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Do ESG Practices Reduce Firms' Cost of Debt? Evidence from the MENA Region

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Abstract

This study examines whether ESG performance reduces firms' cost of debt in the MENA region. Using panel data of publicly listed firms in eight MENA countries from 2019 to 2024, the study relies on data from Thomson Reuters DataStream. Fixed-effects regression models are employed to examine the relationship between ESG performance and debt financing costs. The findings indicate that firms with stronger ESG performance tend to face lower borrowing costs, suggesting that lenders perceive sustainable business practices as a signal of lower risk. These findings contribute to the literature on ESG and debt financing in emerging markets and offer valuable insights for policymakers and corporate managers seeking to promote sustainable and financially resilient businesses.

Keywords: ESG performance, Cost of debt, MENA countries, Panel data, Capital structure

1 Introduction

Sustainable development—defined by the World Commission on Environment and Development as meeting present needs without compromising future generations' ability to meet theirs—has become a central principle in global economic and corporate governance discourse. Within this context, the Environmental, Social, and Governance (ESG) framework has emerged as a key mechanism for evaluating firms' non-financial performance and long-term sustainability. ESG encompasses environmental stewardship, social responsibility, and governance quality, reflecting a broader transition from shareholder-focused models toward stakeholder-oriented capitalism. Existing literature suggests that strong ESG performance enhances transparency, reduces information asymmetry, improves operational efficiency, and strengthens relationships with stakeholders, ultimately contributing to better financial outcomes and lower financing costs.

The growing importance of ESG is closely linked to developments in corporate social responsibility (CSR) and corporate governance since the 1970s. Increasing pressure from investors, regulators, and society has encouraged firms to integrate ESG performance beyond minimum legal compliance. Empirical studies indicate that ESG disclosure improves access to finance, signals effective risk management, and may reduce both the cost of equity and the cost of debt. These effects are particularly significant in emerging markets, where weaker

institutional frameworks and higher information asymmetry make creditors more sensitive to non-financial risks.

The Arab Middle East and North Africa (MENA) region has recently accelerated ESG integration through regulatory reforms and sustainability initiatives. Countries such as Egypt, Saudi Arabia, and the United Arab Emirates have introduced ESG disclosure guidelines and sustainable finance frameworks to improve transparency and attract investment. In Egypt, the Egyptian Exchange launched ESG reporting guidance and the S&P/EGX ESG Index to encourage listed firms to improve sustainability performance. Despite these developments, research on the relationship between ESG performance and firms' borrowing costs in the MENA region remains limited.

This study addresses this gap by examining the impact of the overall ESG performance and its three individual pillars—environmental, social, and governance—on firms' cost of debt in the Arab MENA region. Analyzing the pillars separately is important because each dimension may have different influence on the firm's borrowing costs.The study contributes to understanding how non-financial performance may translates into financial advantages in emerging markets. The findings are expected to provide practical implications for corporations, lenders, regulators, and policymakers seeking to strengthen sustainable finance practices and enhance capital market development in the region.

1.1 Study Problem and Objectives

The researcher's objective is to expand upon prior studies regarding the financing effects of ESG performance by: (i) Investigating the relationship between ESG performance and the cost of debt financing, by exploring the nexus of the aggregated ESG score on the cost of debt. (ii) Examining if one of the ESG pillars has more effect on the cost of debt than the others. Hence, this research tries to answer if companies would be able to decrease their cost of debt financing by focusing on one of the ESG pillars. (iii) Adopting a regional analytical perspective by examining a sample of eight Arab countries across the Middle East and North Africa,

2 Theoretical Framework and Literature Review

The relationship between ESG performance and the cost of debt has been widely examined through several complementary theoretical lenses, including agency theory, stakeholder theory, legitimacy theory, signaling theory, information asymmetry, pecking order theory, and institutional theory (Jensen & Meckling, 1976; Freeman, 1984; Myers & Majluf, 1984; Suchman, 1995; North, 1990). Together, these frameworks provide competing explanations for whether ESG activities reduce or increase firms' financing costs.

Agency theory (Jensen & Meckling, 1976) explains corporate behavior through conflicts of interest between managers, shareholders, and debtholders. Managers may engage in opportunistic behavior due to information asymmetry, generating agency costs such as monitoring, bonding, and residual losses. Debt financing can mitigate these conflicts by disciplining managerial behavior through fixed repayment obligations and reduced free cash flow. However, agency theory also presents a dual view of ESG. On one hand, CSR and ESG engagement may reduce agency conflicts by improving governance and reducing inefficient resource allocation (Ferrell et al., 2016; Harjoto et al., 2015). On the other hand, ESG investments may reflect managerial opportunism, where executives overinvest in CSR for private benefits, reputation building, or personal utility at the expense of shareholders, potentially increasing costs of debt (Barnea & Rubin, 2010; Kruger, 2015; Manchiraju & Rajgopal, 2017). Closely related is the **overinvestment perspective**, which argues that ESG

activities may represent an inefficient allocation of resources that weakens firm value and increases financial risk (Goss & Roberts, 2011).

