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The Influence of Financial Risk on Bank Performance

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Abstract: *This study seeks to examine how financial risk affects the performance of banks listed on the Indonesia Stock Exchange (IDX). The research relies on secondary data sourced from the annual reports of IDX-listed banks for the 2020–2024 period. The sample comprises 36 banks, yielding 180 observations that meet the established criteria. To evaluate the proposed hypotheses, panel data analysis was conducted using E-Views 9. The independent variables include credit risk, liquidity risk, operational risk, bank size, GDP growth, and inflation. Conclusions were drawn based on the results of the panel regression model. The study finds that financial risk plays a role in shaping bank performance. Credit risk negatively impacts performance, whereas liquidity risk does not show a meaningful effect. Operational risk also negatively affects performance. Bank size, on the other hand, contributes positively to bank performance. GDP growth rate has a positive effect on banking performance, whereas inflation has no significant effect.*

Keywords: *Bank size; Credit risk; GDP growth rate; Liquidity risk; Operational risk; Inflation.*

1. Introduction

The relationship between the banking sector and economic growth has become a significant focus of global research (Kumar & Bird, 2020; Murrar et al., 2024; Nguyen, 2022; Slamet & Ikhwan, 2023; Węgrzyn & Kruszka, 2025). Banking is the primary engine of financial intermediation and credit allocation, making its stability and efficiency crucial determinants of a country's macroeconomic resilience (Sylvia et al., 2024). Banking health is an indicator of a country's ability to respond to economic shocks, and banking stability is essential for sustainable economic growth (Ngo & Trinh, 2025; Oanh et al., 2023). Additionally, bank profitability has been shown to enhance economic growth, although a substantial banking sector may reduce this effect due to rising operational costs (Kumar & Bird, 2020). A stable banking sector also plays an important role in minimizing the impact of recessions and accelerating economic recovery (Demirgüç-Kunt et al., 2021). In an increasingly dynamic and unpredictable global business environment, risk management has become a critical component for ensuring corporate sustainability, as long-term success is influenced by the types and levels of risks taken (Hong, 2023; Gleißner & Berger, 2024).

The research variables used, including credit risk, liquidity risk, operational risk, bank size, and macroeconomic factors such as GDP growth and inflation, are essential to study because each plays a strategic role in influencing bank performance (Ngo & Trinh, 2025). Credit risk, typically measured through Non-Performing Loans (NPL), directly affects asset quality, provisioning costs, and the bank's lending capacity. Rising NPL have been shown to reduce Return on Equity (ROE) and weaken the banking sector's ability to support economic growth (Ngo & Trinh, 2025; Al Salamat & Khatatbeh, 2023). Liquidity risk is also

important because liquidity determines a bank's ability to meet short-term obligations and carry out its intermediation function. When liquidity becomes tight, funding costs increase and operational efficiency declines, ultimately pressing profitability downward (Oanh et al., 2023; Cobbinah et al., 2024). Operational risk, including fraud, system failures, and process inefficiencies, also significantly affects performance, as rising operational losses increase costs and reduce profitability (Ngo & Trinh, 2025). Bank size is an important factor because larger banks may benefit from economies of scale, revenue diversification, and cost efficiencies, although excessive size may decrease profitability due to rising managerial and operational complexities (Tran & Phan, 2020; Gržeta et al., 2023). Macroeconomic factors such as GDP growth and inflation influence interest income, credit demand, and asset quality. High economic growth increases financing activity and banking revenues, while inflation exerts varying impacts depending on its level (Sousa & Almeida, 2025; Bilalli et al., 2024).

This study differs from previous research, particularly that of Ngo & Trinh (2025), which focused on the ten largest commercial banks in Vietnam. Differences in economic contexts, banking industry structures, and market characteristics between Indonesia and Vietnam provide an opportunity to re-examine the relationship between financial risk and bank performance in distinct environments. While prior studies of Ngo & Trinh (2025) were limited to large banks in Vietnam, this research includes all banks listed on the Indonesia Stock Exchange, covering small, medium, and large institutions. Studies highlight that bank size heterogeneity can significantly influence the relationship between risk factors and performance, as bank size affects economies of scale, risk absorption capacity, operational efficiency, and competitive behavior in credit markets, thus shaping profitability outcomes more comprehensively when a wide range of bank sizes is considered (León et al., 2023). Moreover, research in Indonesia using a full sample of listed banks shows that diverse bank sizes, together with firm-specific and macroeconomic variables, jointly affect performance indicators such as ROE and ROA, suggesting that excluding smaller or mid-tier banks may overlook important variance in risk-performance relationships (Mutianingsih et al., 2023). By covering all banks listed on the BEI, this study mitigates sample selection bias and enhances the robustness and generalizability of findings regarding the influence of credit risk, liquidity risk, operational risk, bank size, GDP growth, and inflation on bank performance, thereby filling an empirical gap in the literature that has largely been restricted to limited subsamples in other emerging markets (Chowdhury et al., 2024).

