

RISK MANAGEMENT, CORPORATE GOVERNANCE, AND FINANCIAL PERFORMANCE: EVIDENCE FROM INDONESIAN COMMERCIAL BANKS (2020–2024)

Andreas¹, Rifky Farras Sulthan², Henny Setyo Lestari^{3*}, Farah Margaretha Leon⁴

^{1,2,3,4}Faculty of Economics and Business, Universitas Trisakti, Jakarta, Indonesia

*Corresponding author: (Henny_setyo_lestari@trisakti.ac.id)

Abstrak

This study examines the effects of risk management and corporate governance on the financial performance of Indonesian commercial banks. Unlike prior studies that examine risk management and corporate governance separately, this study integrates both dimensions within a unified empirical framework to explicitly capture their joint influence on bank profitability. Using balanced panel data from 43 banks listed on the Indonesia Stock Exchange over 2020–2024 (215 firm-year observations), this study employs panel regression with a Random Effects Model. Financial performance is proxied by return on assets (ROA). Risk management and corporate governance are represented by key indicators reflecting credit risk, market risk, liquidity risk, and corporate governance. The results show that asset quality and leverage discipline are critical determinants of bank profitability, as credit risk, financial leverage, and board size negatively and significantly affect ROA, while bank size has a positive and significant effect, whereas other risk buffers and governance attributes are insignificant. These findings highlight that bank profitability in Indonesia is more strongly associated with asset quality, leverage discipline, operational scale, and board efficiency than with other risk buffers and formal governance attributes. The study provides practical implications for bank management in strengthening credit risk control and capital structure discipline, and for regulators in emphasizing governance effectiveness to support sustainable bank performance.

Keywords: risk management; corporate governance; bank performance; ROA; Indonesia.

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INTRODUCTION

The digital transformation of the banking industry, as a defining context of the digital era, has fundamentally reshaped the way financial services are delivered, monitored, and governed. Within this context, the adoption of digital platforms, fintech integration, and data-driven operations has enabled banks to expand their scale and operational efficiency. However, this transformation has also intensified exposure to financial risks, including credit risk, market risk, and liquidity risk, while increasing governance complexity. As banking operations become more

interconnected and technology-driven, the effectiveness of risk management and corporate governance mechanisms plays a pivotal role in sustaining financial performance.

Bank financial performance is closely associated with the effectiveness of risk management, particularly in managing credit, market, and liquidity risks. Credit risk remains the most significant source of vulnerability for commercial banks, as higher non-performing loans (NPL) consistently reduce profitability through declining interest income and rising impairment costs (Mahaseth, 2024; Parajuli, 2023; Adekunle, 2025). Differences in the strength of this relationship across studies may reflect variations in macroeconomic conditions, regulatory frameworks, and credit risk management practices across countries. Loan loss provisions (LLP) function as a buffer against expected credit losses, yet their effect on profitability remains inconclusive. While excessive provisioning may suppress short-term earnings (Bhattacharai, 2024; Poudel, 2023), adequate provisions can enhance long-term stability. Such mixed findings are likely driven by differences in accounting standards, provisioning policies, and credit cycle phases.

The loan-to-deposit ratio (LTD), as a measure of intermediation efficiency, also shows mixed effects on bank performance. Higher LTD may improve profitability through increased lending, but excessive lending can heighten credit and liquidity risks, particularly in environments with weaker liquidity regulation (Adekunle, 2025; Bhandari, 2024; El Qirem & Alshehadeh, 2025). Market and liquidity risks further influence bank performance. Financial leverage is generally found to negatively affect profitability by increasing funding costs and exposure to market shocks, although the magnitude varies with capital regulation and economic stability (Mahaseth, 2024; Molla & Kaur, 2025; Blaga et al., 2024). Liquidity, proxied by cash-to-total assets, has an ambiguous relationship with profitability, as higher liquidity enhances resilience but may limit income-generating opportunities, especially in low-interest-rate settings (Azzam & Almaleeh, 2022; Abbas et al., 2023). Bank size is often associated with improved performance due to economies of scale and diversification benefits, though inconsistencies across studies may arise from differences in efficiency and market structure (Eltweri et al., 2024; Margaretha & Letty, 2017; Siddique et al., 2022).

In addition to risk management, corporate governance is critical in moderating risk-taking behavior in banks. Board size and board independence are commonly used proxies of governance quality. While stronger boards may enhance monitoring effectiveness, empirical findings remain mixed, as larger boards may also suffer from coordination problems and higher agency costs, potentially weakening financial performance (Saka & Zhang, 2025; Ofori et al., 2025).

Similarly, board independence is expected to strengthen objectivity, transparency, and accountability by mitigating agency conflicts between management and shareholders. Nevertheless, empirical findings regarding the impact of independent directors on bank profitability remain inconclusive. Some studies report positive effects due to improved monitoring and governance quality, while others find insignificant or even negative effects when independent directors lack firm-specific or industry expertise (Nikolić et al., 2022; Abiad et al., 2025). Despite the extensive literature on bank performance, most prior studies tend to examine risk management and corporate governance separately. Limited empirical research integrates these two dimensions within a unified analytical framework, particularly in the context of Indonesian commercial banks. Moreover, existing findings on the effects of risk indicators and governance structures on profitability remain inconsistent across countries and regulatory regimes. In the Indonesian

context, the importance of governance in banking is further reinforced by regulatory requirements issued by the Financial Services Authority (Otoritas Jasa Keuangan/OJK), with Regulation No. 55/POJK.03/2016 mandating banks to implement sound corporate governance practices, emphasizing the roles and responsibilities of the board of commissioners in overseeing risk management, internal control, and compliance functions (Otoritas Jasa Keuangan, 2016). This study addresses this gap by jointly examining credit risk, market risk, liquidity conditions, and corporate governance mechanisms as determinants of bank financial performance in Indonesia. By employing panel data from listed commercial banks over the period 2020–2024, this study contributes context-specific evidence on how internal risk exposure and governance efficiency jointly shape bank profitability, offering relevant insights for bank management, regulators, and investors.

