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THE IMPACT OF ESG DISCLOSURE AND LEVERAGE ON COST OF DEBT WITH AUDIT QUALITY AS A MODERATING VARIABLE IN ENERGY SECTOR COMPANIES IN THE 2022-2025 PERIOD

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Abstract :

The energy sector plays a strategic role in driving the national economy, but faces significant pressure to transition to clean energy, which requires significant funding from creditors. This study aims to examine the relationship between ESG disclosure and leverage on the cost of debt and to determine audit quality as a moderating factor by selecting energy companies listed on the Indonesia Stock Exchange (IDX) for the 2022–2025 period. The research approach is quantitative and uses data panel, obtaining data from sustainability reports and annual reports from a total of 25 companies. The analysis tool used is EViews13. The research findings indicate that ESG has a significant negative effect on the cost of debt, with a coefficient of -0.2485 (p=0.0206). Meanwhile, leverage has an insignificant positive effect with a coefficient of 0.2369 (p=0.2444). Audit quality moderates the relationship between ESG and the cost of debt, weakening the negative effect of ESG (interaction coefficient 0.2605; p=0.0115). Meanwhile, audit quality was not shown to moderate the relationship between leverage and cost of debt (coefficient -0.2214; p=0.2840). This study concludes that increased ESG transparency and high audit quality can help energy sector companies achieve more efficient financing costs. However, high audit quality tends to reduce the influence of ESG on lowering the cost of debt.

Keywords : *ESG, leverage, cost of debt, audit quality*

INTRODUCTION

A company's funding structure is considered crucial in determining business growth and sustainability. Companies can obtain capital from two main sources: equity and debt. Using debt as a funding source carries the consequence of having to pay returns to creditors, often referred to in the financial world as the cost of debt. The amount of interest borrowed must be repaid and reflects the creditor's view of the entity's risk, also known as the cost of debt (Vani, 2025). A company's high level of debt can result in higher interest rates, which can then impact net profit and the company's value in the eyes of investors (Tyas, 2025). During 2022-2024, *the Federal Reserve* increased interest rates, which impacted market sentiment in Indonesia (Kartini & Wijaya, 2025).

Rising interest rates when *the Fed* issued new policies became a key indicator for global investors, resulting in an outflow of foreign capital from the Indonesian capital market and a depreciation of the rupiah. Sharp interest rate increases have a significant impact on the cost of capital, including in the energy sector. The energy sector in Indonesia relies on debt financing (Faizani & Djawoto, 2023).

A recent global trend has emerged that uses the three ESG components *(Environmental, Social, and Governance*) as indicators for assessing corporate social responsibility globally (Amalia & Kusuma, 2023). Through the Financial Services Authority (OJK), the Indonesian government enacted Regulation No. 51/POJK.03/2017, which mandates that sustainable finance be applied not only to financial institutions or issuers but also to public companies. In December 2024, a *Roadmap* for Sustainability Development (SPK) was released, referring to *sustainability. standards Boards* (ISSB) issued by the IAI, subsequently ratified as PSPK 1 & PSPK 2 in July 2025. This latest regulation is to increase the transparency of information obtained by creditors, investors and other capital providers. This ratification can be seen as an institutional pressure that comes not only from global trends but also to create regulatory harmonization at the national level. The energy sector is known not only as a capital-intensive industry but also has high environmental risks (power plant operation, resource exploitation, to renewable energy transition). PJOK 51/2017 encourages financial institutions to consider sustainability projects as a consideration in credit risk assessments. The demand for decarbonization is not only from within the country, but there is pressure from outside, based on a report issued by *the International Energy Agency* in 2022, it is hoped that *the net zero emissions target* by 2060 can begin now by implementing energy efficiency, using renewable energy in electricity, and using electric-powered transportation.

Leverage reflects a company's policy regarding funding to carry out its operational and investment activities. *leverage* can cause a company to bear relatively large risks due to high dependence on external funding sources. (Wulan & Syahzuni, 2023). Creditors not only rely on financial information such as *leverage* but also consider the credibility and reliability of a company's financial statements. This is where audit quality *becomes a* crucial factor that requires further study. Qualified auditors, especially those affiliated with or working with *Big Four accounting firms*, are perceived to have a quality control system and a superior reputation, thus making the audited financial statements more credible (Kristanti et al., 2024).

