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The Impact of Credit Risk, Market Risk, and Operational Risk on Bank Financial Performance with State Ownership as a Moderating Variable in Indonesia (2020-2024)

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ABSTRACT

This research analyzes the impact of credit risk, market risk, and operational risk on the financial performance of Indonesian commercial banks, and examines the moderating role of state ownership across the pandemic (2020–2021) and post-pandemic (2022–2024) periods. Using quantitative panel data regression on 34 conventional banks, credit risk is proxied by non-performing loans (NPL) and loan loss provisions; market risk by market-based income and securities portfolios; and operational risk by BOPO and operating expenses to total assets. Financial performance is measured by Return on Assets (ROA), with state ownership as a moderator. The results indicate that the relationship between risk and financial performance is dynamic and state-dependent. Credit risk shows varying effects across indicators and periods, with one indicator remaining significantly negative during the pandemic while both indicators become significantly negative in the post-pandemic period. Market risk exhibits a selective effect, with market-based income consistently contributing positively to financial performance, while securities portfolio exposure does not show stable effects. Operational risk is found to be the most consistent factor influencing financial performance across all periods. Furthermore, state ownership has a direct effect on financial performance and plays a moderating role that varies across risk types: it tends to strengthen the effect of credit risk, weaken the effect of market risk, and significantly influence the relationship between operational risk and financial performance. These findings suggest that the relationship between risk and bank performance is not static, but is shaped by economic conditions and ownership structure.

INTRODUCTION

The banking sector plays a strategic role in maintaining financial system stability and supporting economic growth through its intermediation function (Otoritas Jasa Keuangan, 2023). During the 2020–2024 period, the Indonesian banking industry experienced significant dynamics due to the COVID-19 pandemic, global economic pressures, and changes in monetary policy and prudential regulations. In the early phase of the pandemic, credit growth slowed and was accompanied by an increase in credit risk. In contrast, during the recovery period, banking performance improved in line with the expansion of credit distribution and the improvement in asset quality (Bank Indonesia, 2023).

In this context, risk management becomes a crucial factor in determining bank financial performance. Theoretically, the relationship between risk and performance is explained by the risk–return trade-off concept, whereby higher risk can generate higher returns if managed optimally (Mishkin, 2019; Saunders et al., 2021). However, under conditions of economic

uncertainty — particularly during periods of crisis — this relationship does not always operate in a linear and consistent manner.

A number of empirical studies suggest that credit risk tends to have a negative effect on bank financial performance (Kingu et al., 2018; Setiawan et al., 2024), while operational risk, which reflects operational efficiency, has a significant impact on profitability (Santika & Fakhrughozy, 2022; Irawan et al., 2025). The effect of market risk on financial performance, on the other hand, shows mixed results and is highly dependent on macroeconomic conditions.

In addition to risk factors, ownership structure also plays an important role in influencing bank performance and risk-taking behavior (Hunjra et al., 2020; Migliardo & Forgione, 2018; Moudud-Ul-Huq et al., 2026). State ownership, in particular, may affect the effectiveness of risk management and the stability of financial performance, especially during periods of economic stress (Lee & Hooy, 2020). However, empirical evidence on the moderating role of state ownership in the relationship between risk and financial performance remains limited, particularly in the context of differing conditions between crisis and economic recovery periods.

Therefore, this study aims to analyze the impact of credit risk, market risk, and operational risk on the financial performance of commercial banks in Indonesia, as well as to examine the moderating role of state ownership by distinguishing between the COVID-19 pandemic period and the post-pandemic period (Huang et al., 2012). This study is expected to provide empirical contributions toward understanding the dynamic relationship between risk and bank financial performance under crisis and recovery conditions (Hamdaoui et al., 2025; Mousa et al., 2025; Omri, 2022).

