
THE EFFECT OF ESG SCORES, TAX STRATEGY, AND COMPANY SIZE ON DEBT COSTS (A STUDY OF MANUFACTURING COMPANIES LISTED ON THE INDONESIA STOCK EXCHANGE FOR THE 2019-2023 PERIOD)

^{1*}Alfa Mightyn, ²Agustin Fadjarenie

Mercu Buana University, Indonesia

Email: alfa.mightyn@gmail.com, agustin.fadjarenie@mercubuana.ac.id

ABSTRACT

The cost of debt is a crucial component of the capital structure because it reflects the credit risk perceived by creditors. In the context of external financing, environmental factors, tax strategies, and company characteristics can influence the level of debt costs. This study aims to analyze the effect of ESG scores, tax strategies, and company size on the cost of debt in manufacturing companies listed on the Indonesia Stock Exchange for the 2019–2023 period. The research method uses panel data regression with purposive sampling of manufacturing companies. The ESG score is proxied by the number of environmental certifications, tax strategies by the Cash Effective Tax Rate (CETR), company size by the natural log of total assets, and the cost of debt by the Interest Coverage Ratio (ICR). The results show that the ESG score negatively affects the cost of debt, tax strategies also negatively affect the cost of debt, while company size has a positive effect on the cost of debt. These findings suggest that corporate sustainability and tax compliance can reduce credit risk perceived by creditors, while large company size does not always guarantee lower funding costs. A contextual approach through the use of environmental certification and CETR provides a more practical understanding of the determinants of debt costs, and emphasizes that sustainability and fiscal governance are relevant financial strategies for the manufacturing sector in Indonesia.

Keywords: ESG, tax strategy, company size, cost of debt, Interest Coverage Ratio, Indonesian manufacturing

INTRODUCTION

The cost of debt is a critical component of a company's capital structure, reflecting the level of return creditors expect for the risks they take on when providing loans. A high cost of debt can burden a company's cash flow and hinder business expansion, while a low cost of debt reflects creditors' confidence in the company's stability and creditworthiness. In the context of modern financial markets, the cost of debt is influenced not only by a company's financial condition but also by non-financial factors such as governance practices, environmental

risks, and fiscal transparency.(Ernst & Woithe, 2024).

Creditors play a crucial role in assessing a company's viability through information regarding its cost of debt. For creditors, the cost of debt is a key indicator of a company's risk level and ability to meet interest obligations. Companies with a low cost of debt are generally perceived as having stable cash flow and sound risk management, making them more likely to be trusted for loans. Conversely, a high cost of debt indicates a greater risk of default, leading creditors to demand higher interest rates to compensate for the risk.(Moussa, FB, & Mnasri, 2019).

Previous research shows that creditors consider not only traditional financial aspects, but also non-financial factors such as sustainability practices (ESG) and tax strategies in assessing the cost of debt.(Hao & Renneboog, 2019; Oikonomou et al., 2014)Creditors tend to provide financing access at lower interest rates to companies with good ESG performance because they are considered capable of reducing long-term risks, such as reputational, litigation, and regulatory risks.(Ng & Rezaee, 2015). Thus, understanding the cost of debt is not only important for internal management but is also a key consideration for creditors in assessing loan eligibility and determining a company's financing structure.

In relation to green accountability, the cost of debt reflects not only the company's internal financial condition but also its commitment to sustainability and governance principles. Companies that demonstrate compliance with environmental regulations, information transparency, and fiscal integrity are perceived as more accountable by investors and creditors. Therefore, companies that integrate green accountability principles into their business operations—including debt management—have a greater opportunity to lower financing costs.

In recent years, attention to sustainability and corporate social responsibility (ESG) has increased significantly. ESG is now a crucial tool in financial decision-making, not only for equity investors but also for creditors and debt providers. In general, companies with high ESG scores are perceived as having better governance, more manageable environmental risks, and higher social

sensitivity, thus being considered more credible in the long term.(Ernst & Woithe, 2024).

Empirical research supports this view. For example, a study bySun, Habib, and Ahmed (2024)found that companies with good ESG performance have lower debt costs, due to lower perceived credit risk from financial institutions. This is reinforced by the findingsLe Chau et al. (2025)which states that good sustainability practices help lower the risk premium charged by creditors to companies. ESG represents a company's long-term commitment to socially and environmentally responsible business continuity.