Previous studies in Indonesia have generally focused on the impact of financial risks on bank performance (Amijaya et al., 2023). However, these studies were often limited to specific combinations of variables, shorter observation periods, or homogeneous samples of banks. Moreover, most of these studies have not accounted for recent developments in the Indonesian banking industry, including rapidly changing macroeconomic conditions. This research addresses this gap by incorporating a more comprehensive set of risk dimensions and examining their effects on bank performance in the context of digital banking developments in Indonesia. Therefore, this study offers a novel contribution by providing a more current analysis, a broader range of variables, and a national context that have not been

extensively explored in previous research. The motivation for this research is to provide empirical evidence on how financial risk affects bank performance in Indonesia, to address a research gap that has not been widely explored in the Indonesian context, and to contribute insights for regulators and the banking industry on the importance of strengthening risk management to maintain national financial system stability.

2. Literature Review & Hypotheses Development

2.1. Risk–Return Trade-Off

The risk–return trade-off posits that banks can achieve higher returns only if they are willing to assume greater risk; however, poorly managed or excessive risk ultimately reduces long-term profitability and stability. This theory has been increasingly supported by recent empirical findings, which show that rising liquidity and credit risks significantly suppress bank profitability, particularly during periods of economic uncertainty (Khan et al., 2023). These results align with other findings that show that fluctuations in credit and liquidity risk push banks along the risk–return frontier, where returns can be maintained only through disciplined risk management (Aregbesola et al., 2024). Similarly, a previous study reports that high levels of credit and operational risk weaken the positive relationship between capital structure and profitability, indicating that unbalanced risk exposure reduces potential returns (Nguyen & Dang, 2022). In addition, bank performance is strongly influenced by a bank's ability to manage credit and liquidity risk to achieve an optimal risk–return combination (Al-Qudah & Jaradat, 2020). Supporting evidence is also provided by other studies, which highlight that banks' responses to risk are heavily shaped by macroeconomic conditions, suggesting that the effectiveness of the risk–return trade-off depends on country-specific contexts and the stability of the financial system (Batten & Vo, 2021). Accordingly, in this study, bank performance (measured by ROE) is conceptualized as the outcome of how effectively a bank positions itself along the risk–return frontier through the management of credit risk, liquidity risk, operational risk, bank size, inflation, and GDP growth, all of which function as independent variables that shape the structure and strength of this trade-off.

2.2. Return on Equity

Evaluating a bank's financial performance provides essential insights for management to track industry trends and assess the effectiveness of strategic decisions (Mamaro & Legotlo, 2021). The capacity to generate earnings, or profitability, is key to projecting a bank's future success (Dao & Nguyen, 2020). Furthermore, the assessment of operational performance using metrics such as profitability is a vital indicator of a bank's long-term viability and sustainability (Chukwu et al., 2024). Ngo & Trinh (2025) measure banking performance through profitability, represented by the Return on Equity (ROE) ratio. Return on Equity (ROE) is an indicator that reflects a bank's ability to generate profits based on its equity capital. A higher ROE indicates stronger profitability and operational efficiency, as it demonstrates the bank's effectiveness in managing shareholders' funds. ROE is commonly used as a proxy variable for measuring a bank's profitability and efficiency performance

(Moyo & Obadire, 2024). Furthermore, ROE is a key metric for evaluating a bank's profit generation relative to its equity (Eltweri et al., 2024).

2.3. Credit Risk

Credit risk is a key risk in the banking sector, arising when borrowers are unable to meet their contractual payment obligations. This risk is considered a significant concern, as it may lead to financial instability and reduced operational efficiency (Ogundele et al., 2020). Credit risk management aims to maintain efficiency and ensure the sustainability of business operations. Credit risk can be measured using Non-Performing Loans (NPL). NPL is a key instrument for assessing the magnitude of credit risk. Credit risk is represented through loan loss provisions and the level of problematic loans (Laporšek et al., 2025). NPL occurs when borrowers fail to meet their principal or interest payment obligations according to schedule, thereby directly affecting the bank's cash inflows (Kalkan, 2025). Effective credit risk management, including robust credit governance and risk mitigation strategies, is critical for improving financial performance metrics such as ROE and ROA, particularly in emerging markets where financial systems are more sensitive to loan defaults (Susalit et al., 2025). Therefore, understanding credit risk and its measurement via NPLs remain essential for evaluating the resilience and performance of banking institutions (Chowdhury et al., 2024).