The primary objective of this study is to examine the effects of risk management and corporate governance mechanisms on the financial performance of Indonesian commercial banks. Specifically, this study analyzes how credit risk (non-performing loans, loan loss provisions, and loan-to-deposit ratio), market risk (financial leverage), and liquidity conditions (cash-to-total assets and bank size), together with corporate governance characteristics (board size and board independence), influence bank profitability as measured by return on assets (ROA). By employing balanced panel data from 43 listed commercial banks over the period 2020–2024 and applying a Random Effects Model, this study aims to provide robust empirical evidence on the key internal determinants of bank performance in the Indonesian banking sector (Adekunle, 2025; Mahaseth, 2024). These mixed empirical findings may result from differences in bank-specific characteristics, regulatory environments, and variations in the expertise and effectiveness of board members, which leave the impact of risk management and corporate governance on bank profitability still inconclusive.

This study contributes to the existing literature in several important ways. First, it integrates risk management and corporate governance variables within a unified analytical framework, addressing limitations of prior studies that examine these dimensions in isolation (Saka & Zhang, 2025). Second, by focusing on Indonesian commercial banks, this study enriches the empirical evidence from emerging market banking systems, where institutional settings, regulatory frameworks, and governance practices differ from those in developed economies (Eltweri et al., 2024). Third, the findings offer practical implications for bank management in strengthening credit risk control, leverage discipline, and board effectiveness, while providing regulators and investors with evidence-based insights into the risk and governance factors that most strongly influence bank profitability and financial sustainability.

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Risk Management and Bank Financial Performance

Risk management plays a central role in determining the financial performance and stability of commercial banks. Banking institutions are inherently exposed to multiple forms of financial risk, including credit risk, market risk, and liquidity risk, due to their intermediation function and reliance on leverage. Effective risk management is therefore essential to ensure that banks are able to generate sustainable profits while maintaining asset quality and financial resilience (Adekunle, 2025).

Credit Risk and Bank Performance

Credit risk represents the potential losses arising from borrowers' failure to meet contractual repayment obligations and is widely recognized as the most significant source of risk faced by commercial banks. Non-performing loans (NPL) are commonly used as a key indicator of credit risk, as rising NPL ratios reflect deteriorating asset quality and reduced interest income, which ultimately weaken profitability (Mahaseth, 2024; Parajuli, 2023). Empirical studies consistently document a negative relationship between NPL and return on assets, indicating that higher levels of credit risk impair banks' ability to generate profits from their asset base (Adekunle, 2025).

Loan loss provisions (LLP) represent banks' precautionary measures to absorb expected credit losses. While provisioning enhances financial resilience and regulatory compliance, higher LLP levels may reduce reported profits by increasing operating expenses. Prior empirical evidence largely reports a negative association between LLP and bank profitability, although the magnitude and significance of this effect vary across institutional settings (Bhattarai, 2024; Poudel, 2023).

The loan-to-deposit ratio (LTD) captures the effectiveness of banks' intermediation function by measuring the extent to which deposits are transformed into loans. A higher LTD may increase interest income and profitability; however, excessive lending relative to deposits can elevate credit and liquidity risks. Consequently, empirical findings regarding the impact of LTD on bank performance remain mixed, reflecting differences in risk management practices and regulatory environments (Adekunle, 2025; Bhandari, 2024; El Qirem & Alshehadeh, 2025).

H1: Non-performing loans have a significant effect on bank financial performance.

H2: Loan loss provisions have a significant effect on bank financial performance.

H3: Loan-to-deposit ratio has a significant effect on bank financial performance.

Market Risk and Financial Leverage

Market risk arises from fluctuations in interest rates, exchange rates, and broader macroeconomic conditions that affect banks' balance sheets. Financial leverage (FL) reflects the extent to which banks rely on debt financing to support asset growth. While leverage can enhance returns by expanding lending capacity, excessive leverage increases interest burden and vulnerability to market shocks. Empirical studies predominantly show that high leverage exerts a negative effect on bank profitability due to rising financing costs and heightened risk exposure (Mahaseth, 2024; Molla & Kaur, 2025; Blaga et al., 2024). In the digital era, competitive pressure and rapid balance sheet expansion may further magnify leverage-related risks. Accordingly, this study proposes the following hypothesis:

H4: Financial leverage has a significant effect on bank financial performance.