Theoretically, bank financial performance — measured by ROA — reflects efficient resource management and is influenced by various types of risk. The risk–return trade-off Markowitz, (1952) suggests that higher risk may yield higher returns if managed optimally, though economic uncertainty can disrupt this linearity. Credit risk, proxied by NPL and loan loss provisions, arises from borrower default; asymmetric information theory Akerlof, (1970) explains the presence of adverse selection and moral hazard, and higher credit risk is generally associated with reduced profitability, although policy interventions during crises may weaken this effect (H1). Market risk, proxied by market-based income and securities portfolios, has inconsistent effects — beneficial under conditions of stability but harmful under volatility (H2). Operational risk, proxied by BOPO and operating expenses to total assets, reflects inefficiency and negatively affects profitability (H3). Drawing on agency theory (Jensen & Meckling, 1976), state ownership influences monitoring and decision-making, potentially moderating risk–performance relationships. Accordingly, state ownership is expected to moderate the effects of credit risk (H4), market risk (H5), and operational risk (H6) on bank financial performance. This study analyzes these relationships by distinguishing between the pandemic (2020–2021) and post-pandemic (2022–2024) periods, using panel data regression on 34 conventional commercial banks in Indonesia.

METHOD

Research Design and Data

This study employs a quantitative approach using panel data regression to analyze the impact of banking risks on financial performance. The data used are secondary data obtained from the annual financial statements of conventional commercial banks in Indonesia during the 2020–2024 period.

The population of this study consists of all conventional commercial banks in Indonesia. The sample is selected using a purposive sampling method based on the availability of complete and consistent data throughout the observation period. Furthermore, this study only includes publicly listed conventional commercial banks, while excluding digital banks and Islamic banks to maintain sample homogeneity.

To improve the quality of estimation, observations identified as outliers are excluded based on data characteristics, particularly extreme ratio values that do not represent general industry conditions. Specifically, several banks with extremely high Non-Performing Loan (NPL) ratios and highly negative Return on Assets (ROA) are excluded to avoid distortion in the model estimation results.

This approach is applied to ensure sample representativeness and the stability of panel regression estimates, considering that extreme values may lead to biased estimation results. Based on these criteria, the final sample consists of 34 banks with a total of 170 observations.

Operational Definition of Variables

The dependent variable in this study is financial performance, measured by Return on Assets (ROA). The independent variables consist of three types of banking risks: credit risk, market risk, and operational risk.

Credit risk is proxied by the Non-Performing Loan (NPL) ratio and loan loss provisions. Market risk is measured by market-based income to total assets and securities portfolio to total assets. Operational risk is proxied by the Operating Expenses to Operating Income ratio (BOPO) and operating expenses to total assets.

The moderating variable in this study is state ownership, which is used to examine its moderating role in the relationship between risk and financial performance.

To ensure consistency between the research model and variable measurement, each variable is represented by specific proxies and coded accordingly. Credit risk is divided into two indicators, where RK1 represents credit risk proxied by the Non-Performing Loan (NPL) ratio, and RK2 represents credit risk proxied by the ratio of loan loss provisions (CKPN) to total loans.

Market risk is also represented by two indicators, where RP1 refers to market risk proxied by the ratio of market-based income to total assets, while RP2 represents market risk proxied by the ratio of securities portfolio to total assets.

Furthermore, operational risk consists of two indicators, where RO1 represents operational risk proxied by the Operating Expenses to Operating Income ratio (BOPO), and RO2 represents operational risk proxied by the ratio of operating expenses to total assets.

In addition, state ownership is denoted as KN and measured using a dummy variable, where a value of 1 is assigned to banks with government ownership and 0 otherwise.

The use of these codes (RK1, RK2, RP1, RP2, RO1, RO2 and KN) aims to simplify the presentation of the regression model while maintaining consistency with the operational definition of each variable.

Data Analysis Technique

The analysis is conducted using panel data regression with model selection procedures through the Chow test and Hausman test to determine the most appropriate model among the Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM).

Hypothesis testing is performed using the t-test to examine the partial effect of each independent variable, and the F-test to assess the simultaneous effect of all independent variables. The coefficient of determination (R^2) is used to evaluate the model's explanatory power.

Moderation analysis is conducted by incorporating interaction terms between each risk variable and state ownership to examine the moderating effect in the relationship between risk and financial performance.

Research Model

The panel data regression model used in this study is formulated as follows:

$$ROA\_it = \alpha + \beta1RK1\_it + \beta2RK2\_it + \beta3RP1\_it + \beta4RP2\_it + \beta5RO1\_it + \beta6RO2\_it + \beta7KN\_it + \beta8(RK1\times KN)\_it + \beta9(RK2\times KN)\_it + \beta10(RP1\times KN)\_it + \beta11(RP2\times KN)\_it + \beta12(RO1\times KN)\_it + \beta13(RO2\times KN)\_it + \varepsilon\_it$$

where ROA represents financial performance, RK, RP, and RO represent credit risk, market risk, and operational risk, respectively, KN represents state ownership, and ε denotes the error term.

