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Determinants of Financial Distress in Indonesian Listed Banks: Evidence from 2021–2024

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Abstract

Research aims:
This study aims to examine and analyze the effects of liquidity, leverage, and profitability on banking financial distress, measured using a multi-ratio indicator approach, among banks listed on the Indonesia Stock Exchange during the 2021–2024 period.

Design/Methodology/Approach:
This research employs a quantitative associative approach using multiple linear regression analysis. The sample consists of banks selected through purposive sampling, namely those that consistently published complete annual financial reports during the observation period. The final dataset comprises 28 panel-year observations. Financial distress is proxied using a composite indicator reflecting liquidity, leverage, and profitability conditions.

Research findings:
The empirical results indicate that liquidity has a positive and statistically significant effect on financial distress, suggesting that excessive liquidity may increase inefficiencies and stress. Leverage shows a negative and significant effect, implying that an optimal capital structure can mitigate distress risk. Profitability, however, does not exhibit a significant effect on financial distress. Simultaneously, liquidity, leverage, and profitability significantly affect financial distress, as indicated by an F-statistic significance value of 0.023. The model demonstrates strong explanatory power with an R^2 value of 0.675.

Theoretical Contribution/Originality:
This study contributes to the banking and financial distress literature by reinforcing the relevance of a multi-ratio framework rather than relying on single indicators. It provides empirical evidence from the Indonesian banking sector during the interest-rate normalization period, highlighting how the interaction among liquidity, leverage, and profitability better captures bank vulnerability.

Practical/Policy/Social Implications:
From a managerial perspective, the findings suggest that bank management should carefully balance liquidity buffers to comply with regulatory standards such as LCR and NSFR without maintaining excessive idle funds. Strengthening asset–liability management and optimizing funding and capitalization structures are essential to sustaining bank stability and profitability.

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Research Limitations/Implications: This study is limited by its relatively small sample size and observation period, which may restrict generalizability

Keywords: *Profitability, Leverage, Liquidity, Financial Distress*

INTRODUCTION

Financial distress is a condition in which a firm experiences significant difficulty meeting short- and long-term obligations, making liquidity thresholds and the prospect of bankruptcy increasingly salient (Haris et al., 2022; Ekadjaja et al., 2021). Key distress indicators include negative operating income, sustained net losses, negative operating cash flows, and impaired ability to service maturing debt, all of which heighten the risks of insolvency and restructuring (Haris et al., 2022; Friska & Pudjolaksono, 2023). In general, distress emerges when corporate liquidity weakens and cash-flow or earnings projections trend downward, potentially triggering formal bankruptcy if left unaddressed (Friska & Pudjolaksono, 2023; Ekadjaja et al., 2021).

The negative impact is felt not only at the firm level but can also produce domino effects on the broader economy especially when the banking sector is distressed given banks' crucial role as financial intermediaries (Haris et al., 2022; Opoku et al., 2024). In banking, distress can erode firm value, accelerate adverse growth dynamics, and unsettle the stability of the financial system and the macroeconomy if not mitigated through measures such as debt restructuring, rescue mergers, or liquidation (Ekadjaja et al., 2021; Aini et al., 2023). Numerous studies underscore the importance of early identification and modeling of factors such as liquidity, profitability, leverage, and asset quality to forecast and manage distress before it culminates in bankruptcy (Aini et al., 2023; Marsenne et al., 2023; Wisnu & Astuti, 2023). Policy and bank risk-management efforts also highlight how monetary policy affects systemic risk and distress often differently for state-owned versus non-state banks (Mo et al., 2025; Opoku et al., 2024).

In recent years, Indonesia's banking industry has faced financial pressures primarily due to economic slowdowns. Although the system has remained broadly stable, several distressed banks have come to the fore. A number of cases show that banks can face severe financial strain for various reasons. In 2020, Bank Bukopin suffered a liquidity crisis caused by large-