Information asymmetry and signaling theory (Spence, 1973; Grossman & Hart, 1982) further suggest that firms with higher transparency and stronger ESG performance can reduce uncertainty for creditors. Because managers possess superior information about firm prospects, ESG disclosure serves as a credible signal of long-term stability, lower risk, and better governance quality. Since ESG performance is observable, verifiable, and costly to imitate, it reduces information asymmetry and may lead to lower required returns on debt.

Stakeholder theory **(Freeman, 1984)** broadens the focus of corporate objectives beyond shareholders to include employees, customers, suppliers, and society. From this perspective, ESG engagement strengthens stakeholder relationships, reduces operational risk, and enhances long-term firm value. Empirical evidence generally supports a negative relationship between ESG performance and cost of debt, as improved sustainability reduces bankruptcy risk, legal exposure, and financial volatility (Menz, 2010; Velte, 2017; Ratajczak & Mikołajewicz, 2021).

Legitimacy theory (Suchman, 1995) complements this view by arguing that firms seek to align their operations with societal norms to maintain legitimacy and long-term survival. ESG disclosure is used as a tool to demonstrate conformity with social expectations, particularly during periods of reputational pressure. Firms may engage in both substantive changes and symbolic reporting to maintain legitimacy, which can influence stakeholder perceptions and financing conditions (Deegan, 2014; Deephouse, 1996).

Overall, these theoretical perspectives provide contrasting but complementary explanations. While agency and overinvestment theories highlight potential inefficiencies and managerial opportunism that may increase the cost of debt, stakeholder, legitimacy, and signaling theories suggest that ESG performance can reduce information asymmetry, strengthen stakeholder relations, and improve perceived firm quality, ultimately lowering financing costs. The net effect of ESG on cost of debt is therefore an empirical question.

The relationship between environmental, social, and governance (ESG) performance and firms' cost of debt (COD) has been widely studied in financial literature, but there is still no single agreed conclusion. Overall, the literature can be grouped into three main views: ESG reduces the cost of debt, ESG increases the cost of debt, and ESG has no meaningful effect on the cost of debt at all. Although ESG, CSR, and corporate sustainability are conceptually related, the literature uses these constructs with some variation in terminology and measurement.

A large part of the literature suggests that better ESG performance helps firms reduce their cost of debt. The main explanation is that ESG practices improve transparency, reduce uncertainty, and lower perceived risk from the perspective of lenders. When firms behave responsibly toward stakeholders and manage environmental and social risks effectively, they are generally seen as more stable and less risky borrowers (Cheng et al., 2014; Eliwa et al., 2021). This lower risk is often reflected in better credit ratings, lower interest rates, and narrower bond yield spreads (Bauer & Hann, 2010; Ge & Liu, 2015). From a broader perspective, stakeholder theory also supports this idea by arguing that firms that balance the interests of different stakeholders tend to achieve more stable long-term performance and financial sustainability (Velte, 2017).

Empirical studies also show that ESG can improve operational efficiency and financial stability, which indirectly strengthens firms' creditworthiness. For example, strong ESG performance has been linked to innovation, better access to financing, and fewer financial

constraints (Wang, 2022; Sheng et al., 2022). In addition, ESG disclosure itself plays an important role by reducing information asymmetry between firms and lenders. When companies provide more transparent and detailed sustainability reporting, creditors are better able to assess risk, which often leads to lower borrowing costs (Sengupta, 1998; Eliwa et al., 2019).

However, not all studies agree with this positive view. A second stream of research argues that ESG activities can actually increase firms' cost of debt. This argument is mainly based on the idea that ESG investments may come at the expense of financial efficiency. According to Friedman (1970), firms should focus on maximizing shareholder value, and any spending on CSR activities may reduce profitability. From this perspective, ESG engagement may be seen as a cost rather than a benefit. Agency theory also supports this view, suggesting that managers may use ESG initiatives for personal reputation building or private benefits, rather than for shareholder value maximization (Kruger, 2015; Cheng et al., 2014). In such cases, lenders may perceive ESG spending as inefficient or even risky, leading to higher borrowing costs (Goss & Roberts, 2011).

Interestingly, some studies also find more complex, non-linear relationships. For example, moderate levels of CSR may be beneficial, while extremely high or very low levels may increase the cost of debt due to concerns about managerial overinvestment or strategic manipulation (Ye & Zhang, 2011). This suggests that the effect of ESG is not always straightforward and may depend on how it is implemented.