Audit quality reflects the level of confidence that the auditor is able to detect and disclose material violations in the client's accounting system, thereby increasing the credibility of financial reports in the eyes of users. Qualified auditors, especially those affiliated with *Big Four accounting firms*, are considered to have superior quality control systems, high-quality human resources, and a higher level of professional care in carrying out audit procedures (Kristanti et al., 2024). However, the rampant phenomenon *of greenwashing* can cast doubt on the ESG information presented by companies.

Serious *greenwashing can increase debt costs and credit risk. When companies are not transparent about their actual performance, it can create a sense of uncertainty and distrust among creditors* (Castro et al., 2025). To build trust from creditors or investors, *audit quality* is expected to increase creditor confidence. However, the impact is more significant for business entities that do not use the services of *Big Four accounting firms* than those audited by *Big Four accounting firms.* (Wang et al., 2025).

A study examining ESG disclosure as a dependent variable and *cost of Debt* in Indonesia is still relatively low. Overall, various studies generally find a negative relationship, which is interpreted as indicating that companies that disclose good ESG information have a relatively lower chance of obtaining debt financing. However, these research results are not entirely consistent, as some studies found an insignificant relationship. Furthermore, the effect *of leverage* on the cost of debt also shows mixed findings; some studies note a negative effect, while others report a positive or insignificant effect. Furthermore, audit quality is known to potentially function as a moderating variable in ESG testing as a dependent variable with *cost. of debt* as an independent variable. However, the study of the influence of ESG disclosure along with other independent variables, namely *leverage* , and the moderating role *Audit quality* of debt costs is still very minimal, especially in Indonesia.

The novelty of this research lies in the moderating variable that uses *audit quality* in testing the relationship between ESG and *leverage* on *cost. of Debt research* remains relatively limited, particularly in the Indonesian context. This research also addresses the inconsistencies in previous findings regarding the influence of ESG and *leverage* on *cost of capital. of debt* , while providing empirical evidence from the context of *emerging capital markets markets* like Indonesia, where ESG regulations and corporate governance are still evolving.

In *stakeholder theory*, better ESG disclosure should benefit creditors, which impacts the cost of debt. This is because creditors assess the company's stability and sustainability, and gain legitimacy from stakeholders. Companies that are transparent about social responsibility are perceived as more concerned with workplace safety, employee relations, the community, and consumers. Creditors view this as a marker of operational stability. Arditiyan & Purwanto (2025).

H1 : *Cost of Debt* has a significant negative impact on ESG *Disclosure.*

Leverage represents the extent of debt use in a company's financing structure. According to *stakeholder theory*, creditors, as stakeholders, will consider the level of *leverage* in assessing a company's risk. High *leverage* can lead to higher financial risks borne by the company, so a higher risk premium tends to lead creditors to charge this premium in the form of loan interest. Therefore, *leverage* is estimated to have a substantial positive effect on *cost of capital. of debt.*

H2: *Leverage* has a significant positive effect on *costs. of debt*.

Referring to *stakeholders Stakeholder theory* suggests that ESG reporting can reduce the information gap between companies and creditors and meet

stakeholder expectations. Companies that provide high ESG disclosures tend to be perceived as having lower risk values, thus reducing *costs. of debt*. In this discussion, there is an allegation of *audit quality* strengthening *cost* reduction *of debt* by ESG *disclosure*, because companies that hire the services of *Big Four KAP* can impact the credibility of the information that will be obtained by creditors.

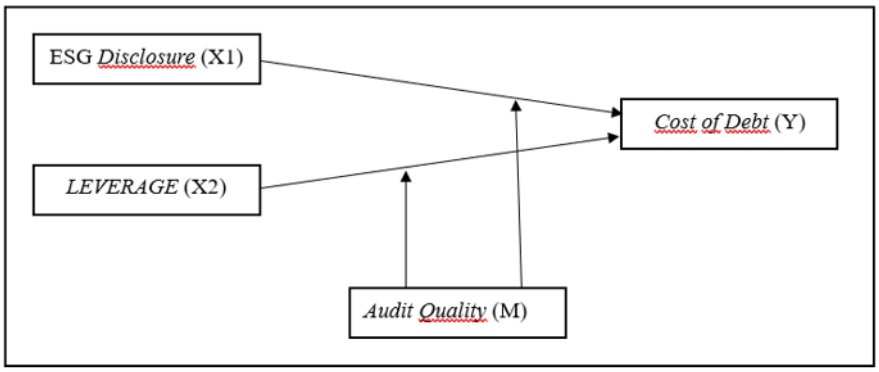
H3: Strengthening the negative influence of ESG *disclosure by audit quality* as a moderating variable on *cost of debt.*

stakeholder theory, it is suspected that there is a weakening of the positive influence of *audit quality* in the relationship between *leverage* and *the cost of Debt*. A high- *quality audit* increases creditor confidence in the reliability of a company's financial statements and risk management, thereby reducing perceived risk despite high *leverage levels*.

