

LEVERAGE, NET WORKING CAPITAL, AND FIRM SIZE ON FINANCIAL PERFORMANCE OF INFRASTRUCTURE COMPANIES LISTED ON THE INDONESIA STOCK EXCHANGE

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Abstract: This study examines the effect of leverage, net working capital (NWC), and firm size on the financial performance of infrastructure companies listed on the Indonesia Stock Exchange (IDX) for the 2020–2024 period. Financial performance is proxied by Return on Assets (ROA). A quantitative method with multiple linear regression analysis via SPSS 26 was employed, using a purposive sampling technique that yielded 16 companies (75 observations after outlier removal). Results show that leverage has a negative and significant partial effect on ROA; NWC has a negative and significant partial effect on ROA; firm size has a negative and insignificant partial effect on ROA; and all three variables simultaneously exert a significant effect on ROA. The Adjusted R² equals 0.210, indicating these variables collectively explain 21.0% of the variation in financial performance.

Keywords: Leverage, Net Working Capital, Firm Size, Financial Performance, ROA

Abstrak: Penelitian ini menganalisis pengaruh leverage, net working capital (NWC), dan ukuran perusahaan terhadap kinerja keuangan perusahaan infrastruktur yang terdaftar di Bursa Efek Indonesia periode 2020–2024. Kinerja keuangan diproksikan dengan Return on Assets (ROA). Metode kuantitatif dengan analisis regresi linier berganda melalui SPSS 26 digunakan, dengan teknik purposive sampling menghasilkan 16 perusahaan (75 observasi setelah penghapusan outlier). Hasil menunjukkan bahwa leverage berpengaruh negatif dan signifikan secara parsial terhadap ROA; NWC berpengaruh negatif dan signifikan secara parsial terhadap ROA; ukuran perusahaan berpengaruh negatif dan tidak signifikan secara parsial terhadap ROA; dan ketiga variabel secara simultan berpengaruh signifikan terhadap ROA. Adjusted R² sebesar 0,210 menunjukkan bahwa variabel-variabel ini secara bersama-sama menjelaskan 21,0% variasi kinerja keuangan.

Kata Kunci: Leverage, Net Working Capital, Ukuran Perusahaan, Kinerja Keuangan, ROA

INTRODUCTION

The infrastructure sector plays a pivotal role in driving national economic development and serves as the backbone of sustainable growth in emerging economies. In Indonesia, infrastructure companies listed on the Indonesia Stock Exchange (IDX) are responsible for managing substantial asset bases while navigating complex financial structures. Assessing their financial performance is therefore critical for investors, regulators, and management alike. Financial performance, measured through Return on Assets (ROA), captures how effectively a company utilizes its total assets to generate profit a particularly relevant metric for asset-intensive industries such as infrastructure.

Among the key determinants of financial performance, leverage reflects the extent to which companies rely on debt financing. According to Brigham and Houston (2021), financial leverage can amplify returns during periods of growth but simultaneously increases the burden of fixed interest obligations and financial distress risk. For infrastructure companies with large capital expenditures, the trade-off between the tax shield benefit of debt and the cost of potential financial distress becomes especially pronounced. Empirical findings by (Arhinful & Radmehr, 2023) confirm that excessive leverage tends to erode profitability, particularly in capital-intensive industries.

Net working capital (NWC) represents the difference between current assets and current liabilities, serving as an indicator of a firm's operational liquidity and short-term financial health. Effective NWC management enables companies to fund day-to-day operations without resorting to costly external financing. Al-Mwalla, Karasneh & Aldaihani (2024) highlight that firms maintaining



optimal NWC ratios tend to exhibit superior profitability because they minimize idle cash and reduce opportunity costs. In the context of Indonesian infrastructure companies, NWC management is complicated by the long-duration nature of projects and irregular cash inflows.

Firm size is another factor widely examined in corporate finance literature. Larger firms typically benefit from economies of scale, stronger bargaining power, and easier access to capital markets at lower costs. However, (Li & Wang, 2023) caution that as firms grow, organizational complexity and bureaucratic inefficiencies may offset these advantages, potentially reducing the marginal benefit of size on profitability. Ahmad et al., 2024 further argue that for firms in emerging markets, the relationship between size and financial performance is non-linear.