A third group of studies finds no clear relationship between ESG and the cost of debt. From this perspective, creditors may place greater emphasis on traditional firm-specific financial characteristics, such as profitability, leverage, and liquidity, when assessing credit risk, particularly when ESG information is perceived as voluntary or difficult to verify. Concerns about symbolic or strategically motivated CSR disclosure may also limit the extent to which stakeholders rely on ESG information when assessing firms (Hemingway & Maclagan, 2004).

When examining individual ESG dimensions, the literature also reports mixed results. Environmental performance is often associated with lower borrowing costs, particularly where environmental risks are financially material (Chava, 2014; Eliwa et al., 2021). Social performance has also been linked to lower credit risk (Oikonomou et al., 2014). Governance-related characteristics may reduce debt costs by improving transparency and mitigating agency problems, although the magnitude and significance of these effects vary across institutional settings (Andrade et al., 2014; Ghouma et al., 2018).

Overall, the literature suggests that ESG performance can influence firms' borrowing costs through several channels, including risk reduction, improved transparency, and better credit ratings. However, the results are not fully consistent across all studies. The impact of ESG depends on factors such as industry type, country context, and whether ESG is measured as a whole or by individual components.

Recent evidence from the MENA region has begun to address this gap, although the regional literature remains relatively limited. Al Barrak et al. (2023), using a sample of Saudi-listed firms over the period 2013–2021, find that stronger ESG practices are associated with lower borrowing costs, indicating that lenders may perceive ESG performance as a signal of lower firm risk. Similarly, Fadaly (2024) provides evidence from firms included in the EGX100 in Egypt and examines the relationship between ESG performance and firms' cost of debt. More recent Egyptian evidence has also examined the role of sustainability-related information in debt financing, including studies linking sustainability reporting and ESG disclosure to firms'

borrowing costs (Ahmed et al., 2025; Ellelly et al., 2026). However, the existing MENA evidence remains concentrated in individual countries, particularly Saudi Arabia and Egypt, with limited evidence covering multiple MENA countries within a common empirical framework.

In conclusion, while many studies support the idea that ESG reduces the cost of debt, the relationship is still complex and not universally agreed upon. Differences in methodology, market conditions, and ESG measurement all contribute to mixed findings. This creates a clear research gap, particularly in emerging markets, where institutional settings differ and ESG disclosure practices are still developing.

This study therefore extends the emerging regional literature by examining the relationship between ESG performance and the cost of debt across eight MENA countries using a common panel-data framework. In addition, it distinguishes between aggregate ESG performance and the individual Environmental, Social, and Governance pillars, allowing the analysis to identify whether particular dimensions of ESG are more strongly associated with debt financing costs.

2.1 Study Hypotheses and Conceptual Model

Based on the above analysis and given that the relationship between ESG performance and the cost of debt is context-dependent and may vary across markets and institutional environments. The study also deepens the analysis by investigating the effect of individual dimensions of ESG performance on firm's cost of debt. And accordingly, the following principal hypotheses are proposed:

- **H_1**: There is a negative impact of ESG performance on the firm's cost of debt in the Arab MENA region.
- **H_{1a}**: There is a negative impact of environmental performance on the firm's cost of debt in the Arab MENA region
- **H_{1b}**: There is a negative impact of social performance on the firm's cost of debt in the Arab MENA region.
- **H_{1c}**: There is a negative impact of governance performance on the firm's cost of debt in the Arab MENA region.

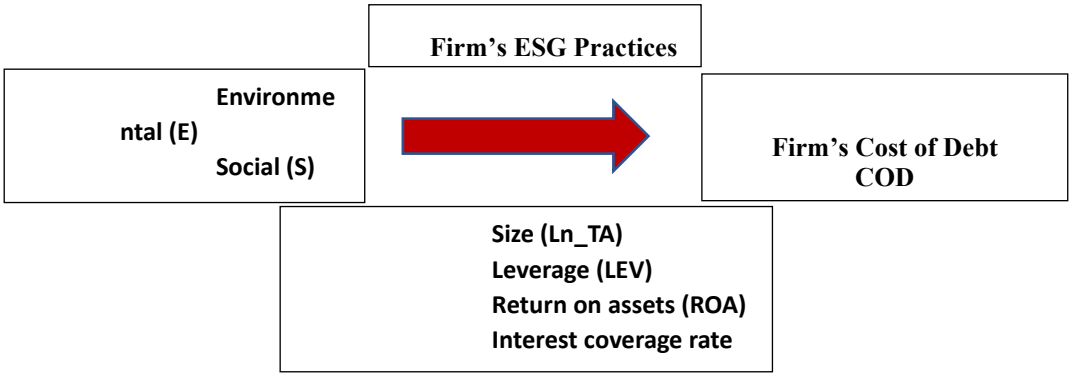

Figure 1. Conceptual Framework

Source: Done by the author

Furthermore, the framework distinguishes between the environmental, social, and governance dimensions of ESG, as these components are expected to exert heterogeneous effects on debt

financing. Overall, the model provides a structured basis for analysing how ESG-related factors influence firms' access to and cost of external debt.