RESULTS AND DISCUSSION

Model Estimation Results

The results of the panel data regression estimation indicate that the model is statistically significant and has strong explanatory power in explaining variations in bank financial performance. Overall, the findings suggest that the impact of risk on financial performance is not homogeneous across periods, reflecting a dynamic relationship influenced by economic conditions.

Differences in results between the COVID-19 pandemic period and the post-pandemic period indicate that the sensitivity of bank performance to risk changes in response to shifts in macroeconomic conditions and regulatory policies.

To provide a more comprehensive understanding of the dynamics of risk effects on financial performance, this study classifies the observation period into three categories: the full period (2020–2024), the COVID-19 pandemic period (2020–2021), and the post-pandemic period (2022–2024). This classification aims to identify differences in the relationships between variables under crisis conditions and economic recovery phases.

Full (2020-2024)					Covid (2020-2021)					Non Covid (2022-2024)				
Variabel	Koefisien	t-Stat	Prob	Keterangan	Variabel	Koefisien	t-Stat	Prob	Keterangan	Variabel	Koefisien	t-Stat	Prob	Keterangan
RK1	-0.024210	-8.711942	0.0000	Signif (-)	RK1	-0.041157	-6.923898	0.0000	Signif (-)	RK1	-0.010005	-3.854743	0.0001	Signif (-)
RK2	-0.004325	-2.201341	0.0278	Signif (-)	RK2	-0.004666	-1.079624	0.2804	tidak signifikan	RK2	-0.004962	-2.854847	0.0043	Signif (-)
RP1	0.200165	11.21589	0.0000	Signif (+)	RP1	0.311041	9.309244	0.0000	Signif (+)	RP1	0.375970	12.68025	0.0000	Signif (+)
RP2	0.001547	3.244770	0.0012	Signif (+)	RP2	0.000465	0.441619	0.6588	tidak signifikan	RP2	-0.000197	-0.451086	0.6520	tidak signifikan
RO1	-0.064520	-168.2072	0.0000	Signif (-)	RO1	-0.062499	-86.17087	0.0000	Signif (-)	RO1	-0.063888	-157.4514	0.0000	Signif (-)
RO2	0.065690	17.68767	0.0000	Signif (+)	RO2	0.061172	9.202909	0.0000	Signif (+)	RO2	0.063301	16.03101	0.0000	Signif (+)
KN	1.143761	11.52389	0.0000	Signif (+)	KN	3.112364	7.734968	0.0000	Signif (+)	KN	0.612139	5.248058	0.0000	Signif (+)
RK1_KN	0.172214	11.91977	0.0000	Signif (+)	RK1_KN	0.293742	5.215082	0.0000	Signif (+)	RK1_KN	0.128400	8.576149	0.0000	Signif (+)
RK2_KN	-0.011726	-1.998304	0.0457	Signif (-)	RK2_KN	-0.016926	-1.491516	0.1360	tidak signifikan	RK2_KN	0.003830	0.578264	0.5631	tidak signifikan
RP1_KN	-0.614454	-8.956561	0.0000	Signif (-)	RP1_KN	-0.888039	-5.513940	0.0000	Signif (-)	RP1_KN	-0.538610	-5.770657	0.0000	Signif (-)
RP2_KN	-0.011350	-5.380632	0.0000	Signif (-)	RP2_KN	-0.031747	-5.276824	0.0000	Signif (-)	RP2_KN	-0.002104	-0.742163	0.4580	tidak signifikan
RO1_KN	-0.031395	-21.14162	0.0000	Signif (-)	RO1_KN	-0.057294	-7.304800	0.0000	Signif (-)	RO1_KN	-0.028518	-21.24248	0.0000	Signif (-)
RO2_KN	0.201880	19.57979	0.0000	Signif (+)	RO2_KN	0.236467	5.600438	0.0000	Signif (+)	RO2_KN	0.232885	24.37584	0.0000	Signif (+)

Figure 1. Panel Data Regression Results (Full, COVID-19, and Post-COVID Periods)
Source: Data processing results using panel data regression analysis (2025).