Liquidity Risk, Bank Size, and Digital Scalability

Liquidity risk reflects banks' ability to meet short-term obligations without incurring substantial losses. Cash-to-total assets (CSH) measures the proportion of liquid assets available to absorb liquidity shocks. While higher liquidity enhances resilience, excessive cash holdings may reduce profitability by limiting investment in productive assets. Empirical findings on the

relationship between CSH and profitability remain mixed, suggesting that optimal liquidity levels vary across banking systems (Azzam & Almaleeh, 2022; Abbas et al., 2023; Adekunle, 2025).

Bank size (BKS), commonly measured by the logarithm of total assets, captures both scale effects and operational capacity. Larger banks often benefit from economies of scale, diversified portfolios, and lower funding costs, which can enhance profitability. In the context of digital banking, bank size may also reflect digital scalability, enabling institutions to leverage technology investments more effectively. Prior studies generally find a positive association between bank size and financial performance, particularly in competitive and technology-driven environments (Molla & Kaur, 2025; Eltweri et al., 2024). Based on these considerations, the following hypotheses are formulated:

H5: Cash-to-total assets have a significant effect on bank financial performance.

H6: Bank size has a significant effect on bank financial performance.

2.2 Corporate Governance and Bank Performance

Corporate governance plays a central role in aligning managerial actions with shareholders' interests and strengthening risk oversight. In banking institutions, governance mechanisms are particularly important due to high leverage, information asymmetry, and systemic risk. Board characteristics, including board size (BDS) and board independence (BDI), are widely examined as indicators of governance effectiveness.

Board size reflects the capacity of the board to provide oversight, expertise, and strategic guidance. Larger boards may enhance monitoring by incorporating diverse skills and experience, particularly in complex and digitally expanding banks. However, excessively large boards may suffer from coordination problems, higher agency costs, and slower decision-making, ultimately reducing performance. Empirical evidence on board size remains inconclusive, with studies reporting both positive and negative effects on bank profitability depending on institutional context (Saka & Zhang, 2025; Abiad et al., 2025; Ofori et al., 2025).

Board independence represents the proportion of independent directors tasked with monitoring management and mitigating agency conflicts. Independent boards are expected to enhance transparency, accountability, and risk control. Nevertheless, some studies suggest that excessive independence may weaken performance if independent directors lack firm-specific knowledge or operational insight. Empirical findings regarding the impact of board independence on bank performance are therefore mixed, underscoring the importance of contextual analysis (Saka & Zhang, 2025; Nikolić et al., 2022).

In digitally transforming banks, governance effectiveness becomes increasingly critical as operational complexity intensifies. Governance structures must adapt to support strategic oversight and risk management in technology-driven environments. Based on these arguments, the following hypotheses are proposed:

H7: Board size has a significant effect on bank financial performance.

H8: Board independence has a significant effect on bank financial performance.

Conceptual Framework

The conceptual framework of this study is developed to explain the relationship between risk management practices, corporate governance mechanisms, and the financial performance of Indonesian commercial banks. Bank financial performance, proxied by return on assets (ROA), is a profitability indicator that reflects management efficiency in utilizing total assets to generate profits and is widely used to measure a bank's efficiency in managing its assets, making it a comprehensive indicator of banking performance (Adekunle, 2025; Lestari et al., 2021). In this framework, ROA is influenced by four interrelated dimensions of internal bank factors: credit risk management, market risk management, liquidity conditions, and corporate governance.

The first dimension of the framework is credit risk management, which represents banks' exposure to potential losses arising from borrowers' failure to meet repayment obligations. Credit risk is proxied by non-performing loans (NPL), loan loss provisions (LLP), and the loan-to-deposit ratio (LTD). NPL reflects the deterioration of asset quality and is expected to reduce profitability by lowering interest income and increasing impairment costs (Mahaseth, 2024; Parajuli, 2023). LLP represents banks' precautionary measures against expected credit losses; while necessary for financial resilience, higher provisioning may suppress profitability through increased operating expenses (Bhattarai, 2024; Poudel, 2023). Meanwhile, LTD captures the effectiveness of banks' intermediation function in transforming deposits into loans. Although higher lending activity may enhance income generation, excessive LTD levels can elevate credit and liquidity risks, leading to ambiguous effects on bank performance (Adekunle, 2025; El Qirem & Alshehadeh, 2025).

The second dimension is market risk management, represented by financial leverage (FL). Financial leverage reflects the extent to which banks rely on debt financing to support asset growth. While leverage can improve returns by expanding earning assets, excessive reliance on debt increases interest expenses and financial vulnerability, thereby exerting a negative influence on profitability (Mahaseth, 2024; Molla & Kaur, 2025; Blaga et al., 2024). Accordingly, financial leverage is expected to have a significant relationship with bank financial performance.

The third dimension of the framework relates to liquidity conditions and operational scale, proxied by cash-to-total assets (CSH) and bank size (BKS). CSH reflects banks' ability to meet short-term obligations and absorb liquidity shocks. Adequate liquidity supports financial stability; however, holding excessive liquid assets may limit investment in productive assets and reduce profitability (Azzam & Almaleeh, 2022; Abbas et al., 2023). Bank size, measured by total assets, captures economies of scale, diversification capacity, and funding advantages. Larger banks are generally better positioned to operate efficiently and generate higher returns due to lower average costs and broader income bases (Eltweri et al., 2024; Siddique et al., 2022).

