

ESG reporting quality and its impact on investment and debt financing decisions: evidence from emerging market firms

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Abstract

Purpose – While corporate financing requires external funding, high-quality sustainability disclosures can signal transparency and help reduce borrowing costs, particularly in emerging markets where firm motivations vary. This study examines whether environmental, social and governance (ESG) reporting quality contributes to lower debt financing costs and how it informs investment and financing decisions by enhancing investment efficiency in firms with lower debt financing costs.

Design/methodology/approach – A quantitative approach was employed using panel data of 609 firm-year observations from non-financial firms listed on the Thai Stock Exchange, 2019–2023. We used a Least Squares Dummy Variable regression for the main analysis and a generalized method of moments approach for robustness checks.

Findings – We find that high-quality ESG reports are positively associated with lower costs of debt financing. ESG reporting quality positively strengthens the association between lower costs of debt financing and investment efficiency. Both overinvestment and underinvestment are mitigated in firms with lower debt financing costs and high-quality ESG disclosures.

Practical implications – Our results could make managers aware of integrating ESG considerations into a firm's strategies for improving financing and investment decisions. Strengthening high-quality ESG reporting can potentially enhance more effective investment and financing outcomes.

Social implications – High-quality ESG disclosures can serve as a credible signal of investment quality in debt markets.

Originality/value – This study, among empirical studies on ESG and the cost of debt, provides evidence that high-quality ESG disclosures could improve investment efficiency in firms, leading to lower debt financing costs.

Keywords ESG reporting quality, Debt financing costs, Information asymmetry, Investment efficiency, Overinvestment, Underinvestment

Paper type Research article

1. Introduction

Corporate financing behavior mainly relies on internal sources of funds, and when external financing is required, firms tend to use debt over equity (Myers and Majluf, 1984). These financing decisions are closely linked to investment behavior for firms that need to wisely manage both the cost and structure of their capital to pursue investment opportunities (Modigliani and Miller, 1958; Fazzari *et al.*, 1988). While traditional capital structure has emphasized firm-specific financial factors, such as profitability, asset tangibility, and market conditions (Myers, 2001; Modigliani and Miller, 1958), increasing attention has turned to how non-financial disclosures—particularly environmental, social, and governance (ESG) reporting—influence financing and investment outcomes (Suttipun, 2023). In emerging



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markets, corporate governance, among ESG elements, has the greatest effect on lowering financing costs (Shi *et al.*, 2024). The debt market, in particular, perceives useful information in a company's report to support their lending decisions (Muttakin *et al.*, 2020). While corporate social responsibility (CSR) disclosures tend to primarily reduce underinvestment (Zamir *et al.*, 2022), a high ESG rating has become a crucial factor for investors, requiring inclusion of all ESG pillars to ensure transparency through the measurable ESG data (Apergis *et al.*, 2022). Nevertheless, empirical evidence of the impact of ESG reporting quality on both debt financing costs and investment efficiency remains limited.

This study is motivated by the increasing emphasis on how ESG ratings reduce debt costs (Apergis *et al.*, 2022; Shi *et al.*, 2024) and how high-quality ESG disclosures influence investment decisions (Kotsantonis *et al.*, 2016; Ellili, 2022). Particularly, in emerging markets, studies have significantly investigated how corporate social performance positively influences debt costs (e.g. Suto and Takehara, 2017; Magnanelli and Izzo, 2017). Similarly, ESG performance has been found to reduce the cost of capital (Tanjung, 2023) and improve investment efficiency (Xue *et al.*, 2023). However, limited attention has been paid to the firm-level channels—including information asymmetry, financial constraints, internal cash flows, and risk exposure—through which ESG performance affects investment inefficiency (Bilyay-Erdogan *et al.*, 2024). Such disclosures serve as credible signals about a firm's long-term commitment, risk profile, and governance quality to external investors (Spence, 1973). Moreover, ESG reporting quality helps reduce information asymmetry between firms and investors, thereby mitigating perceived risks and the costs of external capital (Dhaliwal *et al.*, 2011). Despite these insights, the role of high-quality ESG disclosures in signalling transparency and lowering borrowing costs remains underexplored, particularly in emerging markets where sustainability reporting is driven by different motivations. We propose research questions as follows:

- RQ1. How does ESG reporting quality influence firms' lower costs of debt financing in an emerging market?
- RQ2. How does ESG reporting quality strengthen the association between lower debt financing costs and investment efficiency by mitigating investment inefficiencies in an emerging market context?