2.4. Liquidity Risk

Liquidity risk is the ability of a bank to meet its short-term obligations without incurring excessive or detrimental losses (Al-Nimer et al., 2024). Effective management of liquidity risk is crucial for the bank's financial stability. When liquidity risk is not appropriately managed, banks tend to have to seek short-term funding sources at a higher cost, which ultimately suppresses the bank's profit and financial efficiency (Ngo & Trinh, 2025). Based on the Financial Services Authority (OJK) Circular Letter Number 34/SEOJK.03/2016 concerning the implementation of risk management in commercial banks, liquidity risk is defined as the risk that arises when a bank is unable to generate cash flow from productive assets or the proceeds from the sale of assets, including liquid assets. Based on Bank Indonesia (BI) Circular Letter No. 15/41/DKMP dated October 1, 2013, the Loan-to-Deposit Ratio (LDR) has a lower limit of 78% and an upper limit of 92%. Bank Indonesia established the LDR as one of the banking liquidity health indicators that serves to maintain a balance between fundraising and credit disbursement.

2.5. Operational Risk

Operational risk is the risk of financial loss arising from inefficiencies or failures in internal processes, human resources, systems, or external events (Ngo & Trinh, 2025). This risk reflects the extent to which financial institutions can manage their resources effectively and maintain operational efficiency. In the banking industry, operational risk is considered one of the primary risks, alongside credit and liquidity risks, as it directly affects the efficiency and profitability of financial institutions. Operational risk is a crucial factor in banking performance; weaknesses in operational risk management can significantly affect the stability of the financial system (Oudat et al., 2023). Operational risk is commonly assessed

using the Operating Expense to Operating Income ratio (BOPO), calculated by dividing total operating expenses by total operating income and then multiplying the result by 100%.

2.6. Bank Size

Bank size refers to the scale of a bank, typically measured by its total assets (Ngo & Trinh, 2025). A larger size often reflects a broader operational scope, wider service reach, and greater resource capacity. Moreover, larger banks tend to benefit from higher efficiency, stronger risk diversification, and improved access to lower-cost funding, all of which can enhance their profitability and financial stability. Nevertheless, effective risk management and operational efficiency remain essential to optimize scale advantages fully. The other study measures bank size as the sum of total assets and deposits at year-end (Ngo & Trinh, 2025). Considerable bank size may reduce profitability due to higher administrative and other operational costs (Tran & Phan, 2020). The other study shows that larger firms derive greater benefits from good governance practices in mitigating operational risk and enhancing ROA (Ofori et al., 2025).

2.7. GDP Growth Rate

The GDP growth rate is a macroeconomic indicator that measures the increase in a country's total output of goods and services over a given period (Ngo & Trinh, 2025). This indicator is used to demonstrate how a country’s economic development influences the stability and profitability performance of banks. Economic growth increases credit demand, improves asset quality, and strengthens banks' financial positions. Favorable macroeconomic conditions create a supportive environment for banks to expand. GDP growth rate is recognized as a key macroeconomic variable and a factor affecting banking profitability (Laporšek et al., 2025). The GDP growth rate plays a significant role in determining banking performance. When the economy expands, demand for credit increases, thereby allowing banks to raise interest rates on loans. This dynamic subsequently increases interest income and overall profitability (Sousa & Almeida, 2025).

2.8. Inflation

Inflation is defined as a broad and sustained increase in the prices of goods and services within an economy (Ngo & Trinh, 2025). This indicator serves as a macroeconomic variable reflecting price pressures that may affect banks' profitability and stability. Inflation captures the movement of prices for goods and services, thereby serving as an indicator of potential liquidity risk. Rising inflation can influence the purchasing power of both individuals and firms, ultimately reducing their ability to meet financial obligations and maintain adequate liquidity (Mariscal-Cáceres et al., 2024). The previous study highlights the impact of inflation on the financial sector in OECD countries and finds that high inflation can undermine its performance, thereby affecting the stability and efficiency of the banking system (Bilalli et al., 2024).