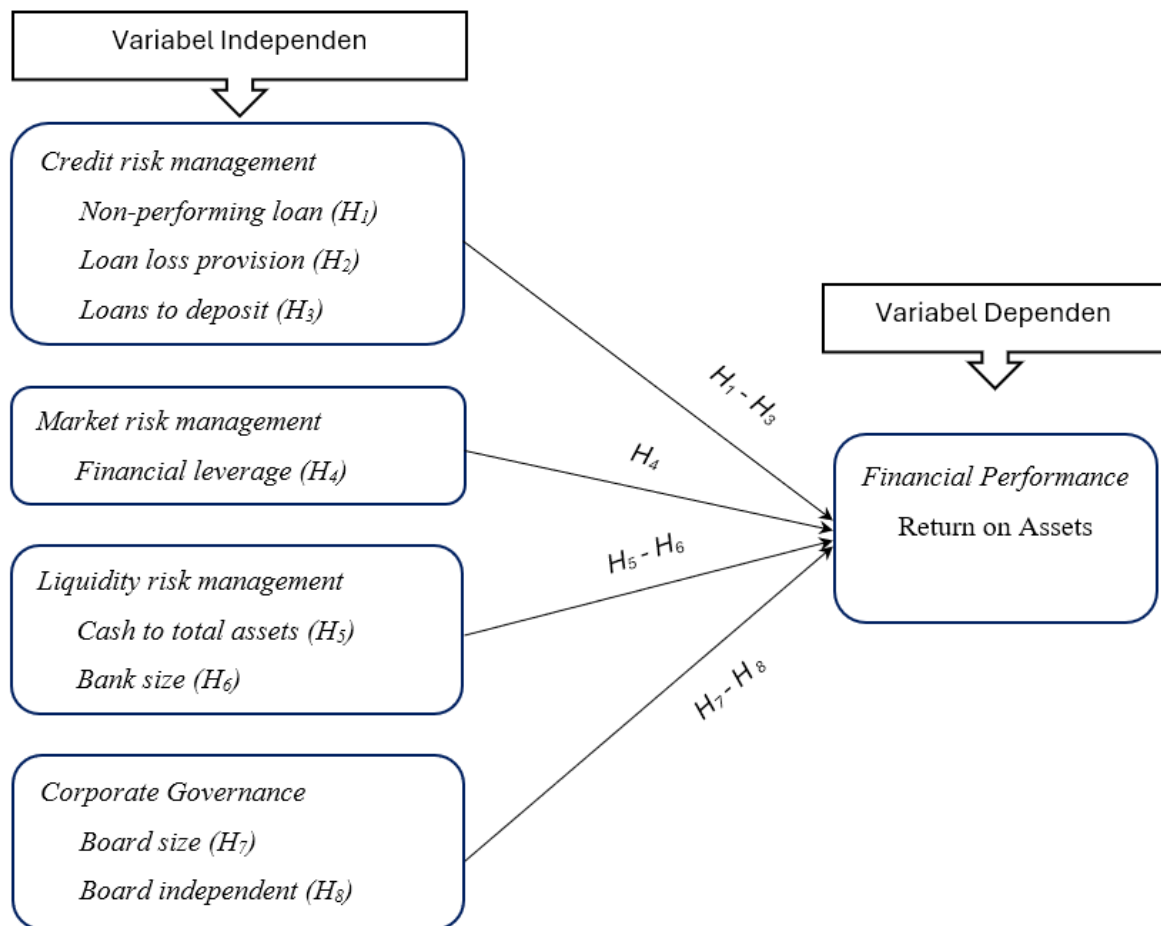


Figure 1. Conceptual Framework

The final dimension of the conceptual framework is corporate governance, represented by board size (BDS) and board independence (BDI). Corporate governance mechanisms play a crucial role in monitoring management behavior, controlling risk-taking, and aligning managerial decisions with stakeholders’ interests. Board size reflects the board’s monitoring capacity and availability of expertise; however, excessively large boards may face coordination inefficiencies and higher agency costs that undermine performance (Saka & Zhang, 2025). Board independence represents the presence of independent directors who are expected to enhance objectivity, transparency, and accountability. Nevertheless, empirical evidence suggests that the effectiveness of independent boards in improving bank profitability varies across institutional contexts, depending on directors’ expertise and involvement in strategic oversight (Nikolić et al., 2022; Abiad et al., 2025).

This conceptual framework posits that bank financial performance is jointly determined by risk management practices and corporate governance mechanisms. By integrating credit risk, market risk, liquidity conditions, and governance characteristics within a single analytical structure, the framework provides a comprehensive perspective on the internal determinants of bank profitability. This integrated approach addresses gaps in prior studies that examine these factors separately and forms the basis for the development of hypotheses H1 through H8 in this study.

RESEARCH METHOD

This study employs a quantitative research design with a hypothesis-testing approach to examine the effects of risk management and corporate governance on bank financial performance in the digital era. The analysis uses balanced panel data from Indonesian commercial banks listed on the Indonesia Stock Exchange over the period 2020–2024. The sample consists of 43 conventional banks selected through purposive sampling based on data availability and consistency of financial reporting during the observation period, resulting in 215 firm-year observations.

Secondary data are obtained from audited annual financial statements published by each bank. The use of panel data allows the study to capture both cross-sectional and time-series variations in bank performance, providing more robust and efficient estimates than single-dimension data structures.