H4: *Audit quality* is assumed to weaken the positive influence of *leverage* in influencing *cost. of Debt*

The conceptual framework is systematically structured to describe the relationship between ESG disclosure and *leverage levels* which are jointly tested as variables X or independent of Variable Y using *cost. of debt*, with *audit quality* acting as the M or moderating variable.

Figure 1
Conceptual Framework



Source: Data processed by researchers, 2026

RESEARCH METHOD

Quantitative research was chosen as the research method, using associative causality. Panel data was then selected because it was deemed to meet data characteristics.

Table 1. Sample Criteria

Number	Information	Amount
1	Total number of companies included in the energy sector and listed on the IDX.	91
2	The company did not produce a sustainability report during the 2022-2025 period or use GRI standards.	(66)
3	**Number of companies that meet the criteria (sample criteria)**	**25**
4	**Total observations (25 x 4 years)**	**100**

Source: Data processed by researchers, 2026

The energy sector was chosen because it often has a significant impact on the environment, making ESG *disclosure* more relevant for research. Twenty-five companies met the established criteria. The following variables were measured:

Table 2. Operational Definition of Variables

No	Variables	Definition	Calculation
1	*Cost of Debt*	*Cost of debt* is the value of the company's financial obligations that must be paid immediately for what has been used (Sagala & Sinaga, 2022)	$\frac{\text{interest expense}}{\text{long} - \text{term debt}}$
2	ESG *Disclosure*	ESG is the process of conveying information regarding performance and accountability by a company which includes aspects of the 3 ESG pillars (Dimyati et al., 2025)	$\frac{\text{Disclosure value ESG}}{\text{Maximum total disclosure}}$
3	*Leverage*	*Leverage* is the use of borrowed funds aimed at increasing the company's asset base (Arhinful & Radmehr, 2023)	*Debt to Asset Ratio* $= \frac{\text{Total Debt}}{\text{Total Assets}}$
4	*Quality Audit*	*Audit quality* refers to the quality of the client's financial reports that he has audited, on which report the auditor provides his opinion (Francis, 2024)	The company gets a score of 0 if it is audited by someone other than *big four* and will get a score of 1 if the financial report is audited by a *big KAP four*

Source: Data processed by the author, 2026

RESULTS AND DISCUSSION

Results

The initial stage in testing is carried out by determining the panel data regression model that is considered suitable for the research.

Table 3. Chow Test

Effects Test	Statistics	df .	Prob .
Cross-section	2.971682	(24.70)	0.0002
Cross-section Chi- square	70.253415	24	0.0000

Source: Data processed by EViews13, 2026.

Table 3 shows that the MF-statistic obtained is 2.971682 with a p- value of 0.0002. Because the p-value is less than 0.05, the most appropriate model is FEM (Wulansari et al., 2023).

Table 4. Hausman test

Test Summary	Chi- Sq . Statistic	Chi- Sq . df .	Prob .

Cross-section random	3.727307	5	0.5893

Source: 9Data processed by EViews13, 2026

Referring to the results from Table 4, the Chi- Square = 3.727307 with a probability of 0.5893. Therefore, the p- value is > 0.05. Therefore, REM is considered more appropriate than FEM (Firdaus & Hasmarini, 2023).

