

Environmental Performance, the Role of Sustainable Development, and Board Diversity on Debt Costs in State-Owned Enterprises



Nandha Pangestu¹, Jainal Abidin Turnip², Rohayati³, Farah Margaretha Leon⁴

^{1,2,3,4} Faculty of Economics and Business, Universitas Trisakti, Jakarta-Indonesia

ABSTRACT: The purpose of this study was to see the effect of the things above and then the variables used in this study were independent variables consisting of environmental performance, sustainable development, and diversity of the board which is a novelty from previous research studies. While the dependent variable is the cost of debt. This research was conducted by collecting data from 23 state-owned companies in Indonesia that were listed on the Indonesia Stock Exchange over a period of 10 years (2013-2022). Then the result of corporate environmental performance is negative with the Cost of Debt, Corporate Sustainable is positively significant with the Cost of Debt, Corporate Sustainable with Corporate Environmental Performance is positively significant with the Cost of Debt, and Board Diversity is negative with the Cost of Debt.

KEYWORDS: Board Diversity, Cost of Debt, Environmental Performance, and Sustainable Development Performance

I. INTRODUCTION

With the diversification of economic development, to consolidate and further enhance market share and competitiveness, companies need to overcome the problem of insufficient supply of their funds, so external financing is becoming increasingly important (Sun et al., 2023). Business ventures are currently growing and many new companies are being formed resulting in significant competition between companies (Julianto & Megawati, 2020). State-Owned Enterprises (BUMN) themselves are business institutions and capital wholly or mostly owned by the state (Law of the Republic of Indonesia No.19 of 2003). The goal of the company itself is not only to maximize profits but also to increase the value of the company in the eyes of investors, luring investors to place their capital in the company (Fauziyah et al., 2020). Financing from financial institutions pays great attention to corporate governance including the characteristics of the diversity of the board of directors because these components greatly affect the financial stability of the company (Zhou et al., 2022). While promoting sustainable national economic development, has greatly reduced the pressure on corporate financial leverage (Orazalin & Akhmetzhanov, 2019).

Previous literature findings say that companies should improve their sustainable development capabilities, to reduce debt costs and achieve long-term development of companies (Aksoy & Yilmaz, 2023). Board diversity is added as a variable in this study because it is an important factor to be considered by shareholders and financing institutions as an indicator of long-term investment risk and the potential positive impact on company performance and the cost of debt as well as reflecting inclusivity and better decision making. The involvement of board members from various backgrounds can bring different perspectives on problems, thereby increasing the quality of decision-making (Sun et al., 2023).

This study has two contributions to the literature. First of all, at present, several studies have investigated the impact of disclosing environmental information and other environmental factors on the cost of debt (Yoo, 2021). From a company perspective, this analysis helps to determine the effectiveness and economic significance of environmental performance. Second, other researchers do not associate board diversity with the cost of debt but only focus on the impact of other company factors such as the company's financial performance on the cost of debt and sustainable development on the cost of debt (Sun et al., 2023).

In this study, sustainable development is used as a moderating variable, so that investors can better understand the importance of environmental performance. The financial manager of a company is responsible for making the right funding decisions by determining the optimal capital structure. The novelty in this study is the addition of an independent variable in the form of board diversity taken from (Aksoy & Yilmaz, 2023) where previous research shows that there is a lower debt cost effect on board

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diversity, this of course can also affect simultaneously with other variables in the form of performance environment and sustainable development.