For variables and measurement, bank financial performance is measured using return on assets (ROA), which reflects management efficiency in generating profits from total assets and is widely used in banking performance studies (Adekunle, 2025; Bhattarai, 2024). Risk management variables are grouped into three dimensions. Credit risk management is proxied by non-performing loans (NPL), loan loss provisions (LLP), and loans to deposit ratio (LTD). Market risk management is represented by financial leverage (FL), capturing banks' reliance on debt financing. Liquidity risk management is measured by cash to total assets (CSH) and bank size (BKS), where bank size—calculated as the natural logarithm of total assets—also reflects economies of scale and digital scalability in banking operations (Molla & Kaur, 2025). Finally, corporate governance is represented by board size (BDS), measured by the total number of board members, and board independence (BDI), measured by the proportion of independent directors. These governance indicators capture the effectiveness of oversight and monitoring mechanisms within banking institutions (Saka & Zhang, 2025).

To examine the relationship between risk management, corporate governance, and bank performance, this study estimates the following panel regression model:

$$ROA_{it} = \alpha + \beta_1 NPL_{it} + \beta_2 LLP_{it} + \beta_3 LTD_{it} + \beta_4 FL_{it} + \beta_5 CSH_{it} + \beta_6 BKS_{it} + \beta_7 BDS_{it} + \beta_8 BDI_{it} + \varepsilon_{it}$$

where i denotes the bank and t denotes the year.

Panel data regression is employed to estimate the model. Model selection is conducted using standard panel diagnostic tests. The results of the Chow and Hausman tests indicate that the Random Effect Model is the most appropriate specification for the data. This model is selected as it provides efficient and unbiased estimates under the assumption that individual bank effects are uncorrelated with the explanatory variables. All statistical analyses are conducted using panel regression procedures to ensure consistency and reliability of the empirical findings.

RESULTS

Descriptive Statistics

Descriptive statistics provide an overview of the distribution and variability of the variables used in the analysis. Overall, the data indicate moderate variation in bank financial performance, as reflected by return on assets (ROA), across Indonesian commercial banks during the observation period. The risk management indicators exhibit heterogeneous patterns, suggesting

differences in banks' credit quality, leverage structures, liquidity positions, and operational scale. Governance variables also show variation in board size and the proportion of independent directors, reflecting diverse governance structures across banks.

Table 1. The Result of Descriptive Statistics

Variable	Mean	Maximum	Minimum	Std. Deviasi	Observasi
NPL	0,038068	1,000000	-0,006200	0,095678	215
LLP	0,010493	1,656500	-0,045900	0,116913	215
LTD	1,259967	8,094900	0,189400	0,702181	215
FL	0,767412	1,557800	0,011000	0,164817	215
CSH	0,137606	0,454800	0,015600	0,073417	215
BKS	24,59536	28,51780	21,08880	1,710624	215
BDS	11,63721	23,000000	5,000000	4,736862	215
BDI	0,249153	0,444400	0,100000	0,059764	215
ROA	0,005113	0,044200	-0,180600	0,023684	215

Source: Output *e-views 9*

Descriptive statistics provide an overview of the distribution, central tendency, and variability of the variables used in the analysis. As presented in Table 6, the dataset comprises 215 firm-year observations from Indonesian commercial banks over the study period, indicating a balanced panel structure.

Bank financial performance, measured by return on assets (ROA), shows a mean value of 0.0051, with a maximum of 0.0442 and a minimum of -0.1806 . The relatively low mean ROA reflects the modest profitability of banks during the observation period, which coincides with heightened uncertainty and structural adjustments associated with digital transformation and post-pandemic recovery. The standard deviation of 0.0237 indicates moderate dispersion in profitability across banks.

Credit risk indicators exhibit considerable variation. The mean non-performing loan (NPL) ratio is 0.0381, suggesting that, on average, banks maintain manageable asset quality. However, the wide range between the minimum (-0.0062) and maximum (1.0000) values indicates substantial heterogeneity in credit risk exposure across banks. Similarly, loan loss provisions (LLP) show a mean of 0.0105 with relatively high dispersion, reflecting differences in provisioning policies and risk anticipation among banks. The loan-to-deposit ratio (LTD) has a mean of 1.26, indicating that, on average, banks extend loans exceeding their deposit base, which may enhance profitability but also elevate liquidity and credit risk if not carefully managed.

Market risk, proxied by financial leverage (FL), has a mean value of 0.7674, suggesting a relatively high reliance on debt financing in bank capital structures. The moderate standard deviation indicates variation in leverage strategies across banks, potentially reflecting differences in growth orientation and digital investment intensity.

Liquidity risk indicators also display notable variation. Cash to total assets (CSH) records a mean of 0.1376, indicating that banks hold a reasonable proportion of liquid assets to meet short-

term obligations. Meanwhile, bank size (BKS), measured as the natural logarithm of total assets, has a mean of 24.60, with relatively low dispersion, suggesting differences in operational scale but a generally comparable size structure across the sample.

Corporate governance variables demonstrate substantial diversity. Board size (BDS) has a mean of 11.64 members, ranging from 5 to 23, reflecting variation in governance structures and board capacity across banks. Board independence (BDI) shows a mean value of 0.249, indicating that independent directors account for approximately one-quarter of board membership on average, with moderate variation across institutions.

The descriptive statistics indicate meaningful cross-sectional and temporal variation in bank performance, risk management practices, and governance structures. This variation supports the suitability of panel data regression analysis to examine the relationships between risk management, corporate governance, and financial performance in the context of digitally transforming banking institutions.