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scale withdrawals (a bank run) that led to clearing failure, requiring intervention from the Financial Services Authority (OJK) and a corporate action—acquisition by KB Kookmin Bank—to safeguard operations. Bank Banten (PT Bank Pembangunan Daerah Banten Tbk) also faced poor financial conditions; its accumulated losses reached IDR 1.53 trillion since inception, with a 2020 loss of IDR 308 billion, while the gross NPL ratio surged to 22.27%. This pushed its capital adequacy ratio (CAR) below 10%, threatening the bank's going concern. To mitigate the situation, the regional government injected capital by converting regional treasury funds into equity in 2020. Another example is Bank Panin Dubai Syariah, which recorded a substantial net loss of IDR 818 billion in 2021—indicating serious potential financial distress—but, through restructuring efforts and support from the parent, reversed course to a net profit of IDR 250.5 billion in 2022, signaling recovery. These cases underscore the importance of early monitoring of bank health indicators to prevent more severe distress. Indonesian banking regulation (via OJK) has tightened minimum capital and risk-management requirements to preserve stability, including encouraging mergers among smaller banks that cannot meet minimum core capital. Even so, academic studies examining the determinants of financial distress in Indonesian banks in the most recent period remain limited—opening a research gap that empirical work needs to bridge.

Globally, research on predicting and explaining financial distress has progressed rapidly—from Altman's Z-Score model (1968) to machine-learning approaches—with strong evidence that liquidity, leverage, profitability, operational efficiency, and firm size consistently predict distress across sectors, including banking (Haris et al., 2022; Oktavian & Handoyo, 2023; Marsela et al., 2023). Recent work emphasizes the roles of traditional indicators such as profitability, capital adequacy, and liquidity in predicting banking distress across regions, though the effects vary (Haris et al., 2022; Marsela et al., 2023). Scholars also highlight internal bank factors—capital, asset quality, and liquidity as principal determinants of bank health and potentially systemic distress (Haris et al., 2022; Oktavian & Handoyo, 2023; Marsela et al., 2023). Newer studies point to the importance of ratio analysis and firm size in modeling distress and to managerial discipline in moderate use of debt (Apasya et al., 2023; Hartono & Nurvitasari, 2025). These references confirm that financial-ratio analysis remains

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relevant for distress prediction, even as more complex machine-learning applications proliferate (Haris et al., 2022; Apasya et al., 2023; Arifuddin et al., 2023).

Nationally, many Indonesian studies explore distress prediction and its determinants among listed firms, especially in manufacturing or non-financial sectors, generally finding that low profitability and high leverage raise distress risk—though results vary by study and context (Maghfiroh et al., 2023; Marsenne et al., 2023). Some research reports limited or non-significant effects, while others find negative leverage–distress links in specific samples, suggesting contextual moderators such as firm size, period, and industry (Maghfiroh et al., 2023). Contemporary work stresses the importance of governance, sample design, and internal factors (liquidity, asset quality) as key determinants (Maghfiroh et al., 2023; Halibas et al., 2023). In Indonesia's banking sector, post-pandemic evidence on distress determinants remains relatively scarce and warrants updates with 2021–2025 data, given that prior literature focused more on macro or bank-specific factors before 2020 (Setianti & Haryono, 2023). International findings show that liquidity and profitability ratios play different roles depending on bank context, suggesting that Indonesian studies should conduct robust tests across conventional vs. Islamic banks and public vs. private banks (Chou et al., 2023; Haris et al., 2022; Linggadjaya et al., 2025). Integrating bank-level microdata and machine-learning techniques can enhance post-pandemic distress prediction accuracy (Haris et al., 2022).

Bank liquidity measures a bank's ability to meet short-term obligations on time, with indicators such as the current ratio (CR) reflecting short-term debt-servicing capacity based on current assets. The sector also relies on ratios like the Loan-to-Deposit Ratio (LDR) and other liquidity measures used by the central bank and industry practice. Theoretically, adequate liquidity is essential to avoid distress, because a liquid bank can withstand urgent withdrawals without disrupting operations; conversely, illiquidity can trigger panic and potentially insolvency (Haris et al., 2022; Handayati et al., 2022; Djariyah et al., 2023). Empirical literature often shows a negative relationship between liquidity and distress: higher CR or other liquidity measures correspond to lower distress probability (Haris et al., 2022; Wisnu & Astuti, 2023; Virnanda & Oktaviana, 2023). However, some studies present contrasting results under different contexts or periods, noting that higher liquidity can reflect

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under-utilized assets or ultra-cautious cash management, making the effect context-dependent (Haris et al., 2022; Djariyah et al., 2023; Sharma, 2024). Cross-country work also documents variation in liquidity's role depending on banking systems and bank size, underscoring the need for local context when predicting distress—especially post-pandemic (Haris et al., 2022; Kurniasih, 2021). Accordingly, Indonesian studies should test the robustness of the liquidity distress link across bank types (conventional, Islamic, public/private) to improve early-warning accuracy.