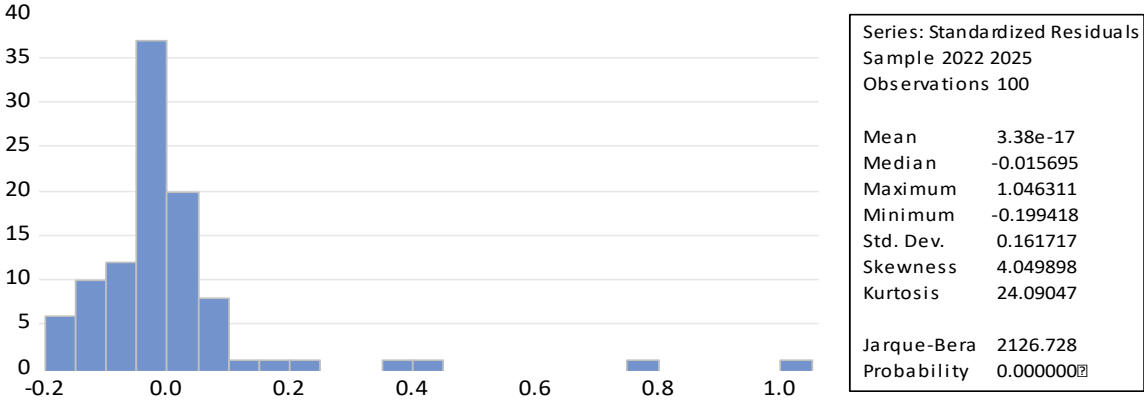
Table 5. Lagrange Test Multiplier

	Test Hypothesis		
	Cross-section	Time	Both
Breusch-Pagan0	13.68361 (0.0002)	0.314089 (0.2517)	14.99770 (0.0001)

Source: Data processed by EViews13, 2026.

Lagrange test The multiplier indicates a Breusch -Pagan value of 13.68361 while the probability is 0.0002. Meanwhile, the value is less than 0.05, with this value it is concluded that REM (Widianto et al., 2024). So based on the results referring to the results of the Hausman test and the LM test, the REM model is the *final model*.

Table 6. Normality Test Results



Source: Data processed by EViews13, 2026

After the normality test was conducted, it was found that the probability was less than 0.05 with a probability of 0.0000, so the data was declared not to pass the normality test. The thing that can be done to overcome this is to use Transform the data with a log or natural log. However, after the data transformation, the probability value remains 0.000. Therefore, to overcome the normality problem, use the CLT or *center limit theorem.* by assuming the data passes the normality test without looking at the original form of the distribution if the data is above (n>30) (Ifeanyichukwu et al., 2023); (Putri & Trisnawati, 2024). Then the next test is the multicollinearity test.

Table 7. Multicollinearity Test

	Y	X1	X2	Z	X1Z	X2Z
Y	1,000,000	-0.296653	0.022556	-0.394986	-0.370749	-0.338274
X1	-0.296653	1,000,000	0.354145	0.440135	0.593848	0.426096

X2	0.022556	0.354145	1,000,000	0.207960	0.220170	0.443249
Z	-0.394986	0.440135	0.207960	1,000,000	0.951631	0.896283
X1Z	-0.370749	0.593848	0.220170	0.951631	1,000,000	0.869982
X2Z	-0.338274	0.426096	0.443249	0.896283	0.869982	1,000,000

Source: Data processed by EViews13, 2026

Based on Table 7, the correlation value between Z and X1Z reached 0.9516, between Z and X2Z was 0.8963, and the correlation between X1Z and X2Z was 0.8700. The correlation value exceeding 0.8 indicates a serious multicollinearity problem. According to (Kanellopoulos, 2023), to overcome the problem of normality, *mean-centering* can be done. According to Park & Youjae, (2024) Mean-centering has been shown to reduce multicollinearity. The variables to be *mean-centered* are X1, X2, X1Z, and X2Z. Variable Z, on the other hand, does not require *mean-centering* because its assessment uses only binary numbers (1 and 0) for ease of interpretation. After *centering*, the results are as follows:

Table 8. Multicollinearity Test Results after mean-centering

	Y	**X1_C**	**X2_C**	**Z**	**X1Z_C**	**X2Z_C**
Y	1,000,000	-0.296658	0.022556	-0.394986	-0.131770	-0.037594
X1_C	-0.296653	1,000,000	0.354145	0.440135	0.692619	0.150849
X2_C	0.022556	0.354145	1,000,000	0.207960	0.144790	0.607514
Z	-0.394986	0.440135	0.207960	1,000,000	0.372844	0.183538
X1Z_C	-0.131770	0.692619	0.144790	0.372844	1,000,000	0.182576
X2Z_C	-0.037594	0.150849	0.607514	0.183538	0.182576	1,000,000

Source: Data processed by EViews13, 2026

The mean-centering technique has proven effective in overcoming the previously serious problem of multicollinearity. After the *centering process* After the correlation test was carried out, the correlation value of all independent variables showed a value <0.8, thus indicating that there was no indication of a significant multicollinearity problem. The next stage was to conduct a heteroscedasticity test.

