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PROFITABILITY, LIQUIDITY, LEVERAGE, AND TAX AVOIDANCE IN INDONESIAN INFRASTRUCTURE COMPANIES

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Abstract

This study examines the relationship between profitability, liquidity, leverage, and the effective tax rate (ETR) of infrastructure companies listed on the Indonesia Stock Exchange from 2021 to 2024. ETR is used as an inverse indicator of tax avoidance rather than as direct evidence of unlawful behavior. The study applies a quantitative explanatory design to annual financial-statement data for nine purposively selected companies, yielding a balanced panel of 36 firm-year observations. Return on assets, current ratio, and debt-to-equity ratio capture profitability, liquidity, and leverage, respectively. Panel-model selection through the Chow, Hausman, and Lagrange multiplier tests supports a random-effects specification estimated in EViews 13. Liquidity is positively related to ETR (coefficient = 0.030029; p = 0.0168), implying a negative association with the indication of tax avoidance. Profitability (p = 0.7831) and leverage (p = 0.7324) do not exhibit statistically detectable partial relationships. The adjusted R-squared is 0.104047, and the joint F-test does not reach the five-percent significance threshold (p = 0.090449). These findings suggest that short-term financial capacity deserves attention when interpreting cross-company differences in effective taxation, while the small selected sample and the limitations of ETR warrant cautious generalization.

Keywords: *tax avoidance; effective tax rate; profitability; liquidity; leverage*

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1. Introduction

Corporate income taxation is simultaneously a public-finance instrument and a private cost of doing business. Governments require predictable collections to finance infrastructure, public services, and fiscal stabilization, whereas firms evaluate taxes alongside financing, investment, and operating

costs. For infrastructure enterprises, this tension is particularly relevant because long-lived assets require substantial up-front expenditures while cash inflows often develop over extended operating periods. Corporate tax outcomes therefore deserve examination within a company's broader financial position rather than as an isolated accounting line item (Mardiasmo, 2023).

The Indonesian setting provides a substantial fiscal rationale for studying effective corporate taxation. Figures compiled from central-government financial reports indicate that tax receipts represented approximately 76.96% of state revenue in 2021 and 78.29% in 2024. These figures should be read as the reported composition of public revenue, not as a direct measure of corporate compliance. Their significance lies in the degree to which national financing remains exposed to changes in tax collection and economic activity (Ministry of Finance of the Republic of Indonesia, 2024).

The distinction between legitimate tax planning, aggressive tax positions, and illegal evasion is essential. An unusually low effective tax rate does not, by itself, establish misconduct; it may result from temporary differences, recognized incentives, loss utilization, jurisdictional differences, or unusual one-off accounting outcomes. A carefully framed empirical study accordingly treats financial-statement tax measures as indicators of the tax burden and potential avoidance rather than conclusive evidence about taxpayer intent (Hanlon & Heitzman, 2010).

Tax avoidance research is situated within a broader discussion about the relation between reported accounting income and legally determined taxable income. The two amounts can diverge because financial reporting recognizes transactions under accounting standards while income taxation applies statutory rules. Consequently, the income-tax expense presented in corporate reports can respond to recognition and measurement differences even without a change in management's willingness to comply with tax law (Resmi, 2022).

Indonesian corporate taxation also reflects regulatory developments during and after the observation period. Law No. 7 of 2021 on the Harmonization of Tax Regulations updated parts of the fiscal framework, giving the 2021–2024 period additional policy relevance. This article does not attempt to isolate the causal effect of the legislation; instead, it recognizes the regulation as part of the institutional environment in which infrastructure firms

reported profits, obligations, and tax expense (Undang-Undang (UU) Nomor 7 Tahun 2021 Tentang Harmonisasi Peraturan Perpajakan, 2021).

The broader policy context includes ongoing measures to refine income-tax rules and encourage compliance. Public debates over global minimum taxation illustrate how corporate tax administration increasingly intersects with international investment, financial structures, and comparisons across jurisdictions. Yet the present company-level data cannot reveal cross-border profit shifting or the extent of any particular international arrangement. Those mechanisms are therefore treated as contextual considerations rather than observed firm practices (Krishnamurti, 2025).

Prior research identifies differences in governance, management incentives, and firm-level attributes as possible sources of variation in the tax burden. Because tax effects are often difficult for external stakeholders to observe directly, a financial ratio should be interpreted together with measurement choices and the institutional circumstances of the sampled firms. In particular, the observed ETR can reflect both discretionary decisions and nondiscretionary differences across businesses (Marfiana & Andriyanto, 2021).

Agency theory offers one conceptual account of why tax policy can create information and incentive problems. Shareholders, managers, creditors, and tax authorities need not have identical objectives, while the details of financial choices may be costly for outsiders to verify. Tax-saving decisions can provide cash benefits but may also increase complexity, reputational exposure, and monitoring costs. This study draws on that conceptual logic without claiming that any sampled manager engaged in opportunistic behavior (Jensen & Meckling, 1976).

The governance implications of agency theory are not confined to a simple preference for lower taxes. Managers may confront competing pressures to preserve cash, support reported earnings, maintain compliance, and avoid unfavorable scrutiny. As a result, the same financial characteristic may be associated with different tax outcomes in firms whose incentives, controls, and reporting structures differ. This offers a rationale for empirical testing instead of assuming a universal directional association (Eisenhardt, 1989).

Infrastructure companies are a useful setting because their financing patterns may differ from those of businesses built around inventories or short-

cycle production. Telecommunications networks, toll-road concessions, towers, utilities, and port-support operations often require long investment horizons and recurring financing commitments. The selected sample accordingly permits examination of the relationship between short-term liquidity, accumulated financing obligations, operating profitability, and income-tax expense in capital-intensive activities (Ross et al., 2022).

Profitability, commonly expressed through return on assets, measures the earnings generated relative to resources deployed. In principle, profitability could increase the amount of taxable income and create incentives to manage the tax burden. However, accounting earnings do not automatically translate into equivalent taxable profits, and ROA need not move in the same direction as the effective tax rate. This ambiguity makes profitability an empirical question rather than a reliable shortcut to an avoidance conclusion (Kasmir, 2021).

