

Determinants of Return on Equity in Regional Banks: An Empirical Study from the Special Region of Yogyakarta

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ABSTRACT

This study aims to examine the influence of BOPO (Operational Expenses to Operational Income), NIM (Net Interest Margin), LDR (Loan to Deposit Ratio), GWM (Statutory Reserves), and KPMM (Capital Adequacy Ratio) on ROE (Return on Equity) at the Regional Development Bank of the Special Region of Yogyakarta. The research utilizes quarterly data obtained from the Financial Services Authority (OJK) spanning from March 2017 to December 2024. A multiple linear regression approach is employed to analyze the relationship among the variables. The results indicate that BOPO, GWM, and KPMM have a statistically significant negative effect on ROE. In contrast, NIM exerts a significant positive effect on ROE, while LDR shows no significant influence. Based on these findings, bank managers are advised to implement strategic policies aimed at improving efficiency by reducing operational costs (BOPO), optimizing reserve fund allocations (GWM), and maintaining a balanced capital structure (KPMM). Additionally, increasing NIM through better interest rate management can enhance profitability. Monitoring and controlling these financial ratios effectively will support sustainable financial performance and maximize shareholder value.

Keywords: BPD Yogyakarta, ROE, BOPO, GWM, KPMM

1. INTRODUCTION

In the rapidly evolving landscape of the global financial system, the performance of banking institutions plays a pivotal role in supporting economic development, particularly in emerging economies like Indonesia (Jameaba, 2022). Regional Development Banks (Bank Pembangunan Daerah or BPD) are instrumental in driving local economic growth, channelling financial resources to strategic sectors, and serving communities that may be underrepresented by national or multinational banks. Among these institutions, the Regional Development Bank of the Special Region of Yogyakarta (BPD DIY) stands out for its strategic role in supporting regional development goals. Thus, understanding the financial performance of BPD DIY is crucial for both academic inquiry and practical policymaking.

Return on Equity (ROE) is one of the most widely used indicators in assessing bank profitability, as it reflects the efficiency with which a bank utilizes its shareholders' equity to generate profit (Pointer & Khoi, 2019; Petria, et al., 2015). A higher ROE indicates better financial performance and greater investor appeal. However, ROE does not exist in a vacuum; it is influenced by various internal and external factors, including financial ratios that reflect operational efficiency, liquidity management, and capital adequacy.

This study focuses on five key financial ratios: BOPO (Operational Expenses to Operational Income), Net Interest Margin (NIM), Loan to Deposit Ratio (LDR), Statutory Reserves (GWM), and Capital Adequacy Ratio (KPMM or CAR). Each of these variables offers insights into different dimensions of bank management and performance. BOPO serves as a proxy for operational efficiency; a lower BOPO suggests better cost control relative to income. NIM represents the core earning capability of a bank through its interest income.

LDR indicates the bank's capacity to convert deposits into loans, reflecting its liquidity risk. GWM, mandated by the central bank, ensures the bank's liquidity while potentially limiting lending capacity. KPMM, on the other hand, represents the bank's capital strength and its ability to absorb potential losses.

Despite their relevance, the individual and collective impacts of these variables on ROE in the context of regional banks in Indonesia remain underexplored, especially using long-term quarterly data. Most existing literature focuses on commercial banks or uses cross-sectional approaches, which may not capture the dynamics specific to regional banks like BPD DIY. Given the unique regulatory, operational, and socio-economic environment in which BPD DIY operates, a focused empirical investigation is needed to understand how these internal financial factors affect profitability.

Furthermore, the Indonesian banking industry has experienced numerous regulatory and economic shifts between 2017 and 2024, including changes in reserve requirements, interest rate policies, and macroeconomic shocks due to the COVID-19 pandemic and post-pandemic recovery. These fluctuations may have directly or indirectly influenced the financial ratios and, consequently, the profitability of BPD DIY. Therefore, it becomes imperative to analyse these factors using a robust statistical framework, such as multiple linear regression on panel data, to generate evidence-based insights.

By identifying the financial ratios that significantly influence ROE, this study not only contributes to the academic discourse but also provides practical implications for bank managers and policymakers. The findings can guide more informed decision-making in areas such as cost efficiency, liquidity management, capital allocation, and interest rate strategy, ultimately improving the sustainability and competitiveness of regional banks in Indonesia.

