FINANCIAL DISTRESS AND FINANCIAL SUSTAINABILITY: PANEL EVIDENCE FROM INDONESIAN NON-FINANCIAL FIRMS

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ABSTRACT

Financial sustainability is a fundamental pillar of long-term corporate viability; however, it remains underexplored within the broader sustainability discourse, which is often dominated by environmental and social dimensions. This study aims to bridge this gap by examining financial distress as a key indicator of financial resilience and sustainable business continuity in emerging markets. Using panel data from 416 Indonesian non-financial firms over the period 2013–2022, this study employs a logistic regression approach to analyze the impact of profitability, liquidity, leverage, operating cash flow, and firm size on the likelihood of financial distress. Financial distress is defined based on the interest coverage ratio, where firms with a ratio below one are classified as distressed.

The empirical results reveal that profitability is the only statistically significant determinant of financial distress, highlighting its dominant role in sustaining firm operations. In contrast, liquidity, leverage, operating cash flow, and firm size do not exhibit significant effects, suggesting that traditional financial indicators may have limited predictive power in the Indonesian context. These findings emphasize the importance of profitability-driven resilience as a core component of financial sustainability in emerging markets.

This study contributes to the literature by repositioning financial distress within the financial sustainability framework and providing empirical evidence from a large panel dataset in Indonesia. The results offer practical implications for investors, creditors, and policymakers in developing more effective early warning systems and strengthening financial resilience as a foundation for sustainable business practices.

Keywords: Financial Distress, Financial Sustainability, Profitability, Panel Data, Emerging Markets

1. Introduction

Corporate sustainability has become a central topic in both academic research and business practice. While sustainability discussions are often dominated by environmental and social dimensions, financial sustainability remains a fundamental prerequisite for long-term corporate survival. Without the ability to generate stable earnings and maintain financial resilience, firms are unlikely to sustain their operations, regardless of their environmental or social performance (Bansal & DesJardine, 2014; Eccles et al., 2014).

Financial distress represents a critical stage in a firm's lifecycle, reflecting its inability to meet financial obligations and signaling potential bankruptcy risk. As such, financial distress serves as an important early warning indicator of weakened financial sustainability. The prediction of financial distress has been widely studied using accounting-based models such as Altman's Z-score and Ohlson's O-score, which rely on financial ratios to assess firm vulnerability (Altman, 1968; Ohlson, 1980). In the Indonesian context, recent empirical studies also confirm that financial ratios remain relevant predictors of financial distress, although their significance may vary across firms and economic conditions (Pratiwi et al., 2022; Yanti & Fauzan, 2023).

Despite extensive research on financial distress prediction, most studies focus on developed markets and emphasize traditional financial indicators without explicitly linking distress conditions to the broader concept of financial sustainability. Furthermore, empirical findings on the role of key financial variables such as liquidity, leverage, and operating cash flow remain inconsistent across studies, particularly in emerging markets (Beck et al., 2010; Claessens & Kose, 2013). In Indonesia, several studies report mixed results regarding the impact of liquidity, leverage, and cash flow on financial distress, suggesting that the predictive power of these variables is context-dependent (Hilwa & Sari, 2025; Hasanah et al., 2025).

As an emerging market, Indonesia presents a unique institutional and economic environment characterized by higher volatility, limited access to capital, and varying firm structures. These conditions may influence how financial indicators affect firm stability and distress risk. Therefore, a more contextualized analysis is needed to better understand the determinants of financial distress within the framework of financial sustainability.

This study aims to address this gap by examining the determinants of financial distress within a financial sustainability framework using panel data from Indonesian non-financial firms over the period 2013–2022. Specifically, this research investigates the effects of profitability, liquidity, leverage, operating cash flow, and firm size on the likelihood of financial distress. By integrating financial distress modeling with financial sustainability perspectives and combining international theoretical foundations with Indonesian empirical evidence, this study provides a more comprehensive understanding of corporate resilience in emerging markets.