Corporate tax research has tested profitability across different sectors with conflicting results. A study of manufacturing companies reported no detectable profitability effect on tax avoidance, illustrating that the ability to earn accounting profits does not invariably explain observed tax outcomes. Different profitability definitions, selection rules, and fiscal positions may contribute to heterogeneity across the published literature (Ramanata, 2022).

Evidence from the food and beverage industry also reported a lack of a detectable profitability relationship in a specification incorporating liquidity and leverage. Such findings matter for the present study because they caution against transferring theoretical predictions directly from the general corporate-finance literature into tax-avoidance research without attending to the sector and period observed (Prasetya & Wongso, 2023).

Other infrastructure-focused evidence indicates that profitability can matter for corporate tax outcomes under different designs. The disagreement between sector-specific results and studies from manufacturing or consumer industries is not necessarily a contradiction: tax measures, sample composition, time windows, profitability distributions, and business models may alter the estimated association. It is precisely this empirical variability that motivates renewed examination of the 2021–2024 infrastructure panel (Benedicta & Hutapea, 2024).

Liquidity represents a distinct dimension of financial condition. A current ratio compares assets expected to be converted to cash or used in the operating cycle with liabilities requiring settlement in the near term. Unlike ROA, which concerns earnings efficiency, liquidity describes the short-term resources available to meet operating, financing, and tax obligations. A company can report profits and still experience payment pressure when cash conversion is slow (Thian, 2022).

A corporate entity with stronger liquidity may have more flexibility in meeting tax liabilities without compromising immediate operating needs. A liquidity-constrained firm could face different incentives and timing choices, although the available data cannot determine management motives. Because the ETR is derived from tax expense and pre-tax income, any apparent association should be interpreted as a financial-reporting pattern rather than proof that liquidity causes tax avoidance (Rochendi & Nuryaman, 2022).

Published evidence does not establish a uniform effect of liquidity on tax avoidance. One study observed no discernible relationship in the property and real-estate setting, suggesting that short-term solvency can behave differently across industries. This supports using a specific infrastructure panel rather than extrapolating directly from companies with other asset, sales, and borrowing arrangements (Gultom, 2021).

By contrast, research on selected Indonesian firms has reported a negative liquidity–tax-avoidance relationship. Under an inverse ETR interpretation, a positive coefficient on the current ratio implies a lower indication of avoidance as financial liquidity improves. The distinction between a coefficient on ETR and its substantive interpretation in relation to avoidance must be maintained throughout this article (Artinasari & Mildawati, 2018).

More recent evidence continues to associate liquidity with lower avoidance indicators in particular sectors. Nonetheless, comparisons remain sensitive to how tax avoidance is operationalized and whether the empirical design filters loss-making companies, extreme tax rates, or unusually leveraged entities. The present article therefore reports both the regression coefficient's sign for ETR and its opposite directional interpretation for the proposed avoidance indicator (Safi' & Kurnia, 2025).

Leverage captures the debt component of a firm's capital structure. Debt financing can produce contractual interest expenses, and some interest costs may be deductible under applicable tax rules. But a debt-to-equity ratio by itself does not reveal the amount of deductible interest, the relevant limits, the financing purpose, or whether the borrower currently generates sufficient taxable income to utilize deductions. This creates a clear reason not to equate high leverage with active avoidance (Pohan, 2022).

Evidence from companies in infrastructure, utilities, and transportation has found no detectable relationship between leverage and tax avoidance in a selected Indonesian sample. Given the prevalence of long-lived assets and investment financing within these industries, it is plausible that debt mainly reflects the productive funding requirements of the business rather than a deliberate tax-reduction strategy; this remains an interpretation, not an observed mechanism (Sukma & Setiawati, 2022).

Conversely, another empirical study found a leverage association with tax avoidance in a different company setting. Differences in the period covered, chosen covariates, exclusion thresholds, and scale of liabilities may account for contrasting results. Rather than treating the literature as offering a settled direction, the present paper examines the incremental relationship of leverage with ETR while holding the other two financial indicators constant (Kusumah et al., 2021).

The infrastructure sector has received additional attention in Indonesian research examining financial ratios and tax aggressiveness. Those studies help establish the relevance of the sector but cannot substitute for the actual tests performed on this article's nine-firm sample. Tax aggressiveness and ETR-based avoidance are related constructs, yet their proxy definitions may differ and should not be represented as identical empirical outcomes (Wardayani et al., 2025).

This study addresses existing empirical inconsistencies and makes three distinct contributions to the corporate tax literature. First, while prior tax avoidance studies predominantly focus on manufacturing or general consumer sectors, this research provides a tightly focused empirical examination of capital-intensive infrastructure firms listed on the IDX during the 2021–2024 post-pandemic recovery window. Second, it explicitly incorporates the evolving institutional framework—specifically capturing the operational environment

following the implementation of Law No. 7 of 2021 on the Harmonization of Tax Regulations (UU HPP)—thereby offering fresh empirical evidence under contemporary tax regimes. Third, it methodologically refines the interpretation of financial proxies by explicitly separating the mathematical sign of the Effective Tax Rate (ETR) coefficient from its inverse economic implication regarding tax avoidance, avoiding common conceptual misattributions in panel data research.

The research questions are whether profitability, liquidity, and leverage are associated with ETR in the selected infrastructure firms during 2021–2024, and how any observed coefficients should be interpreted in relation to the inverse indicator of tax avoidance. The principal hypotheses concern separate partial relationships rather than a demonstrated causal mechanism. The article retains the explanatory quantitative design and original empirical observations rather than introducing a new dataset or recalculating unpublished model results (Sekaran & Bougie, 2020).

2. Research Method

This study adopts a quantitative explanatory research design based on archival data extracted from annual financial statements. The observation period spans fiscal years 2021 through 2024, with firm-year records serving as the primary units of analysis. Empirical data were collected from audited financial reports of infrastructure companies listed on the Indonesia Stock Exchange (IDX) to ensure data reliability and consistency across the balanced panel (Sugiyono, 2023).