2.9. Hypotheses

Empirical evidence indicates that credit risk negatively affects the profitability of banks in Jordan (Eyalsalman et al., 2024). This finding is consistent with evidence that higher credit

risk significantly reduces bank profitability (Abdelaziz et al., 2022). Similarly, studies document a negative relationship between credit risk and bank profitability in the Pakistani banking sector (Haris et al., 2024). Further evidence reveals that credit risk has a significant and negative effect on the financial performance of commercial banks, primarily driven by rising non-performing loans and weak credit management practices (Ogundele & Nzama, 2025). In the European context, credit risk has also been found to affect bank profitability adversely (Laporšek et al., 2025). Based on the empirical insights above, the following hypothesis is proposed:

H_1: Credit risk has a negative effect on banking performance in Indonesia.

Empirical evidence shows that effective liquidity risk management can enhance bank profitability and strengthen operational efficiency, highlighting the importance of maintaining adequate liquidity buffers (Al-Nimer et al., 2024). In contrast, higher liquidity risk has been shown to significantly reduce bank profitability, indicating that insufficient liquidity exposes banks to financial vulnerability and reduced earning capacity (Abdelaziz et al., 2022). Consistent with these results, liquidity risk also exerts a negative and significant influence on banking performance, as reflected in declining ROE as liquidity risk increases (Ngo & Trinh, 2025). Collectively, these studies suggest that liquidity risk plays a critical role in shaping bank performance, and mismanagement of liquidity can adversely affect a bank's financial outcomes. Based on the empirical evidence above, the following hypothesis is proposed:

H_2: Liquidity risk has a negative effect on banking performance in Indonesia.

Empirical evidence demonstrates that operational risk has a negative and statistically significant impact on banking performance, particularly on profitability indicators such as ROA and ROE (Ngo & Trinh, 2025). Supporting this conclusion, higher operational risk is also found to reduce ROE in Nepal significantly (Khadka, 2024). Consistent results are documented in the U.S. banking sector, where operational losses have been shown to diminish bank profitability, particularly ROE, during periods of macroeconomic instability (Frame et al., 2024). These studies collectively highlight that operational risk consistently undermines financial performance across diverse banking environments. Operational risk is a critical factor influencing banking performance, and weaknesses in its management can have substantial impacts on the stability of the financial system (Oudat et al., 2023). Based on these empirical findings, the following hypothesis is proposed:

H_3: Operational risk has a negative effect on banking performance in Indonesia.

Empirical evidence indicates that bank size positively influences financial performance, suggesting that larger institutions benefit from economies of scale and stronger operational capacity (Blaga et al., 2024). Consistent with this, bank size is positively associated with banking profitability (Kalkan, 2025). Further evidence indicates that larger banks tend to achieve higher Returns on Equity (ROE) and exhibit greater resilience than smaller banks (Caparusso et al., 2023). Similarly, bank size has a positive and statistically significant effect on ROE, indicating that size contributes materially to financial strength (Nguyen, 2024). Additional findings reveal that bank size positively affects profitability;

however, this effect becomes optimal only when accompanied by sound leverage structures and high operational efficiency, suggesting that the magnitude of the size-profitability relationship depends on the bank's internal managerial effectiveness (Mirović et al., 2024). Based on these empirical insights, the following hypothesis is formulated:

H_4: Bank size has a positive effect on banking performance in Indonesia.

Empirical evidence indicates that GDP growth has a positive and significant effect on bank profitability, as measured by ROE (Ngo & Trinh, 2025). Conversely, higher GDP growth has been reported to negatively affect bank profitability, suggesting that the macroeconomic environment may impose pressures that reduce financial performance under certain conditions (Koroleva et al., 2021). Consistent with these findings, GDP growth is also shown to have a positive and significant effect on bank performance, as measured by ROE. However, the magnitude of this effect varies across middle-income countries (Abdelmoneim & Yasser, 2023). Supporting this view, GDP growth has also been shown to positively affect bank profitability (Mirović et al., 2024). The previous empirical results also indicate that the direction of the GDP-profitability relationship may vary with the banking sector's regional and structural characteristics (Koroleva et al., 2021). Based on the collective insights from these studies, the following hypothesis is proposed:

H_5: The GDP growth rate has a positive effect on banking performance in Indonesia.