2. Literature Review

2.1 Financial Distress and Financial Sustainability

Financial distress refers to a condition in which a firm experiences difficulty in fulfilling its financial obligations, particularly interest and principal payments. It is widely recognized as an early warning stage preceding more severe outcomes such as insolvency, bankruptcy, or liquidation (Altman, 1968; Ohlson, 1980). In this sense, financial distress is not only a short-term financial problem but also a signal of weakened financial sustainability. A firm that cannot maintain its financial obligations over time is unlikely to preserve operational continuity, invest in future growth, or support broader sustainability commitments.

Within the broader corporate sustainability discourse, financial sustainability is a foundational dimension because long-term business viability depends on the firm's ability to remain economically resilient. Although sustainability studies often emphasize environmental and social aspects, the financial dimension remains essential for ensuring that firms can survive, adapt, and continue creating value over time (Bansal & DesJardine, 2014; Eccles et al., 2014). Therefore, analyzing financial distress can provide a meaningful way to assess corporate resilience from a financial sustainability perspective.

In empirical research, financial distress has commonly been measured using accounting-based indicators such as Altman's Z-score, Ohlson's O-score, and the interest coverage ratio. These indicators are useful because they rely on observable financial statement information and provide an early warning signal before actual bankruptcy occurs (Altman, 1968; Ohlson, 1980). In the Indonesian context, recent studies also continue to use financial ratios to identify distress conditions, especially among firms operating in volatile and debt-sensitive environments (Pratiwi et al., 2022; Yanti & Fauzan, 2023).

2.2 Profitability and Financial Distress

Profitability reflects a firm's ability to generate earnings from its assets and operations. It is one of the most important indicators of financial health because profits provide internal resources to cover expenses, repay obligations, and support future investment. Firms with stronger profitability are generally more resilient and less vulnerable to financial distress because they possess greater capacity to absorb shocks and maintain operational continuity.

From a theoretical perspective, profitability reduces financial distress risk by strengthening internal financing capacity and lowering dependence on external debt. A profitable firm is better positioned to meet fixed financial commitments, maintain investor confidence, and avoid deterioration in creditworthiness. Prior international studies consistently report a negative relationship between profitability and financial distress, suggesting that firms with stronger earnings performance face lower bankruptcy risk (Altman, 1968; Beaver, 1966). Similar findings have also been documented in Indonesian studies, where profitability is often identified as a significant predictor of distress (Pratiwi et al., 2022; Hasanah et al., 2025).

Based on these arguments, profitability is expected to reduce the likelihood of financial distress.

2.3 Liquidity and Financial Distress

Liquidity refers to a firm's ability to meet short-term obligations using current assets. A higher level of liquidity indicates that a firm has greater flexibility in managing working capital needs and covering near-term liabilities. In principle, firms with stronger liquidity should face lower financial distress risk because they are less likely to encounter immediate cash shortfalls.

However, the empirical relationship between liquidity and financial distress is not always consistent. On one hand, adequate liquidity may protect firms from operational disruption and short-term solvency problems. On the other hand, excessive liquidity may also indicate inefficient asset utilization, while low liquidity does not necessarily imply distress if firms have strong cash generation or access to financing. As a result, the predictive power of liquidity often varies across industries, countries, and economic periods.

Previous studies have produced mixed findings. Some studies suggest that liquidity significantly reduces financial distress risk, while others report weak or insignificant relationships (Ohlson, 1980; Almamy et al., 2016). In Indonesia, empirical evidence also remains inconclusive, with several studies showing that liquidity may matter in some settings but not in others (Yanti & Fauzan, 2023; Hilwa & Sari, 2025). This inconsistency makes liquidity an important variable to re-examine in the context of Indonesian non-financial firms.

2.4 Leverage and Financial Distress

Leverage reflects the extent to which a firm relies on debt to finance its assets. A higher leverage ratio generally implies greater fixed financial obligations, including interest and principal repayments, which may increase the risk of financial distress. From a risk perspective, excessive leverage reduces financial flexibility and makes firms more vulnerable to earnings volatility, interest rate changes, and adverse macroeconomic conditions.