The main objective of this study is to analyse the effect of key financial ratios—namely BOPO (Operational Expenses to Operational Income), NIM (Net Interest Margin), LDR (Loan to Deposit Ratio), GWM (Statutory Reserves), and KPMM (Capital Adequacy Ratio)—on the Return on Equity (ROE) of the Regional Development Bank of the Special Region of Yogyakarta (BPD DIY) over the period from March 2017 to December 2024.

Most previous studies have concentrated on national or commercial banks. This research fills the gap by focusing on a Regional Development Bank (BPD DIY), which operates under different regulatory, market, and strategic constraints compared to larger commercial banks. The insights derived are more context-specific and relevant for policymakers at the regional level. The study employs quarterly data over an extended period (March 2017–December 2024), capturing both pre-pandemic, pandemic, and post-pandemic economic conditions. This longitudinal approach allows for a more robust analysis of variable impacts across different economic cycles.

2. LITERATURE REVIEW

The financial performance of a banking institution, particularly measured through Return on Equity (ROE), is fundamentally influenced by a combination of internal and external factors. From a theoretical standpoint, this study is grounded in the theory of financial intermediation and the resource-based view (RBV) of the firm, both of which explain how banks manage their internal resources to achieve profitability.

a. Financial Intermediation Theory

This theory posits that banks exist primarily to channel funds from surplus units (depositors) to deficit units (borrowers), thereby reducing information asymmetry and transaction costs (Allen & Santomero, 1997; Scholtens & Van Wensveen, 2003). The efficiency and effectiveness with which a bank performs this intermediation function directly

impact its profitability. Financial ratios such as the Net Interest Margin (NIM) and Loan to Deposit Ratio (LDR) are commonly used indicators to assess how well a bank fulfils its intermediation role. A higher NIM indicates that the bank is earning more from its core activity—lending—relative to the interest it pays on deposits. Meanwhile, LDR reflects the bank's risk appetite and its effectiveness in utilizing customer deposits to generate income through loans.

b. Operational Efficiency and Cost Management (BOPO)

The BOPO ratio (Operational Expenses to Operational Income) is derived from the cost management perspective. According to efficiency theory, banks that manage operational costs effectively tend to perform better financially. A lower BOPO suggests higher efficiency, leading to improved profitability (ROE). Thus, operational cost control is a crucial factor in determining a bank's ability to generate returns for shareholders (Sholika & Zaki, 2024; Wiadnyani & Artini, 2023; Febriyanata & Achyani, 2023).

c. Liquidity Management and Reserve Requirements (GWM)

Liquidity management theories emphasize the balance that banks must strike between holding sufficient liquid assets to meet short-term obligations and investing those assets to generate returns. The GWM (Statutory Reserve Requirement) is a regulatory tool that impacts a bank's liquidity. While necessary for stability, higher reserve requirements reduce the funds available for income-generating activities, potentially exerting a negative influence on profitability (Bianchi & Bigio, 2022; Edem, 2017; Calomiris, et al., 2015).

d. Capital Adequacy and Risk Management (KPMM/CAR)

The Capital Adequacy Ratio (KPMM or CAR) is based on the risk-based capital theory, which argues that sufficient capital buffers are essential for absorbing losses and maintaining solvency (Chakroun & Abid, 2016; Heydari & Abdoli, 2015; Mushtaq, et al., 2015). However, excessively high capital ratios may imply under-leveraging, where too much capital is idle and not optimally used to generate profit. Therefore, while capital adequacy ensures stability, it must be balanced to avoid negative impacts on ROE.

In sum, this study's theoretical framework integrates key concepts from banking efficiency, intermediation, and risk management theories. Each financial ratio analyzed—BOPO, NIM, LDR, GWM, and KPMM—represents a specific managerial or regulatory dimension influencing bank profitability. These theories collectively provide the foundation for understanding how internal bank operations, framed through financial ratios, affect ROE in the context of a regional development bank

3. RESEARCH METHODOLOGY

a. Research Design

This study employs a quantitative research design with a causal-comparative approach to examine the relationship between selected financial ratios and bank profitability as measured by Return on Equity (ROE). The study uses multiple linear regression analysis to evaluate the influence of independent variables on the dependent variable across time.

b. Object and Scope of the Study

The object of this study is the Regional Development Bank of the Special Region of Yogyakarta (BPD DIY). The research focuses on the internal financial performance of the bank over a specified time frame, considering five key financial indicators: BOPO, NIM, LDR, GWM, and KPMM.

