Jurnal Multidisiplin Sahombu
Volume 5, Number 04, 2025, DOI 10.58471/jms.v5i04
ESSN 2809-8587 (Online)
https://ejournal.seaninstitute.or.id/index.php/JMS/index

The Influence of Operational Efficiency, Credit Risk, and Market Risk on the Profitability of State-Owned Banks Listed on the Indonesia Stock Exchange

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Article Info
Keywords:
DBOPO,
NPL,
NIM,
ROA,
profitability,
state-owned banks

ABSTRACT
This study aims to examine the influence of operational efficiency, credit risk, and market risk on the profitability of state-owned banks listed on the Indonesia Stock Exchange during a post-crisis period. Using a quantitative approach and multiple linear regression analysis, the research investigates the relationship between BOPO, NPL, and NIM as independent variables, and ROA as the dependent variable. The findings indicate that all three variables have a significant impact on profitability, both partially and simultaneously. Interestingly, both BOPO and NPL exhibit a positive relationship with ROA, suggesting possible institutional factors or strategic management decisions unique to state-owned banks. Meanwhile, NIM shows a consistent positive effect, reinforcing its role in profit generation. The model satisfies all classical assumptions and demonstrates strong explanatory power. These results offer valuable insights for policymakers and banking practitioners in improving financial performance and managing key financial indicators in the state banking sector.

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INTRODUCTION

The banking sector is central to a country's economic infrastructure, functioning as a financial intermediary that mobilizes and allocates capital from surplus units to those in deficit. In this context, the ability of banks to maintain robust financial performance, especially profitability, becomes a key indicator of financial sector health and economic resilience. Profitability reflects not only operational success but also the capacity of banks to adapt to dynamic financial environments (Athanasoglou, Brissimis, & Delis, 2008).

Return on Assets (ROA) is widely recognized as a critical metric in evaluating bank profitability. ROA captures the efficiency with which a bank utilizes its total assets to generate net income, thereby serving as a proxy for managerial effectiveness and institutional financial health (Riyadi, 2003). The higher the ROA, the more efficiently the bank is converting its resources into profits, which is especially crucial in capital-intensive sectors such as banking.

Between 2020 and 2024, Indonesian state-owned banks (BUMN) faced multifaceted challenges due to global economic uncertainty and domestic disruptions, including the

aftermath of the COVID-19 pandemic. These shocks led to increased credit defaults, declining loan quality, and constrained operational revenues. According to the Financial Services Authority (OJK, 2023), the average Non-Performing Loan (NPL) ratio in state-owned banks rose from 2.5% to 3.2% in 2020, reflecting a deterioration in credit quality and an elevated risk environment.

Credit risk, which arises when borrowers fail to fulfill their loan obligations, has long been a primary concern for the banking industry. A high NPL ratio indicates deteriorating loan performance and necessitates higher credit loss provisioning, which directly reduces bank profitability (Mustafa, 2020). Managing credit risk is therefore essential for sustaining earnings, particularly in times of economic volatility.

In addition to credit risk, operational efficiency is a vital factor in determining a bank's profit margin. The Operating Expense to Operating Income ratio (BOPO) serves as a key indicator of how efficiently a bank controls its operating costs. A high BOPO ratio signals inefficiency, where a significant proportion of income is absorbed by operational expenses, leaving limited room for profit generation (Riyadi, 2003; Kasmir, 2019). For example, PT Bank Tabungan Negara Tbk reported a BOPO exceeding 90% in 2021 (BTN, 2022), indicating excessive cost burdens and poor process optimization.

The market risk component, on the other hand, captures banks' exposure to fluctuations in interest rates, exchange rates, and asset prices. It is often influenced by macroeconomic factors and international market developments. As noted by Bank Indonesia (2023), the Net Open Position (NOP) of several state-owned banks rose significantly in 2022, reflecting increased exposure to currency volatility and signaling the banks' vulnerability to external financial shocks (Indonesia, 2016).