Table 9. Heteroscedasticity Test

Variable	Coefficient	Std . Error	t- Statistic	Prob .
C	0.927311	0.140692	6.591058	0.0000
X1_C	1.243707	0.567604	2.191152	0.0309
X2_C	-0.965095	0.616393	-1.565713	0.1208
Z	-0.445729	0.204060	-2.184309	0.0314
X1Z_C	-0.816968	0.768082	-1.063647	0.2902
X2Z_C	0.283034	0.936314	0.302285	0.7631

Source: Data processed by EViews13, 2026

Based on the results of Table 9, it can be seen that there are data that do not pass the test, namely the X1_C variable and the Z variable because the value of each is less than 0.05 (Munawaroh et al., 2025). To overcome

heteroscedasticity and there are signs that the autocorrelation test is not fulfilled, *the Robust test is carried out and the selected model is the White* model . *period.*

Table 10. Results of Heteroscedasticity Test after REM+Robbust White Period

Variable	Coefficient	Std . Error	t- Statistic	Prob .
C	0.190095	0.056025	3.393070	0.0024
X1_C	-0.248515	0.100292	-2.477922	0.0206
X2_C	0.236897	0.198500	1.193436	0.2444
Z	-0.122736	0.052863	-2.321772	0.0291
X1Z_C	0.260517	0.095231	2.735645	0.0115
X2Z_C	-0.221379	0.202025	-1.095800	0.2840

Source: Data processed by EViews13, 2026

After the application of the *Robust method Random Effect Model* (REM) with *White Period*, the model produces a standard error that is robust to heteroscedasticity problems and is also able to correct for possible autocorrelation in the time dimension of panel data.

Table 11. Panel Data Regression Test

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.190095	0.056025	3.393070	0.0024
X1_C	-0.248515	0.100292	-2.477922	0.0206
X2_C	0.236897	0.198500	1.193436	0.2444
Z	-0.122736	0.052863	-2.321772	0.0291
X1Z_C	0.260517	0.095231	2.735645	0.0115
X2Z_C	-0.221379	0.202025	-1.095800	0.2840

Source: Data processed by EVIews13, 2026

The results of Table 11 indicate that the variable X1_C has a coefficient of -0.248515 with a p-value of 0.0206. Therefore, it can be concluded that X1_C has a significant negative effect on the variable Y. A decrease of 0.248515 units occurs for every one unit increase in X1_C, in a situation where other variables remain unchanged or constant. The variable X2_C shows a coefficient of 0.236897 and a p-value of 0.2444. Because of this value, the evidence is not strong enough to be said to be *cost. of Debt* is influenced by *leverage* . Meanwhile, *audit quality* with a coefficient value of -0.122736 with a probability of 0.0291 indicates that high and good *audit quality* makes the company potentially have lower debt funding. The interaction variable X1Z_C produces a coefficient of 0.260517 with a probability of 0.0115, so referring to these results, hypothesis H3 is not supported. However, there is a significant moderating effect in the opposite direction from the hypothesis prediction. Assuming other variables remain unchanged, each one-unit increase in X1Z_C will cause *cost of Debt* increased by 0.260517 units. Furthermore, the interaction variable X2Z_C has a coefficient of -0.221379, while its probability is 0.2840. This indicates that there is insufficient evidence to conclude that *audit quality* can moderate the relationship between *leverage and audit quality.* with cost of debt.

Table 12. Results of T, F, and Determination Coefficient Tests

Weighted Statistics			
R- squared	0.107016	Mean dependent var	0.074318
Adjusted R- squared	0.059517	SD dependent var	0.138180
SE of regression	0.134005	Sum square residual	1.687998
F- statistic	2.253010	Durbin-Watson	1.495888
Prob (F- statistic)	0.055350		

Source: Data processed by EViews13, 2026

Based on the findings of the REM estimate with *White correction For the period*, the F- statistic value was 2.253010 with a probability of 0.055350 and a p-value of 0.055350, which was known to be 0.05. Although the model was not significant simultaneously, partial analysis was still performed (Y). Meanwhile, the R-squared value was 0.107016 or 10.70%. This finding means that all X variables can simultaneously explain the variation in *cost. of Debt* as a dependent variable is 10.70% and 89.30% comes from outside the scope of the variables studied.