c. Data Type and Source

The study utilizes secondary data in the form of quarterly financial reports obtained from the Financial Services Authority of Indonesia (OJK) and BPD DIY's official financial

disclosures. The observation period spans from March 2017 to December 2024, providing 32 quarterly data points.

d. Variables and Operational Definitions

- **Dependent Variable:**
 ROE (Return on Equity): Measures the bank’s profitability in generating returns from shareholders’ equity.
- **Independent Variables:**
 - a) BOPO (Operational Expenses to Operational Income): Indicator of operational efficiency.
 - b) NIM (Net Interest Margin): Reflects the profitability of core banking activities.
 - c) LDR (Loan to Deposit Ratio): Measures liquidity and loan allocation efficiency.
 - d) GWM (Statutory Reserves): Indicates liquidity compliance based on regulatory requirements.
 - e) KPMM (Capital Adequacy Ratio): Measures the bank’s capital strength to absorb losses.

e. Data Analysis Technique

The analysis is conducted using multiple linear regression to determine the effect of each independent variable on ROE. The regression model is expressed as:

$$ROE_t = \beta_0 + \beta_1 BOPO_t + \beta_2 NIM_t + \beta_3 LDR_t + \beta_4 GWM_t + \beta_5 KPMM_t + \epsilon_t$$

Where:

- ROE_t is Return on Equity at time *t*
- β₀ is the constant
- β₁–β₅ are the coefficients of the independent variables
- ε_t is the error term

Before performing the regression, the data undergo several statistical tests, Classical assumption tests (Basuki & Prawoto, 2019; Gujarati, 2002). including:

- 1) Normality Test
- 2) Multicollinearity Test
- 3) Autocorrelation Test
- 4) Heteroscedasticity Test

4. RESULTS AND DISCUSSION

This study aims to determine the influence of BOPO, NIM, LDR, GWM, and KPMM on ROE at the Yogyakarta Special Region Development Bank (BPD DIY) during the period March 2017 to December 2024. Based on the results of multiple linear regression, a significant model was obtained and can explain the variation in ROE well.

Table 1. Multiple Linear Regression Results

Dependent Variable: ROE & Sample: 2017Q1 2024Q4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BOPO	-0.32037	0.04987	-6.42453	0.00000
NIM	0.85194	0.35489	2.40057	0.02380
LDR	0.01008	0.04019	0.25082	0.80390
GWM	-0.17297	0.07815	-2.21326	0.03590
KPMM	-0.31289	0.02211	-14.14955	0.00000
C	37.66273	4.20934	8.94741	0.00000

		Breusch-Godfrey Serial Correlation	
R-squared	0.95981	LM Test:	
Adjusted R-squared	0.95208	Obs*R-squared	2.208776
S.E. of regression	0.63963	Prob. Chi-Square (2)	0.3314
Sum squared resid	10.63743	Heteroskedasticity Test: ARCH	
F-statistic	124.17650	Obs*R-squared	1.255453
Prob(F-statistic)	0.00000	Prob. Chi-Square (5)	0.2625

Source: data processed (2025)

a. BOPO (Operating Costs to Operating Income)

Coefficient: -0.32037; Significance: 0.00000 (significant at the level of 1%). BOPO shows a significant negative influence on ROE. This means that every increase in BOPO by 1 unit will reduce ROE by 0.32037 units, *ceteris paribus*. These results confirm that operational efficiency is critical in increasing bank profitability. The high BOPO reflects the waste of costs or low productivity of operational income. Therefore, the management of BPD DIY needs to tighten cost control, operational efficiency, and maximize revenue without increasing operational burden.

b. NIM (Net Interest Margin)

Coefficient: 0.85194; Significance: 0.02380 (significant at the level of 5%). NIM has a positive and significant influence on ROE. An increase in NIM by 1 unit will increase the ROE by 0.85194 units. This shows that the bank's ability to generate margins from intermediation activities (the difference between interest on loans and deposits) greatly determines the level of profit. The right interest rate strategy, optimization of a profitable loan portfolio, and efficient cost of fund management are essential to maintain and increase NIM.

c. LDR (Loan to Deposit Ratio)

Coefficient: 0.01008; Significance: 0.80390 (insignificant). Although the LDR coefficient is positive, it is very small and not statistically significant. This shows that during the study period, the level of credit disbursement against third-party funds did not have a direct impact on the change in ROE. This can happen if credit quality (NPL), profit margins on loans, or credit risk are not managed properly. Therefore, management needs to review not only the magnitude of the LDR, but also the effectiveness and quality of credit disbursement.