Despite an extensive body of literature, prior studies report inconsistent findings on these relationships. Some researchers find leverage positively affects ROA (Fathoni & Swandari, 2020), while others document negative effects (Kurniawan & Samhaji, 2020; Amalia, 2021). Similarly, net working capital has been shown to affect performance both positively (Fasya & Murtanto, 2025; Nugrahani & Harun, 2025) and negatively (Dumilah et al., 2023). Comparable discrepancies exist regarding firm size (Sasmita & Wijaya, 2023; Rahardjo & Wuryani, 2021). These research gaps motivate the present study, which investigates the three variables simultaneously within the Indonesian infrastructure sector over the 2020–2024 period a timeframe encompassing both the COVID-19 economic disruption and the subsequent recovery. The remainder of this paper is structured as follows: Section 2 presents the theoretical framework and hypotheses; Section 3 describes the research methodology; Section 4 reports and discusses the empirical findings; Section 5 concludes with managerial implications and suggestions for future research.

Research Objectives

The objectives of this research are as follows:

1. To analyze the partial effect of leverage (DAR) on the financial performance (ROA) of infrastructure companies listed on the IDX for the 2020–2024 period.
2. To analyze the partial effect of net working capital (NWC) on financial performance (ROA).
3. To analyze the partial effect of firm size (Ln Total Assets) on financial performance (ROA).
4. To analyze the simultaneous effect of leverage, net working capital, and firm size on financial performance (ROA).

THEORETICAL FRAMEWORK

Trade-Off Theory

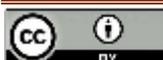
The Trade-Off Theory, pioneered by (Myers, 1984) building on Kraus and Litzenberger (1973), postulates that firms balance the tax shield benefits of debt financing against the costs of financial distress and agency conflicts arising from excessive leverage. Under this framework, an optimal capital structure exists at the point where the marginal benefit of additional debt equals its marginal cost. For infrastructure firms, which are characterized by high capital intensity and long investment horizons, exceeding the optimal leverage point leads to escalating financial distress costs that outweigh the tax shield advantage, ultimately suppressing profitability and ROA.

Agency Theory

Jensen & Meckling, 1976 developed Agency Theory to explain the principal–agent relationship between shareholders and management. Effective management of net working capital reflects managerial competence in fulfilling stewardship obligations toward shareholders. When NWC is managed optimally, agency costs arising from information asymmetry and conflicts of interest are reduced. Jensen (1986) further argued that efficient resource management lowers agency costs and enhances firm value, underscoring the importance of disciplined working capital practices in asset-intensive industries.

Signaling Theory

Signaling Theory, introduced by Spence (1973) and extended by Ross (1977) in a financial context, explains how firms transmit credible information to external stakeholders through observable corporate attributes. Firm size serves as a powerful signal of stability, operational capacity, and creditworthiness. Large infrastructure companies communicate their ability to undertake complex, large-scale projects, thereby reducing information asymmetry and gaining preferential access to



financing. This enhanced financial accessibility can, in theory, support higher ROA through lower capital costs and greater operational efficiency.

Leverage

Leverage refers to the degree to which a firm relies on borrowed funds to finance its assets and operations. According to (Brigham & Houston, 2021), financial leverage amplifies both the returns and the risks borne by equity holders. In this study, leverage is operationalized using the Debt to Asset Ratio (DAR), which measures the proportion of total assets financed by debt. Arhinful & Radmehr, (2023) note that DAR is a stable and comprehensive leverage indicator that is not subject to equity price volatility, making it particularly appropriate for longitudinal studies of infrastructure firms. As DAR rises beyond the optimal threshold, interest burden escalates, free cash flow diminishes, and ROA declines. The formula is: $DAR = \text{Total Debt} / \text{Total Assets}$.

Net Working Capital

Net working capital (NWC) represents the residual of current assets minus current liabilities and is a fundamental measure of a firm's short-term liquidity and operational efficiency. Garg and Singh (2024) demonstrate in their study of Indian manufacturing firms that efficient NWC management translates into higher profitability by accelerating cash conversion cycles and minimizing idle capital. In this study, NWC is quantified by the Net Working Capital Ratio (NWCR): $NWCR = (\text{Current Assets} - \text{Current Liabilities}) / \text{Total Assets}$. Nguyen, Pham & Nguyen (2025) confirm that NWCR is a superior profitability predictor compared to simple liquidity ratios such as the current ratio. Moussa (2023) similarly finds a strong link between NWCR and firm performance in volatile economic environments.

Firm Size

Firm size captures the scale of a company's operations and its resource base. Dang, Li, and Yang (2018) demonstrate that the natural logarithm of total assets (Ln Total Assets) is the most reliable and statistically consistent proxy for firm size in empirical corporate finance, as it normalizes skewed distributions and reduces heteroscedasticity. Ahmad et al. (2024) find that in emerging-market contexts, larger firms do not always outperform smaller counterparts—organizational complexity and diseconomies of scale can erode profitability gains from size advantages. Li and Wang (2023) further corroborate that the size–performance relationship is contingent on managerial efficiency and governance quality. The formula used is: $\text{Firm Size} = \text{Ln}(\text{Total Assets})$.