II. THEORETICAL REVIEW CORPORATE ENVIRONMENTAL PERFORMANCE

The results of the study show that improving environmental performance can reduce the cost of debt for companies (Sun et al., 2023). According to research (An & Pivo, 2020), it shows that investing in environmental performance will reduce a company's operational risk, and reducing operational risk can make it easier for companies to obtain funds and even reduce financing costs. According to research (Sui et al., 2019) that the company's environmental performance has a significant negative impact on the cost of debt. The results of research (Zhou, 2023) stated that environmental performance had a significant negative impact on the cost of debt, and (Anwar & Malik, 2020) stated that environmental performance had a significant negative correlation with the cost of debt. So the hypothesis is formulated as follows:

H₁: There is an influence of the company's environmental performance on the cost of debt

Sustainable Development

The results of the study show a negative correlation between the company's environmental performance and the cost of debt (Sun et al., 2023). Effect of sustainable development Research shows that CSR disclosure as a whole has a negative and significant effect on the cost of debt (Anriasa et al., 2022). According to research (Khatib et al., 2022) measuring many classifications for the distribution of sustainable development capability standards. Corporate governance at that level can be divided into strategic development capability, production, and sustainability operations (Khatib et al., 2022) and from the financial management level, it can be divided into operating capabilities, profitability, solvency, growth capabilities, and others. Several studies show that the scale of company assets and profits, organizational structure, maturity structure of asset obligations, financial leverage, free cash flow, and other factors significantly influence the cost of corporate debt (Orazalin & Akhmetzhanov, 2019). In research (Bacha et al., 2021) (Ratajczak & Mikołajewicz, 2021) shows that CSR has a negative and significant effect on the cost of debt. The results of the study (Anriasa et al., 2022) show that corporate social responsibility performance has a negative and significant effect on the cost of debt. So the hypothesis is formulated as follows:

H₂: There is an influence between sustainable developments on the cost of debt

Sustainable Development Modified by Environmental Performance

Sustainable development weakens the inhibitory effect of environmental performance on the cost of debt. The stronger the sustainable development (internal capacity growth), the lower the cost of debt (Sun et al., 2023). Improved environmental performance undermines the ability to sustain sustainable development at the cost of debt financing. A higher level of corporate environmental performance will send a positive signal, help enterprises obtain long-term and stable financial support in the period of seeking sustainable development, promote enterprises to achieve long-term, healthy and stable development, and then reduce financing costs (Ghardallou & Alessa, 2022).

H₃: There is an influence between sustainable development moderated by environmental performance on the cost of debt

Sustainable Development Modified by Environmental Performance

Research results (Aksoy & Yilmaz, 2023) revealed that gender diversity positively affects debt financing. Based on research (Kamil & Appiah, 2022) board gender diversity is positively related to the cost of debt. Based on the results of the study (Sumira & Prihandini, 2022) said that board gender diversity has a positive relationship with the cost of debt. So the hypothesis is formulated as follows:

H₄: There is an influence between gender diversity on the cost of debt.

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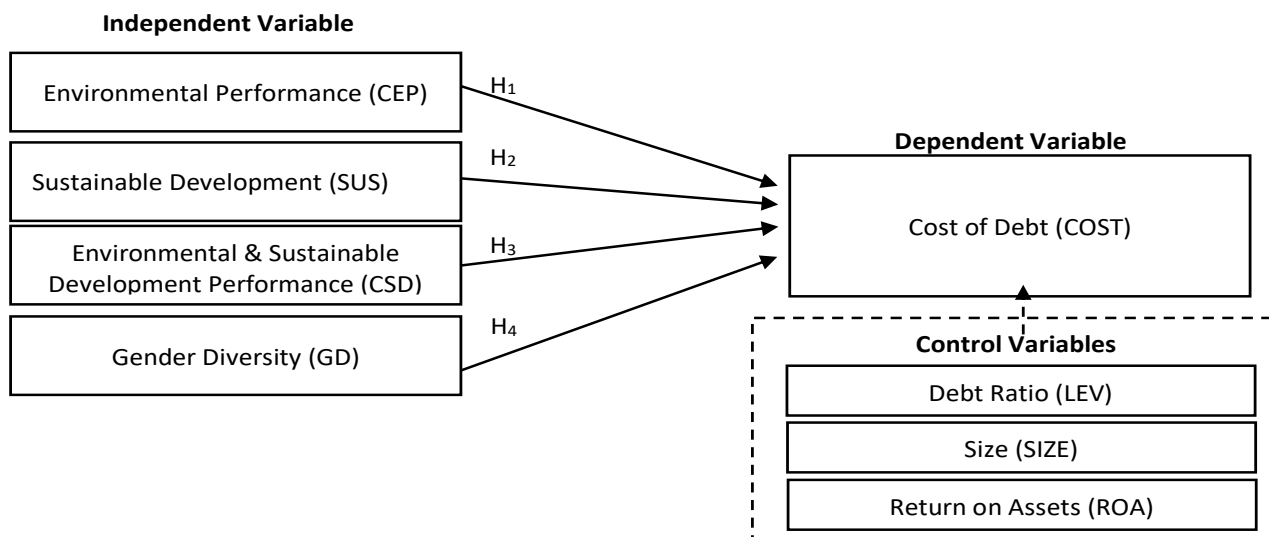