According toErnst & Woithe (2024)In their study of 2,000 global companies, companies with higher ESG performance tended to receive lower loan spreads and had easier access to debt-based financing. This suggests that lenders are increasingly considering non-financial risks as part of their credit risk assessment process. Accordingly, the reportMSCI (2023)stated that environmental and social factors are now important indicators in determining the risk of corporate default, especially in the energy and natural resource-intensive industrial sectors.

In the financing context, non-financial risk factors, such as potential environmental sanctions, social demands, and governance failures, can increase the risk of default. Creditors are now more wary of potential losses resulting from non-compliance with ESG standards, which ultimately encourages financial institutions to charge higher interest rates to companies with low ESG scores.(MSCI, 2023)Therefore, effective ESG

management is a crucial risk mitigation strategy that can improve a company's credit standing and lower interest expenses.

In external financing practices, creditors assess not only traditional financial performance but also the sustainability and fiscal compliance dimensions of a company. Recent research shows that a sustainability-oriented tax strategy can reduce tax avoidance aggressiveness and strengthen a company's reputation, thereby lowering creditors' perceptions of risk. (Octaviani et al., 2025) This finding confirms that integrating tax and sustainability aspects is crucial for creating more efficient access to financing.

Tax strategy is a component of financial management that companies use to legally minimize their tax burden through efficient tax planning. This strategy impacts not only cash flow but also capital structure and the perception of risk by external parties, such as creditors. In the context of debt financing, tax strategy can influence financial institutions' perceptions of the company's profitability and fiscal compliance risks. This directly or indirectly affects the interest rate or cost of debt charged to the company. (Kang & Kim, 2023).

Companies that adopt aggressive tax strategies, such as complex tax avoidance schemes, potentially face litigation risks, regulatory sanctions, and uncertainty about future net income. These risks impact creditors' perceptions of the company's financial stability, which can lead to increased interest rate spreads or even restricted access to credit. (Desai & Dharmapala, 2006; Lanis & Richardson, 2015) On the other hand, companies that

demonstrate good tax compliance tend to be perceived as more transparent and credible, which can reduce information risk and increase lender confidence.

Research by Duong & Huang (2022) shows that companies with aggressive tax strategies tend to have a higher cost of debt, as creditors recognize such practices as a signal of high managerial risk and potential conflicts of interest. Conversely, companies with conservative tax strategies—as measured by a high Cash Effective Tax Rate (CETR)—may be perceived as more fiscally responsible, ultimately resulting in a lower cost of debt.

In the era of sustainability, tax strategies also have an indirect relationship with green accountability. Organization for Economic Co-operation and Development (OECD, 2022) highlights the importance of tax principles as a sustainability policy tool, including in encouraging companies to integrate environmental considerations into their operations. Creditors are increasingly recognizing that companies engaging in extreme tax avoidance often pay little attention to social and environmental responsibilities, thus being perceived as having a weak sustainability commitment.

Thus, tax strategy is not only a tool for fiscal efficiency but also an important signal about corporate integrity and governance quality. In the context of financing, tax strategy influences a company's long-term risk expectations, including the possibility of a liquidity crisis due to fines or tax adjustments.

Company size is a key determinant of financing structure, including the

amount of debt a company incurs. In general, larger companies tend to have a stronger negotiating position with creditors, which in turn results in lower interest rates than smaller companies. This is due to the assumption that larger companies have greater financial stability, a more established organizational structure, and expectations of more consistent financial performance. Frank & Goyal, 2009; Gao et al. (2020).

From a financial institution's perspective, the default risk posed by large companies is typically lower than that of smaller companies. Large companies generally have access to capital markets, more diverse assets, and a greater capacity to withstand macroeconomic pressures, making them considered more bankable. In research by (Ozkan, 2000), it was found that company size has a negative and significant influence on the cost of debt, meaning that the larger the company size, the lower the cost of debt imposed by creditors.

Another study by Chau et al. (2020) Research shows that large companies have the ability to demonstrate greater transparency and credibility to the market, including in financial reporting and risk disclosure. With greater information transparency, information asymmetry between companies and creditors is reduced, so creditors tend to set lower debt costs. However, several recent studies have also shown that excessively large companies can create negative investor perceptions, as they are perceived as inefficient in asset management. (Kasibi et al., 2023)

Furthermore, in the context of sustainability and green accountability, company size also plays a significant

role. Large companies are often in the public and regulatory spotlight, thus having a greater incentive to comply with environmental regulations and implement sustainable business practices. This also influences creditors' perceptions of the environmental risks inherent in a company's operations. For example, research by Garcia-Sánchez & Noguera-Gámez (2017) states that large companies that demonstrate a commitment to sustainability through environmental certification and ESG reporting can receive incentives in the form of reduced debt costs from financial institutions that support green investments.