Discussion

After conducting testing, it can be stated that ESG *Disclosure* has a negative influence or impact on *costs. of significantly lower debt*. This finding indicates that high levels of ESG disclosure correlate with a lower cost of debt, holding other factors constant. This is because creditors view a company based on its broad ESG perspective as a low-risk entity. Consequently, the company has the opportunity to obtain cheaper debt financing or competitive interest rates. This finding aligns with findings (You et al., 2025); (Malik & Kashiramka, 2024); (Darsono et al., 2024) that similarly found the influence of ESG on *cost of debt. of Debt* is negative. This is related to the energy sector itself, which is a high-risk sector, encompassing exploration, exploitation, carbon emissions, and hazardous waste. Under strict supervision, the Ministry of Energy and Mineral Resources strives to provide transparency and comply with applicable regulations to avoid sanctions. However, this differs from findings (Priem & Gabellone, 2022) and (Gonçalves et al., 2022) that found *cost of Debt,* as the dependent variable, is positively influenced by ESG. This finding may be due, in part, to differences in location. According to Priem & Gabellone (2022), in Europe, negative and significant results can be found in countries with weak institutional enforcement. Therefore, H1 is accepted.

Other results regarding the influence *of leverage* at *cost of debt* is consistently the same as that reported by (Calce, 2025) who obtained insignificant results, but these findings differ from Tanin et al. , (2024) who obtained negative results. These results indicate that *Leverage*, which is proxied by the debt to asset ratio, has not been a major factor in the size of *the cost of Debt* in the energy sector. This condition can be explained by the fact that companies in the energy sector have large amounts of fixed assets (such as infrastructure, mining, and power plants) that can be used as collateral, so creditors' perceptions of risk remain low despite high *leverage*. Therefore, based on the research results, H2 is rejected.

The results of the interaction variables between ESG and *audit quality* have a significant impact on *costs. of debt*, where the coefficient is positive. However, the moderating direction indicates that *audit quality* tends to weaken the negative impact of ESG. Thus, the hypothesis that audit quality plays a role in strengthening the negative impact of ESG on *cost of debt* is not supported. The same direction is shown by a study (Hazaea et al., 2025) in the UK which found the existence of *Big Four auditors.* significantly moderates ESG and *cost of debt* with a positive coefficient direction. This finding means that creditors prioritize financial reports audited by reputable KAPs, but *sustainability disclosures The report* provides little added value for creditors when there is a strong signal from *the Big- four KAP.* Conceptually, this is called *substitution. effect*. As a result, the influence of ESG in reducing *costs of debt* becomes less dominant. Based on these results, it can be stated that H3 is rejected.

In other tests, the test results from *the quality audit* were not able to moderate the impact *of leverage.* at *cost of debt*. The presence of high-quality auditors represented by *the Big Four KAPs* has not been proven to significantly change the relationship between *leverage* and *cost. of debt*. Thus, when a direct relationship is not proven to be significant from *leverage* to *cost of debt* results in no evidence of the role of *audit quality* as a moderator. Therefore, with these results, the conclusion of this study rejects H4, which states that the alleged moderating role *audit quality* on the relationship between *leverage* and cost of debt is not proven.

CONCLUSION

This study discusses how the influence of ESG and *leverage* is moderated by *audit quality* on *cost of debt* in the energy sector for the period between 2022 and 2025. Referring to the results, it is concluded that ESG *disclosure* has a significant negative impact on *cost of Based* on these results, it means that high ESG *disclosure* results in lower debt financing obtained by companies. However, the *leverage test* did not provide sufficient evidence of an effect on *cost. of Meanwhile* , *audit quality* has been shown to play a moderating role between ESG and *cost. of debt*, but its effect weakens the negative influence of ESG, so H3 is rejected. This occurs because creditors tend to look at financial reports that are considered higher quality in *Big-Four audit firms* than ESG disclosures in *sustainability reporting. report*. On the other hand, there is no evidence that *audit quality* moderate *leverage* with *cost of debt* statistically.

These results can prove that the role of *audit quality* is able to provide a little influence on the relationship between ESG and *cost. of debt* in the current *Greenwashing phenomenon*. Furthermore, high ESG *disclosure* can reduce a company's risk in the eyes of creditors and lower the cost of debt. A limitation of this study is the relatively short period, which suggests that the results may reflect long-term conditions. Furthermore, the measurement of *audit quality* is based on dummy variables, which do not fully reflect audit quality in depth. Furthermore, the absence of control variables that might influence *cost of Debt*. Future researchers can include companies from other sectors and expand the

sample size. Meanwhile, future researchers *can* use *audit fees*, *audit tenure, or other audit quality* proxies and add control variables to strengthen the model's explanation.

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