We predict that ESG reporting quality can have a tendency to lower debt financing costs, which in turn improves investment efficiency by reducing inefficiencies, particularly for emerging firms. First, we argue that ESG reporting quality creates greater benefits for firms in reducing debt financing costs. ESG rating has a positive impact on the lower costs of unsecured debt (Apergis *et al.*, 2022). Among three ESG components, corporate governance solely plays a significant role in reducing firms' debt financing costs (Shi *et al.*, 2024). A good corporate reputation allows firms to reduce the cost of debt financing by disclosing strong ESG performance (Maaloul *et al.*, 2023). Second, we expect that ESG reporting quality strengthens the association between firms' lower debt costs and investment efficiency through the mitigation of both overinvestment and underinvestment. CSR disclosures enable firms to reduce underinvestment while leaving overinvestment with higher asymmetry (Zamir *et al.*, 2022). By extending prior studies (e.g. Suto and Takehara, 2017; Tanjung, 2023; Magnanelli and Izzo, 2017; Shi *et al.*, 2024; Zamir *et al.*, 2022), we investigate whether ESG reporting quality positively influences investment efficiency—by reducing both overinvestment and underinvestment—in firms with lower debt financing costs.

Our results contribute to the following literature by integrating sustainability reporting quality into traditional models of investment and financing decision-making. First, firms that provide high-quality ESG reports benefit from lower debt financing costs. The quality of ESG information enables debt market investors to assess borrowers' sustainability information more accurately, which can potentially lead to lower costs of borrowing (La Rosa *et al.*, 2018;

Apergis *et al.*, 2022; Eliwa *et al.*, 2021; Maaloul *et al.*, 2023). Particularly, lending institutions integrate ESG data into their decision-making procedures to assess the financial stability and long-term sustainability of the borrowers (Eliwa *et al.*, 2021). Second, our findings extend prior research (e.g. Suto and Takehara, 2017; Magnanelli and Izzo, 2017; Zamir *et al.*, 2022), which suggests that CSR disclosures significantly reduce underinvestment and debt costs, by showing that high-quality ESG disclosures play a moderating role in strengthening the effect of investment efficiency—reducing both overinvestment and underinvestment—on lower debt financing costs. In emerging markets, in particular, the quality of ESG information correlates with lower costs of borrowing (Tanjung, 2023), with this correlation being stronger for firms that enhance investment efficiency by reducing investment inefficiencies (Al-Hiyari *et al.*, 2023; Xue *et al.*, 2023). Our findings inform investors and other market participants that high-quality ESG disclosures serve as a credible signal, guiding lending and investment decisions.

Using a sample of 609 firm-year observation drawn from the Stock Exchange of Thailand, 2019–2023, we examine whether high-quality ESG reporting influences investment efficiency and debt financing costs. Across panel regression models, we find that high-quality ESG reporting enhances investment efficiency in firms with lower borrowing costs. This is particularly important for debt-reliant firms, as high-quality disclosures can reduce lenders' perceived risk and debt financing costs (Sengupta, 1998). Our findings are robust across alternative ESG quality measures, model specifications, econometric procedures, and endogeneity controls.

The remainder of the paper proceeds as follows: Section 2 reviews relevant literature and hypothesis development. Section 3 provides theoretical framework. Section 4 details the empirical framework, including sample and data collection, model specification, and variable definitions. Section 5 presents the empirical results, robustness checks, and discussion, while Section 6 offers concluding remarks.

2. Literature review and hypothesis development

2.1 ESG reporting quality and debt financing costs

Research on ESG reporting and corporate finance has grown substantially, highlighting how high-quality ESG disclosures enhance corporate transparency and responsibility, reduce information asymmetry, and signal responsible management to debt markets (Dhaliwal *et al.*, 2011; Eliwa *et al.*, 2021; Apergis *et al.*, 2022). Such disclosures can increase demand for their securities and appeal to lenders, who may, in turn, offer more favorable debt terms (La Rosa *et al.*, 2018; Apergis *et al.*, 2022). The impact of ESG performance disclosure on the cost of debt is often stronger in developed markets with a stakeholder-oriented approach, where public interests play a vital role (Eliwa *et al.*, 2021). Nevertheless, ESG controversies may undermine the credibility of reporting and its signalling effectiveness (Hampl and Vágnerová Linnertová, 2024), as well as limit the extent to which firms can lower their costs of debt financing (Maaloul *et al.*, 2023).