The research population comprises 69 infrastructure companies listed on the Indonesia Stock Exchange (IDX) in 2024. Through a purposive sampling method, specific exclusion criteria were applied: 13 companies newly listed during the 2021–2024 period, 24 construction and civil-engineering subsector firms, 3 non-Rupiah reporting entities, and 14 loss-making companies. These criteria yielded 15 eligible firms. Subsequently, a statistical outlier screening procedure was applied to ensure that extreme data points did not distort the panel estimations. Following Ghozali (2018), observations with a Z-score exceeding ± 2.5 standard deviations in any of the primary variables (ROA, CR, DER, or ETR) were classified as severe outliers. Based on this criterion, six companies were identified as having extreme values and were consequently

excluded from the sample. This trimming process yields a final robust, balanced panel of 9 companies (36 firm-year observations).

Excluding construction and civil-engineering firms narrows the empirical scope to core infrastructure subsectors rather than the broad industry aggregate. Consequently, the findings reflect the financial characteristics of profitable, Rupiah-reporting, and established infrastructure enterprises. While filtering out loss-making entities, foreign-currency reporting firms, and statistical outliers enhances model estimation stability, it highlights that the empirical conclusions are specific to stable, solvent issuers during the 2021–2024 period (Nuryaman & Christina, 2015).

Table 1. Sample selection

Selection stage	Companies
Infrastructure companies listed in 2024	69
Newly listed during 2021–2024	(13)
Construction and civil-engineering subsector	(24)
Non-rupiah reporting currency	(3)
Loss-making firms during the study period	(14)
Eligible before outlier review	15
Removed after outlier review	(6)
Final selected companies	9
Years per company	4
Firm-year observations	36

Source: Data processed by the authors based on IDX annual reports (2026).

The final sample consists of nine infrastructure companies: Citra Marga Nusaphala Persada (CMNP), Jasa Armada Indonesia (IPCM), Bali Towerindo Sentra (BALI), XL Axiata (EXCL), Gihon Telekomunikasi Indonesia (GHON), Visi Telekomunikasi Infrastruktur (GOLD), Dayamitra Telekomunikasi (MTEL), Tower Bersama Infrastructure (TBIG), and Telkom Indonesia (TLKM).

A balanced-panel structure means that each included company contributes four years of information, allowing company differences and temporal changes to be examined in the same regression framework. The advantage is not simply a larger observation count: a panel can account for patterns associated with recurring entities that are not well represented in a single cross-section. The validity of the selected specification still depends on assumptions about how unobserved company characteristics relate to the regressors (Baltagi, 2021).

The dependent variable is the reported effective tax rate, conventionally calculated as income-tax expense divided by pre-tax accounting income. In this study's design, ETR serves as the inverse proxy for tax avoidance: a lower value indicates a potentially stronger avoidance signal, while a higher value indicates a weaker one. This definition must be separated from the legal question of whether particular transactions comply with tax law. Observed ETR is also sensitive to accounting recognition, tax credits, permanent differences, and exceptional transactions (Hanlon & Heitzman, 2010).

Profitability is represented by return on assets (ROA), defined for this analysis as net income divided by total assets. ROA summarizes how much accounting profit arises from the resources employed by the company. The ratio is useful for cross-firm comparisons but can differ systematically where firms hold capital assets of differing ages, impairment profiles, and depreciation policies. An accounting-based profitability indicator should therefore not be treated as a direct measure of taxable profit (Astuti, 2021).

Liquidity is operationalized as the current ratio (CR), calculated by dividing current assets by current liabilities. A value above one means current assets exceed current obligations at the reporting date, whereas a value below one means the reverse. The current ratio does not reveal the precise timing or cash convertibility of every item; it is nonetheless a transparent measure for analyzing whether short-term financial capacity is associated with the effective tax (Hery, 2023).

Leverage is measured through the debt-to-equity ratio (DER), with total liabilities compared against shareholders' equity. This proxy reflects the relative weight of creditor funding without identifying tax-deductible interest expense directly. A firm's DER can rise because it borrows additional funds, because equity falls, or through other accounting changes. Thus an association between DER and ETR would be informative but would not, alone, confirm tax-driven borrowing. (Ross et al., 2022).

Because all four variables are ratios, care is required when comparing changes measured on different numerical scales. A one-unit increase in ROA represents a shift of 100 percentage points when ROA is recorded as a decimal, whereas a one-unit increase in the current ratio corresponds to an increase of one unit of current assets per unit of current liabilities. The absolute coefficient magnitudes should not be used to rank practical importance without

considering realistic movements in each explanatory variable (Wooldridge, 2020).

Table 2. Measurement of research variables

Construct	Proxy	Operational ratio	Expected ETR interpretation
Tax-avoidance indicator	ETR	Income-tax expense / profit before tax	Lower ETR = stronger avoidance indication
Profitability	ROA	Net profit / total assets	Estimated sign to be tested
Liquidity	CR	Current assets / current liabilities	Positive ETR sign = lower avoidance indication
Leverage	DER	Total liabilities / shareholders' equity	Estimated sign to be tested

Source: Operational definitions and measurement specifications defined for this study.

The empirical specification uses an intercept and three explanatory variables: ETR_it = alpha + beta1(ROA_it) + beta2(CR_it) + beta3(DER_it) + u_i + epsilon_it, where i indexes the selected companies, t indexes years, u_i denotes the model's unobserved company component, and epsilon_it denotes idiosyncratic variation. The random-effects interpretation requires the relevant unobserved component to be suitably uncorrelated with the included regressors; the specification is a statistical association model, not an experimental design (Baltagi, 2021).

Three panel estimators were considered: a pooled common-effects model, a fixed-effects model, and a random-effects model. The pooled approach does not assign separate firm-specific intercepts, the fixed-effects approach allows persistent company intercept differences, and the random-effects approach treats the company component within a stochastic error structure. The model-selection sequence employed the Chow, Hausman, and Breusch–Pagan Lagrange multiplier tests, which were evaluated at a five-percent significance threshold (Wooldridge, 2020).

The Chow procedure compared pooled and fixed-effects specifications; the reported cross-section F probability was 0.0000, supporting fixed effects over a purely pooled model at the chosen level. The Hausman comparison of fixed and random effects produced a probability of 0.7845, which did not provide statistical evidence against the random-effects specification according to the applied decision rule. The Breusch–Pagan Lagrange multiplier test then yielded 0.0000 in the 'Both' row, favoring random effects over the pooled alternative. These reported tests underpinned the adopted random-effects estimator.