Financial Performance

Financial performance reflects the extent to which a company effectively deploys its resources to generate value. Return on Assets (ROA) is selected as the performance proxy in this study because it comprehensively measures the efficiency of asset utilization in generating net profit an especially relevant dimension for capital-intensive infrastructure firms. Arhinful and Radmehr (2023) highlight that ROA captures managerial effectiveness across all asset categories, providing a holistic view of operational and financial performance. The formula is: $ROA = (\text{Net Income} / \text{Total Assets}) \times 100\%$.

Hypotheses

Based on the theoretical framework and prior empirical evidence, the following hypotheses are proposed:

H₁: Leverage (DAR) has a partial negative effect on financial performance (ROA) of infrastructure companies listed on the IDX for the 2020–2024 period.

H₂: Net Working Capital (NWCR) has a partial positive effect on financial performance (ROA) of infrastructure companies listed on the IDX for the 2020–2024 period.

H₃: Firm size (Ln Total Assets) has a partial positive effect on financial performance (ROA) of infrastructure companies listed on the IDX for the 2020–2024 period.

H₄: Leverage, Net Working Capital, and Firm Size simultaneously exert a significant effect on financial performance (ROA) of infrastructure companies listed on the IDX for the 2020–2024 period.

RESEARCH METHOD

This study adopts a quantitative research design using secondary data derived from the annual financial reports of infrastructure companies listed on the IDX during the 2020–2024 period. Data were obtained from the official IDX website (www.idx.co.id). Purposive sampling was applied to ensure that selected companies met three criteria: (1) continuously publishing audited financial statements throughout the observation period; (2) consistently reporting positive net income; and (3) reporting



financial data denominated in Indonesian Rupiah. These criteria yielded a final sample of 16 companies from an initial population of 70 infrastructure-sector firms, generating 80 firm-year observations. Following outlier detection and removal of five extreme observations using the standard SPSS outlier protocol, the final analytical dataset comprised 75 observations.

The independent variables are: (X₁) Leverage, measured by the Debt to Asset Ratio (DAR = Total Debt / Total Assets); (X₂) Net Working Capital, measured by the Net Working Capital Ratio (NWCR = (Current Assets – Current Liabilities) / Total Assets); and (X₃) Firm Size, measured as the natural logarithm of total assets (Ln Total Assets). The dependent variable is (Y) Financial Performance, proxied by Return on Assets (ROA = Net Income / Total Assets × 100%). Descriptive statistical analysis was conducted first to characterize the distribution of each variable. Classical assumption tests were then performed, including: the Kolmogorov–Smirnov normality test supplemented by histogram and Normal P-P Plot analyses; the Variance Inflation Factor (VIF) and Tolerance multicollinearity test; the Glejser and scatter plot heteroscedasticity test; and the Durbin–Watson autocorrelation test. Multiple linear regression was subsequently estimated using SPSS 26 according to the following model:

$$ROA = \alpha + \beta_1DAR + \beta_2NWCR + \beta_3SIZE + \epsilon$$

Hypothesis testing was conducted using the partial t-test (α = 0.05), the simultaneous F-test (α = 0.05), and the Adjusted R² coefficient of determination to assess the proportion of variance in ROA explained by the three predictors.

RESULTS AND DISCUSSION

Descriptive Statistics

Table 1 presents the descriptive statistics for all research variables after outlier removal (N = 75).

Table 1. Descriptive Statistics (Post-Outlier Removal, N = 75)

Variable	Minimum	Maximum	Mean	Std. Deviation
Leverage (DAR)	0.0374	0.8168	0.4941	0.2414
NWC (NWCR)	-0.3894	0.9117	0.1422	0.2893
Firm Size (Ln TA)	25.7110	34.2881	30.5920	2.6752
Financial Perf. (ROA)	0.0506	11.2207	3.9709	3.0536

Source: Processed Data from SPSS 26, 2026

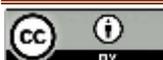
The mean DAR of 0.4941 suggests that, on average, nearly half of the sampled firms' assets are financed through debt a level consistent with a moderately leveraged capital structure. The mean NWCR of 0.1422 indicates that net working capital is positive on average, though the high standard deviation (0.2893) reflects considerable cross-firm variability. The average firm size of 30.5920 (Ln Total Assets) corresponds to substantial real asset bases typical of infrastructure operators. The average ROA of 3.9709% signals moderate profitability, with notable dispersion across firms and years.