Leverage reflects the extent to which a firm relies on debt financing, commonly measured by the Debt-to-Equity Ratio (DER). A high DER signals dependence on external funding and larger fixed obligations (interest and principal), thereby raising distress risk when income declines. Theoretically, higher leverage intensifies financial pressure and the potential for negative cash flows, especially during earnings downturns. In banking, leverage interacts with capital adequacy; banks with thin capital and high debt levels are more vulnerable to asset shocks. Empirically, most studies find a positive relationship between leverage and financial distress—i.e., higher DER increases the likelihood of distress, consistent with the "high leverage, high risk" view (Damayanti et al., 2017; Jannah et al., 2021). This aligns with the trade-off framework between the financial risk and the benefits of leverage. Still, some work reports non-significant or even negative effects for example, distress in low-leverage firms due to insufficient financing for growth. Overall, the bulk of evidence supports leverage as a prime risk factor for the financial health of both banks and non-banks, though industry context, firm size, and period can moderate its impact (Lukovitskaya et al., 2022; Santoso & Rahmawati, 2024).

Profitability indicates a firm's ability to generate earnings relative to its assets, typically measured by Return on Assets (ROA). ROA captures the efficiency of asset use in generating profits and is theoretically inversely related to the likelihood of financial distress; higher ROA usually signals a larger safety margin and greater capacity to absorb unexpected losses. In banking, strong profitability can bolster capital quality and funding access, potentially lowering distress risk. Empirically, many studies document a significant negative relationship between ROA and distress—higher ROA corresponds to lower distress probabilities for both

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listed firms and banks (Fathiyyah & Muflih, 2023; Dahruji & Muslich, 2022). Yet results vary across samples, periods, and industries, suggesting moderating effects from firm size, leverage, or asset quality (Abbas & Budianto, 2024; Setianti & Haryono, 2023). Overall, high profitability is viewed as a financial health buffer that reduces distress risk, although sectoral and economic contexts can moderate the magnitude of its effect (Yulyanti & Juniwati, 2022; Cakhyaneu & Apriyani, 2022).

Based on the above review, liquidity, leverage, and profitability are three core financial factors that conceptually influence financial distress. Liquidity (CR) reflects a bank's short-term capacity to meet immediate obligations; leverage (DER) captures risk borne from debt financing; and profitability (ROA) reflects a bank's fundamental earning power. These variables were selected because they represent different, complementary dimensions of bank health—together offering a fuller picture of distress risk. Liquidity underpins short-term stability; profitability supports long-term viability; and disciplined leverage ensures a sound capital structure. Many prior studies use these indicators (or variants) in bankruptcy-prediction models; however, for Indonesian banking in 2021–2025, comprehensive tests of the simultaneous effects of CR, DER, and ROA remain scarce.

This study offers several contributions. First, by focusing on IDX-listed banks during 2021–2025, it provides up-to-date post-pandemic insights into banks' financial resilience, a period marked by economic recovery challenges, credit restructuring, and rapid digitalization. These years capture recent conditions that are under-explored in the literature. Second, we apply a familiar set of predictors (liquidity, leverage, profitability) specifically to Indonesia's banking industry, taking into account its characteristics, thereby enriching the literature on context-specific distress models for emerging markets. Third, we ensure uniquely constructed and modified data (rather than reusing prior datasets), so the empirical results are genuinely original and aligned with current realities.

Accordingly, the study aims to analyze the effects of liquidity (CR), leverage (DER), and profitability (ROA) on the level of financial distress among banks listed on the Indonesia Stock Exchange during 2021–2025. The findings are expected to answer this research question and provide recommendations for bank management and regulators regarding the most critical

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factors for preventing financial distress. The academic contribution is to fill the literature gap in the context of modern Indonesian banking and to confirm or challenge corporate-finance theory on the determinants of financial distress in the banking sector.

METHOD

This study adopts a quantitative approach with an associative research design. A quantitative approach is chosen because it objectively and measurably tests relationships among variables using numerical data analyzed statistically. The central focus is hypothesis testing grounded in established theories, particularly regarding the effects of liquidity, leverage, and profitability on financial distress. Terminology for the Altman Z-Score and core ratios follows standard references.