Thus, firm size influences not only perceived financial risk but also the social and environmental responsibility signals perceived by creditors. Therefore, within a green accountability framework, firm size can be an important indicator mediating the relationship between firm characteristics and the cost of debt.

The cost of debt can technically be represented by the Interest Coverage Ratio (ICR), which is the ratio of earnings before interest and taxes (EBIT) to interest expense. This ratio measures a company's ability to meet its debt interest obligations.

The CETR, or cash effective tax ratio, is a commonly used proxy for measuring a company's tax strategy, as it better reflects the actual amount of cash paid for tax liabilities relative to taxable profit. A low CETR may indicate high tax avoidance practices, while a high CETR indicates tax payments commensurate with profit performance, thus suggesting strong fiscal accountability. (Hanlon & Heitzman, 2010).

In empirical practice, firm size is often measured using total assets, as it reflects the total economic resources owned by the firm to generate revenue. For statistical purposes and to minimize outliers, firm size is usually proxied using the natural logarithm (Ln) of total assets, which has been widely used in accounting and finance research.(Barros et al., 2021; Lan et al., 2022).

In Indonesia, awareness of the importance of ESG is growing, in line with increasing global pressure on sustainability principles. The government, through the Financial Services Authority (OJK), has issued POJK No. 51/POJK.03/2017, which requires companies in the financial services sector to submit sustainability reports. In non-financial sectors such as manufacturing, companies are beginning to seek environmental certifications such as ISO 14001 or PROPER (Company Performance Rating Assessment Program) from the Ministry of Environment and Forestry (KLHK) as a form of compliance with national environmental standards. Such certifications serve as important indicators that companies have internalized sustainability values in their business processes.

This environmental certification not only serves as a form of compliance reporting but also increases the trust of external parties such as creditors and investors. World Bank (2023) Companies with formal environmental certification are more likely to receive green loans or other sustainable financing incentives at more competitive interest rates. This demonstrates the close link between sustainability, green accountability,

and the cost of debt borne by companies.

Overall, ESG is no longer just a reputational initiative, but has become a real determinant in determining corporate financing risk. Green accountability requires companies to not only generate profits but also be responsible for their social and environmental impacts.

In the Indonesian context, manufacturing companies face structural challenges in debt financing due to economic volatility and global pressure on sustainability practices. A survey conducted by PwC Indonesia (2022) A survey of large manufacturing companies showed that 61% of respondents acknowledged the difficulty of obtaining long-term, low-interest financing without a clear and transparent ESG track record.

The manufacturing industry plays a central role in the global and national economy. In many developing countries, including Indonesia, this sector is one of the largest contributors to gross domestic product (GDP), job creation, and state tax revenue. Based on data from World Bank (2023b) Indonesia's manufacturing sector's contribution to GDP was estimated at 18.3% in 2022, making it a key driver of the national economy. However, despite this contribution, the industry also has a large environmental footprint, is energy-intensive, and faces significant challenges in achieving sustainable business practices.

In the context of financing, manufacturing companies have high capital requirements, both for raw material procurement, machinery purchases, and operational costs. This reliance on external funding, particularly debt, makes it crucial to

manage debt costs efficiently. According to Barros et al., (2021) The manufacturing industry has relatively high leverage compared to the service sector, making the cost of debt a crucial component of its financial efficiency. Therefore, factors influencing the cost of debt, such as ESG reputation, tax strategy, and company size, are highly relevant to analyze in this industry context.

Regarding ESG scores, manufacturing companies face greater pressure from stakeholders, particularly on environmental issues. Carbon emissions, industrial waste, and energy use are central issues that must be managed responsibly. A study by Fatemi et al. (2018) shows that manufacturing companies with high ESG performance, including environmental certifications such as ISO 14001, tend to receive preference from green creditors and financial institutions, thus enjoying lower debt costs.

Meanwhile, from a tax strategy perspective, manufacturing companies in developing countries often utilize various tax incentive schemes or even engage in aggressive tax planning practices to reduce their fiscal burden. This has drawn particular attention from regulators and creditors. The Cash Effective Tax Rate (CETR) is a commonly used proxy to assess the extent to which a company utilizes its tax strategy. Research Fonseca (2020) found that companies with high CETR (which indicates a conservative tax strategy) are perceived as more stable and have a positive relationship with reduced credit risk.