Theoretically, firms with high leverage face a greater probability of distress because debt commitments must be met regardless of business performance. When profitability weakens or cash flow declines, highly leveraged firms are more likely to experience

repayment difficulties. This argument is well established in financial distress literature, where leverage is frequently found to have a positive relationship with bankruptcy risk (Altman, 1968; Campbell et al., 2008).

In the Indonesian context, prior studies also generally suggest that leverage increases distress risk, although the magnitude and significance may vary depending on firm characteristics and sample composition (Budiarsyah, 2025; Azyyati, 2025). Given that many firms in emerging markets operate with constrained capital access and higher financing costs, leverage remains an important determinant of financial vulnerability.

2.5 Operating Cash Flow and Financial Distress

Operating cash flow represents the cash generated from a firm's core business activities. Unlike accounting profit, cash flow directly reflects the firm's ability to generate liquid resources needed to sustain operations and meet obligations. Strong operating cash flow is therefore expected to reduce financial distress risk because it improves the firm's capacity to pay suppliers, employees, lenders, and other stakeholders.

From a financial sustainability perspective, operating cash flow is especially relevant because long-term viability depends not only on reported earnings but also on the ability to convert operations into cash. A firm may appear profitable on an accrual basis while still facing distress if its cash inflows are insufficient to meet short-term commitments. For this reason, cash-based indicators are often considered important complements to profitability measures in distress prediction models.

Empirical evidence on the role of operating cash flow remains mixed. Some studies find that stronger operating cash flow lowers the likelihood of financial distress, while others report insignificant effects once profitability and leverage are controlled for (Beaver, 1966; Almamy et al., 2016). In Indonesia, recent studies also suggest that the impact of cash flow may differ across sectors and firm conditions (Pratiwi et al., 2022; Yanti & Fauzan, 2023). Accordingly, operating cash flow deserves further examination in panel-based distress models.

2.6 Firm Size and Financial Distress

Firm size is commonly associated with financial stability, market access, and operational diversification. Larger firms generally have broader resource bases, stronger reputations, and better access to capital markets, which may reduce the likelihood of financial distress. They are also more likely to benefit from economies of scale and diversified revenue sources, making them more resilient during economic downturns.

However, the effect of firm size is not always straightforward. While larger firms may enjoy financial advantages, they may also face structural inefficiencies, agency problems, or complex cost structures. Therefore, the influence of size on financial distress may depend on how effectively firms manage their resources and adapt to external shocks.

Prior international research often finds that larger firms are less likely to experience bankruptcy or distress due to stronger financial flexibility and greater external support (Ohlson, 1980; Campbell et al., 2008). Indonesian studies similarly suggest that firm size may reduce financial vulnerability, although the results are not always uniformly significant across samples (Azyyati, 2025; Hasanah et al., 2025). This indicates that firm size remains a relevant control variable in explaining distress risk.

3. Research Method

3.1 Research Design

This study employs a quantitative research approach using panel data analysis to examine the determinants of financial distress among Indonesian non-financial firms. Panel data analysis is considered appropriate because it allows the combination of cross-sectional and time-series dimensions, enabling more comprehensive and efficient estimation compared to purely cross-sectional or time-series models (Wooldridge, 2016).

The dataset consists of financial statement data from 416 Indonesian non-financial companies over the period 2013–2022. The data are obtained from a publicly available dataset provided by Telkom University Dataverse (https://doi.org/10.34820/FK2/ZT2PEC), ensuring transparency and reproducibility of the analysis. The data are processed through several stages, including data cleaning, handling missing values, standardizing data formats, and ensuring consistency across variables. These procedures are essential to improve data reliability and minimize potential bias in empirical analysis (Gujarati & Porter, 2009).

Subsequently, key financial ratios used in this study—profitability, liquidity, leverage, operating cash flow, and firm size—are calculated based on financial statement information. The processed data are then structured into a panel dataset suitable for regression analysis.

The empirical analysis is conducted using Python through Google Colab, which facilitates efficient data processing, statistical computation, and reproducibility of results. The use of computational tools in financial research is increasingly common as it enhances transparency and replicability of empirical findings (Provost & Fawcett, 2013).