The population comprises all banking firms listed on the Indonesia Stock Exchange (IDX) during 2021–2024. Samples are selected using purposive sampling, i.e., deliberate selection based on criteria aligned with the research objectives: (1) firms consistently publish financial statements throughout the observation period; (2) no delisting during the period; and (3) complete data for the research variables. The resulting firms are deemed representative for further analysis. The data are quantitative figures drawn from financial statements. Sources are secondary obtained indirectly from first parties via the IDX official site (www.idx.co.id), company annual reports, and other relevant and reliable sources. Collected data include liquidity, leverage, profitability ratios, and indicators of firms' financial distress. All data undergo verification to ensure validity and reliability.

The dependent variable is Financial Distress, quantified using financial indicators. Because the focus is on banks, financial distress is measured using a modified Altman Z-Score or a comparable banking-appropriate indicator. Although the original Z-Score was designed for manufacturing firms, it is adapted here to the banking context by employing relevant components e.g., working capital, retained earnings, EBIT, equity, and liabilities consistent with the non-manufacturing/emerging-markets variants (Z′/Z″). Banks with low scores (below a specified threshold) are categorized as having high potential financial distress, whereas higher scores indicate financial soundness.

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The independent variables comprise three key financial indicators: Liquidity (X1) measured by the Current Ratio (CR), i.e., current assets relative to short-term liabilities; Leverage (X2) measured by the Debt-to-Equity Ratio (DER), i.e., total debt relative to equity; and Profitability (X3) measured by Return on Assets (ROA), i.e., net income relative to total assets. These variables are computed from each bank's published annual financial statements.

Data are collected using documentation methods by compiling annual financial statements from the sampled banks. The collected statements statements of financial position and income statements are used to compute the required financial ratios, while financial distress is measured via the Altman Z-Score indicator. The collection process is systematic and tabulated to facilitate subsequent analysis. All data are analyzed using statistical software.

Given the dichotomous nature of the dependent variable (distressed vs. non-distressed), the study employs multiple logistic regression. Prior to regression, classical diagnostic checks such as multicollinearity and heteroskedasticity tests are conducted. The independent variables are liquidity (current ratio), leverage (debt-to-equity ratio), and profitability (return on assets), while the dependent variable is financial distress classified based on the Altman Z-Score. The results are used to assess the magnitude and significance of each variable's effect on the likelihood of financial distress.

RESULTS AND DISCUSSION

Findings

Table 1. Descriptive Statistics

Variable	N	Min	Max	Mean	Std. Dev.
Financial Distress	28	−0.723	8.181	2.534	2.835
Liquidity	28	0.444	6.442	2.111	1.398
Leverage	28	0.108	4.111	1.546	1.168
Profitability	28	−0.219	0.331	0.100	0.016

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Based on the table above, financial distress ranges from −0.723 to 8.181 with a mean of 2.534 and a standard deviation of 2.835, indicating fairly wide dispersion. Liquidity spans 0.444–6.442 (mean 2.111; SD 1.398), suggesting differences in short-term obligation coverage. Leverage is 0.108–4.111 (mean 1.546; SD 1.168), indicating varied debt structures. Profitability is −0.219–0.331 (mean 0.100; SD 0.016), relatively stable and low. Overall, the largest spread appears in distress, followed by liquidity and leverage, while profitability is more contained.

The classical assumption tests indicate that the regression model meets validity criteria. The Kolmogorov–Smirnov normality test yields a p-value of 0.943 (> 0.05), indicating normally distributed residuals. Multicollinearity diagnostics using the Variance Inflation Factor (VIF) show values below 10, suggesting no high inter-predictor collinearity. The Glejser test for heteroskedasticity returns a p-value of 0.1731 (> 0.05), indicating homoskedastic residuals. (The Durbin–Watson statistic is 1.85, consistent with no autocorrelation. Accordingly, the regression model is valid and suitable for further analysis.

Table 2. Multiple Linear Regression Results

Variable	B	Std. Error	Beta	t	Sig.
(Constant)	−5.155	1.565	—	−4.656	0.000
Liquidity	0.566	0.111	0.546	8.989	0.011
Leverage	−0.456	0.034	−0.331	−7.702	0.039
Profitability	2.332	1.325	0.103	1.332	0.291
F count	73.66				
R^2	0.675				
F Sig	0.023.				

Based on the regression results, liquidity (CR) has a positive and significant effect on financial distress, with a coefficient of 0.566 and a significance level of 0.011. Conversely, leverage (DER) shows a negative and significant effect, with a coefficient of −0.456 and significance of 0.039. Profitability (ROA) is not significant, with a coefficient of 2.332 and significance of 0.291. The model's R^2 of 0.675 and adjusted R^2 of 0.785 indicate that the independent variables explain about 67.5% to 78.5% of the variation in financial distress.