d. GWM (Giro Wajib Minimum)

Coefficient: -0.17297; Significance: 0.03590 (significant at the level of 5%). The reserve requirement shows a significant negative influence on ROE. This indicates that the larger the funds held as mandatory reserves, the smaller the funds that can be used for productive activities. Although the reserve requirement is a regulatory obligation that must be met, management needs to manage reserves optimally so as not to sacrifice potential revenue. For example, keeping the reserve requirement efficient by accurately estimating short-term liquidity needs.

e. MOE (Capital Adequacy Ratio)

Coefficient: -0.31289; Significance: 0.00000 (significant at the level of 1%). The results showed that KPMM had a significant negative influence on ROE. This indicates that excess capital that is not used productively can reduce the level of profits. While KPMM is important for maintaining the bank's stability and resilience to risks, management needs to find a balance point between stability and efficiency in the use of capital.

Capital must be managed in such a way that it does not settle without producing a commensurate return.

f. Model Consistency and Statistical Validity

- a. R-squared = 0.95981, indicating that the model can explain 95.98% variation in ROE.
- b. F-statistic = 124.17, significant at 1%, proving that the model as a whole is valid.
- c. Breusch-Godfrey test (Autocorrelation): There was no autocorrelation ($p = 0.3314$).
- d. ARCH test (Heteroscedasticity): There was no heteroscedasticity ($p = 0.2625$). This shows that the model has met the BLUE (Best Linear Unbiased Estimator) assumption.

The results of this study provide important insights for the management of BPD DIY, namely that improving operational efficiency and managing interest margins are the main keys in driving profitability. Meanwhile, capital and reserve management must be carried out strategically to remain compliant with regulations but not at the expense of potential profits. Although LDR is not significant in the short term, asset quality management remains an important factor to consider in long-term policies.

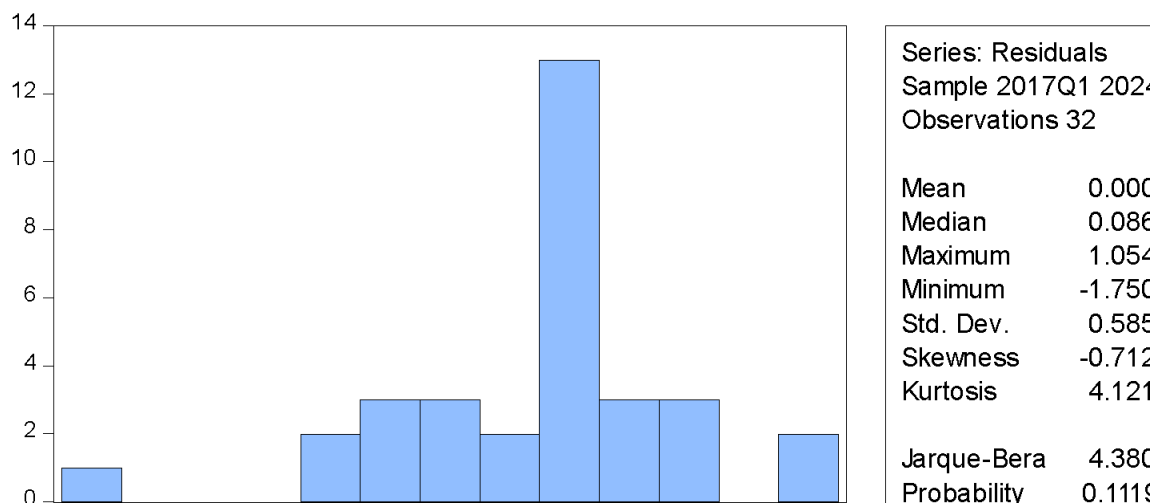


Figure 1. Normality Test

Berdasarkan Gambar 1 nilai Jarque-Bera 4,380 dengan probabilitas 0,1119, artinya residual berdistribusi normal.

Table 2. Multicollinearity Test

Variable	Variance Inflation Factors		
	Coefficient Uncentered		Centered
	Variance	VIF	VIF
BOPO	0.002487	974.2396	1.351168
NIM	0.125947	423.4735	3.342096
LDR	0.001615	748.7315	3.294248
GWM	0.006107	14.80738	1.458914
KPMM	0.000489	29.91609	1.685216
C	17.71858	1385.847	NA

Source: data processed (2025)

Variance Inflation Factor (VIF) is used to detect multicollinearity, which is a condition when independent variables are highly correlated with each other. This can interfere with the interpretation of regression coefficients.