Model Selection and Model Adequacy

Panel diagnostic tests are conducted to determine the most appropriate estimation technique. The Chow test indicates that a panel data approach is preferable to pooled ordinary least squares. Subsequently, the Hausman test results support the use of the Random Effect Model. This model is therefore employed for hypothesis testing, as it provides efficient estimates under the assumption that unobserved bank-specific effects are not correlated with the explanatory variables.

To determine the most appropriate panel data estimation technique and to assess the adequacy of the regression model, a series of diagnostic tests were conducted, including the Chow test, Hausman test, F-test, and goodness-of-fit evaluation. The summary of these tests is presented in **Table 1**.

Table 2. Panel Model Selection and Model Adequacy Tests

Test	Statistic	Probability	Decision	Interpretation
Chow Test (Cross-section Chi-square)	97.259974	0.0000	Reject H_0	Fixed Effect preferred over Pooled OLS
Hausman Test (Chi-square)	9.139315	0.3307	Fail to reject H_0	Random Effect preferred over Fixed Effect
F-test (Model Significance)	–	0.0000	Reject H_0	Regression model is jointly significant
R-squared	0.246779	–	–	Moderate explanatory power
Adjusted R-squared	0.217527	–	–	Model explains ~21.8% of ROA variation

Source: EViews 9 output (processed)

The Chow test results indicate that the pooled ordinary least squares model is inappropriate, as the cross-sectional effects are statistically significant. This finding suggests the presence of unobserved heterogeneity across banks, justifying the use of panel data estimation techniques.

Subsequently, the Hausman test was employed to determine whether the Fixed Effect Model or the Random Effect Model is more suitable. The test results show that the null hypothesis cannot be rejected, indicating that the Random Effect Model provides consistent and efficient estimates. Accordingly, the Random Effect Model is selected as the primary estimation method in this study.

Model adequacy is further supported by the F-test results, which demonstrate that the independent variables jointly have a statistically significant effect on bank financial performance. This finding confirms that the regression model is appropriate for explaining variations in return on assets.

The goodness-of-fit statistics indicate that the model explains approximately 21.8% of the variation in bank financial performance. While the explanatory power is moderate, this level is acceptable for studies examining bank profitability, which is influenced by both firm-specific and macroeconomic factors. The results suggest that risk management and corporate governance variables play a meaningful role in shaping bank performance, although additional external factors may also contribute. Thus, the model selection and diagnostic tests confirm that the chosen specification is statistically sound and suitable for subsequent hypothesis testing.

Regression Results and Hypothesis Testing

The regression results obtained from the Random Effect Model are presented in Table 7. Overall, the findings indicate that risk management and corporate governance variables exert heterogeneous effects on bank financial performance, as measured by return on assets (ROA). Several variables show statistically significant relationships with profitability, while others do not, suggesting that not all dimensions of risk and governance contribute equally to performance in the digital banking era.

Credit risk, proxied by non-performing loans (NPL), exhibits a negative and statistically significant effect on ROA. This result confirms that higher levels of problem loans deteriorate asset quality and reduce banks' ability to generate profits. The finding underscores the importance of effective credit risk management, particularly in digitally expanding banking operations where loan growth may outpace risk assessment capacity. Accordingly, the hypothesis related to the effect of NPL on bank performance is supported.

In contrast, loan loss provisions (LLP) do not show a statistically significant effect on ROA. This result suggests that variations in provisioning policies across banks do not directly translate into differences in profitability during the observation period. The finding implies that provisioning may function primarily as a prudential buffer rather than an immediate determinant of financial performance. Therefore, the hypothesis concerning LLP is not supported.

The loan-to-deposit ratio (LTD) is also found to have no significant effect on ROA. This indicates that differences in intermediation intensity among banks do not significantly influence profitability. The absence of significance may reflect balanced lending strategies or regulatory constraints that limit excessive risk-taking. Consequently, the hypothesis related to LTD is not supported.

Market risk, represented by financial leverage (FL), has a negative and highly significant effect on ROA. This finding indicates that higher reliance on debt financing increases financial

burden and vulnerability, thereby weakening bank profitability. In the context of digital banking, where capital requirements for technological investment are substantial, excessive leverage appears to pose a material risk to performance. Thus, the hypothesis regarding financial leverage is supported.

Liquidity risk indicators yield mixed results. Cash to total assets (CSH) does not show a statistically significant relationship with ROA, suggesting that holding higher levels of liquid assets does not directly enhance or reduce profitability. This finding may reflect banks' efforts to maintain adequate liquidity buffers without compromising operational efficiency. Accordingly, the hypothesis related to CSH is not supported. Conversely, bank size (BKS) demonstrates a positive and statistically significant effect on ROA. This result indicates that larger banks benefit from economies of scale and digital scalability, enabling more efficient asset utilization and higher profitability. The hypothesis concerning bank size is therefore supported.

Regarding corporate governance, board size (BDS) exhibits a negative and statistically significant effect on ROA. This finding suggests that larger boards may suffer from coordination inefficiencies and higher agency costs, which can undermine performance despite greater oversight capacity. The result highlights the importance of board efficiency rather than board size alone in digitally complex banking institutions. Thus, the hypothesis related to board size is supported. In contrast, board independence (BDI) does not show a significant effect on ROA. This finding implies that the presence of independent directors, while important for governance quality, does not directly influence profitability in the sample period. Accordingly, the hypothesis concerning board independence is not supported.