On the other hand, the size of companies in the manufacturing sector varies widely, from small and medium

enterprises to large conglomerates. In relation to the cost of debt, as explained by Lan et al. (2022), large companies tend to have better negotiating leverage, including access to green financing, which also encourages them to be more environmentally responsible.

With growing awareness of green accountability, the Indonesian manufacturing industry is being challenged not only to produce efficiently but also to account for the environmental and social impacts of its operations. In line with Financial Services Authority Regulation No. 51/POJK.03/2017 concerning Sustainable Finance, manufacturing companies are required to report on environmental and social responsibility, which is an integral part of ESG and green accountability in business decision-making.

Research on the factors influencing the cost of debt has grown significantly over the past decade, particularly with increasing attention to non-financial factors such as environmental, social, and governance (ESG) practices. ESG is considered a form of green accountability that influences the perception of credit risk by investors and creditors. A study by El Ghouli et al. (2018) Studies have shown that companies with strong ESG performance tend to have lower debt costs because they are perceived as more responsible and have better risk management. However, most of these studies focus on developed countries, such as the United States and European countries, where market structures are more mature in assessing ESG aspects.

On the other hand, research on the relationship between ESG and debt costs in developing countries, such as

Indonesia, is still limited, particularly in the manufacturing sector, which has a significant environmental impact. Barros et al. (2021) The limited availability of ESG data in developing countries presents a challenge in generating empirical generalizations. Furthermore, approaches to ESG measurement vary. Most studies rely on ESG scores from commercial data providers such as Bloomberg, MSCI, or Refinitiv. However, there is a gap in alternative approaches, such as using the number of environmental certifications as a more operational and measurable proxy. This method has not been widely explored in previous studies, particularly in Indonesia, despite the high legitimacy of certifications such as ISO 14001 or PROPER from the Ministry of Environment and Forestry in the local context.

In addition, tax strategy variables are often used in financial efficiency studies, but their specific relationship to the cost of debt has not been extensively researched. Most studies focus more on the relationship between tax strategy and the cost of equity. (Desai & Dharmapala, 2020; Hanlon & Heitzman, 2010), or on the company's value. Study Fonseca (2020) began to bridge this gap by stating that companies pursuing conservative tax strategies—as reflected in a high Cash Effective Tax Rate (CETR)—tend to have lower risk perceptions from creditors, ultimately resulting in lower debt costs. However, this research remains limited and needs to be expanded across sectoral and geographic contexts.

Firm size as a control variable has also been widely studied in relation to the cost of capital. Larger firms tend to

have better diversification and broader access to financing, which can lower the cost of debt. (Lan et al., 2022) However, these research results are inconsistent, depending on the sector and research region. In Indonesia's manufacturing sector, few studies have simultaneously investigated the relationship between ESG (using environmental certification as a proxy), tax strategy (CETR), and firm size on the cost of debt.

Thus, this study fills this gap by presenting a locally relevant proxy approach, using the Indonesian manufacturing sector as its research object, which has unique characteristics, and simultaneously examining the relationship between the three independent variables and the cost of debt. This research also strengthens the discourse on green accountability in the context of corporate financing in developing countries.

Ultimately, this research contributes to strengthening the concept of green accountability in financing structures. ESG is not merely positioned as a reputational or ethical issue, but rather is directly linked to a company's financial strategy through its impact on the cost of debt. Thus, this research offers a new perspective that sustainability practices are not merely a social responsibility but also a strategic tool for managing financial risk and accessing financing.

This research is important not only academically but also has practical implications for corporate management and policymakers. Academically, this research contributes to the accounting and corporate finance literature in developing countries, particularly regarding the influence of

ESG and tax strategies on corporate financing structures. Meanwhile, from a practical perspective, the results of this research can be used as a reference for corporate management in designing sustainability strategies integrated with fiscal policy and financing risk management. For regulators and stakeholders, the findings of this research can also serve as a reference in developing incentive policies that encourage increased green accountability in the manufacturing sector.

Therefore, studying the determinants of debt costs is increasingly relevant in the current economic context, where sustainability factors, fiscal risk, and company size play a role in influencing lender risk perceptions. This research is crucial to provide a more comprehensive picture of how factors such as ESG, tax strategy, and company size influence debt costs, particularly in Indonesia's manufacturing sector, which is undergoing a green transformation.

Considering the background, industry phenomena, and existing research gaps, this research is highly relevant and urgent. The focus on manufacturing companies listed on the Indonesia Stock Exchange for the 2019–2023 period was chosen because this sector is not only economically strategic but also vulnerable to environmental and fiscal governance issues. Therefore, this research is expected to provide a more comprehensive understanding of how ESG, tax strategy, and company size simultaneously influence debt costs, as well as how green accountability can be reflected in the financing structure of today's Indonesian companies.