Empirical evidence indicates that inflation negatively affects banks' financial performance (Mirović et al., 2024). Similarly, inflation is significantly associated with bank profitability, indicating that changes in price levels can directly affect banks' earning capacity (Doan & Bui, 2021). In contrast, inflation may have either a positive or neutral effect on banks' performance, as measured by ROE, depending on how banks adjust their net interest margins (Koukouridis, 2025). Other studies conducted in Spain, France, and Romania also show that a strong banking system promotes economic growth and stabilizes commodity prices (Hamdaoui & Cancelo, 2024). This suggests that increases in inflation can increase or reduce ROE, depending on a bank's ability to reallocate interest income and operating expenses in response to prevailing macroeconomic conditions. Drawing upon this body of literature, the following hypothesis is proposed:

H_6: Inflation has a positive effect on banking performance in Indonesia.

3. Method

This study adopts a hypothesis-testing framework to examine the effects of the independent variables, credit risk, liquidity risk, operational risk, bank size, GDP growth rate, and inflation, on banking performance as proxied by return on equity (ROE). Each variable is theoretically reviewed and integrated into a conceptual framework that outlines the expected causal pathways between the independent and dependent variables. Guided by this framework, research hypotheses were formulated as preliminary statements of the anticipated influence of each variable and subsequently evaluated through statistical hypothesis testing.

The study utilizes panel data, combining time-series and cross-sectional observations over the 2020–2024 period. The sample was selected using a purposive sampling method based on predetermined criteria, namely: (1) banking institutions that consistently published financial statements and annual reports and were listed on the Indonesia Stock Exchange (IDX) throughout the 2020–2024 study period; (2) conventional banking institutions listed on the IDX during 2020–2024 that provided complete data relevant to all variables in this study; and (3) non-digital banking institutions listed on the IDX during the 2020–2024 observation period. Based on these criteria, 36 banking institutions were selected as the analytical units. Data processing and regression estimation were conducted using Eviews 9, which facilitated the examination of the panel data model and the statistical significance of the variables. This methodological approach enables a more robust and comprehensive evaluation of how financial risks and macroeconomic factors dynamically influence banking performance over the study period.

Table 1. Variable Definitions

Variable Name	Measurement
Return on Equity (Ngo & Trinh, 2025)	ROE = Net Profit / Total Equity
Credit Risk (Abdelaziz et al., 2022)	NPL = Non-Performing Loan / Total Loans
Liquidity Risk (Al-Nimer et al., 2024)	LDR = Total Loans / Total Deposits
Operational Risk (Ngo & Trinh, 2025)	OPR = Operating Expense / Total Income
Bank Size (Koroleva et al., 2021)	Logarithm of Total Assets
GDP Growth Rate (Abdelmoneim & Yasser, 2023)	GDP growth rate data (BPS)
Inflation (Ngo & Trinh, 2025)	Bank Indonesia released inflation data.

4. Result

Based on the panel model specification tests, the Chow Test reports a p-value of 0.000, indicating that the Fixed Effects Model (FEM) provides a better fit than the Common Effects Model (CEM). The subsequent Hausman test yields a p-value of 0.500, suggesting that the Random Effects Model (REM) is the more appropriate model for this study. Furthermore, the F-statistic probability value of 0.000 < 0.050, confirming that at least one independent variable significantly influences the dependent variable.

Table 2. Chow Test, Hausman, and F Test Results

	Effect Test	Prob.	Conclusion
Chow Test	Cross-Section Chi-Square	0.000	Selected FEM
Hauman Test	Cross-Section Random	0.500	Selected REM
F Test	Prob. (F-Statistic)	0.000	Selected REM

Table 3. Lagrange Multiplier Test Results

	Breusch-pagan	Cross-section statistic	Conclusion
LM Test	114.579	0.000	Selected REM

The Lagrange Multiplier (LM) Test also yields a chi-square probability of 0.000, which is below the significance threshold of 0.050. Therefore, based on the collective results of these diagnostic tests, the Random Effect Model is determined to be the most suitable estimation approach and is employed in the subsequent analysis.

This analysis provides an overview of data variability by presenting the minimum, maximum, mean, and standard deviation for each variable. The minimum value denotes the lowest observation in the dataset, whereas the maximum value denotes the highest observation. The mean reflects the central tendency of each variable, and the standard deviation illustrates the extent of dispersion in the data, helping researchers determine whether the dataset is relatively uniform or exhibits substantial fluctuations. Based on the results shown in Table 4, Return on Equity (ROE) records a mean of 0.0380 means that on average, the banks analyzed generated a net profit of 3.80% of their equity, with a standard deviation of 0.122, means that most of the banks' ROE values fall within a range of ±12.16% around the average of 3.76%, indicating a significant variation between high-performing and low-performing banks. The highest ROE value of 0.274 was achieved by Bank Maybank Indonesia Tbk. in 2024, whereas the lowest value of –0.795 was observed for Bank KB Indonesia Tbk. in the same year.