Classical Assumption Tests

Normality was evaluated using the Kolmogorov–Smirnov test. After outlier removal (N = 75), the Monte Carlo significance value was 0.326, which exceeds the 0.05 threshold, confirming that the residuals are normally distributed. The histogram displayed a bell-shaped curve and the Normal P-P Plot showed data points tracking closely along the diagonal line—both consistent with the normality assumption.

Table 2. One-Sample Kolmogorov–Smirnov Test (Post-Outlier Removal)

Test Parameter	Unstandardized Residual
N	75
Mean	0.000000
Std. Deviation	2.65893285
Test Statistic (K-S)	0.108



Monte Carlo Sig. (2-tailed)	0.326 (Normal)
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Source: Processed Data from SPSS 26, 2026

The multicollinearity test results (Table 3) confirm the absence of multicollinearity. All VIF values fall well below 10 and all Tolerance values exceed 0.10, meeting the conventional threshold for acceptable collinearity levels (Ghozali, 2019).

Table 3. Multicollinearity Test Results (Post-Outlier Removal)

Variable	Tolerance	VIF
Leverage (DAR)	0.449	2.229
Net Working Capital (NWCR)	0.684	1.463
Firm Size (Ln Total Assets)	0.590	1.694

Source: Processed Data from SPSS 26, 2026

Heteroscedasticity was assessed via scatter plot analysis. The residual scatter plot after outlier removal showed data points distributed randomly above and below zero with no discernible systematic pattern, confirming that the model is free from heteroscedasticity. The Durbin–Watson statistic of 0.670 falls within the acceptable range of -2 to +2, indicating no autocorrelation in the residuals.

Multiple Linear Regression Analysis

Table 4 presents the results of the multiple linear regression analysis.

Table 4. Multiple Linear Regression Results

Variable	B	Std. Error	Beta	t	Sig.
(Constant)	10.273	4.223	-	2.433	0.018
Leverage (DAR)	-6.669	1.952	-0.527	-3.417	0.001
NWC (NWCR)	-4.560	1.319	-0.432	-3.457	0.001
Firm Size (Ln TA)	-0.077	0.154	-0.068	-0.502	0.617

Source: Processed Data from SPSS 26, 2026

The estimated regression equation is:

$$ROA = 10.273 - 6.669 \text{ DAR} - 4.560 \text{ NWCR} - 0.077 \text{ SIZE} + \epsilon$$

The constant of 10.273 represents the baseline ROA when all independent variables are held constant. The negative coefficients for all three predictors indicate that increases in leverage, net working capital, and firm size are individually associated with declining financial performance, ceteris paribus. The magnitude of leverage's coefficient (-6.669) underscores its dominant role in determining ROA relative to the other two variables.

Hypothesis Testing

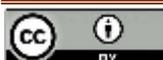
Table 5. Simultaneous F-Test and Coefficient of Determination

Model	R	R ²	Adj. R ²	F / Sig.
DAR, NWCR, SIZE → ROA	0.492	0.242	0.210	7.548 / 0.000

Source: Processed Data from SPSS 26, 2026

Effect of Leverage on Financial Performance (H₁)

H₁ is supported. Leverage carries a coefficient of -6.669 with a significance level of 0.001 (p < 0.05), confirming a significant negative partial effect on ROA. This outcome aligns with the predictions of Trade-Off Theory: as infrastructure companies in Indonesia extended their debt ratios beyond the optimal threshold over the 2020–2024 period, rising interest obligations and financial distress costs progressively eroded profitability. Xu, Wang, and Zhang (2024) corroborate this finding in their study of capital structure and innovation in manufacturing firms, noting that excessive leverage depletes operating cash flow and limits reinvestment capacity. Arhinful and Radmehr (2023) similarly report a



negative leverage–profitability relationship in their systematic review. The practical implication is that infrastructure firms should seek an optimal capital structure that preserves the interest tax shield while limiting financial distress costs especially critical during economic recovery periods such as 2020–2024, when revenue volatility amplifies the risk of over-leverage.