Based on the above explanation, the author is interested in researching ESG scores, tax strategies, company size, and debt costs with the title "The Effect of ESG Scores, Tax Strategies, and Company Size on Debt Costs (A Study of Manufacturing Companies Listed on the Indonesia Stock Exchange for the 2019-2023 Period)."

METHOD

This research is an explanatory quantitative study, which aims to examine the causal relationship between the independent variables, namely Environmental, Social, and Governance (ESG) Score, Tax Strategy, and Company Size, and the dependent variable, Cost of Debt. The explanatory approach is used because this research focuses not only on describing the phenomenon but also on explaining the influence between variables through statistical tests.(Creswell & Creswell 2018).

The quantitative approach was chosen because it is objective, systematic, and allows empirical testing of hypotheses based on numerical data that can be measured statistically.(Sugiyono, 2019)In this study, the data used comes from financial reports and corporate sustainability reports, which are analyzed using a multiple linear regression model to measure the influence of ESG, tax strategy, and company size on the company's cost of capital.

This type of research is associative, because it aims to test the relationship and influence between variables.(Sekaran & Bougie, 2016)The research was conducted within the framework of the positivistic paradigm, namely a research paradigm that assumes that social reality is

objective and can be tested through deductive logic and statistical techniques.(Neuman, 2014).

Thus, the approach used in this research is deductive, starting from existing theory to develop hypotheses that are then tested based on empirical

Descriptive Statistical Analysis

. summarize ICR ESG CETR SIZE

Variable	Obs	Mean	Std. dev.	Min	Max
ICR	200	20.07614	64.80258	-16.12946	670.9249
ESG	200	4.225	2.238174	0	10
CETR	200	.5353424	1.114383	.0006913	12.09899
SIZE	200	29.4051	1.66047	25.32687	32.68294

Figure 4.1 Descriptive Statistics

Descriptive statistics provide an overview of the characteristics of the data in this study, including the variables Interest Coverage Ratio (ICR), Environmental, Social, and Governance (ESG), Cash Effective Tax Rate (CETR), and Company Size (SIZE). The number of observations for each variable is 200.

The ICR variable has an average value of 20.08 with a standard deviation of 64.80, indicating a fairly high data dispersion. The minimum ICR value of -16.13 indicates a company experiencing operational losses and therefore unable to cover interest expenses, while the maximum value of 670.92 indicates a company with very high interest payment capacity.

The ESG variable showed an average value of 4.225 with a standard deviation of 2.238. The minimum value of this variable is 0, while the maximum value is 10, reflecting the variation in the application of environmental, social, and governance

data. This aligns with the characteristics of quantitative research, which focuses on testing theories to explain phenomena systematically and measurably..

RESULTS

principles among the companies studied.

The CETR variable has a mean of 0.535 and a standard deviation of 1.11. A minimum value of 0.00069 and a maximum of 12.10 indicate that cash tax effectiveness varies significantly across companies. A relatively high maximum value may indicate the presence of outliers or the influence of specific tax policies implemented by a company.

Meanwhile, the SIZE variable, measured using the natural logarithm of total assets, has a mean value of 29.41 with a standard deviation of 1.66. The minimum SIZE value is 25.33 and the maximum is 32.68, indicating that the study sample includes companies with a range of medium to large sizes.

Panel Data Regression Model

Chow Test

The Chow test is used to select between a Common Effect or Fixed Effect model. The criteria used are: if the p-value is less than α (p-value < 0.05), then the selected model is Fixed Effect.

ICR	Coefficient	Std. err.	t	P> t	[95% conf. interval]	
ESG	-2.585293	3.343542	-0.77	0.441	-9.18942	4.018835
CETR	-2.072809	3.940796	-0.53	0.600	-9.856626	5.711008
SIZE	62.63411	20.04249	3.13	0.002	23.0464	102.2218
_cons	-1809.654	585.5613	-3.09	0.002	-2966.248	-653.0597
sigma_u	109.83798					
sigma_e	53.799212					
rho	.80651071	(fraction of variance due to u_i)				

F test that all u_i=0: F(39, 157) = 3.10

Prob > F = 0.0000

Figure 4.2 Chow Test Results

Based on the results of the data processing above, it was found that the p-value (Prob>F) = 0.000, this value is smaller than 0.05 (0.000 < 0.05) so it can be concluded that the selected model is Fixed Effect.