3 Methodology

3.1 Sample Study

The dataset employed in this study encompasses 8 Arab Middle Eastern and North African (MENA) countries, excluding Turkey, Israel, Iran, and Iraq to ensure a more homogeneous sample in terms of political economy, regulatory structures, and financial system characteristics. Although certain regional classifications extend to include these countries, their institutional, economic, and geopolitical contexts differ substantially from those of the Arab MENA Specifically, Turkey and Israel are frequently classified within OECD or European frameworks or included in broader "MENAT" definitions, thereby introducing heterogeneity that may compromise the comparability of results. In contrast, Iran and Iraq are often omitted from empirical studies in finance and ESG research due to their limited market integration, incomplete disclosure practices, data unavailability, and persistent political instability. Leaving the sample with (Egypt, Saudi Arabia, United Arab Emirates, Bahrain, Kuwait, Morocco, Oman & Qatar). This outlining aligns with prior regional finance literature, which distinguishes the **Arab MENA** from broader MENAT classifications (El Khoury et al., 2021; Al-Naimi, 2025).

3.2 Data Gathering and Research Methodology

This paper uses the Thomson Reuters World scope and DataStream databases to construct a rich dataset. Data are collected from annual reports, sustainability reports, corporate websites, and verified third-party sources. The overall ESG score reflects both the firm's transparency and its relative performance within each pillar, with weights adjusted to capture the materiality of ESG issues across industries (Refinitiv, 2021).

Cost of Debt (COD), following the established literature, the cost of debt is measured as interest expense divided by average total debt, where average total debt is calculated as the average of total debt in the current and preceding year. To reduce skewness and improve the distributional properties of the dependent variable, the natural logarithm of the cost-of-debt measure is used in the empirical estimations. Thus, the dependent variable is specified as ln_COD, where ln_COD = ln (Interest Expenses/ Average Total Debt).

And to ensure an accurate estimate of the cost of debt financing. Banks and financial institutions have not been included because they have different nature of financial statements and they are not comparable in terms of the cost of debt financing; they are subject to different reporting regulations and are not particularly relevant in terms of ESG. After these adjustments, the final sample consists of 202 listed firms, representing 8 MENA region countries and 24 different industries, and accounting for 545 firm-year observations.

To examine the relationship between ESG performance and COD, the study employs panel data regressions, following the methodology of previous studies (e.g., Hamrouni et al., 2019). Panel data combines time-series and cross-sectional observations, allowing control for unobserved firm-specific heterogeneity and time-specific effects.

Table 1. Variables Definitions

Variable	Definition
Dependent variable	
COD	Cost of debt calculated as the ratio of a firm's interest expense to the average debt.
Independent variables (ESG variables)	
ESG	ESG Score collected from Thomson Reuters DataStream.
ES	The environmental dimension of ESG performance.
SS	The social dimension of ESG performance.
GS	The Governance dimension of ESG performance.
Control Variables	
Leverage	Leverage ratio calculated as total debt of a firm deflated by total assets.
Firm Size (Ln_TA)	Natural logarithm of total assets at the end of the year.
ROA	Return on assets calculated as net income before extraordinary items deflated by total assets.
Int_Cov	Interest coverage is calculated as total operating income deflated by total interest expense.

Source: Done by the researchers

4 Data Analysis

4.1 Descriptive Statistics

Descriptive statistics table summarize the key characteristics of the dataset. They typically include the number of observations, the mean, median, standard deviation, the minimum and maximum values.

Table 2. Descriptive Statistics

Variable	Obs.	Mean	Median	SD	Min	Max
ln_COD	545	-3.2363	-3.1977	2.2412	-11.3713	1.8347
lagESG_t1	545	31.1006	29.2806	18.2441	1.0542	84.4112
L1_E	538	20.1118	12.4373	21.3566	0	83.6008
L1_S	538	27.5402	24.3927	20.4809	0.3207	89.2301
L1_G	538	47.8290	48.5282	21.9119	1.0163	95.4023
ln_TA	545	21.5093	21.5000	1.8022	16.3275	27.2209
Leverage	545	0.2613	0.2575	0.1717	0.0001	1.0542
ROA	544	0.0513	0.0444	0.0861	-0.6885	0.4938
int_cov	544	36.2610	5.0308	207.950	-457.739	3546.440

Source: Done by the researchers

Table 2 presents the descriptive statistics for the ESG performance variables, cost of debt and firm-level control variables. The overall lagged ESG score (lagESG_t1) shows high variability, the mean ESG Score is 31.100, with a median value of 29.28, indicating that more

than fifty percent of listed companies has an ESG score around 29. This shows central ESG performance. The minimum value is 1.05, the maximum value is 84.4, and the standard deviation is 18.2440, which shows that the ESG performance of supervisors' companies varies greatly, with some listed companies performing well and some having more room for improvement. whereas its individual pillars display heterogeneity: the governance pillar (L1_G) exhibits a relatively low standard deviation, while the environmental (L1_E) and social (L1_S) pillars have higher standard deviations. This heterogeneity in ESG components provides prima facie support for analysing the separate effects of the E, S, and G pillars on the cost of debt.