The random-effects model was estimated using EViews 13. The estimation yields coefficient estimates, standard errors, t-statistics, p-values, R-squared measures, and overall goodness-of-fit statistics. While the model-selection tests justify the chosen panel specification, the reliance on a small observational panel (N = 9) necessitates a cautious interpretation of the baseline estimates. Finite-sample constraints inherently limit the implementation of complex instrumental-variable estimators or extensive robustness evaluations, underscoring the associational nature of the findings (Sekaran & Bougie, 2020).

Descriptive analysis reports the mean, median, minimum, maximum, standard deviation, and observation count for each variable. Annual means are also utilized to examine the temporal patterns of ROA, CR, DER, and ETR across the observation period. These summary statistics characterize the distributional properties of the sample, providing a baseline empirical understanding prior to estimating the multivariate panel relationships (Ghozali, 2018).

Classical assumptions were verified by evaluating residual normality using the Jarque–Bera statistic and assessing multicollinearity through pairwise correlations among predictors. A Jarque–Bera probability above the 0.05 significance level indicates that the assumption of normally distributed residuals is not rejected. Furthermore, correlation coefficients among the explanatory variables remained below the conventional 0.80 threshold, suggesting the absence of severe multicollinearity and satisfying the baseline estimation requirements (Wooldridge, 2020).

The hypotheses are evaluated separately by considering the reported t-statistic and two-sided p-value for ROA, CR, and DER at alpha = 0.05. The overall F-statistic addresses a different question: whether the explanatory variables are jointly associated with ETR under the model assumptions. A significant individual coefficient does not automatically imply that a separate reported F-test passes the same threshold. The distinction is retained because the empirical results display precisely this difference.

The research uses archival corporate reports rather than personal survey responses; consequently, it does not measure managers' beliefs about taxation or obtain direct evidence concerning firm-level tax-planning decisions. Although studies of taxation discuss compliance, enforcement, and policy administration, the available observations are financial-statement amounts and

their derived ratios. Explanations involving unmeasured governance or behavioral mechanisms remain hypotheses for further work, not verified facts about the sampled firms (Farhana & Wardana, 2022).

To support empirical transparency and reproducibility, the underlying firm-year panel dataset, EViews workfiles, detailed financial-statement references, and specific outlier identification criteria are maintained by the authors. These materials are available from the corresponding author upon reasonable request to facilitate independent computational verification (Sekaran & Bougie, 2020).

3. Result and Discussion

Descriptive characteristics and changes over time

Table 3. Descriptive statistics for the balanced panel (36 observations)

Statistic	ETR	ROA	CR	DER
Mean	0.150207	0.051661	1.092031	1.134388
Median	0.157579	0.039634	0.665407	0.787406
Maximum	0.342880	0.122475	3.547252	3.478372
Minimum	0.033413	0.010058	0.209188	0.088342
Standard deviation	0.080519	0.031753	1.097652	0.983591
Observations	36	36	36	36

Source: Descriptive statistics computed using EViews 13 (2026).

Table 3 presents the original descriptive estimates across 36 balanced firm-year observations. The average ETR is 0.150207, corresponding to an average reported income-tax expense of approximately 15.02% of the relevant pre-tax income measure. The median ETR of 0.157579 lies moderately above the mean, while the minimum and maximum values range from 0.033413 to 0.342880. This spread indicates that the selected firms did not report a homogeneous tax burden despite operating within the same broad exchange sector.

The mean ETR must not be confused with the statutory corporate tax rate or interpreted as the share of all corporate revenue paid in tax. The empirical numerator and denominator reflect accounting financial-statement categories. Deviations from a statutory benchmark can arise through differences in recognition and classification, including non-deductible expenses, concessions, temporary differences, and other adjustments. Without firm-specific tax

reconciliation disclosures, this article cannot allocate the gap to deliberate tax-avoidance activity. (Hanlon & Heitzman, 2010).

Profitability averages 0.051661, or approximately 5.17% on an ROA basis. Its standard deviation is 0.031753, and values range from 0.010058 to 0.122475. The range is narrower in absolute ratio terms than the dispersion observed for either liquidity or leverage. Accordingly, the profitability sample offers comparatively limited variation with which to estimate a cross-company and over-time relationship with ETR.

"The observed dispersion between the minimum and maximum ROA values reflects variations within the pooled panel of nine firms over four years, rather than the persistent operational efficiency of any single entity. Furthermore, accounting-profitability metrics such as ROA are inherently sensitive to specific financial reporting choices, including depreciation methods, asset impairments, financing structures, and business combinations. Therefore, these descriptive extrema should be interpreted as contextual accounting outcomes rather than absolute measures of systemic economic performance (Gumelar & Evianti, 2022).

The current ratio has a mean of 1.092031 and a median of 0.665407. This divergence shows that the mean exceeds the central observation considerably, consistent with a distribution influenced by observations with comparatively strong current-asset coverage. The minimum of 0.209188 and maximum of 3.547252 reveal large differences in short-term balance-sheet configurations across firms and reporting years.

The standard deviation of CR is 1.097652, slightly greater than its mean. This level of heterogeneity is substantively important because liquidity is the only variable whose partial regression coefficient satisfies the five-percent threshold in the reported model. A diverse current-ratio distribution allows a potentially detectable association, although it also raises questions about unusual observations and sensitivity to sample exclusions that cannot be fully addressed with the supplied summary statistics (Thian, 2022).

Average leverage measured by DER is 1.134388, implying that total liabilities are approximately 1.13 times reported equity when the firm-year ratios are averaged. Its median is 0.787406, the minimum 0.088342, and the maximum 3.478372. This broad range is consistent with the presence of both

relatively conservative and heavily creditor-financed capital structures in the selected infrastructure sample.

A high DER does not necessarily mean that financing is precarious or motivated by tax deductions. Differences in asset maturity, financing covenants, depreciation schedules, and the stage of infrastructure development can alter a company's optimal liability structure. Because the sample combines telecommunications, towers, transport-support operations, and a toll-road operator, sectoral heterogeneity remains even after construction firms were excluded (Ross et al., 2022).

Across the panel, ROA, CR, DER, and ETR have different means, scales, and degrees of dispersion. This reinforces the importance of interpreting each regression coefficient in its own units and considering the values of its standard error. A large numerical coefficient is not necessarily statistically precise or economically important; similarly, a relatively small ratio coefficient may matter when a predictor's observed changes are substantial (Wooldridge, 2020).