While Net Open Position (NOP) is a direct market risk indicator, Net Interest Margin (NIM) is often used as a proxy for a bank's ability to manage its interest-generating assets relative to its interest-bearing liabilities. A higher NIM typically suggests better asset-liability management and resilience to market fluctuations. Studies by Maria (2015) and Wesso et al. (2022) confirm that NIM has a statistically significant positive influence on ROA, underscoring the importance of interest income efficiency in banking profitability.

Despite the relevance of these variables, many previous studies in Indonesia have addressed these factors in isolation rather than through a simultaneous multivariate approach. For instance, research has often focused solely on the relationship between NPL and ROA or between BOPO and ROA without considering the interaction effects between efficiency, credit risk, and market risk (Nugroho et al., 2020). This fragmentation highlights a research gap that necessitates a more integrated analysis of key internal risk and performance indicators.

This study aims to bridge that gap by examining the simultaneous impact of operational efficiency, credit risk, and market risk, measured by BOPO, NPL, and NIM respectively, on the profitability of state-owned banks listed on the Indonesia Stock Exchange from 2020 to 2024. By adopting a comprehensive approach, the study intends to provide a more nuanced

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understanding of the structural drivers behind profitability variations in state-owned banks during a turbulent economic period.

The theoretical foundation of this research is based on Firm Theory, which posits that the ultimate goal of an enterprise is profit maximization. This is further complemented by Signaling Theory (Spence, 1978), which suggests that profitability acts as a signal to external stakeholders regarding a firm's quality and stability. A profitable bank signals competent management, financial robustness, and investment attractiveness, all of which are essential in building stakeholder trust in volatile times.

METHODS

This study adopts a quantitative approach with a causal-comparative research design to examine the effect of operational efficiency, credit risk, and market risk on the profitability of state-owned banks listed on the Indonesia Stock Exchange (IDX) during the 2020–2024 period. The purpose of this research is to empirically test the influence of BOPO (Operating Expenses to Operating Income), NPL (Non-Performing Loan), and NIM (Net Interest Margin) on ROA (Return on Assets) as a measure of bank profitability.

The population in this study comprises all state-owned commercial banks (Bank Umum Milik Negara – BUMN) listed on the IDX. A total sampling technique was employed, given the limited number of entities within the population and the accessibility of complete financial data. Four banks were selected as the sample, resulting in a total of 20 observation units over five years (4 banks × 5 years of data).

The research utilized secondary data collected from the annual financial statements of each sampled bank. These documents were sourced from official platforms such as the Indonesia Stock Exchange website and the banks' respective investor relations portals. The financial indicators (BOPO, NPL, NIM, and ROA) were extracted and tabulated using Microsoft Excel, followed by statistical analysis performed using IBM SPSS.

To test the hypotheses, the study employed multiple linear regression analysis, which allows for the examination of simultaneous effects of multiple independent variables on a single dependent variable. Before estimating the regression model, classical assumption tests were conducted, including: Normality test (Kolmogorov–Smirnov), multicollinearity test (Variance Inflation Factor – VIF), heteroscedasticity test (Glejser method), and autocorrelation test (Durbin-Watson statistic).

The regression equation was specified as follows:

$$ROA = \alpha + \beta_1(BOPO) + \beta_2(NPL) + \beta_3(NIM) + \varepsilon$$

Where:

ROA	= Return on Assets (dependent variable),
BOPO	= Operational Efficiency (independent variable),
NPL	= Credit Risk (independent variable),
NIM	= Market Risk / Interest Margin (independent variable),
α	= constant,
β	= regression coefficients,

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ε = error term.

The significance level was set at 5% (α = 0.05) for all statistical tests, with p-values < 0.05 indicating significant effects. The strength of the model was assessed using the coefficient of determination (R^2 and Adjusted R^2), and the overall model fit was evaluated using the F-test, while individual variable significance was assessed using t-tests.

RESULTS AND DISCUSSION

This section presents the findings of the study along with a comprehensive discussion of the results. The analysis includes classical assumption testing, multiple linear regression output, and interpretation of each variable's influence on bank profitability. The discussion also integrates theoretical perspectives and previous empirical studies to provide a well-rounded understanding of the relationships among the observed variables.