Based on Figure 1, the effects of risk variables on bank financial performance exhibit different patterns across periods. Some variables, such as operational risk (RO1), show consistently significant effects across all periods, emphasizing the importance of operational efficiency in determining bank profitability.

In contrast, credit risk and market risk variables show changes in significance across periods. For instance, certain credit risk indicators are not significant during the pandemic but become significant in the post-pandemic period, indicating a shift in bank sensitivity to risk as economic conditions normalize.

Furthermore, state ownership (KN) and its interaction with risk variables tend to exhibit stronger effects during the pandemic period, suggesting a stabilizing role in mitigating economic pressures.

Overall, the regression results confirm that the model performs well statistically and that the relationship between risk and financial performance is dynamic and influenced by economic conditions.

Credit Risk and Financial Performance

Based on the estimation results in Table 1, the effect of credit risk on financial performance shows variation across indicators and periods. In the full period (2020–2024), both credit risk indicators (RK1 and RK2) have a significant negative effect on financial performance, indicating that an increase in credit risk generally reduces bank profitability.

However, during the COVID-19 pandemic period (2020–2021), only RK1 remains significantly negative, while RK2 is not significant. This suggests that not all aspects of credit risk are fully reflected in bank financial performance during crisis conditions. This phenomenon may be explained by policy interventions such as credit restructuring and regulatory relaxation, which mitigate the impact of declining asset quality on bank profitability.

In the post-pandemic period (2022–2024), both indicators of credit risk again show significant negative effects on financial performance. This finding confirms that after the end of regulatory relaxation policies, credit quality returns to being a key determinant of bank profitability, in line with economic normalization.

These findings indicate that the relationship between credit risk and financial performance is state-dependent, where its impact tends to weaken during crisis periods but strengthens during economic recovery. This result is consistent with prior studies showing that credit risk negatively affects bank profitability under normal conditions (Kingu et al., 2018;

Setiawan et al., 2024). It also suggests that the effectiveness of credit risk management is highly dependent on policy support and macroeconomic conditions.

Market Risk and Financial Performance

Based on Table 1, the effect of market risk on financial performance shows a selective pattern across indicators. Market-based income (RP1) consistently demonstrates a significant positive effect across all periods, including the full period, the pandemic period, and the post-pandemic period. This indicates that income diversification through market-based activities contributes positively and consistently to bank profitability.

In contrast, the securities portfolio indicator (RP2) does not show significant effects in most periods. While it is significant in the full period, it becomes insignificant during both the pandemic and post-pandemic periods. This suggests that not all forms of market risk exposure contribute consistently to financial performance, particularly under economic uncertainty.

The differences between RP1 and RP2 indicate that market risk is not homogeneous but depends on the type of activity and portfolio management strategy adopted by banks. Market-based income tends to be more flexible and adaptive to changing market conditions, while securities portfolios are more vulnerable to volatility and price fluctuations.

These findings are consistent with previous studies indicating that the impact of market risk on financial performance is inconsistent and highly dependent on bank characteristics and macroeconomic conditions (Cristian et al., 2020; Anggraeni et al., 2023). Therefore, market risk management requires a more selective and contextual approach.

Operational Risk and Financial Performance

Based on the estimation results in Table 1, operational risk is the most consistent factor affecting bank financial performance compared to other types of risk. The operational efficiency indicator proxied by the BOPO ratio (RO1) consistently shows a significant negative effect across all periods, confirming that operational efficiency is a key determinant of bank profitability.

On the other hand, RO2 shows a significant positive effect across all periods. This finding suggests that, under certain conditions, increased operational expenses may reflect higher productive business activity, which in turn contributes to increased income and financial performance.

The combination of RO1 and RO2 results indicates that operational risk reflects not only efficiency but also the dynamics of bank operational activities. Therefore, its interpretation must be contextual, distinguishing between inefficient cost increases and productive operational expansion.

Overall, these findings reinforce that operational efficiency remains a critical factor in determining bank profitability, both during crisis and recovery periods, in line with prior studies (Santika & Fakhrughozy, 2022; Irawan et al., 2025).

The Role of State Ownership as a Moderating Variable

Based on Table 1, state ownership (KN) not only has a significant direct effect on financial performance but also acts as a moderating variable that influences the relationship between risk and financial performance differently across risk types and periods.