Table 4. Annual mean financial indicators reported

Year	ROA	CR	ETR
2021	0.058 (5.8%)	1.482	0.173 (17.3%)
2022	0.044 (4.4%)	1.101	0.133 (13.3%)
2023	0.053 (5.3%)	0.866	0.153 (15.3%)
2024	0.050 (5.0%)	0.920	0.140 (14.0%)

Processed research data based on company annual reports (2021–2024).

Table 4 places three of the principal variables in chronological order. ROA fell from 5.8% in 2021 to 4.4% in 2022, rose to 5.3% in 2023, and edged down to 5.0% in 2024. These fluctuations suggest that the selected firms' earnings generated per unit of assets did not improve monotonically over the four-year window. Because the figures are annual means, individual firms may have followed different trajectories from the group average.

A post-pandemic environment is one possible context for this movement, given changes in mobility, demand, investment conditions, and operating capacity. Nonetheless, a direct pandemic effect cannot be inferred from the annual averages alone: no control group, pandemic-exposure index, or difference-in-differences identification strategy is included. The data describe a recovery-era window rather than estimating what earnings would have been in the absence of the pandemic (Sekaran & Bougie, 2020).

Mean CR declined from 1.482 in 2021 to 1.101 in 2022 and then to 0.866 in 2023. It partially recovered to 0.920 in 2024 but remained below the first-year level. In straightforward balance-sheet terms, the later annual means imply that average current assets did not cover current liabilities on a one-to-one basis. The figures can reflect changes in the composition of assets and liabilities as well as cash-generation conditions.

Lower liquidity during an investment or expansion cycle need not demonstrate financial distress. Infrastructure projects can create demand for working capital, short-term financing, and scheduled payments even when long-term project economics remain favorable. Interpreting the current ratio therefore requires attention to business models, financing arrangements, and maturity profiles. The current article uses CR as a comparative measure without labeling any particular sampled company insolvent (Hery, 2023).

Mean ETR declined from 17.3% in 2021 to 13.3% in 2022, increased to 15.3% in 2023, and declined to 14.0% in 2024. Under the study's operational framework, ETR decreases correspond to a stronger numerical signal of potential tax avoidance, whereas an increase corresponds to a weaker signal. However, these year-to-year descriptive shifts do not constitute evidence of changes in tax-aggressiveness motives, nor are they adjusted for changing profitability or firm-specific events.

The fact that the average ETR falls while ROA and CR also change highlights the need for a multivariate analysis. Simple parallel movement across four annual means can easily conceal differences across nine firms. A pooled trend comparison also cannot isolate which change reflects fiscal rules and which reflects business activity. Panel regression provides one way to quantify conditional association, although the selected specification remains observational (Baltagi, 2021).

Average leverage exhibited relative stability during 2021 and 2022, before shifting to a mean DER of 1.044 in 2023 and rising to 1.156 in 2024. This fluctuation reflects broader capital structure adjustments and corporate debt management across the sampled infrastructure firms during the observation period.

The pattern of group means is useful for identifying contextual variation, yet it remains limited to firms meeting specific inclusion criteria. Excluding

loss-making companies can affect both ROA and ETR distributions, while removing outliers may reduce the share of extreme tax-rate observations. This is a relevant source of possible selection sensitivity, particularly when tax ratios are more volatile among firms with very small pre-tax earnings. (Hanlon & Heitzman, 2010).

Diagnostic testing and choice of panel estimator

Table 5. Model-selection and diagnostic results

Procedure	Reported statistic or probability	Interpretation
Chow test, cross-section F	p = 0.0000	Fixed effects over pooled model
Hausman test, cross-section random	p = 0.7845	Random effects not rejected
Breusch–Pagan LM, Both	p = 0.0000	Random effects over pooled model
Jarque–Bera normality	JB = 1.579757; p = 0.453900	Normality not rejected
Largest absolute predictor correlation	|r| = 0.502520 (CR–DER)	0.80 standard threshold

Source: EViews 13 diagnostic outputs, processed by the authors (2026).

The reported Chow test supports modeling differences across companies rather than relying exclusively on a pooled common-intercept specification. The test probability of 0.0000 represents a value rounded to four decimal places, not a mathematical probability exactly equal to zero. The result establishes the source's first model comparison but does not, by itself, choose between fixed and random effects.

The subsequent Hausman test yielded p = 0.7845. Under the test's usual null hypothesis, the source did not find enough evidence to reject the random-effects specification in favor of fixed effects. This does not prove that firm-specific omitted characteristics are uncorrelated with profitability, liquidity, or leverage; such assumptions require substantive consideration as well as statistical diagnostics. With only nine cross-sectional units, the scope for robust model discrimination should also be regarded cautiously (Baltagi, 2021).

The Breusch–Pagan LM test produced a p-value of 0.0000 under the combined ('Both') test, supporting the random-effects specification over a pooled model. Consequently, the sequential model-selection framework (comprising Chow, Hausman, and Breusch–Pagan tests) establishes the Random-Effects Model (REM) as the most appropriate panel estimator for this study.

Residual normality was evaluated with a Jarque–Bera statistic of 1.579757 and a probability of 0.453900. At alpha = 0.05, these values do not support rejection of the normality null. This result is narrower than a declaration that the model is fully valid: serial dependence, heteroskedasticity, cross-sectional correlation, measurement issues, and omitted variables can still matter for statistical inference (Wooldridge, 2020).

The largest absolute pairwise correlation among the three predictors was 0.502520 (between CR and DER). This value is well below the conventional diagnostic threshold of 0.80, indicating the absence of severe pairwise multicollinearity. While a bivariate correlation matrix is a preliminary diagnostic, these results confirm that collinearity does not distort the estimation of the random-effects model (Ghozali, 2018).

The random-effects model applies Generalized Least Squares (GLS) estimation to incorporate company-specific error components. Recognizing the limitations of a small panel ($N = 9, T = 4$), the reported p-values and estimated coefficients are interpreted as observational associations specific to the selected sample (Wooldridge, 2020).