1. $VIF < 5 \rightarrow$ No multicollinearity issues.
2. VIF between 5 – 10 \rightarrow Moderate multicollinearity, need attention.
3. $VIF > 10 \rightarrow$ High multicollinearity, need to be followed up.

Based on Table 2 above, all VIF values < 5 , meaning that there is no indication of serious multicollinearity. This model is free from multicollinearity problems, meaning that the regression results are still valid and can be interpreted well.

BOPO (Operating Costs to Operating Income) reflects the operational efficiency of the bank. The higher the value of the BOPO, the greater the cost incurred by the bank to generate operating income, which indicates low efficiency. In the regression results, the BOPO coefficient was -0.32037 with a p-value of 0.00000 , indicating a negative and statistically significant influence on ROE (Addury, 2023; Lutfiana & Yulianto, 2015; Muksal, 2018).

This means that every 1-point increase in BOPO will decrease the ROE by 0.32037 points, assuming other variables are constant. Poor efficiency (high BOPO) erodes profitability, as high-cost expenses reduce the net profit attributable to shareholders. Therefore, suppressing BOPO is an important strategy to increase ROE.

In the context of bank financial management, maintaining operational efficiency by minimizing costs without sacrificing service quality is key to improving financial performance, especially in terms of return on capital to investors or bank owners.

Net Interest Margin (NIM) is a ratio that describes how efficient a bank is in generating net interest income from productive assets, especially credit. The higher the NIM, the greater the difference between the interest income earned from the loan and the interest fees paid on deposits. In the regression results, NIM has a positive coefficient of 0.85194 with a p-value of 0.02380 , which means that NIM has a positive and significant effect on ROE (Kalam & Utsho, 2020; Setiawan & Budiwitjaksono, 2024).

Economically, this suggests that when the NIM increases by 1 point, then the ROE is expected to increase by 0.85194 points, assuming the other variables remain. This is because net interest income is a major component of a bank's net profit. When net interest income increases without a significant increase in costs, then net income rises, which ultimately increases ROE—a ratio that measures how much net profit is generated from each unit of shareholder's equity.

In practice, banks with high NIM usually have good ability to set loan interest rates, manage fund interest expenses, and maximize productive assets. Therefore, increasing NIM is often used as a key target in banks' financial strategies to strengthen profitability and attract investor interest through increased return on capital (ROE). Improving the efficiency of productive assets and managing the funding structure is key in maintaining optimal NIM.

Loan to Deposit Ratio (LDR) is a ratio that measures how much third-party funds (customer funds) a bank has successfully disbursed in the form of credit. This ratio reflects the bank's efficiency in using sources of funds to generate income through lending and borrowing activities. The higher the LDR, in theory, the greater the proportion of funds that "work" and generate interest income—which is ultimately expected to increase profitability, including ROE (Return on Equity).

However, in the regression results presented, the LDR has a positive coefficient of 0.01008 , but with a p-value of 0.80390 , which suggests that its effect on ROE is not statistically significant. This means that changes in the LDR did not have a strong or consistent impact on ROE in the observed period analysed (Khalifaturafi'ah, 2023).

This insignificance can be caused by several factors. One of them is that even though credit has increased (LDR has increased), poor credit quality (non-performing loans / NPLs) can reduce profits. In addition, an overly aggressive credit disbursement strategy also increases liquidity and credit risks, which can have a negative impact on profitability. On the other hand, an LDR that is too low indicates that banks do not use their funds for productive activities.

Thus, while LDR can theoretically contribute to an increase in ROE, in practice the effect is highly dependent on the quality of credit disbursement, risk management, and overall operational efficiency. Therefore, an increase in LDR must be accompanied by prudent credit management to really encourage an increase in ROE.

Minimum Mandatory Current Account (GWM) is the minimum amount of funds that banks must keep at Bank Indonesia (or other central banks) as reserves, either in rupiah or foreign currency. The main purpose of the reserve requirement is to control liquidity and maintain the stability of the financial system. However, from the perspective of banks as business institutions, reserve requirements are considered as idle funds (non-earning assets) because they cannot be used for productive activities such as credit distribution or interest-generating investments.