Figure 1. Contextual Framework

METHODOLOGY

The sampling method used for this research is purposive sampling. The data collection method used is the secondary data collection method where the data is obtained from sources that have published the data. The data source for this study was obtained from the Indonesia Stock Exchange (<https://www.idx.co.id>) and the website of each company that was sampled. Observational data was taken from 23 companies listed on the Indonesia Stock Exchange with an observation period of 2022-2013 so the total number of observations was 230.

Table 1. Identification and Measurement of Variables

Type Variable	Variable Name	Definition	References
Dependent Variable	Cost of Debt	$COST = \frac{Interest\ Cost}{Total\ Long\ Term\ Debt}$	(Sun et al., 2023)
Independent Variable	Environmental Performance	$ofCEP = Log (Total\ Cost\ of\ CSR)$	(Sun et al., 2023)
	Sustainable Development	$SUS = Log \times \frac{Net\ Profit}{Initial\ Capital} \times \frac{Net\ Profit}{Retained\ Earnings} \times 100\%$	(Sun et al., 2023)
	Gender Diversity	$GD = \frac{Number\ of\ Female\ Directors}{Total\ Board\ of\ Directors}$	(Aksoy & Yilmaz, 2023)
Moderating Variable	Environmental & Sustainable Development Performance	$CSD = CEP \times SUS$	(Aksoy & Yilmaz, 2023)
Control Variables	Debt Ratio	$Lev = \frac{Total\ Debt}{Total\ Assets}$	(Sun et al., 2023)
	Size	$SIZE = Log (Total\ Revenue)$	(Sun et al., 2023)
	Return on Assets	$ROA = \frac{Net\ Profit}{Total\ Assets}$	(Sun et al., 2023)

Model Specification

- $COST_{i,t} = \alpha + \beta_1 CEP_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 LEV_{i,t} + \beta_4 SIZE_{i,t} + \beta_5 ROA_{i,t} + \epsilon_{it}$
- $COST_{i,t} = \alpha + \beta_1 SUS_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 LEV_{i,t} + \beta_4 SIZE_{i,t} + \beta_5 ROA_{i,t} + \epsilon_{it}$

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- $COST_{i,t} = \alpha + \beta_1 CSD_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 LEV_{i,t} + \beta_4 SIZE_{i,t} + \beta_5 ROA_{i,t} + \epsilon_{it}$
- $COST_{i,t} = \alpha + \beta_1 GDI_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 LEV_{i,t} + \beta_4 SIZE_{i,t} + \beta_5 ROA_{i,t} + \epsilon_{it}$
- $COST_{i,t} = \alpha + \beta_1 CEP_{i,t} + \beta_2 SUSI_{i,t} + \beta_3 CSD_{i,t} + \beta_4 GDI_{i,t} + \beta_5 SIZE_{i,t} + \beta_6 LEV_{i,t} + \beta_7 SIZE_{i,t} + \beta_8 ROA_{i,t} + \epsilon_{it}$

Table 2. Sampling Criteria

Description	Amount Company
BUMN companies for the 2013-2022 period	39
BUMN companies that are not listed on the IDX	(16)
The number of companies that are eligible to be sampled	23

RESULTS

Data Analysis Method

There are stages in testing the regression model in this study which are described as follows:

Panel Data Estimation Model

Panel data estimation methods are carried out using three approaches, namely the common effect model (CEM), the fixed effect model (FEM), and the random effect model (REM).