Hausman Test

The Hausman test is used to determine the best model between Fixed Effect and Random Effect. The criteria used are: if the sig. value is <0.05, then the selected model is Fixed Effect.

Test of H0: Difference in coefficients not systematic

$$\text{chi2}(3) = (b-B)'[(V_b-V_B)^{-1}](b-B) \\ = 12.61$$

Prob > chi2 = 0.0056

Figure 4.3 Hausman Test Results

Based on the results of data processing for the Hausman test, it was found that the p-value (Prob>chi2) = 0.0056, this value is smaller than 0.05 (0.0056 < 0.05) so it can be concluded that the selected model is Fixed Effect.

Based on the results of the Chow and Hausman tests, the best model was the Fixed Effect Model (FEM). The Chow test results indicate that the Fixed Effect model is better than the Common Effect, while the Hausman test results indicate that the Fixed Effect is more appropriate than the Random Effect. Therefore, the

Lagrange Multiplier (LM) test is not necessary. (Gujarati & Porter, 2009).

Model Assumption Test

In this study, the selected or best panel data regression model is the Fixed Effect Model, so that classical assumption testing is carried out for the Fixed Effect Model.

Heteroscedasticity Test

The heteroscedasticity test is used to determine whether a regression model from a study exhibits unequal variances from the residuals of one observation to another. The criterion used in this test is that the data does not exhibit heteroscedasticity if the significance value is > 0.05.

Modified Wald test for groupwise heteroskedasticity
in fixed effect regression model

H0: $\sigma(i)^2 = \sigma^2$ for all i

chi2 (40) = 3.9e+07
Prob>chi2 = 0.0000

Figure 4.4 Heteroscedasticity Test Results

Based on the results of the Modified Wald Test, the p-value obtained was 0.0000, which is smaller than 0.05. Therefore, H₀ is rejected, so it can be concluded that the model contains symptoms of heteroscedasticity, which means that the residual variance between observation units is not constant.

Normality Test

The normality test aims to determine whether the residuals in a panel data model are normally distributed. The test is performed using the Jarque-Bera test, with the criterion that if the p-value is >0.05, the residuals are normally distributed, and vice versa.

```
. jb resid
Jarque-Bera normality test: 234 Chi(2) 1.5e-51
Jarque-Bera test for Ho: normality:
```

Figure 4.5 Normality Test Results

Based on the Jarque-Bera test, a statistical value of 234 was obtained with a p-value of 1.5×10^{-51} which is much smaller than 0.05. This result indicates that the residuals in the model are not normally distributed.

Multicollinearity Test

Multicollinearity occurs when there is a high correlation between independent variables in a regression,

which can cause coefficient estimates to become unstable. The criteria used are if the VIF value is > 10 or the tolerance (1/VIF) is .01 or less, indicating multicollinearity.

Based on the output above, it was found that the ESG, CETR, and SIZE variables have VIF values smaller than 10, so it was concluded that there was no multicollinearity.

```
. vif, uncentered
```

Variable	VIF	1/VIF
SIZE	5.21	0.191811
ESG	5.09	0.196507
CETR	1.23	0.809837
Mean VIF	3.85	