For Credit Risk (CR), the mean is 0.032, indicating that, on average, the credit risk level of the banks analyzed is 3.20%. In other words, approximately 3.20% of the total credit portfolio is expected to be at risk of default. The standard deviation is 0.029, indicating that most banks' CR values fall within ±2.90% of the mean of 3.20%, suggesting variation between banks with low and high credit risk. The highest CR value, 0.223, was recorded by Bank Pembangunan Daerah Banten Tbk. in 2020, whereas the lowest value, 0.000, was recorded by Bank Capital Indonesia Tbk. in both 2020 and 2021. Liquidity Risk (LR) has a mean of 0.788, indicating that, on average, the banks in the sample have a liquidity ratio of 78.8%, meaning that most banks' liquid assets can cover approximately 78.8% of their short-term obligations or liquidity needs. Moreover,-The standard deviation of 0.238, indicating that most of the banks' LR values fall within a range of ±23.80% around the average of 78.8%, reflecting significant differences between banks with high liquidity and those with low liquidity, the maximum value of 1.623 observed at Bank Woori Saudara Indonesia Tbk. with the maximum value of 1.623 observed at Bank Woori Saudara Indonesia Tbk. in 2024 and the minimum value of 0.119 recorded by Bank Capital Indonesia Tbk. in 2021. Operational Risk (OPR) has a mean of 0.535, indicating that, on average, the operational risk level of the banks in the sample is 53.5%, meaning that, in general, more than half of the banks' operational aspects pose potential risks that require monitoring or management. The standard deviation of 0.239 indicates that most banks' OPR values fall within ±23.9% of the mean of 53.5%, reflecting significant differences between banks with low and high operational risk. The highest value, 1.872, was recorded by Bank QNB Indonesia Tbk. in 2021, and the lowest value, 0.236, was recorded by Bank Capital Indonesia Tbk. in the same year.

Bank size (SIZE) has a mean of 31.843, indicating that, on average, banks in the sample have total assets of 31.843, reflecting a relatively large average total asset size. The standard deviation of 1.619 means that most of the SIZE values fall within a range of ±1.619 around the mean of 31.843, indicating a relatively moderate variation in bank size within the sample, with Bank Mandiri (Persero) Tbk, reaching the most significant size value of 35.426 in 2024, while the smallest size of 28.945 was recorded by Bank of India Indonesia Tbk. in

2020. The GDP growth rate (GDP) has a mean of 0.034, indicating that, on average, Indonesia's economic growth during the study period was 3.4% per year. The standard deviation is 0.028, meaning that most of the economic growth values fall within a range of ±2.8% around the average of 3.4%, reflecting moderate economic fluctuations during the study period, with the highest value of 0.053 applying to all banks in 2022 and the lowest value of –0.021 applying to all banks in 2020. Meanwhile, inflation (INF) has a mean of 0.026, indicating that the inflation rate during the study period averaged 2.6% per year. The standard deviation of 0.015, meaning that most of the inflation values fall within a range of ±1.5% around the average of 2.6%, reflecting relatively moderate inflation fluctuations during the study period, with a maximum value of 0.055 recorded by all banks in 2022 and a minimum value of 0.016 recorded by all banks in 2024.

Table 4. Results of descriptive analysis test

Variable	Minimum	Maximum	Mean	Std.Deviation
ROE	-0.795	0.274	0.038	0.122
CR	0.000	0.223	0.032	0.029
LR	0.119	1.623	0.788	0.238
OPR	0.236	1.873	0.535	0.239
SIZE	28.945	35.426	31.843	1.619
GDP	-0.021	0.053	0.034	0.028
INF	0.016	0.055	0.026	0.015

Table 5. Hypothesis Test Result

	Coefficient	t-Statistic	Prob.	Results
Constant	-0.588	-2.214	0.014**	
CR	-0.615	-2.432	0.008***	H_1: Accepted
LR	-0.033	-1.005	0.158	H_2: Rejected
OPR	-0.166	-5.715	0.000***	H_3: Accepted
SIZE	0.023	2.835	0.002***	H_4: Accepted
GDP	0.233	1.335	0.091*	H_5: Accepted
INF	0.186	0.585	0.279	H_6: Rejected
Dependent variable: ROE Adj. R^2: 0.245				