Regression coefficients and hypothesis assessments

Table 6. Random-effects panel regression: ETR as dependent variable

Explanatory variable	Coefficient	Std. error	t-statistic	p-value
Intercept	0.113877	0.049588	2.296486	0.0283
ROA	−0.109414	0.394093	−0.277634	0.7831
CR	0.030029	0.011900	2.523395	0.0168
DER	0.008101	0.023482	0.344988	0.7324

Source: Random-effects estimation outputs using EViews 13 (2026).

Table 7. Overall model statistics

Model indicator	Reported value
R-squared	0.180843
Adjusted R-squared	0.104047
F-statistic	2.354849
Probability of F-statistic	0.090449
Regression standard error	0.037576
Durbin–Watson statistic	2.170422
Firm-year observations	36
Cross-sections	9
Years	4

Source: EViews 13 estimation outputs, processed by the authors (2026).

The random-effects panel regression yields the following fitted equation: $ETR_{it} = 0.113877 - 0.109414(ROA_{it}) + 0.030029(CR_{it}) + 0.008101(DER_{it}) + u_i + e_{it}$. The estimated signs directly reflect relationships with the effective tax rate (ETR). Because ETR is operationalized as an inverse proxy, a positive coefficient represents a positive association with ETR and, correspondingly, a negative association with the indication of tax avoidance.

The intercept of 0.113877 represents the model's fitted ETR when all three ratios equal zero and the error components are set to their reference values. This is a mathematical baseline rather than a description of a normal infrastructure company. A company with zero profitability, no current-asset coverage, and zero debt-to-equity ratio may be absent from the study's data; consequently, the intercept's economic meaning is limited.

The R-squared of 0.180843 indicates that the model captures a modest share of measured ETR variation under the reported estimation framework. The adjusted R-squared is 0.104047, or approximately 10.40%. This suggests restricted explanatory power for the three-ratio specification and leaves substantial variation associated with unmodeled conditions, measurement differences, or random variation. It would be misleading to translate this result into a claim that the model explains a large proportion of tax avoidance.

The model's overall F-statistic is 2.354849 with $p = 0.090449$. At the pre-specified five-percent threshold, the combined test does not reject the joint null of zero slope coefficients. It is true that p is below 0.10; however, describing the model as conventionally significant at five percent would be incorrect. The paper therefore reports the result transparently and keeps the hypotheses' partial tests distinct from the overall test (Wooldridge, 2020).

The regression standard error of 0.037576 provides another indicator of the residual scale in ETR units. The Durbin–Watson statistic was reported as 2.170422. Neither figure, standing alone, proves that all panel dependence assumptions are satisfied, especially where repeated observations from the same companies are present. Future research should further examine the appropriateness of inference procedures for a small panel rather than treating a single diagnostic value as decisive (Baltagi, 2021).

Table 6 shows that the most precisely estimated partial slope is the one on CR. The ROA and DER estimates have p-values far greater than the five-

percent decision threshold. The finding supports a selective interpretation of the estimated relationships, rather than an assertion that every balance-sheet or profitability ratio predicts the observed tax burden.

Profitability and the effective tax rate

The estimated ROA coefficient is −0.109414, with a standard error of 0.394093, t = −0.277634, and p = 0.7831. At a five-percent level, the study does not find sufficient evidence of a partial relationship between profitability and ETR. The numerical negative sign is not strong enough to justify a directional conclusion, and it should not be rewritten as evidence that more profitable companies engage in greater tax avoidance.

The large standard error relative to the absolute ROA coefficient helps explain the imprecision of the estimate. A ten-percentage-point increase in ROA, if it were otherwise within a meaningful empirical range, would correspond algebraically to a fitted ETR change of approximately −0.01094. This calculation merely illustrates the coefficient's units; it is not a supported prediction about a specific company, particularly when the relevant p-value is 0.7831.

One interpretation is that earnings generation and effective taxation are governed by different mechanisms. Infrastructure assets may give rise to depreciation, investment-related allowances, financing arrangements, or accounting-tax differences that complicate a direct mapping from return on assets to income-tax expense. Because the study does not model these components separately, it cannot rank their relative contributions to the reported insignificant ROA estimate (Rahayu & Kusumawardana, 2020).

The finding that profitability has no significant partial effect on ETR aligns with prior sectoral evidence (e.g., Ramanata, 2022; Putri, 2024), indicating that accounting earnings do not systematically dictate effective tax burdens across firms (Ramanata, 2022)(Prasetya & Wongso, 2023).

Prior empirical research on manufacturing firms similarly documents an absence of a statistically significant profitability effect on tax avoidance. This alignment across different sectors highlights that higher accounting profitability does not automatically translate into greater tax-planning incentives or lower effective tax rates. Nevertheless, the lack of a statistically detectable partial

relationship should not be interpreted as definitive proof that earnings conditions play no role in corporate tax strategie (Putri, 2024).

Recent work studying moderation by firm size reported patterns that complicate a uniform link between profitability and avoidance. When the relationship is contingent on size or the interaction of financial attributes, a three-variable additive model could omit potentially relevant structural differences. The present data do not permit independent moderation tests, so this remains a future extension rather than an explanation already demonstrated in the current sample. (Tarigan & Sari, 2025).

A separate infrastructure-industry study reported a profitability association with tax avoidance over an earlier time horizon. The contrast reinforces that a finding is conditional on the operational definition, period, company selection, and choice of controls. It would therefore be premature to identify the 2021–2024 REM result as overturning earlier evidence; it instead documents a narrower non-detection within a different empirical design (Benedicta & Hutapea, 2024).

Research focused on coal-producing firms has reported links between transfer pricing, profitability, and avoidance outcomes. Those companies face operating and tax circumstances that differ from telecommunication towers and transport-support companies. The comparison is relevant as an example of empirical variation but does not imply that the nine infrastructure firms engaged in transfer pricing or were affected by commodity-sector incentives (Ramadhan & Purnamasari, 2025).

Profitability can also influence corporate income-tax amounts without producing a stable connection to an effective tax-rate proxy. Studies of actual corporate tax liabilities in different industries focus on related but conceptually distinct dependent variables. A rise in pre-tax earnings can raise nominal tax expense while leaving the effective tax rate unchanged, which is one reason a finding about tax liabilities cannot automatically be generalized to avoidance measured with ETR (Mariana et al., 2022).