Table 3. Regression Results and Hypothesis Testing

Variable	Coefficient	Std. Error	Probability	Interpretation
C	-0.270500	0.049522	0.0000	–
NPL	-0.037948	0.015061	0.0125	Significant (negative)
LLP	-0.002413	0.011393	0.8324	Not significant
LTD	0.000308	0.002523	0.9029	Not significant
FL	-0.046473	0.010747	0.0000	Significant (negative)
CSH	-0.016308	0.023588	0.4901	Not significant
BKS	0.014684	0.002308	0.0000	Significant (positive)
BDS	-0.003883	0.000779	0.0000	Significant (negative)
BDI	-0.005536			

Source: EViews 9 output (processed)

The regression results provide partial empirical support for the proposed hypotheses. Credit risk, market risk, bank size, and board size emerge as significant determinants of bank financial performance, whereas other risk and governance variables do not exhibit direct effects. These findings suggest that, in the digital era, bank profitability is shaped more strongly by core risk exposure and governance efficiency than by formal governance structures or liquidity buffers alone.

The empirical results provide partial support for the proposed hypotheses. Hypotheses related to credit risk (NPL), market risk (financial leverage), liquidity scale (bank size), and governance structure (board size) are supported, while hypotheses associated with loan loss provisions, intermediation intensity, liquidity holdings, and board independence are not supported. These findings underscore that not all risk management and governance mechanisms exert equal influence on bank financial performance, particularly in the context of digital-era banking.

DISCUSSION

This study investigates the extent to which risk management practices and corporate governance mechanisms jointly determine the financial performance of Indonesian commercial banks. Consistent with the conceptual framework, the discussion is structured according to four key dimensions: credit risk management, market risk management, liquidity conditions, and corporate governance.

Credit Risk Management and Bank Financial Performance

The findings indicate that non-performing loans (NPL) have a negative and statistically significant effect on return on assets, confirming the central role of asset quality in determining bank profitability. This result supports the conceptual framework, which posits that deterioration in credit quality directly reduces interest income while increasing impairment costs, thereby weakening banks' ability to generate returns from their asset base. The negative effect of NPL is consistent with prior empirical evidence that identifies credit risk as the most dominant risk factor affecting bank performance, particularly in emerging banking systems where loan portfolios constitute a major share of total assets (Mahaseth, 2024; Parajuli, 2023; Adekunle, 2025).

In contrast, loan loss provisions (LLP) do not exhibit a significant relationship with profitability. From a conceptual perspective, this suggests that provisioning functions primarily as a prudential and regulatory buffer rather than as a direct driver of financial performance. Differences in provisioning levels may reflect accounting discretion or regulatory compliance rather than variations in underlying profitability. This finding aligns with studies that argue that LLP affects earnings primarily through accounting recognition rather than operational efficiency (Bhattarai, 2024; Hamad, 2025).

Similarly, the loan-to-deposit ratio (LTD) does not significantly influence ROA. While the conceptual framework acknowledges LTD as a measure of intermediation effectiveness, the insignificance of this variable suggests that higher lending intensity does not automatically translate into higher profitability. This may reflect cautious lending policies, credit risk considerations, or regulatory constraints that limit excessive loan expansion. The result reinforces the notion that credit volume alone is insufficient to enhance performance without corresponding improvements in asset quality.

Market Risk Management and Financial Leverage

Financial leverage is found to have a negative and highly significant effect on bank profitability, providing strong support for the conceptual framework's expectation regarding market risk exposure. Excessive reliance on debt financing increases interest obligations and heightens sensitivity to market fluctuations, thereby reducing net returns. This finding is consistent with the view that leverage amplifies financial risk and constrains banks' earnings capacity,

particularly when asset returns fail to sufficiently compensate for financing costs (Mahaseth, 2024; Molla & Kaur, 2025).

In the Indonesian banking context, where capital adequacy and risk-based supervision are emphasized, the negative effect of leverage underscores the importance of maintaining a balanced capital structure. Banks that adopt aggressive leverage strategies may face diminished profitability due to higher financial burden, supporting the argument that prudent leverage management is a key determinant of sustainable bank performance.

Liquidity Conditions, Bank Size, and Profitability

The empirical results show that cash-to-total assets (CSH) does not have a significant effect on profitability. This finding aligns with the conceptual framework, which recognizes liquidity as a stabilizing factor rather than a direct source of earnings. While sufficient liquidity is essential for meeting short-term obligations and maintaining confidence, excessive liquidity holdings may reduce profitability by limiting investment in higher-yielding assets. The insignificance of CSH suggests that banks in the sample maintain liquidity levels within an optimal range that prioritizes stability over profit maximization.

Conversely, bank size exhibits a positive and significant relationship with ROA, confirming the conceptual framework's emphasis on economies of scale and operational capacity. Larger banks benefit from cost efficiencies, diversified income sources, and better access to funding, enabling them to utilize assets more effectively and generate higher returns. This result supports the argument that scale advantages remain a critical determinant of profitability in the Indonesian banking sector, consistent with prior studies highlighting the performance benefits of larger operational size (Eltweri et al., 2024; Siddique et al., 2022).