Cost of debt (ln_COD) has a comparatively low standard deviation, suggesting that borrowing costs are relatively stable across the sample. the cost of debt of Arab MENA listed companies varies widely, with a mean value of -3.236276, a minimum value of -11.37128 and a maximum value of 1.834652; indicating that the debt financing of listed companies varies widely, providing a rich sample for this study.

4.2 Reliability and Validity

Reliability and validity were tested utilising multiple tests. To ensure the robustness and credibility of our findings, we examined the potential presence of multicollinearity among the explanatory variables. Multicollinearity arises when two or more independent variables in a regression model are highly correlated, which may inflate standard errors and obscure the true effect of each variable. To assess this issue, we employed the variance inflation factor (VIF) as a diagnostic measure.

4.3 Correlation Matrix and Multicollinearity Test

The pearson correlation matrix reflects only a bivariate relationship and does not control for other firm-specific characteristics. However, once these factors are accounted for in the regression analysis, the estimated effect of ESG on the cost of debt changes, suggesting that the initial positive association was driven by omitted variable bias.

Table 3. Correlation Matrix

Variables	lagESG_t−1	ln_COD	ln_TA	Leverage	ROA	Int_Cov
lagESG_t−1	1.0000					
ln_COD	0.3230***	1.0000				
FirmSize	0.3583***	0.8105***	1.0000			
Leverage	−0.0101	0.4157***	0.0844**	1.0000		
ROA	0.1252***	−0.0057	0.1322***	−0.3503***	1.0000	
Int_Cov	−0.1003**	−0.3122***	−0.0509	−0.1938***	0.1529***	1.0000

*Note: p-values in parentheses p < 0.1, ** p < 0.05, *** p < 0.01*

Source: Done by the researchers

The correlation test results among the coefficients of the main variables are shown in Table 3, where; ESG performance is positively and significantly correlated with the cost of debt ($r = 0.323$, $p < 0.01$), indicating a positive bivariate association between the two variables. Firm size is positively correlated with both ESG performance ($r = 0.358$, $p < 0.01$) and the cost of debt ($r = 0.811$, $p < 0.01$). Leverage is positively associated with the cost of debt, whereas interest coverage exhibits a significant negative correlation, suggesting that firms with stronger debt-servicing capacity tend to incur lower borrowing costs. The correlations among

the explanatory variables are relatively low, with the highest correlation being 0.358 between ESG performance and firm size, providing preliminary evidence that multicollinearity is unlikely to be a concern.

To assess the presence of multicollinearity, the Variance Inflation Factor (VIF) was calculated for all explanatory variables. The VIF values ranged from 1.04 to 3.05, with a mean VIF of 1.82, all of which are well below the commonly accepted threshold of 10. We may therefore conclude that there are no multicollinearity concerns, thus validating the reliability of our regression model.

4.4 Heteroscedasticity and Hausman Test

The researchers applied the Modified Wald test to check whether the error variance is constant across firms. The Modified Wald test for groupwise heteroskedasticity strongly rejects the null hypothesis of homoskedasticity (Chi2= 99,284.07 and p-value < 0.01), indicating the presence of firm-level heteroskedasticity. Accordingly, all fixed-effects regressions are estimated using firm-clustered robust standard errors to ensure valid statistical inference.

The researchers also applied the Wooldridge test for first-order autocorrelation to detect serial correlation in the panel residuals. The test strongly rejected the null hypothesis of no autocorrelation ($F(1,91) = 13.28$, $p < 0.01$), suggesting that residuals are correlated over time within firms. Again, clustering standard errors at the firm level ensures consistent estimation despite the presence of autocorrelation.

Then Hausman's specification test was applied to verify that this estimation is superior to that of random effects. It indicates a statistically significant difference between the two estimators, show a Chi2 = 40.72 and a P-value = 0.000, Accordingly, the null hypothesis is rejected at the 1% significance level, implying that the random effects model is inconsistent. Therefore, the fixed effects model is more appropriate for the analysis, as it accounts for unobserved firm-specific heterogeneity that may be correlated with the explanatory variables.