Effect of Net Working Capital on Financial Performance (H₂)

H₂ is rejected. Although NWC was hypothesized to exert a positive effect on ROA, the empirical results reveal a negative and significant coefficient of -4.560 ($p = 0.001$). This counterintuitive finding can be explained by the specific operational characteristics of infrastructure companies. When infrastructure firms maintain excessively high net working capital, they effectively lock funds in current assets such as cash, trade receivables, and inventories rather than channeling them into productive long-term investments. Dumilah et al. (2023) document a comparable negative NWC–performance relationship in their study of Indonesian infrastructure companies, attributing it to the opportunity cost of idle liquidity. Moussa (2023) further notes that in capital-intensive industries, holding large current asset buffers often signals managerial conservatism rather than operational efficiency, suppressing asset turnover and dragging ROA downward. Garg and Singh (2024) reinforce this view, emphasizing that the NWC profitability relationship is non-linear: moderate NWC enhances liquidity and operational continuity, but excessive NWC reduces productive deployment of resources.

Effect of Firm Size on Financial Performance (H₃)

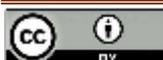
H₃ is rejected. Firm size yields a coefficient of -0.077 with a significance value of 0.617 ($p > 0.05$), indicating a negative but statistically insignificant effect on ROA. While larger infrastructure firms possess theoretical advantages economies of scale, better access to capital, and greater bargaining power these benefits appear to be offset by organizational complexity, bureaucratic inefficiency, and diseconomies of scale. Ahmad et al. (2024) report similar non-significant size–performance relationships in emerging market firms, arguing that managerial quality and governance effectiveness moderate this link. Li and Wang (2023) further document that as Chinese firms scale up, profitability gains plateau or reverse, consistent with the diseconomies of scale hypothesis. In the Indonesian infrastructure context, large state-affiliated companies may prioritize project volume and national development mandates over short-term profitability optimization, contributing to the observed null effect on ROA. Dang, Li, and Yang (2018) underscore that size measurement via Ln Total Assets captures resource endowment but not necessarily the quality or efficiency of resource deployment.

Simultaneous Effect of All Variables on Financial Performance (H₄)

H₄ is supported. The F-statistic of 7.548 with a significance value of 0.000 ($p < 0.05$) confirms that leverage, net working capital, and firm size jointly exert a significant effect on the financial performance of Indonesian infrastructure companies. The Adjusted R² of 0.210 indicates that 21.0% of the variance in ROA is explained by the three predictors in the model, while the remaining 79.0% is attributable to factors outside the current framework such as capital structure quality, operational efficiency, regulatory environment, project portfolio characteristics, and macroeconomic conditions. Oyedokun, Job-Olatunji, and Sanyaolu (2024) similarly find that a multi-factor financial model provides a more nuanced explanation of firm performance than single-variable approaches. This simultaneous significance underscores the importance of holistic financial management: optimizing leverage ratios, streamlining working capital cycles, and leveraging scale advantages in an integrated strategy is more effective than managing these dimensions in isolation.

CONCLUSIONS

This study examined the influence of leverage, net working capital, and firm size on the financial performance of infrastructure companies listed on the Indonesia Stock Exchange for the 2020–2024 period. Four main conclusions emerge from the analysis. First, leverage has a significant negative partial effect on financial performance (ROA), supporting H₁. Infrastructure companies with elevated debt levels incur larger interest burdens and face greater financial distress risk, suppressing profitability. Second, net working capital has a significant negative partial effect on ROA, leading to the rejection of H₂. Contrary to expectations, higher NWC levels in this sector are associated with idle capital and opportunity costs rather than operational efficiency gains. Third, firm size has an insignificant negative partial effect on ROA, leading to the rejection of H₃. Larger infrastructure companies do not systematically outperform their smaller peers when controlling for leverage and NWC, likely due to



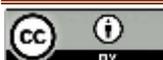
diseconomies of scale and organizational complexity. Fourth, all three variables simultaneously exert a significant effect on ROA, supporting H₄. The Adjusted R² of 21.0% confirms that these financial variables are collectively meaningful predictors of infrastructure firm performance, though substantial unexplained variance underscores the multifactorial nature of ROA determination.

Suggestions

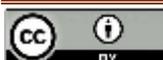
For management, infrastructure companies should proactively calibrate leverage toward the trade-off optimal point, minimizing financial distress costs while retaining tax benefits. Working capital management protocols should be redesigned to reduce cash and receivables lock-up and redirect funds toward productive investments. For investors, the findings suggest that leverage and NWC efficiency rather than firm size are the more informative predictors of ROA in this sector; investment screening should weight these indicators accordingly. For future researchers, extending the observation window beyond 2024 would capture post-recovery trends. Incorporating additional variables such as capital expenditure intensity, corporate governance quality, and macroeconomic indicators would improve the model's explanatory power. Alternative methodologies such as panel data regression with fixed effects or dynamic GMM models would better address potential endogeneity and heterogeneity concerns.

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