Recent studies (e.g. Darsono *et al.*, 2025; Shi *et al.*, 2024) suggest that ESG scores lower corporate debt financing costs by signalling transparency and mitigating information asymmetry. According to signalling theory, firms communicate credible information to reduce such asymmetries (Spence, 1973), which otherwise hinder investors and lenders from accurately assessing firm risk (La Rosa *et al.*, 2018). High-quality voluntary disclosures can therefore reduce the costs of equity capital (Dhaliwal *et al.*, 2011). Drawing from these insights, we examine whether high-quality ESG disclosures help firms achieve lower debt financing costs by signalling transparency and mitigating information asymmetry in the debt markets. We propose the first hypothesis as follows:

H1. Firms with higher ESG reporting quality incur lower costs of debt financing.

2.2 The moderating effect of ESG reporting quality on lower debt costs and investment efficiency

In emerging markets, evidence on ESG reporting and investment efficiency presents a complex picture. Some studies suggest that non-ESG reporting firms experience a lower cost of capital than ESG firms, though this cost negatively affects the market value of non-ESG firms (Tanjung, 2023). Firms facing ESG controversies may improve investment efficiency by reducing underinvestment constraints (Xue *et al.*, 2023), while strong ESG reporting mitigates managerial overinvestment to improve efficiency (Al-Hiyari *et al.*, 2023). Since investment inefficiency is measured by abnormal investment levels based on firms' opportunities (Gomariz and Ballesta, 2014; Biddle *et al.*, 2009), high-quality ESG disclosures may enable firms to align their investment closer to optimal. Nevertheless, the use of ESG data still poses challenges, as its classification as "non-financial" information can potentially mislead users (Glazerman and Cohen, 2020).

ESG reporting quality serves as a credible signal of managerial discipline, operational efficiency, and long-term strategic value, shaping investor and lender perceptions (Apergis *et al.*, 2022; Eliwa *et al.*, 2021). However, managerial discretion in disclosures can create risks for creditors, prompting debt covenants and restrictions that influence debt pricing (Muttakin *et al.*, 2020). ESG performance can signal lower financial risks (Suttipun, 2023) and reduced information asymmetry to creditors (Zamir *et al.*, 2022), supporting their lending decisions while helping firms enhance investment efficiency and lower debt financing costs (La Rosa *et al.*, 2018). Overall, the impact of ESG reporting from emerging markets remains complex and varies depending on firms' motivations to disclose. Thus, we examine whether firms with high-quality ESG disclosures can benefit from lower costs of debt financing, which in turn enhances investment efficiency by mitigating both overinvestment and underinvestment. Our second hypothesis and its sub-hypotheses are proposed.

- H2. The association between lower costs of debt financing and investment efficiency is stronger for firms with ESG reporting quality.
- H2a. The association between lower costs of debt financing and investment efficiency by reducing overinvestment is stronger for firms with ESG reporting quality.
- H2b. The association between lower costs of debt financing and investment efficiency by reducing underinvestment is stronger for firms with ESG reporting quality.

3. Theoretical framework

Recent studies have highlighted how ESG reporting—as more than symbolic—serves as a signal in debt markets and a driver of investment efficiency by providing quality information, thereby reducing information asymmetry and influencing lenders' financing decisions (e.g. Dhaliwal *et al.*, 2011; Eliwa *et al.*, 2021; Apergis *et al.*, 2022). From a signalling perspective, firms with limited engagement in ESG activities may struggle to convey credibility to external stakeholders, leading to inefficient resource allocation and higher information asymmetry (Dhaliwal *et al.*, 2011; Zamir *et al.*, 2022; La Rosa *et al.*, 2018). While high-quality ESG disclosures signal transparency and help reduce overinvestment, they are less effective in addressing underinvestment and financing constraints under high information asymmetry (Bilyay-Erdogan *et al.*, 2024). Moreover, asymmetries of information between firms and debt providers can distort debt pricing (Muttakin *et al.*, 2020).