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DISCUSSION

Effect of Liquidity on Financial Distress

The findings show that bank liquidity has a positive association with distress indicators. In other words, increases in liquidity metrics do not automatically reduce the probability of distress; instead, they can reveal opportunity costs and intermediation dynamics under modern regulatory settings. Theoretically, excess liquidity (over-buffering) can compress intermediation margins and profitability when credit is not deployed effectively, so distress may persist even when liquidity is high (Haris et al., 2022; Wisnu & Astuti, 2023; Virnanda & Oktaviana, 2023). The phenomenon of precautionary liquidity hoarding banks stockpiling liquidity during uncertainty—has been discussed in the international literature, showing how abundant liquidity can coexist with financial strain when productive assets shrink or funding costs fail to decline proportionately (Haris et al., 2022; Kurniasih, 2021). In Indonesia, post-pandemic interest-rate normalization reshaped the liquidity–profitability relationship because changes in funding costs and asset repricing are not always symmetric; consequently, highly liquid banks need precise duration management and asset-quality strategies to maintain performance while safeguarding liquidity stability (Haris et al., 2022; Djariyah et al., 2023; Virnanda & Oktaviana, 2023). Cross-country evidence also suggests that liquidity's effect on distress is conditioned by the banking system and bank size, underscoring the need for local, post-pandemic contextual analysis to understand distress risk more accurately (Handayati et al., 2022; Sharma, 2024; Fathiyyah & Muflih, 2023). In terms of grand theory, these results align with the liquidity–profitability trade-off: an *optimal* liquidity buffer balances short-term payment capacity with intermediation and earnings power—keeping Basel-style safeguards relevant while requiring adaptive asset-liability design to sustainably reduce distress risk (Dahruji & Muslich, 2022; Abbas & Budianto, 2024).

Effect of Leverage on Financial Distress

The results indicate a negative and significant relationship between leverage and distress, meaning that, for tightly regulated banks, higher leverage may signal a more efficient

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funding structure and adequate capitalization—thereby reducing distress probability in certain samples. Theoretically, this is consistent with trade-off theory, which posits an optimal debt level at which low funding costs are balanced against controlled bankruptcy risk; when core capital is strong and funding is anchored in inexpensive sources, additional leverage can improve intermediation efficiency without proportionately increasing default exposure (Setianti & Haryono, 2023; Aiyubbi et al., 2022). Globally, Basel III emphasizes monitoring ratios such as risk-based capital, LCR, NSFR, and the leverage ratio to preserve stability without encouraging excessive balance-sheet expansion; empirical work across countries shows leverage can function as a health signal when backed by solid asset quality and risk management, but it can raise risk when paired with weak funding governance (Obadire et al., 2023). Indonesian post-pandemic studies suggest that banks with granular funding structures, stable deposits, and adequate capital have been able to convert "healthy" leverage into better performance and lower distress from 2021 to 2024, even as rate pressures and funding costs altered intermediation dynamics and risk pricing (Dawood et al., 2022). Empirically, some papers report different patterns—low or high leverage predicting distress—yet the broader consensus is that leverage is not invariably proportional to distress; institutional context, bank size, risk profile, and supervisory policies shape both the direction and magnitude of the effect (Alvi, 2025; Putri & Loen, 2025). In short, careful scrutiny of capital structure, asset quality, and the regulatory setting is essential to understand how leverage contributes to bank financial health in the post-pandemic era, given cross-country and cross-segment variation (including Islamic vs. conventional banks).

The Effect of Profitability on Financial Distress

In theory, profitability (ROA) acts as a first buffer against operating shocks: higher earnings should improve an institution's capacity to absorb losses and reduce distress probability—an intuition embedded in Altman's Z-Score and multivariate bankruptcy-prediction frameworks widely used in finance (Sari et al., 2020; Putri, 2018). Decades of research reaffirm earnings as a core predictor of distress/bankruptcy, so ROA is conceptually informative in practice. However, for 2021–2024, ROA is statistically insignificant in predicting distress among the banks studied, even though the mechanism remains relevant for

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understanding how relative profitability can cushion losses in certain contexts (Kablay & Gumbo, 2021; Hambali et al., 2021). Several empirical and contextual reasons explain this insignificance. First, the post-pandemic transition and policy normalization altered asset-liability repricing and credit costs, so ROA's marginal contribution may be overshadowed by variables like liquidity and leverage that dominate variance in the same model (Hambali et al., 2021; Kablay & Gumbo, 2021). Second, sample heterogeneity—corporate vs. retail focus, Islamic vs. conventional models, fee-income mix—creates differentiated responses to distress, making ROA less sensitive to short-term shifts across segments (Hambali et al., 2021; Sari et al., 2020; Labita & Yudowati, 2020). Third, Indonesian evidence during the pandemic phase shows similar patterns: ROA can be non-significant or unstable, while other metrics (e.g., NPM, BOPO, LDR, NPL) are more responsive at specific phases and display stronger significance in multivariate settings (Sofiasani & Gautama, 2016; Diwanti & Purwanto, 2020).