Common Effect Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-4.785994	45.00137	-0.106352	0.9154
X1	-0.069375	12.75215	-0.005440	0.9957
X2	0.043310	0.063967	0.677064	0.4991
X3	-0.013005	0.015695	-0.828604	0.4082
X4	0.658660	0.525188	1.254142	0.2111
X5	0.194355	0.031494	6.171249	0.0000
X6	0.729625	12.76245	0.057170	0.9545
X7	0.517441	0.506367	1.021870	0.3080
R-squared	0.317365	Mean dependent var		0.473319
Adjusted R-squared	0.295743	S.D. dependent var		1.028579
S.E. of regression	0.863183	Akaike info criterion		2.577930
Sum squared resid	164.6639	Schwarz criterion		2.697886
Log likelihood	-287.1730	Hannan-Quinn criter.		2.626323
F-statistic	14.67793	Durbin-Watson stat		0.693569
Prob(F-statistic)	0.000000			

Fixed Effect Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	12.40331	39.08411	0.317349	0.7513
X1	4.378243	11.10915	0.394112	0.6939
X2	0.483936	0.150341	3.218926	0.0015
X3	-0.128477	0.037885	-3.391220	0.0008
X4	-0.311001	1.725896	-0.180197	0.8572
X5	0.115349	0.035399	3.258552	0.0013
X6	-3.854192	11.08566	-0.347674	0.7285
X7	-0.887675	0.673171	-1.318646	0.1888

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.603349	Mean dependent var	0.473319
Adjusted R-squared	0.545545	S.D. dependent var	1.028579
S.E. of regression	0.693398	Akaike info criterion	2.227167
Sum squared resid	95.67943	Schwarz criterion	2.677000
Log likelihood	-225.0106	Hannan-Quinn criter.	2.408641
F-statistic	10.43794	Durbin-Watson stat	1.093605
Prob(F-statistic)	0.000000		

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Random Effect Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	10.05015	38.55389	0.260678	0.7946
X1	4.328347	10.92884	0.396048	0.6925
X2	0.229301	0.097152	2.360227	0.0191
X3	-0.059878	0.024034	-2.491428	0.0135
X4	0.181936	0.891155	0.204158	0.8384
X5	0.157601	0.031314	5.033005	0.0000
X6	-3.552284	10.93344	-0.324901	0.7456
X7	-0.359066	0.577633	-0.621616	0.5348

Effects Specification		S.D.	Rho
Cross-section random		0.515177	0.3557
Idiosyncratic random		0.693398	0.6443

Weighted Statistics			
R-squared	0.193187	Mean dependent var	0.184330
Adjusted R-squared	0.167632	S.D. dependent var	0.781253
S.E. of regression	0.713075	Sum squared resid	112.3731
F-statistic	7.559600	Durbin-Watson stat	0.947814
Prob(F-statistic)	0.000000		

Chow Test

The results of the Chow test have two options that must be determined, namely the common effect or the fixed effect. In this study, the Chow test is useful to determine which model is better and more appropriate. The Chow test is based on the null hypothesis where there is no individual heterogeneity and the alternative hypothesis where there is heterogeneity in the cross-section.

Table 3. Chow Test Results

Effect Test	Statistic	d.f	Prob.
Cross Section F	6.521.732	-22,199	0.0000
Cross Section Chi - Square	124.324.761	22	0.0000

Source: EViews

Based on Table 3 of the results of the Chow test, the results show that the profitability value is 0.0000. Because the probability value is 0.0000 < 0.05, the estimation model used is the fixed effect model (FEM).