This study draws on signalling theory (Spence, 1973) and information asymmetry theory (Akerlof, 1970) to explain how ESG reporting quality enhances investment efficiency in firms with lower debt financing costs. High-quality ESG disclosures signal transparency, managerial discipline, and long-term value creation, enabling investors and lenders to better assess firms' risks (Dhaliwal *et al.*, 2011; Zamir *et al.*, 2022; La Rosa *et al.*, 2018). With credible ESG signals, firms strengthen stakeholder trust, facilitate favorable financing terms,

and enhance investment efficiency (Zamir *et al.*, 2022; La Rosa *et al.*, 2018). This aspect is particularly relevant in emerging economies like Thailand—where information asymmetry is pronounced—highlighting ESG reporting’s role in reducing corporate financial risks (Suttipun, 2023). Consequently, we examine whether higher ESG reporting quality helps reduce debt financing costs (H1) and strengthens the association between lower debt financing costs and investment efficiency (H2), which we test empirically using panel data regression models.

4. Research design and methodology

Research on ESG reporting, investment efficiency and cost of debt has increasingly highlighted the importance of firm-specific characteristics and temporal dynamics in emerging markets (e.g. Al-Hiyari *et al.*, 2023; Bilyay-Erdogan *et al.*, 2024; Eliwa *et al.*, 2021). Panel estimation, particularly the Least Squares Dummy Variable (LSDV) approach, addresses this by controlling for unobserved firm effects, providing more reliable estimates (Muttakin *et al.*, 2020). Prior studies (e.g. Muttakin *et al.*, 2020; Gomariz and Ballesta, 2014; Eliwa *et al.*, 2021) have employed a variety of econometric approaches to account for heterogeneity and endogeneity with lagged instruments, including change analysis, panel-data models and generalized method of moments (GMM) estimations (Arellano and Bond, 1991; Blundell and Bond, 1998). Building on this literature, this study uses a panel-data design with LSDV fixed-effects models to examine whether ESG reporting quality influences debt financing and investment efficiency in Thai-listed firms. To further address potential endogeneity concerns, we complement our analysis with GMM estimations and change analysis, confirming our findings are robust across different estimation methods.

4.1 Sample and data collection

This study collected data using the SETSMART provided by the Stock Exchange of Thailand (SET, 2022). We selected seven of the eight industry sectors that have publicly disclosed ESG performance for the years covered in our study. We also identify sampled firms that incorporate ESG performance in their reports in alignment with the Global Reporting Initiative (GRI) guidelines and SET requirements (SET, 2015; SET, 2022). The initial dataset comprised 908 firm-year observations. We excluded 149 observations from the financial sector because of its unique reporting practices and regulatory obligations, resulting in 759 observations. After removing eight (8) observations with insufficient ESG information and 142 with missing financial data, the final sample comprises 609 non-financial firm-year observations. This final dataset ensures robust analysis of ESG reporting quality, strengthening the association between investment efficiency and lower debt costs (Table 1).

For the data collection process, we begin with setting ESG pillar themes and weighting methods based on the Refinitiv ESG Materiality Matrix to measure ESG factors relevant to the industry (LSEG, 2022). We then use the materiality matrix to categorise quality ESG

Table 1. Number of a sample and its distribution

Total observations available in SETSMART database (from 2019 to 2022)	908
Less financial observations	81
Funds and Trusts	68
Observations with missing ESG	8
Non-financial observations	751
Less observations with missing financial information	142
Final sample	609
Source(s): Authors’ own work	

information in accordance with category weights to ensure consistency in the ESG score calculated across the 609 sample firms (see [Appendix 1](#)). This process involves three steps: identifying category weights, selecting new category weights, and determining the ESG pillars that meet the threshold for high-quality ESG information (defined as achieving scores equal to or above 0.75 (75%)) (see also [Appendix 2](#)). Additionally, we collected financial data from the SETSMART, a repository of company information, financial statements, key statistics, and corporate announcements ([SET, 2022](#)).