4.5 Regression Analysis

4.5.1 Overall ESG and Cost of Debt

First, a fixed effect regression analysis was conducted to examine the overall impact of the composite ESG score of firms one year ago (lagESG_t-1) on its cost of debt financing (ln_COD). Testing H_1.

$$\ln(COD_{it}) = \alpha_i + \beta_1 lagESG_{i,t-1} + \beta_2 Leverage_{it} + \beta_3 ROA_{it} + \beta_4 IntCov_{it} + \beta_5 Ln_TA_{it} + u_{it} + \varepsilon t \quad (1)$$

Table 4. Regression Results of ESG Performance and Cost of Debt

Variables	Coefficient	Robust Std. Error	t-statistic	p-value
ESG Score (t−1)	**-0.0087*****	0.0030	-2.92	**0.004**
FirmSize (ln_TA)	0.5758***	0.1994	2.89	0.004
Leverage	1.6082**	0.8020	2.01	0.046
ROA	0.2096	0.4278	0.49	0.625
Interest Coverage	-0.0024**	0.0011	-2.08	0.039
Within R^2 = 0.781				

*Note: Robust standard errors clustered at the firm level are reported. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. Source: Done by the researchers*

Table 4 presents the results of the panel regression model estimating the effect of firms' environmental, social, and governance (ESG) performance on the cost of debt (measured as the natural logarithm of the cost of debt, *ln_COD*). Following Francis et al. (2005), we include firm characteristics that are reported to be affecting the cost of debt. Along with ESG-perform and ESG-disclose, we include Size (Ln_TA), leverage, ROA and IntCov.

The overall R^2 of 0.781 shows that firm characteristics also account for a large proportion of differences across firms, highlighting the importance of both ESG practices and traditional financial indicators in determining borrowing costs in MENA countries. The coefficient on lagged ESG (*lagESG_t1*) is negative (−0.0087) and marginally significant at the 5% level (p = 0.004), indicating a negative association between ESG score and cost of debt.

This result suggests that firms with stronger ESG performance are perceived as less risky by creditors and reduce perceived default risk in the eyes of creditors (La Rosa et al., 2018). These results demonstrate that ESG disclosure, on the one hand, reduces information asymmetry but, on the other hand, facilitates access for debt investors to the company's future risk (Raimo et al., 2021), thereby confirming the findings of Eccles et al. (2011), Guidara et al. (2014), and Muttakin et al. (2020).

This finding is in line with expectations; the results suggest that firms with stronger ESG performance tend to benefit from a lower cost of debt. This also implies that as ESG performance improves, lenders are willing to accept lower interest rates on the debt extended to such firms. In other words, lending institutions incorporate ESG-related information into their assessment of borrowers' risk profiles when making financing decisions.

4.5.2 Environmental Score and Cost of Debt

Second, a fixed-effects regression analysis was conducted to examine the impact of firms lagged Environmental score (L_1_E) on the cost of debt (ln_COD), to test **H_{1a}**, using Equation (2).

$$\ln(COD_{it}) = \alpha_i + \beta_1 lagE_{i,t-1} + \beta_2 Leverage_{it} + \beta_3 ROA_{it} + \beta_4 IntCov_{it} + \beta_5 Ln_TA_{it} + u_{it} + \varepsilon t \quad (2)$$

Table 5. Fixed-Effects Regression Results for Environmental (E) Score and Cost of Debt

Predictor	Coefficient	Robust Std. Error	t-statistic	p-value
E_Score (t − 1)	-0.005	0.003	-1.98	.049
Firm Size (ln_TA)	0.504	0.229	2.20	.029
Leverage	1.592	0.825	1.93	.055
ROA	0.232	0.449	0.52	.606
Interest Coverage	-0.002	0.001	-1.99	.048
Within R^2 = 0.3707				

Source: Done by the researchers

Table 5 reports the results of the firm fixed-effects regression examining the determinants of the cost of debt (ln_COD). The model includes firm-specific controls and year fixed effects, with standard errors clustered at the firm level to account for within-firm serial correlation and heteroskedasticity.

The coefficient on lagged Environmental Score (L_1_E) is negative and statistically significant at the 5% level (β= −0.0055, P= 0.049), indicating that improvements in Environmental pillar

is associated with a reduction in firms' cost of debt. Economically, a one-unit increase in E-score is associated with an approximate 0.55% decrease in the cost of debt, supporting the view that ESG engagement mitigates perceived credit risk.

4.5.3 Social Score and Cost of Debt

This model examines the relationship between the social score (S) pillar and the log of cost of debt (ln_COD) and the social score is log-transformed and exponentiated (ln_exp_S) to reduce skewness and improve linearity in the relationship with the dependent variable. Firm size (ln_TA), leverage, profitability (ROA), and interest coverage (int_cov) are included as control variables, while year dummies control for time effects, standard errors are clustered at the firm level.

$$\ln(COD_{it}) = \alpha_i + \beta_1 lagS_{i,t-1} + \beta_2 Leverage_{it} + \beta_3 ROA_{it} + \beta_4 IntCov_{it} + \beta_5 Ln_TA_{it} + u_{it} + \varepsilon t \quad (3)$$

Table 6. Fixed-Effects Regression Results of Social (S) Score and Cost of Debt

Predictor	Coefficient	Robust Std. Error	t-statistic	p-value
S_Score	-0.009	0.005	-1.88	.061
FirmSize (ln_TA)	0.532	0.188	2.83	.005
Leverage	1.683	0.731	2.30	.022
ROA	0.278	0.427	0.65	.516
Interest Coverage	-0.002	0.001	-2.10	.037
Within R^2: 0.3853				

Source: Done by the researchers

The negative coefficient of ln_exp_S (S_Score) (-0.0086, p = 0.061) suggests that higher social pillar scores are associated with slightly lower cost of debt, consistent with **H_{1b}**, that better social performance reduces perceived credit risk. The effect is marginally significant at the 10% level. Control variables perform as expected: larger firms and higher leverage are associated with higher cost of debt, while stronger interest coverage reduces it.