Hausman Test

The results of the Hausman test have two options that must be determined, namely the random effect or the fixed effect. In this study, the Hausman test is useful for determining which model is better and more appropriate.

Table 4. Hausman Test Results

Test Summary	Chi - Sq. Statistic	Prob.
Cross Section Random	19.628667	0.0064

Source: EViews

Based on the Hausman Test Results in Table 4 above, it is known that the probability value is 0.0003. Then the probability value is 0.0064 < 0.05, so the estimation model used is the fixed effect model (FEM).

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Lagrange Multiplier Test

The results of the Lagrange multiplier test have two options that must be determined, namely common effect or random effect. In this study, the Lagrange multiplier test is useful to determine which model is better and more appropriate.

Table 5. Lagrange Multiplier Test Results

Test Summary	Cross-section	Test Hypothesis Time	Both
Breusch-Pagan	7.491101	1.885250	9.376352
	(0.0062)	(0.1697)	(0.0022)

Source: EViews

Based on the results of the Lagrange Multiplier Test in Table 5 above, it is known that the probability value is 0.1697. So the profitability value is $0.1697 > 0.05$, so the estimation model used is the common effect model (CEM).

Normality Test

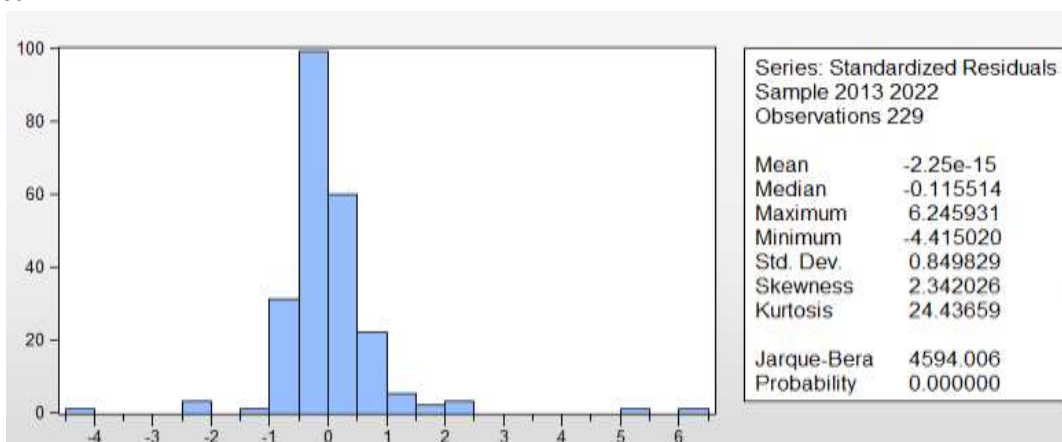


Figure 2 Normality Test

Based on Figure 2 it can be seen that the probability value is 0.000000 which is lower than the established significance level of 0.05 ($0.000000 < 0.005$) so it can be concluded that the data is not normally distributed.

Multicorrelation Test

	COST	CEP	SUS	CSD	GD	LEV	SIZE	ROA
COST	1.000000	0.361679	0.070395	0.075099	0.082344	0.440781	0.361343	0.340215
CEP	0.361679	1.000000	0.479526	0.500455	-0.044885	0.122256	0.999967	0.411372
SUS	0.070395	0.479526	1.000000	0.996610	-0.052332	-0.009475	0.479761	0.333226
CSD	0.075099	0.500455	0.996610	1.000000	-0.076188	5.36E-05	0.500746	0.322994
GD	0.082344	-0.044885	-0.052332	-0.076188	1.000000	-0.049616	-0.045114	0.260830
LEV	0.440781	0.122256	-0.009475	5.36E-05	-0.049616	1.000000	0.121679	0.349121
SIZE	0.361343	0.999967	0.479761	0.500746	-0.045114	0.121679	1.000000	0.410711
ROA	0.340215	0.411372	0.333226	0.322994	0.260830	0.349121	0.410711	1.000000

Based on the table above, it is known that the correlation value between COST and CEP is 0.361679. The correlation value between COST and SUS is 0.070395. The correlation value of COST and CSD is 0.075099. The correlation value of COST and GD is 0.082344. The correlation value of COST and Lev is 0.440781. The correlation value of COST and SIZE is 0.361343. The correlation value of COST and ROA is 0.340215, it can be seen that all data (< 0.80) means that there is no multicollinearity.