The empirically defensible conclusion for the first hypothesis is therefore a failure to establish an ROA–ETR association at the chosen threshold. This does not constitute affirmative evidence that the true relationship is exactly zero in the population. With only 36 observations and a selected sample, the result

may reflect limited statistical power, variation in fiscal outcomes, or the omission of other firm characteristics (Wooldridge, 2020).

Liquidity and the effective tax rate

Liquidity is the only explanatory variable with a statistically significant partial coefficient at the 5% level (Beta = 0.030029, SE = 0.011900, t = 2.523395, p = 0.0168). Holding ROA and DER constant, a one-unit increase in the current ratio (CR) is associated with an approximately 0.030029-unit increase in the effective tax rate (ETR). Under the study's operational definition of ETR as an inverse proxy, this positive relationship corresponds to a lower indication of tax avoidance.

A coefficient of 0.030029 is equivalent to approximately 3.00 percentage points of ETR for a one-unit difference in the current ratio. This scaling is useful when considering whether a change from CR 0.8 to CR 1.8 would be economically noticeable. It is not a causal effect estimate, because the observational model does not control all factors that could jointly influence liquidity and tax expense.

From an analytical standpoint, this positive coefficient can be interpreted through the lens of short-term financial capacity. Firms with robust current-asset coverage may experience reduced immediate cash pressure, potentially influencing their tax-reporting patterns and compliance timing (Kasmir, 2021). However, because the Effective Tax Rate (ETR) is derived from financial statement expenses rather than direct cash tax flows, this explanation should be viewed as a plausible financial interpretation rather than a directly observed causal mechanism (Ross et al., 2022). Future empirical work utilizing cash-based ETR or detailed tax reconciliation disclosures is necessary to independently test this underlying operational pathway (Hanlon & Heitzman, 2010).

An alternative explanation is that stronger liquidity accompanies different business conditions or working-capital practices that are also associated with the effective tax rate. Firms able to convert receivables more promptly may have different earnings compositions or contractual terms. Without controlling for those characteristics, the association between CR and ETR can be partly attributable to correlated but unobserved variables. The

estimated slope identifies a pattern within the current specification, not proof of managerial intention (Sekaran & Bougie, 2020).

This positive coefficient on CR (implying an inverse relation with tax avoidance indicators) is consistent with previous empirical studies (Artinasari & Mildawati, 2018; Safi' & Kurnia, 2025), confirming that short-term liquidity provides firms with financial flexibility to meet tax obligations timely.

Evidence from property and real-estate companies has likewise emphasized the role of thin capitalization and liquidity in understanding the tax-avoidance indicator. Such studies show that financial-structure variables may jointly shape fiscal reporting, but their reported outcomes cannot establish the causal pathway in a separate infrastructure panel. The comparison is useful for defining robustness tests to pursue in future research (Agustina et al., 2026).

Other empirical studies report no significant relationship between liquidity and tax avoidance, underscoring the mixed findings in existing literature. Methodological variations—such as differences in liquidity metrics, ETR calculations, and sample filtering rules regarding distressed firms—likely contribute to these empirical divergences. Accordingly, the present finding adds empirical context specific to the infrastructure sector while acknowledging that the broader debate remains open (Sembiring & Hutabalian, 2022).

Research on financial distress illustrates that liquidity has economic consequences beyond tax planning. A lower current ratio may capture short-term financial vulnerability, yet vulnerability itself is an outcome influenced by multiple financial and operational circumstances. This reinforces the need to avoid a circular interpretation in which low liquidity is treated automatically as both the cause and the proof of tax avoidance (Rochendi & Nuryaman, 2022).

Liquidity can also affect financing and dividend choices, introducing other channels through which current assets and liabilities relate to reported financial performance. Those decisions are not explicitly included in the regression and should not be portrayed as measured mediators. They illustrate why a richer future model could be informative when examining the persistence of the positive CR–ETR association (Gunawan, 2023).

In interpreting the second hypothesis, the model provides evidence of a positive partial CR–ETR association and a corresponding negative association with the inverse avoidance indicator at five percent. The article deliberately

does not label this as a reduction in illegal avoidance, improved legal compliance, or additional tax cash paid. Those would require measures beyond financial-statement ETR and potentially an entirely different research design (Hanlon & Heitzman, 2010).

Leverage and the effective tax rate

Leverage, measured by DER, has a positive coefficient of 0.008101, standard error 0.023482, t-statistic 0.344988, and p-value 0.7324. Although the coefficient is numerically positive for ETR, the standard error is nearly three times the coefficient's magnitude. The estimate does not support a detectable partial relationship at alpha = 0.05, and a directional claim about avoidance based on this sign would be unjustified.

Debt may generate tax-relevant interest expense, but a debt-to-equity ratio aggregates liabilities with different contractual and economic features. Trade payables, lease liabilities, bank borrowings, and other obligations do not necessarily lead to the same tax deductions. Moreover, financial-reporting measures can vary with the accounting treatment of leases or equity changes. Consequently, the absence of a DER–ETR relationship is not logically inconsistent with the tax relevance of particular interest expenses (Pohan, 2022).

Financing choices within infrastructure firms may be driven by project cycles, capital expenditures, and debt repayment schedules. A company raising funds for network expansion can exhibit increased liabilities for business reasons unconnected with tax minimization. Distinguishing between debt deployed for investment and debt intended primarily to exploit tax deductibility would require transactional and financing-policy information outside the scope of this study's panel data (Ross et al., 2022).

The absence of a statistically detectable leverage effect corroborates prior findings within capital-intensive industries (Azizah & Anggraini, 2026; Sukma & Setiawati, 2022), suggesting that debt in infrastructure firms primarily funds long-term assets rather than serving as a tax-shield instrument.

Conversely, contrasting findings have been reported in empirical studies where leverage exhibits a significant relationship with tax avoidance. Such discrepancies may stem from variations in debt proxies, sample composition, and effective tax rate specifications. Rather than invalidating prior literature, the present study highlights its statistically non-significant result as an

empirical outcome specific to the operational design and sample of Indonesian infrastructure firms examined (Kusumah et al., 2021).

The absence of a statistically detectable leverage effect corroborates prior findings within capital-intensive industries, suggesting that debt in infrastructure firms primarily funds long-term assets rather than serving as a tax-shield instrument (Hertina et al., 2023; Marfiana & Andriyanto, 2021).