4.5.4 Governance Score and Cost of Debt

The fourth model examines the effect of the Governance (G) pillar on the cost of debt (ln_COD) using a fixed-effects regression framework, with standard errors clustered at the firm level.

$$\ln(COD_{it}) = \alpha_i + \beta_1 lagG_{i,t-1} + \beta_2 Leverage_{it} + \beta_3 ROA_{it} + \beta_4 IntCov_{it} + \beta_5 Ln_TA_{it} + u_{it} + \varepsilon t \quad (4)$$

Table 7. Fixed-Effects Regression Results of Governance (G) Score and Cost of Debt

Predictor	Coefficient	Robust Std. Error	t-statistic	p-value
G_Score (t − 1)	-0.004	0.002	-1.63	.105
Firm Size (ln_TA)	0.495	0.228	2.17	.031
Leverage	1.615	0.827	1.95	.052
ROA	0.203	0.435	0.47	.641
Interest Coverage	-0.002	0.001	-2.04	.042
Within R^2 = 0.371				

Source: Constructed by the author

Table 7 presents the fixed-effects regression results examining the impact of the governance (G) score on firms' cost of debt in the MENA region. The model is statistically significant overall ($F = 11.05$, $p < 0.01$), indicating that the explanatory variables jointly affect the cost of debt.

The within R-squared value of 0.371 indicates that approximately 37.1% of the variation in the cost of debt is explained by changes within firms over time.

The coefficient of the lagged governance score (L1_G) is negative (-0.004), but statistically insignificant ($p = 0.105$). Therefore, the study finds no significant relationship between governance performance and firms' cost of debt in the sample. This suggests that improvements in governance practices do not significantly influence creditors' assessment of borrowing risk or financing costs for firms in the MENA region during the study period.

Overall, while the Governance pillar does not have a statistically significant effect in this sample, the control variables perform as theoretically expected, providing a robust framework for assessing the influence of ESG dimensions on cost of debt financing.

5 Robustness Analysis

To assess the robustness of the baseline findings, additional specifications are estimated to address the potential influence of extreme observations and unobserved country-specific shocks that vary over time. First, all continuous variables are winsorized at the 1st and 99th percentiles to reduce the potential influence of extreme observations. Second, the models incorporate country-by-year fixed effects, which control for time-varying factors that are common to firms within a given country, such as changes in macroeconomic conditions, regulatory environments, and country-specific financial-market developments. The models continue to include firm fixed effects and year-related controls, with standard errors clustered at the firm level.

Table 8. Robustness Tests: Country-Year Fixed Effects and Winsorization

Variables	Overall ESG	Environmental	Social	Governance
Lagged ESG	−0.0119***			
Lagged E		−0.0060**		
Lagged S			−0.0067**	
Lagged G				−0.0048**
Ln(Total Assets)	0.6910***	0.6190**	0.6312**	0.6294**
Leverage	1.2177	1.1515	1.2066	1.1755
ROA	0.2820	0.2924	0.3388	0.2362
Interest Coverage	−0.0049**	−0.0047**	−0.0049**	−0.0048**
Firm FE	Yes	Yes	Yes	Yes
Country × Year FE	Yes	Yes	Yes	Yes
Observations	544	537	537	537
Firms	202	198	198	198

*Note: All models include firm fixed effects and country-by-year fixed effects, with standard errors clustered at the firm level. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.*

Source: Constructed by the author

Table 8 reports the robustness results for the overall ESG score and its three individual pillars. The results remain consistent with the baseline findings. The coefficient on lagged overall ESG remains negative and statistically significant ($\beta = -0.0119$, $p < 0.01$), indicating

that firms with stronger ESG practices are associated with lower costs of debt after accounting for extreme observations and country-specific time-varying factors. Similarly, the Environmental ($\beta = -0.0060$, $p = 0.028$), Social ($\beta = -0.0067$, $p = 0.040$), and Governance ($\beta = -0.0048$, $p = 0.042$) pillars retain negative and statistically significant coefficients at the 5% level.