Goodness of Fit Test (R^2)

This test aims to see how much influence the independent variables have in explaining the dependent variable. This analysis test uses the adjusted R^2 value because the number of independent variables is more than one. If the value of adjusted R^2 and R^2 shows a value close to 1, it means that the independent variable can explain the dependent variable.

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Table 6. Goodness of Fit Test Results (R²)

Model	Jenis Model	Adjusted R-squared
1	FEM	0.295743
2	FEM	0.545545
3	CEM	0.167632

Source: EViews

Based on the results of the goodness of fit test, the largest adjusted R² value was obtained with a value of 0.545545 compared to other models. This means that the FEM model can explain the independent variables, namely Environmental Performance, Sustainable Development, Moderated Sustainable Development Environmental Performance, and Diversity. not in this model.

Significance Test using the FEM Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	12.40331	39.08411	0.317349	0.7513
X1	4.378243	11.10915	0.394112	0.6939
X2	0.483936	0.150341	3.218926	0.0015
X3	-0.128477	0.037885	-3.391220	0.0008
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Effects Specification			
Cross-section fixed (dummy variables)			
R-squared	0.603349	Mean dependent var	0.473319
Adjusted R-squared	0.545545	S.D. dependent var	1.028579
S.E. of regression	0.693398	Akaike info criterion	2.227167
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Log likelihood	-225.0106	Hannan-Quinn criter.	2.408641
F-statistic	10.43794	Durbin-Watson stat	1.093605
Prob(F-statistic)	0.000000		

Concurrent Test (F-test)

This test was conducted to test whether the independent variables simultaneously have a significant influence on the dependent variable.

Table 7. Concurrent Test Results (F-test)

Model	Model Type	F-Statistic
2	FEM	0.0000000

Source: EViews

Based on the simultaneous test results, it appears that the probability f-statistic produces a value of 0.000000 < 0.05. thus the Results of the analysis in this study indicate that the independent variables namely environmental performance, sustainable Development, environmental performance moderated by sustainable development, and the diversity of the board have a Simultaneous effect on the cost of debt and the model is made appropriately.

DISCUSSIONS

Descriptive Statistical Analysis

Table 8. Descriptive Statistic Test

Variable Name	N	Mean	Median	Maximum	Minimum	Std, Dev
COST	230	0,47	0,20	6.760.000,00	-4.840.000,00	1.026.368,00
CEP	230	3.682.783,00	3.770.000,00	4.660.000,00	2.400.000,00	0,56
SUS	230	8.268.913,00	4.625.000,00	5.778.000,00	-5.660.000,00	1.216.032,00
CSD	230	3.374.000,00	1.735.500,00	2.333.000,00	-2.150.000,00	5.007.218,00
GD	230	0,21	0,20	0,50	-	0,12
LEV	230	1.009.130,00	0,74	1.776.000,00	- 0,43	2.006.647,00
SIZE	230	7.205.652,00	7.290.000,00	8.180.000,00	5.920.000,00	0,56
ROA	230	0,00	0,01	0,61	- 0,58	0,15

Source: EViews

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Environmental Performance (CEP) has an average value of 9,784,771, a median of 5,854,025, and a standard deviation of 10,820. The maximum value of CEP is 45,562 owned by PT Bank Rakyat Indonesia (BBRI) and the minimum value is 2,587 owned by PT PP Property (PPRO). Sustainable Development (SUS) has an average value of 9,910,526, a median of 5,360,000, and a standard deviation of 1,261,311. The maximum value of SUS is 5,778,000 which is owned by PT Semen Indonesia (SMGR) and the minimum value is -2,080,000 which is owned by PT Garuda Indonesia (GIAA). Environmental Performance in Moderation of Sustainable Development (CEPxSUS) has an average value of 152,888, a median of 26,646, and a standard deviation of 270,060. The maximum value of CEPXSUS is 1,486,195 which is owned by PT Bank Rakyat Indonesia (BBRI) and the minimum value is -24,436 which is owned by PT Garuda Indonesia (GIAA).