3.2 Variables Measurement

Dependent Variable

Financial distress (Distress) is measured using the Interest Coverage Ratio (ICR), calculated as Earnings Before Interest and Taxes (EBIT) divided by interest expense. Following prior studies, firms are classified as financially distressed when ICR is less than one, indicating an inability to cover interest obligations from operating earnings (Altman, 1968; Pratiwi et al., 2022). The variable is operationalized as a dummy variable, where 1 indicates distress and 0 indicates non-distress.

Independent Variables

Profitability (ROA) is measured as net income divided by total assets. Higher profitability indicates stronger financial performance and is expected to reduce financial distress risk (Beaver, 1966; Hasanah et al., 2025).

Liquidity (CR) is measured as current assets divided by current liabilities. It reflects a firm's ability to meet short-term obligations and is generally associated with lower financial distress risk, although empirical results remain mixed (Ohlson, 1980; Yanti & Fauzan, 2023).

Leverage (LEV) is measured as total liabilities divided by total assets. Higher leverage indicates greater financial risk due to increased reliance on debt financing (Campbell et al., 2008; Budiarsyah, 2025).

Operating Cash Flow (OCF) is measured as operating cash flow divided by total assets. This variable reflects the firm's ability to generate cash from its core operations and is expected to reduce financial distress risk (Almamy et al., 2016; Pratiwi et al., 2022).

Firm Size (SIZE) is measured as the natural logarithm of total assets. Larger firms are generally more stable and have better access to capital markets, which may reduce financial distress risk (Beck et al., 2010; Azyyati, 2025).

3.3 Hypotheses Development

Based on theoretical foundations and prior empirical studies, this study proposes that financial distress is influenced by key financial indicators related to firm performance and financial structure.

H1: Profitability has a significant negative effect on financial distress.

Firms with higher profitability are more capable of generating internal funds to meet financial obligations, thereby reducing distress risk (Beaver, 1966; Hasanah et al., 2025).

H2: Liquidity has a significant negative effect on financial distress.

Higher liquidity improves a firm's ability to meet short-term liabilities and reduces the likelihood of financial distress (Ohlson, 1980; Yanti & Fauzan, 2023).

H3: Leverage has a significant positive effect on financial distress.

Higher leverage increases financial obligations and reduces financial flexibility, thereby increasing distress risk (Campbell et al., 2008; Budiarsyah, 2025).

H4: Operating cash flow has a significant negative effect on financial distress.

Stronger operating cash flow enhances the firm's ability to sustain operations and fulfill financial commitments (Almamy et al., 2016; Pratiwi et al., 2022).

H5: Firm size has a significant negative effect on financial distress.

Larger firms tend to be more stable and less vulnerable to financial shocks (Beck et al., 2010; Azyyati, 2025).

3.4 Model Specification

As an initial step of data analysis, descriptive statistics are employed to examine the characteristics of the dataset. Descriptive statistics are used to summarize, organize, and present the main characteristics of a dataset in a meaningful way. In this study, descriptive statistics provide an overview of the distribution and behavior of the research variables, including profitability (ROA), liquidity (CR), leverage (LEV), operating cash flow (OCF), and firm size (SIZE).

To examine the relationship between these variables and financial distress, this study employs a logistic regression model because the dependent variable is binary (distress and non-distress). Logistic regression is widely used in financial distress prediction due to its ability to model the probability of a binary outcome (Hosmer et al., 2013; Agresti, 2018).

The model is specified as follows:

$$Distress\_it = \beta_0 + \beta_1 ROA\_it + \beta_2 CR\_it + \beta_3 LEV\_it + \beta_4 OCF\_it + \beta_5 SIZE\_it + \varepsilon\_it$$

where i denotes firm and t denotes year.

The model is estimated using the Maximum Likelihood Estimation (MLE) method, which provides consistent and efficient parameter estimates for binary response models (Wooldridge, 2016). Statistical significance is evaluated at the 5% level ($p < 0.05$).