In the regression results, the reserve requirement has a negative coefficient of -0.17297 and a p-value of 0.03590, which means that the reserve requirement has a negative and significant effect on ROE (Mia, et al.,2023; Geng & Zhai, 2015; Odinaka, 2020). This means that every 1-point increase in the reserve requirement is expected to lower the ROE by 0.17297 points, assuming other variables remain. This relationship is logical because the greater the proportion of funds that must be kept as reserves in the central bank; the less funds can be used to generate profits. As a result, net income declined, and ROE—which measures net income to equity—also declined.

In managerial practice, reserve management is one of the important aspects in maintaining the efficiency of the bank's capital structure and liquidity. Although banks cannot completely avoid requirement requirements because they are regulatory, banks can manage their liquidity strategies efficiently so that the negative impact of reserve requirements on profitability can be minimized. For example, by improving operational efficiency or adjusting their productive asset portfolios, banks can keep their return on capital (ROE) at an optimal level despite high reserve requirements.

Thus, a high reserve requirement can be a burden on a bank's financial performance and needs to be balanced with a careful asset management strategy and liabilities so as not to overburden profits and ROE.

The KPMM (Minimum Capital Adequacy Ratio), or in international terms known as the Capital Adequacy Ratio (CAR), is a ratio that shows the level of capital adequacy of a bank to cover operational, credit, and market risks. Regulators such as Bank Indonesia set minimum KPMM limits to ensure banks have sufficient capital to deal with potential losses and remain stable in volatile financial conditions.

In the regression results, KPMM has a negative coefficient of -0.31289 with a p-value of 0.00000, indicating that KPMM has a negative and very significant effect on ROE (Shingjergji & Hyseni, 2015; Asma & Khadidja, 2015; Halidu, 2021). This means that every 1-point increase in KPMM is likely to decrease the ROE by 0.31289 points, assuming the other variables remain.

In theory, greater capital increases the bank's security and resilience to risk. However, in terms of profitability, especially ROE, excess capital can reduce the efficiency of equity use. Capital that is too large without being balanced with the growth of productive assets will reduce the returns received by shareholders. This is because ROE measures net income

against total equity; if equity increases but profits do not rise proportionally, then ROE will fall.

On the other hand, banks that are too conservative in holding capital may miss out on credit expansion or investment opportunities that could increase profits. Therefore, while KPMM is important for stability, banks also need to strike a balance between regulatory compliance and profitability optimization. The right capital strategy is one that can maintain stability while still generating a competitive rate of return on capital for shareholders.

CONCLUSION

This study empirically investigates the effect of key financial ratios—BOPO, NIM, LDR, GWM, and KPMM—on the Return on Equity (ROE) of Bank Pembangunan Daerah Istimewa Yogyakarta (BPD DIY) using quarterly data from March 2017 to December 2024. The multiple linear regression model demonstrates strong explanatory power, with an adjusted R-squared of 95.2%, indicating that the selected financial indicators significantly explain variations in the bank's profitability.

The results show that BOPO, GWM, and KPMM have a significant negative impact on ROE. This suggests that operational inefficiency, excessive statutory reserves, and underutilized capital can all suppress bank profitability. In contrast, NIM has a positive and statistically significant effect on ROE, affirming that higher interest margins contribute substantially to improved financial performance. LDR, however, was found to have no significant influence on ROE within the study period.

These findings underline the importance of internal financial management in influencing bank profitability. Operational efficiency, interest rate strategy, and optimal capital and liquidity management are all critical factors in enhancing ROE and sustaining competitive performance in the regional banking sector.

Based on the empirical findings, several recommendations are proposed for BPD DIY and similar regional banks:

1. Management should implement cost-control strategies and streamline operational processes to reduce unnecessary expenditures. Investment in digital banking, process automation, and human resource optimization can significantly lower operational costs.
2. Banks should focus on improving their asset-liability management by optimizing lending rates and minimizing the cost of funds. Careful pricing of products and diversification of the loan portfolio can help sustain and improve NIM.
3. While compliance with regulatory reserve requirements is mandatory, excess reserves should be avoided. Banks can employ cash flow forecasting and liquidity management tools to better allocate reserves without compromising regulatory standards.
4. Excess capital should be strategically allocated to income-generating assets. Management must strike a balance between maintaining adequate capital buffers and maximizing shareholder returns.
5. Although LDR was not statistically significant in this study, it remains an essential indicator of credit risk and liquidity. Continuous monitoring of lending practices and credit quality is necessary to mitigate future risk.

Bank managers should periodically assess the performance of key financial ratios and their impact on profitability to support timely strategic decisions.

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