*** Sig < 1 %; ** Sig < 5%;* Sig < 10%

5. Discussion

The analysis shows that credit risk has a negative effect on bank performance. This finding indicates that suboptimal credit risk management—measured by the Non-Performing Loan (NPL) ratio — can lead to inefficiencies in bank performance (Ngo & Trinh, 2025). This implies that the higher the level of credit risk a bank faces, the lower its ability to generate returns on equity (Eyalsalman et al., 2024). An increase in NPLs reflects a rise in problematic loans, requiring banks to allocate higher loan-loss provisions and incur additional operating costs. A study in Pakistan finds that credit risk negatively affects bank profitability. Consequently, net income decreases, resulting in a lower return on equity (ROE) (Haris et al., 2024). Similarly, research confirms that credit risk significantly undermines the financial performance of commercial banks, driven by rising non-performing loans and weak credit management practices (Ogundele & Nzama, 2025).

The analysis shows that liquidity risk does not affect bank performance. The increase in liquidity risk has not been shown to enhance bank performance, indicating that a bank's ability to manage liquidity does not directly influence its ROE (Ngo & Trinh, 2025). This may be attributed to banks' liquidity management strategies, which aim to balance liquid assets and short-term liabilities (Haris et al., 2024). The finding that liquidity risk does not significantly affect Return on Assets (ROA) can be attributed to the prudent liquidity management practices adopted by the banks in this study. Most banks maintain liquidity at safe levels, ensuring that variations are not substantial enough to affect profitability directly (Rasyid & Bangun, 2023). Furthermore, the proxy used, such as the Loan-to-Deposit Ratio (LDR), may be less sensitive to the liquidity dynamics that drive profitability, leading to statistically insignificant coefficients. This finding is consistent with several previous studies that reported that liquidity risk does not significantly affect the ROA of commercial banks in Indonesia (Syahpria et al., 2024).

The analysis shows that operational risk has a negative effect on bank performance. This indicates that the higher the operational burden relative to income, the lower the bank's ability to generate returns on its equity (Amijaya & Alaika, 2023). This condition occurs because high operational risk typically increases operating expenses, elevates the likelihood of non-financial losses, and reduces the effectiveness of business processes, all of which ultimately erode net income (Cheng et al., 2020). In addition, high operational risk can hinder bank efficiency, as banks must allocate more resources to risk mitigation, strengthen internal control systems, and improve operational procedures (Frame et al., 2024). These additional costs reduce profit margins, thereby reducing bank performance, particularly ROE. In other words, the more operational issues arise, the lower the bank's ability to optimize assets and equity to generate profit (Qabajeh et al., 2023). Operational risk (BOPO) negatively affects bank performance (ROA) because this ratio measures operational efficiency, and high operating costs erode net profit (Mrindoko et al., 2020). Operational risk negatively impacts bank performance by directly relating to internal process failures, human error, inadequate systems, and external events that increase operating expenses (Wanjohi et al., 2017). A higher cost-to-income ratio indicates a larger proportion of costs, such as salaries, administration, and technology, relative to operating income, thereby reducing overall profitability (Purwanti & Manda, 2024). Bank Indonesia regulations require an optimal BOPO (cost-to-income) ratio of <50%; however, violations are associated with a decrease in ROA of up to 20% due to sustained inefficiencies (Utami & Silaen, 2018).

The analysis shows that bank size has a positive effect on bank performance. This finding indicates that larger banks possess greater capacity to manage resources, achieve operational efficiency, and benefit from economies of scale (Tran & Phan, 2020). Large banks also tend to have stronger capabilities in diversifying risk and obtaining funding at lower costs, which can enhance profitability and strengthen financial stability (Ofori et al., 2025). Bank size tends to have a positive effect on banking performance because larger banks can benefit from economies of scale, whereby the cost per unit of service declines as the volume of services and assets increases, thereby increasing efficiency and profitability (Blatter & Fuster, 2022). In this context, large banks can spread overhead costs, such as

Information technology, accounting, administration, marketing, and human resources, across a broader asset base, resulting in a lower cost-to-income ratio and relatively higher profits. From a shareholder profitability perspective, global analyses of thousands of banks across countries that use the natural logarithm of total assets as a proxy for bank size find a positive and statistically significant relationship between size and return on equity (ROE) in certain model specifications, supporting the argument that "the larger the bank, the greater its ability to generate equity returns" (Lamothe et al., 2024). From a policy and industry governance perspective, European evidence indicates that regulatory impacts on efficiency and profitability tend to favor large and medium-sized banks over smaller institutions, implying that bank size is associated with superior performance under certain regulatory conditions (Gržeta et al., 2023). These findings support the notion that large banks typically possess greater organizational capacity and resource endowments to meet compliance and risk-management requirements without excessively sacrificing profitability.

