94408, and Standard Deviation: 0.193292. Profitability (Y), Minimum: -0.250, Maximum: 0.121.

Classical Assumption Test

Based on the classical assumption test that has been carried out, it shows that the normality test based on the One-Sample Kolmogorov-Smirnov Test table shows a sig value of 0.200> 0.05, meaning that the research data is normally distributed, the heteroscedasticity test also shows that the regression model shows a constant variance, meaning that the regression model has residuals that are free from heteroscedasticity, which is indicated by the presence of points that spread on the scatterplot graph. The multicollinearity test shows that all variables used have a tolerance value of more than 0.10 and a VIF value of <10. At the same time, the autocorrelation test by comparing the Durbin-Watson value in the statistical test with the DW table shows that the research variables are in an autocorrelation-free area, where the DU DL calculation shows that DU <DW <4–DU is 1.7407 <1.816 <2.2593.

Hypotesis Test

Simultaneous Test

Table 2. Simultaneous Test

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	,170	6	,028	9,344	,000[b]
	Residual	,212	70	,003		
	Total	,382	76			
a. Dependent Variable: Profitability_Y						
b. Predictors: (Constant), BOPO_Control, LDR_X2, CAR_X4, MRR_X5, NPL_X3, LAR_X1						

Source: Data processed using statistical test tools

The Effect of LAR, LDR, NPL, CAR, and MRR on Profitability with BOPO as a Control Variable

The results of the simultaneous F-test indicate that the independent variables (LAR, LDR, NPL, CAR, and Minimum Reserve Requirement) significantly influence bank profitability, with the BOPO as the control variable. This confirms that a bank's ability to manage assets effectively and third-party funds is crucial in increasing profitability. Compliance with the minimum reserve requirement regulations also strengthens customer trust, which ultimately positively impacts the bank's financial performance.This simultaneous effect demonstrates the bank's success in carrying out its intermediary function between surplus and deficit parties (Gurley & Shaw, 1956). BOPO, as a control variable, reflects operational efficiency, where a high ratio indicates wasteful costs and potentially lower profits. By including BOPO, the analysis becomes more objective because it considers cost efficiency. In addition to aligning with intermediation theory, these results are also supported by agency theory (Ross, 1973), which emphasizes the importance of management professionalism in managing risk, complying with regulations, and carrying out the intermediary function responsibly to maintain customer and investor trust.

Partialy Test

Table 3. Partialy Test

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	,284	,096		2,957	,004
	LAR_X1	-,412	,152	-,712	-2,709	,008
	LDR_X2	,100	,049	,542	2,047	,044
	NPL_X3	,016	,273	,007	,058	,954
	CAR_X4	-,082	,017	-,688	-4,820	,000
	MRR_X5	-,015	,124	-,013	-,124	,902
	BOPO_Control	-,902	,135	-,776	-6,690	,000
a. Dependent Variable: Profitabilitas_Y						

Source: Data processed using statistical test tools

The Effect of LAR on Profitability with BOPO as a control variable

The Loan-to-Asset Ratio (LAR) has a significant negative effect on profitability, as indicated by a significance value of 0.008 < 0.05 and a coefficient of -0.412. This result implies that when a bank allocates too large a proportion of its assets to loans, it may face increased credit risk, especially if the lending is not accompanied by proper risk assessment. High LAR values suggest aggressive credit expansion, which, if not matched by creditworthiness of borrowers, can result in a surge of non-performing loans (NPLs), thereby reducing net income. From the perspective of intermediation theory, this imbalance indicates inefficiency in performing the bank’s core function of allocating funds productively. Instead of improving profitability, overexposure to credit can jeopardize the quality of assets. From the agency theory perspective, this may reflect poor decision-making by management (agents) who prioritize loan volume over loan quality, thus failing to align with the interests of shareholders (principals). This supports the findings of Mijoč et al. (2025) and Hastasari & Suharini (2024) who also observed a negative relationship between LAR and profitability. Hence, optimal asset allocation is essential to balance between risk and return in enhancing bank performance.

The Effect of LDR on Profitability with BOPO as a Control Variable

The results of statistical tests show that the Loan to Deposit Ratio (LDR) has a positive effect on profitability with a significance of 0.044 < 0.05 and a coefficient of 0.100, as reflected in the positive regression coefficient. This indicates that utilizing third-party funds for lending can increase interest income and strengthen a bank's financial performance. The allocation of third-party funds (TPF) as credit reflects management's effectiveness in managing funding sources into productive assets.

However, LDR is not the only factor influencing profitability. This is where the role of BOPO as a control variable becomes crucial. By including BOPO in the regression model, it can be ensured that the increase in profitability truly stems from effective lending, not solely from operational efficiency. This study confirms previous findings by Hasmiana et al. (2022), Bortoluzzo et al. (2024), Meliza et al. (2024), and Haris et al. (2024) which stated that LDR has a positive relationship with profitability. The high LDR, which has a positive impact, indicates the success of the bank in carrying out its intermediary function and the role of management as an agent capable of acting in the principal's interests, namely, maximizing profitability through efficient and responsible fund management.