The number of observations differs slightly across the specifications because of differences in data availability. The overall ESG specification is estimated using 544 firm-year observations representing 202 firms, whereas the three pillar-level specifications are estimated using 537 firm-year observations representing 198 firms. The difference reflects seven firm-year observations with missing values for the lagged Environmental, Social, and Governance pillar scores, together with one additional observation excluded because of missing control-variable information. No additional sample-selection criteria were imposed.

Overall, the consistency in the sign and statistical significance of the ESG coefficients across the four specifications suggests that the negative association between ESG practices and firms' cost of debt is robust to the treatment of extreme observations and to controlling for country-specific time-varying factors. These findings provide additional support for the robustness of the baseline results.

5.1 Alternative Measure of the Cost of Debt

As an additional sensitivity test, an alternative accounting-based measure of the alternative COD was employed, calculated as interest expense divided by total debt, consistent with prior studies (Miao et al., 2021; Karaman et al., 2025; Cicchini et al., 2026). This specification provides a robustness check of whether the baseline findings depend on the use of average total debt in the denominator.

Table 9. Robustness Test Using an Alternative Cost-of-Debt Measure

Variables	Alternative COD
Lagged ESG	−0.0084*
Ln(Total Assets)	−0.2058
Leverage	−3.7838**
ROA	−0.3602
Interest Coverage	−0.0009
Year FE	Yes
Firm FE	Yes
Observations	544
Firms	202
R^2 (within)	0.2357

*Notes: Standard errors are clustered at the firm level. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.*

Source: Constructed by the researchers

Using this alternative COD measure, the coefficient on lagged ESG remains negative ($\beta = -0.0084$), although it is statistically significant only at the 10% level ($p = 0.088$). This result is directionally consistent with the baseline finding, suggesting that the negative association between ESG performance and firms' cost of debt is not entirely driven by the specific construction of the cost-of-debt measure.

5.2 Endogeneity and Instrumental-Variable Robustness

To assess whether the estimated relationship between ESG performance and firms' cost of debt may be affected by endogeneity, an instrumental-variable fixed-effects specification was estimated, using the one-period lag of ESG performance as an instrument for lagged ESG.

The first-stage results indicate that the excluded instrument is statistically significant (cluster-robust F-statistic = 11.58, p = 0.001), while the Kleibergen–Paap rk LM statistic rejects the null hypothesis of underidentification ($\chi^2 = 8.924$, p = 0.0028).

The second-stage IV estimate of lagged ESG is statistically insignificant ($\beta = 0.0076$, p = 0.752). Importantly, the Durbin–Wu–Hausman endogeneity test fails to reject the null hypothesis that lagged ESG is exogenous ($\chi^2 = 0.371$, p = 0.542).

Thus, the test provides no statistically significant evidence that lagged ESG is endogenous in the cost-of-debt specification. While the IV coefficient itself is not statistically significant, the DWH result suggests that the baseline fixed-effects specification does not require an instrumental-variable correction on the basis of detected endogeneity.

6 Discussion of Results

This study finds that higher overall ESG performance is associated with a lower cost of debt, indicating that ESG engagement reduces firm risk and information asymmetry in credit markets. The results are consistent with prior research showing that firms with strong ESG profiles benefit from improved access to finance, lower financing constraints, and reduced perceived default risk (El Ghoul et al., 2011; Cheng et al., 2014). The use of lagged ESG variables suggests that lenders incorporate ESG as a forward-looking indicator of long-term creditworthiness rather than short-term performance.

In the context of emerging and institutionally diverse markets, such as the Arab MENA region, lenders appear to rely more heavily on aggregate ESG signals and reputational indicators than on detailed disclosures (Nguyen & Phan, 2020). The results confirm a negative relationship between ESG performance and the cost of debt in this region, suggesting that creditors treat ESG as a comprehensive signal of firm quality and risk.

At the pillar level, environmental and social performance are both negatively related to the cost of debt, implying that firms with stronger environmental practices and stakeholder relations face lower borrowing costs due to reduced regulatory, reputational, and operational risks. In contrast, governance performance shows a negative but statistically insignificant effect, suggesting that governance factors are less emphasized by lenders in the MENA context, possibly due to differences in enforcement quality and disclosure practices.

Overall, the study supports existing literature documenting a negative relationship between ESG performance and cost of debt, while extending this evidence to the Arab MENA region. It highlights that ESG is priced holistically in debt markets and functions as a multidimensional signal of risk, reputation, and long-term sustainability rather than as isolated components.

7 Research Limitations and Recommendations for Future Academic Research

This study is subject to several limitations. First, ESG measures rely on secondary scoring systems that may suffer from inconsistencies and limited comparability across firms and countries, particularly in emerging markets. Second, although lagged ESG variables are

employed, potential endogeneity issues such as reverse causality and omitted variable bias cannot be fully ruled out. Third, the model does not include several relevant determinants of the cost of debt, such as credit ratings and macroeconomic conditions. Finally, the relatively short panel period limits the ability to capture long-term ESG effects.

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