Figure 4.6 Multicollinearity Test Results

Autocorrelation Test

In this study, the autocorrelation test used was the Wooldridge test. The

criterion used was that if the p-value > 0.05, the conclusion was that there was no autocorrelation.

```
. xtserial resid

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
F( 1, 39) = 5.166
Prob > F = 0.0286
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Figure 4.7 Autocorrelation Test Results

Based on the output above, it was found that the p-value was 0.0286, this value was smaller than 0.05, so it was concluded that an autocorrelation case occurred.

Based on the results of the classical assumption tests, violations of the assumptions were found in the normality, heteroscedasticity, and autocorrelation tests. To address these violations, the Seemingly Unrelated Regression (SUR) method was used. The SUR method is appropriate for panel data regression when there is heteroscedasticity and autocorrelation in the residuals between cross-sections. Furthermore, this method is more appropriate for panel data conditions with a larger number of cross-sections (N) than the number of time periods (T), also known as the large N, small T condition.(Beck & Katz, 1995).

The advantage of the SUR method is its ability to produce more accurate standard error estimates than Ordinary Least Squares (OLS) on panel data experiencing heteroscedasticity and autocorrelation. This results in more reliable and trustworthy model estimations for statistical inference purposes.

Seemingly Unrelated Regression(SUR)

In panel data regression using the Seemingly Unrelated Regression (SUR) model, stationarity testing is necessary to ensure that the data does not contain trends that could lead to spurious regression. Stationarity testing is performed because in this study, the number of time series observations is greater than the number of cross-sections, so stationarity testing is necessary before model estimation.

Table 4.1 Stationarity Test Results

Series	Prob. Level	1st difference
<i>Cost of Debt(ICR)</i>	0.5381	0.0000
<i>ESG Score</i>	0.0000	0.0000
<i>Tax Strategy(CETR)</i>	0.0000	0.0000
<i>Company Size</i>	0.4997	0.0000

Source: Data Processing Results (2025)

Stationarity testing is performed by comparing conditions at the level and first difference levels using the ADF-Phillips-Perron (Augmented Dickey-Phillips-Perron) tests. The decision-making criterion is that if the probability value (p-value) of the test result is less than 0.05, then the variable is declared stationary. Conversely, if the probability value is greater than

0.05, then the variable is non-stationary at that level.

Based on the results of the stationarity test in the table above, at the Cost Of Debt (ICR) and Size Company variable levels, it was concluded that they were not stationary because they had a p-value greater than 0.05 (sig > 0.05) so that these two variables were transformed

first difference and the results showed that all variables were stationary with a probability below 0.05. Because all variables were stationary after the first difference, the study can be continued

```
. xtpcse ICR ESG CETR SIZE
```

Linear regression, correlated panels corrected standard errors (PCSEs)

```
Group variable: NO
Time variable: TAHUN
Panels: correlated (balanced)
Autocorrelation: no autocorrelation

Number of obs = 200
Number of groups = 40
Obs per group:
    min = 5
    avg = 5
    max = 5

Estimated covariances = 820
Estimated autocorrelations = 0
Estimated coefficients = 4

R-squared = 0.0377
Wald chi2(3) = 15.50
Prob > chi2 = 0.0014
```

ICR	Panel-corrected					
	Coefficient	std. err.	z	P> z	[95% conf. interval]	
ESG	-5.834325	2.366587	-2.47	0.014	-10.47275	-1.1959
CETR	-4.310316	1.822608	-2.36	0.018	-7.882562	-.7380711
SIZE	4.583701	1.43713	3.19	0.001	1.766978	7.400424
_cons	-87.75055	30.47398	-2.88	0.004	-147.4785	-28.02264

Figure 4.8 Results of the Seemingly Unrelated Regression (SUR) Test

Based on the panel data output with SUR estimation, the following conclusions are obtained:

- 1) The ESG Score variable has a coefficient of -5.834 with a p-value of 0.014, which is less than 0.05. This indicates that the ESG Score has a statistically significant effect on the cost of debt (ICR). The negative sign on the coefficient indicates that every 1-point increase in the ESG Score will reduce the cost of debt by 5.834 points, assuming other variables remain constant. Buallay et al. (2020) found that in the context of developing countries, ESG has a positive impact on bank financial performance, indicating that ESG practices can reduce risk and increase investor confidence, potentially lowering the cost of debt. Luo & Tang (2021) shows that good corporate governance

and form a panel data regression model with SUR estimation.

Hypothesis Testing

Partial Test of Panel Data SUR Estimation

contributes to improved carbon performance, which can indirectly reduce the environmental and social risks faced by companies, thus positively affecting the cost of capital. Although the research results Buallay et al. (2020) While studies in developed countries show that ESG can increase the cost of capital because it is perceived as an additional burden, this finding does not completely contradict H1 because the developing country context actually supports that ESG can lower the cost of debt through increased transparency and risk reduction. Thus, both studies provide partial support for hypothesis H1, especially in the developing country context where ESG practices are perceived as an effort to increase legitimacy and

stakeholder trust, which can ultimately reduce the cost of debt.

- 2) The Tax Strategy (CETR) variable has a coefficient of -4.310 with a p-value of 0.018, which is less than 0.05. This indicates that Tax Strategy has a significant effect on the cost of debt (ICR). The negative sign on the coefficient indicates that every 1-point increase in CETR will reduce the cost of debt by 4.310 points, assuming other variables remain constant. This finding is supported by previous research, as revealed by Hasan et al. (2014), which found that corporate tax avoidance is perceived by banks as an activity that poses significant risk, resulting in banks charging higher lending spreads. Similarly, Balakrishnan et al. (2019) supports this view by showing that aggressive tax avoidance practices can increase financial complexity and reduce corporate transparency, which in turn increases information risk for creditors. Therefore, creditors, in this case banks, will compensate for this increased risk by increasing the cost of debt charged to the company.
- 3) The Company Size variable has a coefficient of 4.583 with a p-value of 0.001, which is smaller than 0.05. This indicates that Company Size has a significant effect on the cost of debt (ICR). The positive sign on the coefficient indicates that every 1-unit increase in company size will increase the cost of debt by 4.583 points, assuming other variables remain constant. This

finding indicates that the larger the company size, the higher the cost of equity it bears. This result directly rejects the initial hypothesis and contradicts the common view in capital structure theory that large companies, because they are considered more diversified and have a lower risk of bankruptcy, should enjoy a lower cost of capital. However, this finding is in line with more complex arguments in the literature. Research by Frank & Goyal (2009) found that larger companies tend to have higher leverage, which can indirectly increase the debt risk profile and raise investors' return expectations. Furthermore, in the context of governance, Daryanto & Setiawan (2021) highlight that internal factors such as board quality and transparency significantly influence investor perceptions. Therefore, it can be interpreted that in large companies, increased operational complexity, potentially higher agency risks, and higher investor expectations may be dominant factors driving up debt costs, outweighing the benefits of economies of scale and stability.

F Test

The F test is conducted to see the overall magnitude of the influence of the independent variables on the dependent variable, where simultaneously the independent variables can be stated to have a significant influence on the dependent variable with an alpha value of 0.05.