4.2 Model specification

Following [Eliwa et al. \(2021\)](#), this study proposes a model to test the association between ESG reporting quality, firms' costs of debt financing, and relevant control variables ([H1](#)). The regression model is proposed as follows:

$$\begin{aligned} DebtFinCost_{i,t} = & \beta_0 + \beta_1 ESG_{i,t} + \beta_2 FSIZE_{i,t} + \beta_3 FAGE_{i,t} + \beta_4 MTB_{i,t} + \beta_5 LEV_{i,t} \\ & + \beta_6 PROF_{i,t} + \beta_7 TANG_{i,t} + \beta_8 LOSS_{i,t} + \beta_9 INDUSTRYDUMMIES_{i,t} \\ & + \beta_{10} YEARDUMMIES_{i,t} + \varepsilon_{i,t} \end{aligned} \quad (1)$$

Where $DebtFinCost_{i,t}$ represents the total interest expenses divided by the total debt reported on the income statement ([Magnanelli and Izzo, 2017](#)). In this model, the negative and significant coefficients for ESG and its individual pillars indicate that firms with high-quality ESG reports have lower debt costs, which suggests more favorable lending terms and greater creditor trust ([Eliwa et al., 2021](#)). ESG reporting quality is the total score of environmental, social, and governance pillars, measured by the Refinitiv Eikon format ([LSEG, 2022](#)). The control variables include firm size ($FSIZE$), firm age ($FAGE$), market-to-book value (MTB), leverage (LEV), profitability ($PROF$), tangibility ($TANG$), and loss ($LOSS$). This study further proposes a second model to examine the effect of ESG reporting quality on firms' debt financing costs and investment efficiency as follows:

$$\begin{aligned} InvEff_{i,t} = & \beta_0 + \beta_1 DebtFinCost_{i,t} + \beta_2 ESG_{i,t} + \beta_3 (DebtFinCost_{i,t} \times ESG_{i,t}) + \beta_4 FSIZE_{i,t} \\ & + \beta_5 FAGE_{i,t} + \beta_6 MTB_{i,t} + \beta_7 LEV_{i,t} + \beta_8 PROF_{i,t} + \beta_9 TANG_{i,t} + \beta_{10} LOSS_{i,t} \\ & + \beta_{11} INDUSTRYDUMMIES_{i,t} + \beta_{12} YEARDUMMIES_{i,t} + \varepsilon_{i,t} \end{aligned} \quad (2)$$

Where $DebtFinCost_{i,t} \times ESG_{i,t}$ represents the interaction effect. In this model, debt financing costs is also expected to be negative and significant as for lowering debt costs. ESG pillar scores are expected to be positive for improving investment efficiency and negative for reducing overinvestment and underinvestment. The negative and significant coefficients for ESG and its individual pillars indicate that firms with ESG reporting quality have an impact on lowering debt costs, which suggests more favorable lending terms and greater creditor trust ([Eliwa et al., 2021](#)). Thus, the coefficient β_1 is expected to be negative and significant, indicating that the effect of investment efficiency on lower debt costs when ESG reporting quality is at its median. For firms with ESG reporting quality, the sum of the coefficients represents the total effect of investment efficiency on the lower debt costs is given by the sum of the coefficients $\beta_1 + \beta_3$, indicating that this effect is higher than the median. Therefore, if firms with high-quality ESG reports experience a greater reduction in the debt costs through investment efficiency, β_3 will be negative and significant.

4.3 Definitions of variables and measurement

4.3.1 *Dependent variable.* Debt financing cost (*DebtFinCost*) is a dependent variable (Equation (1)). Following Magnanelli and Izzo (2017), we consider interest expenses on debt, which encompass service charges for capital usage prior to deducting capitalized interest. In this study, debt financing costs are the expenses a firm incurs when raising and servicing debt, including interest, issuance fees, and any other charges.

Investment efficiency (*InvEff*) refers to the efficiency of capital allocation, which is measured as the absolute value of the residuals of the investment model multiplied by -1 . Following Biddle et al. (2009), we evaluate investment efficiency based on sales growth, with deviations including overinvestment and underinvestment. The model is shown below.

$$Investment_{i,t} = \beta_0 + \beta_1 SalesGrowth_{i,t} + \varepsilon_{i,t} \tag{3}$$

Where $Investment_{i,t}$ is the net increase in tangible and intangible assets scaled by lagged total assets. $SalesGrowth_{i,t-1}$ is the percentage increase or decrease in sales for firm i during the period $t-2$ to $t-1$. We estimate the model cross-sectionally by industry and year. The residuals of the regression model represent the differences between actual and projected investment levels and serve as proxies for investment efficiencies.

Following Gomariz and Ballesta (2014), overinvestment and underinvestment, the sub-independent variables, are measured using residuals from the investment efficiency model. Positive residuals (multiplied by -1) refer to overinvestment—where actual investment exceeds the optimal level—while negative residuals indicate underinvestment, or investment below the optimal level.