Individual Test (T-test)

The test is carried out whether each independent variable has a significant influence on the dependent variable. The decision-making criteria are if $\text{sig.t} < 0.05$, H_0 is rejected and if $\text{sig.t} > 0.05$, H_0 is accepted.

Table 9. Individual Test Result

Variable Name	Dependent Variable		Decision
	Cost of Debt		
	Coefficient	Prob.	
CEP	4.37	0.6939	Not Significant
SUS	0.48	0.0015	Significant Positive to Cost of Debt
CSD	-0.12	0.0008	Significant Negative to Cost of Debt
GD	-0.31	0.8572	Not Significant
LEV	0.11	0.0013	Significant Positive to Cost of Debt
SIZE	-3.85	0.7285	Not Significant
ROA	-0.88	0.1888	Not Significant

Source: EViews

Environmental Performance (CEP) on the cost of debt has a probability value of 0.6939 < 0.05 , CEP on the cost of debt has a coefficient value of 0.2906 > 0.05 which indicates no effect. This is following research from Sun et.al, 2023).

H_1 : There is no effect of the company's environmental performance on debt costs

Sustainable Development (SUS) on the cost of debt has a probability value of 0.0015 > 0.05 , and sustainable development on the cost of debt has a coefficient value of -0.02 < 0.05 which indicates a significant negative effect. This is by research from (Sun et al., 2023).

H_2 : There is a significant positive influence between the company's sustainable development on the cost of debt

Moderated Sustainable Development Environmental Performance (CEPxSUS) to the cost of debt has a probability value of 0.0158 < 0.05 , CEP X SUS to total debt has a probability value of 2.42 > 0.05 which indicates a significant positive effect. This is following research from (Sun et al., 2023).

H_3 : There is a significant negative effect between environmental performance moderated by sustainable development on the cost of debt

Board diversity (GD) on the cost of debt has a probability value of 0.8572 > 0.05 which shows no effect. This is different from research from (Aksoy & Yilmaz, 2023) which states that there is an effect of gender differences on debt costs.

H_4 : There is no influence between Board Diversity on the cost of debt.

The control variables (Lev, SIZE, and ROA) on the cost of debt have a probability value of (0.0013, 0.7285, 0.18888) when compared to < 0.05 , only the debt ratio variable influences the cost of debt.

H_5 : There is an influence between the ratio of debt to the cost of debt, and for company size and return on assets there is no effect on the cost of debt.

Research Regression Model

The panel data regression model previously used by Ali et al., (2022) can be written as follows:

$$Y = 10.0501470772 + 4.32834714567 * CEP + 0.229300623865 * SUS - 0.0598779457005 * CSD + 0.181936309102 * GD + 0.157601375624 * LEV - 3.55228357972 * SIZE - 0.359065665768 * ROA + \epsilon$$

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CEP = Environmental Performance

SUS = Sustainable Development

CSD = Environmental Performance

GD = Diversity of Women Board of Directors

LEV = Debt Ratio

SIZE = Total Income

ROA = Return on Assets

α = Constant

ϵ_{it} = Error

CONCLUSIONS

Based on the results of the tests performed, the following conclusions were obtained:

- Environmental Performance Variable does not affect the cost of debt;
- The Sustainable Development Variable has a positive and significant effect on the Cost of Debt;
- The Sustainable Development Variable in moderation of Environmental Performance has a significant negative effect on the cost of debt;
- Board Diversity Variable does not affect the cost of debt.

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