In the context of credit risk, the interaction variable (RK1_KN) shows a consistently significant positive effect across all periods, indicating that state ownership strengthens the relationship between credit risk and financial performance. This reflects a stabilizing role,

where state-owned banks tend to have greater capacity to manage credit quality, particularly under economic pressure. However, RK2_KN shows inconsistent results, indicating that not all aspects of credit risk are moderated uniformly.

For market risk, the interaction between state ownership and market-based income (RP1_KN) shows a consistently significant negative effect, suggesting that state ownership weakens the positive impact of market risk on financial performance. This reflects a more conservative approach to market exposure. Meanwhile, RP2_KN is only significant in certain periods, indicating a limited moderating effect.

In terms of operational risk, both RO1_KN and RO2_KN show consistent and significant effects across all periods, indicating that state ownership strengthens the role of operational efficiency in influencing financial performance.

Overall, these findings suggest that state ownership acts as an institutional mechanism that influences the sensitivity of bank performance to different types of risk. The moderating role varies across risk types, indicating that its effect is not homogeneous but depends on the characteristics of risk and economic conditions.

General Discussion

Overall, the findings of this study indicate that the relationship between risk and bank financial performance is dynamic and state-dependent. The empirical results in Table 1 show that the sensitivity of financial performance to different types of risk changes significantly between the COVID-19 pandemic period and the post-pandemic period.

During the crisis period, the effects of certain risks, particularly credit risk and market risk, tend to weaken or become insignificant due to policy interventions such as credit restructuring and regulatory relaxation (Audi & Al Masri, 2024; Nistor & Ongena, 2023). In contrast, during the post-pandemic period, the effects of risk become stronger and more significant as economic conditions normalize.

Among all types of risk, operational risk is the most consistent factor influencing financial performance across all periods, confirming the critical role of operational efficiency in both crisis and recovery phases.

Furthermore, state ownership not only has a direct effect on financial performance but also plays a moderating role that varies across types of risk. This reflects its institutional function in maintaining stability during periods of economic stress and influencing bank risk management strategies.

Thus, this study confirms that the relationship between risk and financial performance in the banking sector is not static but is shaped by the interaction between macroeconomic conditions and ownership structure, which together drive the dynamics of banking performance.

CONCLUSION

This study aims to analyze the impact of credit risk, market risk, and operational risk on the financial performance of Indonesian commercial banks, as well as to examine the moderating role of state ownership during the 2020–2024 period, which encompasses both the COVID-19 pandemic and post-pandemic phases. The results indicate that the relationship between risk and financial performance is not static but condition-dependent. With respect to credit risk, the effect varies across indicators and periods: one indicator remains significantly

negative during the pandemic while the other is not significant, but both become significantly negative in the post-pandemic period, indicating that economic normalization restores credit quality as a key determinant of bank profitability. Market risk exhibits a selective effect, with market-based income consistently contributing positively to financial performance, while securities portfolio exposure does not show stable effects across periods, suggesting that not all forms of market exposure equally support bank profitability. Operational risk is the most consistent factor affecting financial performance, with operational efficiency serving as a key determinant across all periods. Furthermore, state ownership has a direct effect on financial performance and acts as a moderating variable with varying effects across risk types: it strengthens the impact of credit risk, weakens the impact of market risk, and plays a significant role in relation to operational risk, highlighting that ownership structure shapes banks' performance sensitivity to different types of risk.

The findings carry strategic implications for bank management, regulators, and future research. For bank management, the results emphasize adaptive and condition-dependent risk management strategies: during crisis periods, credit restructuring and regulatory relaxation help mitigate risk impacts, while during normalization, stricter discipline in credit risk management is essential to maintain asset quality and profitability, and operational efficiency should be prioritized as the most consistent performance factor. With regard to market risk, management should adopt a selective approach, focusing on flexible and adaptive income sources rather than relying on volatile securities portfolios. For regulators, the findings highlight the importance of countercyclical policies in maintaining financial stability during crises, and the significant role of state ownership suggests that supervisory approaches should account for ownership structure, with adaptive and risk-based regulatory policies essential to balancing stability and performance. For future research, this study opens opportunities to explore other institutional factors — such as corporate governance and macroprudential policies — as moderators of the relationship between risk and bank financial performance.

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