Logistic regression does not require the normality assumption of residuals because it is based on likelihood estimation rather than ordinary least squares. Therefore, normality testing is not required in this study (Hosmer et al., 2013; Agresti, 2018).

4. Results and Discussion

4.1 Descriptive Statistic Results

Table 1 presents the descriptive statistics of the variables used in this study based on 3,534 firm-year observations.

Table 1. Descriptive Statistic Results

Variables	Count	Mean	Std Dev	Min	Max
ROA	3534	0.022	0.159	-3.583	2.192
CR	3534	1.872	1.593	0.000	9.954
LEV	3534	0.566	0.523	0.002	9.853
OCF	3534	0.058	0.113	-1.966	1.899
SIZE	3534	28.875	1.702	22.758	35.228

Overall, the results indicate substantial variation across firms in terms of profitability, liquidity, leverage, operating cash flow, and firm size. The mean value of profitability (ROA) is relatively low at 0.022, suggesting that, on average, firms generate modest returns on their assets. The wide range of ROA values, from -3.583 to 2.192, indicates that some firms experience significant losses while others achieve exceptionally high profitability. This variability suggests that firm performance differs considerably across the sample.

Liquidity (CR) shows a mean value of 1.872, indicating that firms generally maintain adequate short-term solvency. However, the large dispersion between minimum and maximum values reflects heterogeneity in liquidity management among firms. Similarly, leverage (LEV) exhibits considerable variation, suggesting differences in capital structure and financial risk across companies.

Operating cash flow (OCF) is, on average, positive, but the presence of negative values indicates that some firms face operational challenges in generating cash from their core activities. Firm size (SIZE) also varies across the sample, indicating that the dataset includes both relatively small and large firms.

Importantly, the presence of extreme values in several variables suggests potential outliers, which may influence regression estimates. This variation supports the use of regression analysis to further investigate the determinants of financial distress.

4.2 Logistic Regression Results

Table 2. Logistic Regression Results on Financial Distress

Variables	Coefficient	Std. Error	z-Statistic	Prob.
Intercept	-0.923	1.887	-0.490	0.624
ROA	-224.039	13.393	-16.728	0.000
CR	0.086	0.074	1.156	0.248
LEV	0.273	0.253	1.078	0.281
OCF	-2.141	1.480	-1.447	0.148
SIZE	-0.025	0.064	-0.388	0.698

Table 2 presents the results of the logistic regression analysis examining the determinants of financial distress among Indonesian non-financial firms.

The model converged successfully after 13 iterations, indicating a stable estimation process. The likelihood ratio (LLR) test is statistically significant ($p < 0.001$), confirming that the independent variables jointly explain variations in financial distress. The pseudo R-square value of 0.8524 suggests a strong model fit; however, consistent with the nature of logistic regression, this value should be interpreted with caution (Hosmer et al., 2013).

The results show that profitability (ROA) is the only variable that has a statistically significant effect on financial distress ($p < 0.001$). The coefficient is negative, indicating that higher profitability substantially reduces the probability of financial distress. This finding reinforces the role of profitability as a fundamental indicator of firm resilience, as firms with stronger earnings capacity are better able to sustain operations and meet their financial obligations (Beaver, 1966; Pratiwi et al., 2022).

In contrast, liquidity (CR), leverage (LEV), operating cash flow (OCF), and firm size (SIZE) do not exhibit statistically significant effects. Although the direction of the coefficients is generally aligned with theoretical expectations—leverage showing a positive relationship and operating cash flow and firm size showing negative relationships—the lack of significance suggests that these variables do not consistently explain financial distress within the observed sample.

A notable observation is the exceptionally large magnitude of the profitability coefficient, which may indicate the presence of quasi-separation in the data. This implies that profitability strongly differentiates distressed and non-distressed firms, potentially leading to inflated coefficient estimates. While the model remains statistically valid, this condition suggests that the results should be interpreted with caution, as pseudo R-square does not have the same interpretation as R-square in linear regression models.