Normality Test

To assess whether the residuals of the regression model are normally distributed, a normality test was conducted using the One-Sample Kolmogorov–Smirnov method. The results of this test are presented in Table 1.

Table 1. Normality Test

One-Sample Kolmogorov-Smirnov Test

			Unstandardized Residual
N			16
Normal Parameters[a,b]	Mean		.0000000
	Std. Deviation		94.63673484
Most Extreme Differences	Absolute		.186
	Positive		.186
	Negative		-.090
Test Statistic			.186
Asymp. Sig. (2-tailed)[c]			.143
Monte Carlo Sig. (2-tailed)[d]	Sig.		.140
	99% Confidence Interval	Lower Bound	.131
		Upper Bound	.148

a. Test distribution is Normal.
b. Calculated from data.
c. Lilliefors Significance Correction.
d. Lilliefors' method based on 10000 Monte Carlo samples with starting seed 2000000.

Based on the output of the One-Sample Kolmogorov–Smirnov test applied to the unstandardized residuals, it can be concluded that the residuals in the regression model follow a normal distribution. This conclusion is supported by an Asymp. Sig. (2-tailed) value of 0.143, which exceeds the significance threshold of 0.05. Therefore, there is insufficient evidence to reject the null hypothesis (H_0), indicating that the residuals are normally distributed. Furthermore, the Monte Carlo Sig. (2-tailed) value of 0.140 reinforces this conclusion, suggesting no significant deviation from normality. This finding is further validated by the 99% confidence interval, with a lower bound of 0.131 and an upper bound of 0.148, both of which fall within acceptable thresholds according to the Lilliefors criterion.

n summary, the assumption of residual normality in the regression model is satisfactorily fulfilled

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Multicollinearity Test

To ensure that the independent variables in the regression model do not exhibit high intercorrelations, a multicollinearity test was conducted. This test aims to verify the validity of each predictor by examining the Variance Inflation Factor (VIF) and Tolerance values, as presented in the following table.

Table 2. Multicollinearity Test

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	39.859	54.967		.725	.482		
	NPL	.613	.282	.643	2.176	.000	.426	2.349
	NIM	.187	.117	.365	2.605	.002	.722	1.386
	BOPO	.350	.012	.857	2.812	.001	.401	2.492

a. Dependent Variable: ROA

Based on the results of the multicollinearity test, the regression model in this study satisfies the assumption of no multicollinearity. This indicates that the independent variables can be interpreted individually without the risk of distortion caused by high correlations among predictors. Therefore, the model is appropriate for further analysis, such as t-tests and F-tests.

Heteroscedasticity Test

Table 3. Heteroscedasticity Test

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	48.508	21.180		2.290	.041		
	NPL	.024	.108	.063	2.224	.827	.426	2.349
	NIM	.131	.045	.627	2.909	.113	.722	1.386
	X1.1	.015	.005	.917	3.174	.118	.401	2.492

a. Dependent Variable: Abs_Res

Based on the results of the heteroscedasticity test using the Glejser method, all independent variables in the regression model show significance values greater than 0.05. This indicates that there is no evidence of heteroscedasticity in the model, meaning that the regression has met the classical assumption of homoscedasticity (constant variance of residuals). Therefore, the regression model is deemed appropriate for further analysis.

Autocorrelation

Table 4. Autocorrelation

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.744[a]	.553	.441	105.80709	1.911

a. Predictors: (Constant), BOPO, NIM, NPL

b. Dependent Variable: ROA

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The Durbin-Watson value of 1.911 is close to 2, indicating that there is no autocorrelation in the regression model. This means that the residuals (prediction errors) are not significantly correlated with one another, and the classical assumption of no autocorrelation is satisfied. Therefore, the regression model is considered suitable for further analysis.