```
. xtpcse ICR ESG CETR SIZE

Linear regression, correlated panels corrected standard errors (PCSEs)

Group variable:      NO                      Number of obs   =      200
Time variable:      TAHUN                   Number of groups =      40
Panels:             correlated (balanced)   Obs per group:
Autocorrelation:    no autocorrelation      min =           5
                                                avg =           5
                                                max =           5

Estimated covariances =      820             R-squared        =      0.0377
Estimated autocorrelations =      0          Wald chi2(3)     =      15.50
Estimated coefficients =      4              Prob > chi2      =      0.0014
```

Figure 4.9 F Test Results

Based on the SUR estimation panel data table above, it is found that the F test value is 0.0014, which means the probability value is less than 0.05, so it can be concluded that it is significant at the 5% alpha significance level, which means that the ESG Score, Tax Strategy, and Size Company variables simultaneously affect the Cost of Debt.

```
R-squared      =      0.0377
Wald chi2(3)   =      15.50
Prob > chi2    =      0.0014
```

Figure 4.10 Results of the Determination Coefficient

The coefficient of determination (R-squared) obtained from the panel data model using the Seemingly Unrelated Regression (SUR) approach was 0.0377 or 3.77%. This indicates that the independent variables used in the model, namely ESG Score, Tax Strategy (CETR), and Company Size, were only able to explain 3.77% of the variation in the cost of debt (ICR), while the remaining 96.23% was explained by other factors outside the model. Although the R-squared value is relatively small, this condition is common in financial and social research due to the presence of many external factors influencing the cost of debt that cannot be fully included in the model. The regression coefficient values for each variable show significant statistical significance, so the model remains relevant for testing

Coefficient of Determination

The coefficient of determination (R-squared) in the panel data model with the Seemingly Unrelated Regression (SUR) approach shows the proportion of variation in the dependent variable that can be explained by the independent variables in the model.

the relationship between ESG Score, tax strategy (CETR), and company size (Size) on the cost of debt. Thus, these findings provide an empirical picture that sustainability factors and company characteristics play a role in determining the cost of debt, although they are not the only determinants.

CONCLUSION

Based on the data analysis and discussion, several important conclusions can be drawn. First, ESG scores have a negative and significant effect on the cost of debt. Companies with high ESG scores tend to have a lower cost of debt, as creditors perceive companies that implement good environmental, social, and governance practices as entities with lower risk. Second, tax strategies have a negative and significant effect on the cost of debt. Tax efficiency achieved through

legal tax planning creates a positive perception in the eyes of creditors that the company has effective financial management and is able to maintain liquidity. Third, company size has a positive and significant effect on the cost of debt. The larger the company, the higher the cost of debt. This is due to the tendency of large companies to access substantial financing, which increases the expectation of moral hazard risk from creditors. Furthermore, large companies often have complex structures and broad

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- market exposure, which increases the perception of risk in the eyes of financial institutions. Overall, this study confirms that ESG and efficient tax strategies can lower the cost of debt, while larger company size can increase the cost of debt, depending on how creditors assess the company's structural and operational risks. Therefore, companies need to focus not only on the scale of their business, but also on the quality of their sustainability and fiscal management to obtain efficient financing.
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