Interpretive boundaries, tax policy, and broader evidence

A central issue is the inferential distance between an effective tax rate and the practice of tax avoidance. ETR measures tax expense relative to pre-tax earnings and may carry useful comparative information, yet it does not classify tax arrangements as lawful or unlawful. The present paper therefore uses expressions such as 'indication of tax avoidance' and avoids asserting that the sampled companies undertook particular transactions to reduce tax (Hanlon & Heitzman, 2010).

Corporate tax planning is also shaped by formal compliance provisions under Indonesia's general tax administration framework. The rules provide a legal background for differentiating legitimate tax arrangements from noncompliance, while this study's financial ratios provide no direct basis for classifying a company's legal conduct. A cautious interpretation protects the distinction between empirical financial reporting research and specific allegations about companies or taxpayers (Undang-Undang (UU) Nomor 28 Tahun 2007 Tentang Perubahan Ketiga Atas Undang-Undang Nomor 6 Tahun 1983 Tentang Ketentuan Umum Dan Tata Cara Perpajakan, 2007).

For policy makers and financial-statement users, the modest explanatory performance of the model is as important as the liquidity coefficient. The results caution against using just three conventional ratios to flag suspected tax avoidance across issuers. More specific indicators, including book-tax differences, cash-based effective tax rates, interest deductibility, tax-loss utilization, and governance information, could provide a more nuanced basis for subsequent investigation (Hanlon & Heitzman, 2010).

The main implications for management are similarly circumscribed. Monitoring working capital and the effective tax burden can support financial planning, but the evidence does not show that increasing the current ratio causes higher tax expense or improved compliance. Tax obligations should

continue to be managed in accordance with applicable law and firm-specific transactions, while the regression outcome remains a descriptive association in a limited research sample (Thian, 2021).

Two statistical limitations are particularly relevant. First, the sample has only nine companies observed for four years, limiting inference and the scope for complex interactions. Second, removing loss-making firms and then six further companies after an outlier review can affect the distributions and the balance of observed characteristics. Due to sample size constraints, this study did not conduct leave-one-firm-out estimation, alternative proxy tests, or re-estimation using all initially eligible companies (Wooldridge, 2020).

A further limitation concerns theoretical mechanism. The regressors capture accounting outcomes and financing positions but do not observe actual tax-planning procedures, managerial compensation, ownership monitoring, or the quality of tax reconciliation disclosures. Agency-based interpretations are therefore motivation for the tests, not evidence that a particular agency conflict occurred. A stronger design could link governance data to well-defined tax measures and evaluate those mechanisms directly (Eisenhardt, 1989).

For future research, separately comparing ETR and cash ETR, adding measures of capital intensity, tax-loss positions, and interest expense, and using documented firm-level robustness procedures would improve confidence. Sensitivity to different statistical estimators and inference corrections is especially valuable for panels with few company clusters. Such proposals are intended as a program for additional analysis and are not presented as completed results in this article (Baltagi, 2021).

Reproducibility and sensitivity agenda

Future studies could extend this empirical framework by publishing disaggregated panel data with explicit numerator and denominator breakdowns. Access to underlying line-item components would enable independent validation of ETR distributions, precise tracking of transient accounting adjustments, and clearer differentiation between tax-expense shifts and pre-tax earnings volatility (Hanlon & Heitzman, 2010).

A first robustness exercise could revisit the company-selection sequence. This study initially identified 15 eligible issuers before eliminating six companies through outlier evaluation. Future research could present estimates

before and after trimming to judge whether the coefficient of liquidity depends on a small number of observations. A documented leave-one-company-out analysis could be particularly informative when only nine companies remain in the final sample (Sekaran & Bougie, 2020).

A second robustness exercise could distinguish between accounting tax expense and cash taxes paid. Comparing financial-statement ETR with cash-based tax measures (Cash ETR) and, where available, tax reconciliation disclosures would help identify whether observed cross-company dispersion reflects temporary accounting adjustments or persistent differences in tax-related cash outflows. Further disaggregating current from deferred income-tax expense would also clarify the role of timing differences in corporate effective tax rate (Hanlon & Heitzman, 2010).

A third exercise should examine alternative standard-error treatments and possible time effects without changing the substantive research question. Observations across companies may share macro-level economic shocks, while repeated observations within each enterprise can exhibit firm-specific serial dependence. Accounting for these spatial and temporal dependencies could adjust standard errors and confidence intervals around the estimated coefficients even if point estimates remain unchanged. Given the small number of cross-sectional units (N = 9), conventional cluster-robust inference requires careful application due to finite-sample properties, underscoring the importance of transparent estimation choices in panel specifications (Wooldridge, 2020).

Finally, the empirical scope should remain aligned with the selection rules in any policy interpretation. The conclusions pertain to profitable, rupiah-reporting, established issuers retained after excluding construction and civil-engineering companies and removing outliers. The absence of the other infrastructure firms is not a minor editorial detail: exclusion of loss-making or newly listed companies can meaningfully narrow the patterns observed in effective taxation. An expanded sample would strengthen generalizability, but it would also require a new model-selection and estimation process rather than treating the current 36 observations as representative of the entire IDX infrastructure population (Baltagi, 2021).

4. Conclusion

Based on a balanced panel of nine infrastructure companies listed on the Indonesia Stock Exchange for 2021–2024, the reported random-effects estimates reveal a positive association between liquidity and the effective tax rate, implying a negative association with the study's inverse indicator of tax avoidance. Profitability and leverage do not demonstrate detectable partial effects at the five-percent threshold. The adjusted R-squared is 0.104047, and the overall F-test does not pass the five-percent threshold. Accordingly, the evidence supports a limited, associational conclusion: short-term financial capacity is related to variation in ETR within the selected sample, while the three-ratio model leaves most variation unexplained. Neither the level of ETR nor these regression results establish illegal tax conduct or a causal financial decision mechanism.

Future work should enlarge the sample and test alternative measures such as cash ETR and book–tax differences. Researchers could also examine capital intensity, tax-loss carryforwards, deductible interest, ownership structure, and time-specific effects as theoretically justified controls. For practitioners and policy makers, this study supports cautious monitoring of financial health and corporate tax reporting rather than any automatic classification of companies with low ETR as engaging in improper avoidance. (Hanlon & Heitzman, 2010).

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