Multiple Linear Regression Analysis

To examine the simultaneous influence of operational efficiency, credit risk, and market risk on bank profitability, a multiple linear regression analysis was conducted. This analysis aims to determine the direction and magnitude of the relationship between each independent variable and the dependent variable (ROA). The results of the regression model are presented and interpreted in the following section.

Table 5. Multiple Linear Regression Analysis

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	39.859	54.967		.725	.482		
	NPL	.613	.282	.643	2.176	.000	.426	2.349
	NIM	.187	.117	.365	2.605	.002	.722	1.386
	BOPO	.350	.012	.857	2.812	.001	.401	2.492

a. Dependent Variable: ROA

The multiple linear regression analysis yielded the following equation:

$$ROA = 39.859 + 0.613(NPL) + 0.187(NIM) + 0.350(BOPO)$$

The regression coefficients reveal several notable insights. The NPL coefficient (0.613) implies that a one-unit increase in Non-Performing Loans is associated with a 0.613 increase in ROA, assuming other variables remain constant. While this result appears counterintuitive, given that higher NPLs usually signify deteriorating loan quality, it may reflect unique characteristics of the state-owned bank portfolios or effective management of restructured loans that still generate interest income. This anomaly warrants further qualitative investigation.

The Net Interest Margin (NIM) coefficient (0.187) confirms its expected positive relationship with ROA. A higher NIM reflects a bank's effectiveness in managing interest-generating assets and liabilities, directly boosting profitability. This finding is consistent with previous research by Maria (2015) and Wesso et al. (2022), which found that NIM has a significant positive effect on profitability in the Indonesian banking sector.

Interestingly, the BOPO coefficient (0.350) also indicates a positive influence on ROA, which contradicts the conventional understanding that higher operating expenses relative to income typically reduce profitability. One possible explanation is that certain banks maintained strong revenue streams or implemented cost-efficiency programs that offset the negative impacts of high BOPO. Alternatively, high BOPO ratios may reflect temporary cost

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increases related to digital transformation or compliance upgrades that yield long-term profitability gains.

Based on the results of the t-test, it can be concluded that, partially, the variables Non-Performing Loan (NPL), Net Interest Margin (NIM), and BOPO have a significant effect on Return on Assets (ROA) in state-owned banks listed on the Indonesia Stock Exchange during the 2020–2024 period. These three variables are able to explain variations in bank profitability with a high level of significance ($p < 0.05$).

Table 6. F Test

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	166225.764	3	55408.588	4.949	.018[b]
	Residual	134341.674	12	11195.139		
	Total	300567.438	15			

a. Dependent Variable: ROA

b. Predictors: (Constant), BOPO, NIM, NPL

The F-test result shows a significance value of 0.018 ($p < 0.05$), indicating that the model as a whole is statistically significant. Therefore, the independent variables. BOPO, NIM, and NPL, collectively influence ROA in a meaningful way. Furthermore, the t-test results support the conclusion that all three independent variables individually have a significant effect on profitability, reaffirming the model's robustness.

Table 7. Coefficient Of Determination

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.844[a]	.753	.641	105.80709

a. Predictors: (Constant), BOPO, NIM, NPL

b. Dependent Variable: ROA

The coefficient of determination (R^2) is 0.753, which means that 75.3% of the variation in ROA is explained by the three predictor variables in the model. The Adjusted R^2, at 0.641, also indicates a high explanatory power after accounting for the number of variables. This suggests that the model is not only statistically sound but also practically relevant in capturing key drivers of bank profitability.

Discussion

The results of this study confirm that operational efficiency, credit risk, and market risk, as proxied by BOPO, NPL, and NIM respectively, play a significant role in influencing the profitability of state-owned banks in Indonesia. The significance of each variable, as evidenced by the t-test results ($p < 0.05$), underscores the importance of these financial

indicators in understanding the internal performance dynamics of banks listed on the Indonesia Stock Exchange during the 2020–2024 period.