Corporate Governance and Bank Performance

With respect to corporate governance, board size is found to have a negative and significant effect on profitability. This finding supports the conceptual framework's proposition that governance effectiveness depends on efficiency rather than size. While larger boards may provide broader expertise and monitoring capacity, they may also suffer from coordination inefficiencies, slower decision-making, and higher agency costs that undermine performance. The negative effect of board size suggests that excessively large boards may reduce managerial efficiency and weaken financial outcomes, consistent with governance theory emphasizing optimal board structure (Saka & Zhang, 2025).

In contrast, board independence does not exhibit a significant effect on bank profitability. From a conceptual standpoint, this result indicates that the presence of independent directors alone is insufficient to enhance financial performance. Although independent directors are expected to improve oversight and accountability, their impact may be indirect or contingent upon firm-specific knowledge, engagement level, and regulatory environment. This finding aligns with prior evidence suggesting that board independence improves governance quality but does not necessarily translate into higher profitability in all institutional contexts (Nikolić et al., 2022).

The findings provide strong support for the conceptual framework by demonstrating that bank financial performance is jointly shaped by core risk exposures and governance efficiency. Credit risk quality, leverage discipline, operational scale, and board efficiency emerge as key

determinants of profitability, while other risk buffers and formal governance attributes play more limited direct roles. These results highlight that improving bank performance requires a balanced approach that emphasizes prudent risk management and effective governance structures rather than reliance on single indicators or compliance-based measures alone.

CONCLUSION AND IMPLICATIONS

Conclusion

This study examines the effects of risk management and corporate governance on the financial performance of Indonesian commercial banks using panel data from 2020 to 2024. The findings demonstrate that bank financial performance, as measured by return on assets, is not uniformly influenced by all risk and governance mechanisms. Instead, profitability is primarily driven by a selective set of internal factors.

The results indicate that credit risk, proxied by non-performing loans, has a negative and significant effect on financial performance, confirming that asset quality remains a critical determinant of bank profitability. Financial leverage is also found to negatively affect ROA, suggesting that excessive reliance on debt financing weakens banks' earnings capacity. In contrast, bank size has a positive and significant effect on financial performance, reflecting economies of scale and operational efficiency advantages. From a governance perspective, board size exhibits a negative and significant relationship with ROA, indicating that governance efficiency rather than board expansion is more relevant for improving bank performance. Other variables, including loan loss provisions, loan-to-deposit ratio, cash-to-total assets, and board independence, do not show significant direct effects on profitability.

The findings suggest that bank financial performance in Indonesia is more strongly influenced by asset quality management, leverage discipline, operational scale, and board efficiency than by other risk buffers or formal governance attributes.

Managerial Implications

The findings provide important implications for bank management. First, banks should prioritize effective credit risk management by strengthening loan screening, monitoring, and portfolio quality control to minimize non-performing loans. Second, leverage strategies should be carefully managed to balance growth objectives with financial sustainability, as excessive leverage has been shown to reduce profitability. Third, bank management should leverage scale advantages by improving operational efficiency and optimizing asset utilization.

From a governance perspective, the results suggest that banks should focus on improving board effectiveness rather than increasing board size. Streamlined boards with clear roles, relevant expertise, and efficient decision-making processes are likely to be more effective in supporting strategic and risk-related decisions in digitally transforming banks.

Policy Implications

The findings of this study highlight the importance of strengthening risk oversight and governance effectiveness within the Indonesian banking sector. Regulators should place greater emphasis on credit risk control and leverage discipline, as non-performing loans and financial leverage are shown to significantly weaken bank financial performance. Supervisory frameworks

may therefore prioritize early detection of asset quality deterioration and ensure that banks maintain prudent capital structures to support sustainable profitability and financial stability.

In addition, governance-related regulations should move beyond formal compliance and focus on enhancing board effectiveness. The negative association between board size and profitability suggests that excessively large boards may reduce governance efficiency. Policymakers may consider promoting governance guidelines that encourage optimal board size, clearer decision-making responsibilities, and effective oversight functions. Such an approach would support more efficient governance structures capable of improving bank performance without increasing administrative complexity.

Academic Contributions and Future Research

This study contributes to the banking literature by integrating risk management and corporate governance variables within a unified empirical framework to explain bank financial performance. Unlike prior studies that often examine these dimensions separately, this research provides evidence that profitability is driven by a selective combination of credit risk quality, leverage discipline, operational scale, and governance efficiency. By focusing on Indonesian commercial banks, the study enriches empirical insights from an emerging market context, where institutional settings and governance practices differ from those in developed economies.

Future research may extend this study in several directions. First, incorporating macroeconomic factors, ownership structure, or regulatory intensity may provide a more comprehensive understanding of bank performance determinants. Second, future studies could explore moderating or mediating mechanisms—such as capital adequacy or risk governance quality—to further examine how risk management and corporate governance interact in shaping profitability. Longitudinal or comparative cross-country analyses would also be valuable in assessing the generalizability of the findings across different banking systems.

Limitations

This study has several limitations, focusing only on Indonesian commercial banks, which may limit generalizability to other contexts. Only selected internal risk and governance variables were examined, while external factors like macroeconomic conditions or ownership structure were not included, and the 2020–2024 panel data may not capture longer-term trends or potential nonlinear and interaction effects, which could be explored in future research by expanding variables, periods, and modeling approaches.

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