GDP, which has a positive effect on ROE, indicates that when the economy grows, a bank's ability to generate equity profit also increases. Theoretically, this aligns with the view that economic growth expands activities in the real sector, thereby increasing demand for credit and banking services, which ultimately boosts bank profitability (Jeris, 2021). From a macroeconomic growth theory perspective, an increase in GDP reflects higher output and household income, thereby increasing financial transactions and financing needs in the banking sector (Siniţîn & Socol, 2020). Higher credit demand allows banks to allocate more productive funds at profitable interest margins, thereby increasing the return on equity (ROE) (Rumaly, 2023). The GDP growth rate tends to have a positive effect on banking performance because, as the economy expands, production and consumption activities increase, leading to higher demand for financing (credit) and banking services, which ultimately enhances bank profitability (Jeris, 2021). Economic expansion also generally improves borrowers' repayment capacity and reduces the relative risk of default, thereby strengthening asset quality and supporting bank performance, as reflected in indicators such as ROA and ROE (Handriani, 2025). When GDP grows, rising credit demand provides banks with greater opportunities to allocate funds to productive uses and expand interest income, making performance indicators such as profitability more likely to improve (Yoon et al., 2023). From an income-stability perspective, an improving macroeconomic environment during growth periods is also associated with more vigorous banking activity, enabling banks to better maintain margins and operational efficiency when economic cycles are favorable (Abdelmoneim & Yasser, 2023).

The study shows that inflation does not affect bank performance. This finding reflects that inflation plays an important role in a bank's financial performance, as it can affect operating costs, interest rates, and consumer purchasing power (Petria et al., 2015). Inflation often has little effect on banking performance because, in many banks, increases in income and operating costs tend to move in the same direction as inflation rises, causing their effects on net profit to largely offset one another (Bergant, 2025). In addition, many banks engage in matching between income and expense exposures, such as through asset–liability repricing, so that profitability is relatively operationally "hedged" against changes in

Inflation. When inflation is anticipated (expected inflation), banks tend to adjust interest rate structures and funding costs in advance, thereby maintaining margins and limiting the net effect of inflation on profitability (Mashamba & Chikutuma, 2023). Low or moderate inflation has minimal impact on operational profitability, in contrast to its effects on stock returns and ROE, which are more sensitive to market expectations (Melinda & Berliani, 2024).

Overall, the results of this study indicate that financial risk plays different roles in influencing banking performance. Credit risk has been shown to reduce bank performance, indicating that rising non-performing loans directly pressure profitability through increased provisioning costs and weakened asset quality. Operational risk also has adverse effects, as excessive operational burdens and inefficient internal processes hinder the bank's ability to generate profits. Conversely, bank size has a positive effect on performance, indicating that larger banks can leverage economies of scale, risk diversification, and stronger operational capacity, thereby generating higher returns on equity. On the other hand, liquidity risk, GDP growth rate, and inflation were found to have no significant effect on bank performance. These findings indicate that the stability of bank profitability during the research period was primarily determined by internal factors related to risk management and operational efficiency. In contrast, fluctuations in liquidity and macroeconomic conditions did not directly drive changes in ROE.

6. Limitations and Suggestions for The Future

This study still presents several limitations that should be considered. The scope of the data covers only a five-year period, namely 2020–2024, which may limit the findings' ability to capture long-term dynamics within the banking industry fully. In addition, the independent variables examined are limited to three main aspects—credit risk, liquidity risk, and operational risk —indicating that other factors that may influence capital adequacy or overall bank performance were not included in the research model. In light of these limitations, future studies should extend the observation period to approximately 7-10 years to produce a more comprehensive analysis and enhance the generalizability of the results. Subsequent researchers may also consider incorporating additional independent variables, both internal bank indicators and external macroeconomic factors, such as interest rate policy, to achieve a more holistic understanding of the relationships among variables (Paukmongkol, 2024). By expanding the scope of variables, future research is expected to offer deeper insights for bank management, regulators, and investors in formulating more accurate strategies and policies (Trung, 2025).

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