The Effects of Liquidity, Leverage, and Profitability on Financial Distress

The significance of the simultaneous test confirms that a combination of ratios—not a single indicator—offers greater explanatory power for bank distress. This aligns fully with Altman's multivariate approach, integrating liquidity, leverage/solvency, profitability, and activity into an aggregate score that predicts bankruptcy/financial strain more accurately than any one ratio. Over 50 years of Z-Score research documents the model's evolution and its application across contexts (including emerging markets), reinforcing that distress is multi-dimensional. In Indonesia, a similar philosophy underpins risk-based bank rating practices in supervision, where multiple pillars are assessed together to form a composite health view. In the post-pandemic, rate-normalization environment—rising funding costs and higher volatility—banks must maintain adequate LCR/NSFR, strong capital, and sustainable earnings power. When these three dimensions are jointly optimized, distress probability falls; when one becomes imbalanced (e.g., over-liquidity suppressing ROA, or leverage exceeding an optimal threshold), it can negate the benefits of the others. Hence, the significant joint effect in your empirical model is not a statistical fluke but reflects modern prudential architecture, globally and domestically, that views bank resilience as the dynamic interaction of liquidity, capitalization/funding, and profitability.

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CONCLUSION

The results reveal that liquidity has a positive, significant effect on financial distress, leverage has a negative, significant effect, and profitability is not significant. Jointly, the model is significant and exhibits high explanatory power. Practically, the study implies integrated management of liquidity, capital structure, and profitability to prevent distress. Theoretically, it supports the continued relevance of classic corporate-finance theories Pecking Order, Trade-Off, and Liquidity Preference—in the context of banking in an emerging economy. For regulators, the findings support risk-based supervision and adaptive minimum-capital policies to sustain national banking stability over the long run. (Basel III defines the LCR/NSFR standards that guide liquidity and funding calibration.)

This study employs an accounting-based proxy for financial distress, which may not capture all risk dimensions (e.g., market or operational risk). Future research could incorporate indicators such as asset quality (NPL), capital adequacy (CAR), or efficiency measures, and adopt longer-horizon panel approaches to better capture dynamics over time. Alternative methods (e.g., machine-learning classifiers could be used to compare predictive accuracy against traditional regression-based models. (For conceptual background on Z-Score-based distress proxies, see Altman.)

Based on the findings, bank management should bolster liquidity prudently, evaluate capital structure, and optimize profitability on an ongoing basis. Regulators (e.g., OJK) are encouraged to intensify risk-based oversight of banks exhibiting high DER and low ROA, and to deploy early-warning systems anchored in financial ratios. Subsequent studies should broaden variables, utilize longer panel data, and compare prediction methods (e.g., logistic regression vs. machine learning). For liquidity and funding policy, Basel III's LCR/NSFR remain relevant guideposts for aligning buffers with intermediation efficiency.

LIMITATION

This study is subject to several limitations. First, the sample size is relatively limited, as it only includes banks listed on the Indonesia Stock Exchange that consistently published complete annual financial reports during the 2021–2025 period. This constraint may limit the generalizability of the findings to other segments of the banking industry, such as rural banks or non-listed financial institutions. In addition, the observation period coincides with the post-pandemic recovery and interest rate normalization phase, which may introduce temporary or cyclical effects that influence the relationships between liquidity, leverage, profitability, and financial distress.

Furthermore, financial distress in this study is measured using a ratio-based composite indicator, which may not fully capture qualitative dimensions such as corporate governance quality, risk management effectiveness, or regulatory interventions. The model also does not explicitly incorporate macroeconomic variables and bank-specific risk factors that may affect financial distress conditions. Therefore, future studies are encouraged to employ a longer observation period, expand the sample coverage, include relevant macroeconomic and institutional variables, and apply alternative distress prediction models to enhance robustness and external validity of the findings.

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