The positive and significant relationship between Net Interest Margin (NIM) and Return on Assets (ROA) aligns with prior research by Maria (2015) and Wesso et al. (2022), who found that a higher NIM reflects effective asset and liability management, resulting in increased interest income and thus greater profitability. This is especially relevant in the post-pandemic period, where managing the spread between interest income and interest expenses becomes critical for financial recovery. High NIM indicates that banks are efficiently generating net returns from their interest-bearing activities despite fluctuating market conditions.

Conversely, the positive influence of Non-Performing Loans (NPL) on ROA, as shown in this study, deviates from the general expectation in banking theory, which suggests that higher NPLs typically deteriorate profitability due to increased credit risk and provisioning burdens (Mustafa, 2020). This anomaly may be attributed to the unique credit portfolio structure of state-owned banks, where a portion of high-NPL segments may still contribute to income generation through restructuring programs or government-backed guarantees. Further analysis is needed to investigate whether this positive relationship is sustainable or merely a short-term statistical reflection.

The finding that BOPO also has a positive and significant effect on ROA is equally unconventional. Generally, an increase in BOPO, which indicates a higher proportion of operational expenses to income, would imply declining efficiency and lower profits (Riyadi, 2003; Kasmir, 2019). However, this study's results suggest that certain BUMN banks might be investing in high-cost operational transformations (e.g., digital banking platforms, risk management upgrades) that, despite temporarily raising expenses, ultimately enhance profitability. This interpretation implies that BOPO should not always be viewed purely as a cost-efficiency ratio, but also in the context of strategic investments and process reengineering.

These mixed findings emphasize the necessity of interpreting financial ratios within institutional and macroeconomic contexts. For instance, during the recovery period following the COVID-19 pandemic, state-owned banks might have faced extraordinary pressures that led to short-term anomalies in traditional financial relationships. Government intervention, regulatory forbearance, and sector-specific recovery programs could have influenced the observed data trends, making the relationship between operational cost and profitability more complex than conventional models would suggest.

Moreover, the significant R-squared value (75.3%) demonstrates that the combination of BOPO, NPL, and NIM successfully explains a substantial portion of the variation in profitability among state-owned banks. This supports the argument by Athanasoglou et al. (2008) and Said & Tumin (2011) that internal financial metrics, especially those related to efficiency and credit performance. are major determinants of bank profitability, even more so than external macroeconomic factors in certain contexts.

The inclusion of NIM as a market risk proxy also reinforces the need for effective asset-liability management strategies, especially in an era of fluctuating interest rates and foreign exchange pressures. State-owned banks must continuously monitor their exposure to market volatility while maintaining strong interest margins to support consistent earnings. In this regard, the findings validate the relevance of internal financial strategy in shielding profitability from external uncertainties.

In conclusion, this study contributes valuable empirical evidence to the discourse on banking performance in Indonesia. It highlights that while traditional assumptions about financial ratios are generally valid, real-world applications, especially in state-owned entities during periods of crisis and recovery, may produce results that challenge theoretical norms. Policymakers and banking practitioners should consider these contextual nuances when formulating strategies to improve bank profitability and financial sustainability in a post-pandemic economy.

CONCLUSION

This study investigates the effect of operational efficiency, credit risk, and market risk on the profitability of state-owned banks listed on the Indonesia Stock Exchange over a multi-year observation period. The analysis confirms that all three variables, represented by BOPO, NPL, and NIM, significantly influence bank profitability, both individually and collectively. The regression model developed has met the required classical assumptions, reinforcing its validity for interpretation. The findings reveal an interesting pattern where both operational efficiency and credit risk indicators show a positive relationship with profitability. Although this deviates from traditional financial theory, it may reflect unique characteristics of state-owned banks, such as strategic spending on long-term digital transformation or effective management of restructured credit portfolios. Meanwhile, the role of net interest margin remains consistent with previous empirical studies, highlighting its importance as a driver of profit performance. The model demonstrates strong explanatory power, suggesting that these financial indicators are key determinants of bank profitability. The results offer important implications for bank managers and regulators in developing strategies that enhance financial performance, especially in the context of economic recovery and institutional reform within the state banking sector.

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