The Effect of Non-Performing Loans (NPLs) on Profitability with BOPO as a Control Variable

According to the study's findings, non-performing loans (NPL) do not significantly affect profitability, as shown by the significance value of 0.954, greater than 0.05, reflected in low BOPO, can mitigate the negative impact of non-performing loans. Although NPLs typically reduce profitability, banks that effectively manage operating costs can maintain profits by optimizing operating income. This efficiency reflects management's ability to allocate resources appropriately, reduce costs, and maintain profit margins. This finding aligns with research by Anh & Huong (2024), Sayari (2024), and Sunaryo et al. (2021) which states that NPLs do not always impact profitability. From an agency theory perspective, operational efficiency demonstrates management's accountability and alignment with the interests of shareholders. Meanwhile, according to intermediation theory, high NPLs reflect a failure to channel credit productively, but can be offset by cost efficiency to maintain optimal intermediation functions.

The Effect of Capital Adequacy Ratio (CAR) negatively impacts profitability with BOPO as a Control Variable

The Capital Adequacy Ratio (CAR) was found to have a significant negative effect on profitability, with a significance level of 0.000 < 0.05 and a coefficient of -0.082. This finding suggests that although capital adequacy is critical for bank stability, excessively high capital buffers may constrain a bank’s ability to utilize funds in more profitable lending or investment activities. High CAR may imply that a large portion of capital is retained for safety rather than being deployed for revenue-generating operations. From the intermediation theory viewpoint, an overly cautious capital stance can hinder the bank’s ability to act as an effective financial intermediary. Capital that remains idle fails to contribute to earnings, reducing overall profitability. Meanwhile, in agency theory, conservative capital management may signal risk aversion by managers that limits returns for shareholders, especially if the risk level of assets is already being well-managed. These findings are consistent with prior research by Lufianda & Syafri (2023), Bortoluzzo et al. (2024), and Meliza et al. (2024), which observed a similar negative relationship. Banks must therefore seek an optimal capital structure that balances regulatory compliance with strategic capital utilization for profit maximization.

The Effect of Minimum Reserve Requirement (MRR) on Profitability with BOPO as a Control Variable

Profitability was not significantly impacted by the Reserve Requirement (MRR), which had a value of 0.902, higher than 0.05. This suggests that money kept at Bank Indonesia as required reserves has no bearing on the bank's capacity to turn a profit. As non-earning and non-productive assets, fluctuations in MRR do not directly affect revenue or operating expenses. Even when BOPO is introduced as a control variable, the insignificance of MRR remains, confirming that its impact is independent of operational efficiency. This finding is consistent with prior studies by Anggraeni & Siahaan (2021), Kornitasari et al. (2023), Ross et al. (2021) and Pratiwi (2020), which also concluded that MRR does not affect profitability. MRR functions as a regulatory compliance tool rather than a financial strategy and serves primarily to maintain banking system liquidity (Hasibuan et al., 2023). From the perspective of intermediation theory, MRR does not support the bank's core role of channeling funds from surplus to deficit units, as the reserves are not available for lending or investment. Its passive nature explains the lack of influence on profitability. From the standpoint of agency theory, MRR represents a regulatory obligation beyond managerial discretion. Since it cannot be strategically allocated, it does not create a potential conflict of interest between management (agents) and shareholders (principals). Consequently, MRR has no bearing on agency relationships or profit maximization.

Adjusted R^2 Determination Test

Using BOPO as a control variable, the adjusted R^2 determination test is designed to quantify the impact of the LAR, LDR, NPL, CAR, and MRR variables on profitability. With an adjusted R^2 value of 0.397, or 39.7%, according to the test results, the independent variables used in the study were only able to drive changes in profitability by 39.7%, with other variables not included in this study, such as NIM, capital structure, etc., influencing the remaining 60.3%.

CONCLUSION

This study examines the effect of LAR, LDR, NPL, CAR, and Minimum Reserve Requirement (MRR) on profitability, with BOPO as a control variable for conventional BUKU 1 banks listed on the Indonesia Stock Exchange in 2024. Even after controlling for BOPO, the results of the simultaneous test (F-test) show that all independent factors taken together significantly affect profitability. This means that asset utilization, third-party fund distribution, credit quality, capital adequacy, and compliance with monetary policy contribute to increased profits, regardless of operational efficiency.

Partially, LAR negatively impacts profitability because excessive asset allocation to credit can reduce productive investment opportunities. LDR positively impacts, indicating that using third-party funds can increase revenue. Meanwhile, NPL and Minimum Reserve Requirement (MRR) do not significantly impact profitability. NPL becomes ineffective when banks can maintain operational efficiency. CAR exhibits a negative effect, indicating that excess capital can hinder asset productivity. These results indicate that the impact of the independent variables on profitability is not due to efficiency (BOPO), but rather to the characteristics of each variable.

This study has limitations, namely, it only covered conventional BUKU 1 banks, without considering Islamic banks or banks from other classifications, and did not include moderating or mediating variables. Therefore, further studies are recommended to cover a wider range of banks and use a more complex modeling approach for more comprehensive results. In terms of managerial implications, BUKU 1 banks need to: first Control LAR to prevent assets from being concentrated in less productive loans. Second, Optimize LDR (Loan to Deposit Ratio) to increase profitability through the utilization of third-party funds. Third Maintain operational

efficiency (BOPO) to minimize the impact of NPLs. Fourth Manage CAR proportionally to prevent capital from hindering credit expansion. Fifth Maintain compliance with minimum reserve requirements, even though they do not directly impact profitability.

Banks must balance credit expansion, cost efficiency, and regulatory compliance. Strengthening governance, risk management, and cost efficiency is key to maintaining long-term profitability. These results also confirm that operational efficiency (BOPO) plays a crucial role in maintaining profit stability, so controlling operating expenses should be a focus of managerial strategy.

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