These findings suggest that profitability plays a dominant role in determining financial distress in the Indonesian context. One possible explanation is that firms in emerging markets tend to rely more heavily on internal financing due to relatively limited access to external capital. Consequently, the ability to generate profits becomes a critical factor in maintaining financial stability. This finding is consistent with classical distress prediction models such as Altman (1968) and Ohlson (1980), which emphasize the importance of profitability-related indicators.

The insignificance of liquidity and leverage may also reflect structural heterogeneity across firms, where variations in capital structure and short-term financial positions do not uniformly translate into distress risk. This is consistent with prior studies reporting mixed evidence on the impact of these variables in emerging markets (Yanti & Fauzan, 2023; Hasanah et al., 2025).

Overall, the results highlight the central role of profitability-driven financial resilience as the primary determinant of firm stability, emphasizing the importance of earnings performance in assessing financial distress risk.

5. Conclusion

This study investigates the determinants of financial distress among Indonesian non-financial firms using panel data from 2013 to 2022 and a logistic regression approach.

The empirical findings reveal that profitability is the only variable that significantly influences financial distress. Firms with higher profitability are substantially less likely to experience distress, underscoring the critical role of earnings generation in sustaining financial stability. In contrast, liquidity, leverage, operating cash flow, and firm size do

not exhibit statistically significant effects, indicating that these commonly used financial indicators may have limited predictive power within the Indonesian context.

This study contributes to the financial distress literature by providing evidence from an emerging market, where profitability appears to dominate other financial indicators in explaining firm resilience. Unlike findings from developed markets that often highlight the importance of leverage and liquidity, this study suggests that internal performance—particularly profitability—is the primary driver of financial stability in Indonesia. This highlights the importance of contextual differences in financial distress determinants across markets. This finding suggests that traditional distress prediction models may require adaptation when applied to emerging markets, where internal performance appears to outweigh capital structure considerations.

From a practical perspective, the findings imply that investors and creditors should prioritize profitability metrics when evaluating firm risk. For corporate managers, sustaining consistent profitability is essential in reducing the likelihood of financial distress. Meanwhile, policymakers may benefit from enhancing financial reporting quality and transparency to support early identification of vulnerable firms.

However, this study is subject to several limitations. First, financial distress is proxied using the Interest Coverage Ratio, which may not fully capture the multidimensional nature of distress conditions. Second, the analysis is limited to firm-level financial variables and does not account for macroeconomic, institutional, or corporate governance factors that may also influence distress risk. In addition, the presence of quasi-separation in the logistic regression model may affect the stability of coefficient estimates, particularly for profitability.

Future research is encouraged to incorporate alternative distress measures, include broader explanatory variables, and apply more advanced analytical approaches, such as machine learning or penalized regression techniques, to improve predictive robustness and generalizability.

APPENDIX

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Optimization terminated successfully.
         Current function value: 0.084130
         Iterations 13
                           Logit Regression Results
==============================================================================
Dep. Variable:               Distress   No. Observations:                 3534
Model:                          Logit   Df Residuals:                     3528
Method:                           MLE   Df Model:                            5
Date:                Thu, 19 Mar 2026   Pseudo R-squ.:                  0.8524
Time:                        01:49:47   Log-Likelihood:                -297.31
converged:                       True   LL-Null:                       -2013.8
Covariance Type:            nonrobust   LLR p-value:                     0.000
==============================================================================
                 coef    std err          z      P>|z|      [0.025      0.975]
------------------------------------------------------------------------------
Intercept     -0.9243      1.887     -0.490      0.624      -4.622       2.773
ROA         -224.0391     13.393    -16.728      0.000    -250.288    -197.790
CR             0.0857      0.074      1.156      0.248      -0.060       0.231
LEV            0.2730      0.253      1.078      0.281      -0.223       0.769
OCF           -2.1406      1.480     -1.447      0.148      -5.040       0.759
SIZE          -0.0247      0.064     -0.388      0.698      -0.150       0.100
==============================================================================

Possibly complete quasi-separation: A fraction 0.54 of observations can be
perfectly predicted. This might indicate that there is complete
quasi-separation. In this case some parameters will not be identified.
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