4.3.2 *Independent variables.* In this study, ESG reporting quality is used as an independent variable. Following Shi et al. (2024), we evaluate the three ESG dimensions separately using pillar scores for environmental (ENV), social (SOC), and governance (GOV) as proxies. We then sum these scores to create an aggregated ESG score (ESG aggregate). Firms are identified as having ESG reporting quality if their total ESG pillar score is equal to or greater than 0.75 (75%).

Debt financing cost is also used as an independent variable (Equation (2)), measured the same as a dependent variable in the first model. In the second model, *DebtFinCost* serves as an interaction effect with ESG reporting quality to examine its effect on investment efficiency, overinvestment and derangement.

4.3.3 *Control variables.* The control variables include firm size (*FSIZE*), which measures the firm's dimension using the natural logarithm of the book value of total assets. Firm age (*FAGE*) is the logarithm of the firm's age. Market-to-book value (*MTB*) is the ratio of the market value of equity to the book value of equity to measure a firm's growth opportunities. We calculate leverage (*LEV*) by dividing total debt by total assets. Profitability (*PROF*) is the ratio of earnings before interest and taxes to total assets. Tangibility (*TANG*) is the ratio of property, plant, and equipment to total assets, and *LOSS* is a dummy variable, indicating "1" if a firm reported any loss in the previous financial year and 0 otherwise. A self-contained summary of all variable definitions and measurement methods is given in Table 2.

5. Empirical results

5.1 Descriptive statistics

Table 3 presents the descriptive statistics. The sampled firms' debt financing costs (*DebtFinCost*) have a mean of 0.456 and a median of 0.470. Investment efficiency (*InvEff*) has a mean and median of 0.133 and 0.150 respectively. Overinvestment and underinvestment have means of 0.972 and -1.065 and medians of 0.986 and -0.684 . Environmental, social, governance, and ESG aggregates show means (medians) of 0.297 (0.296), 0.276 (0.276), 0.229 (0.229), and 0.802 (0.801), respectively. Firm size (*FSIZE*) and firm age (*FAGE*) have mean and median values of 8.551 and 2.965 and 8.280 and 3.060. Market-to-book value

Table 2. Definitions of variables

Variables	Types	Description
Debt financing costs (DebtFinCost)	Dependent/Independent	The ratio of total financial interest expenses divided by the total debt
Investment efficiency (InvEff)	Dependent	The net increase in tangible and intangible assets scaled by lagged total assets
Overinvestment	Sub-dependent	Positive residuals multiplied by -1 in the investment model
Underinvestment	Sub-dependent	Negative residuals in the investment model
Environmental (ENV)	Independent	The calculation of environmental pillar score
Social (SOV)	Independent	The calculation of social pillar score
Governance (GOV)	Independent	The calculation of governance pillar score
ESG aggregate	Independent	The sum of an aggregated ESG score
Firm size (FSIZE)	Control variable	The firm's dimension using the natural logarithm of the book value of total assets
Firm age (FAGE)	Control variable	The logarithm of the firm's age
Market-to-book value (MTB)	Control variable	The ratio of the market value of equity to the book value of equity
Leverage (LEV)	Control variable	The total debt divided by total assets
Profitability (PROF)	Control variable	The ratio of earnings before interest and taxes to total assets
Tangibility (TANG)	Control variable	The ratio of property, plant, and equipment to total assets
LOSS	Control variable	Dummy variable equal to 1 if the firm reported a loss in the previous year, 0 otherwise

Source(s): Authors' own work**Table 3.** Descriptive statistics

Variables	Observation no.	Minimum	Maximum	Mean	Median	Std. deviation
DebtFinCost	3,045	-0.001	0.900	0.456	0.470	0.202
InvEff	3,045	-0.660	1.400	0.133	0.150	0.257
Overinvestment	2,205	0.021	3.602	0.972	0.986	0.445
Underinvestment	840	-5.738	-0.008	-1.065	-0.684	1.110
Environmental	3,045	0.263	0.353	0.297	0.296	0.023
Social	3,045	0.245	0.328	0.276	0.276	0.021
Governance	3,045	0.203	0.272	0.229	0.229	0.018
ESG aggregate	3,045	0.711	0.953	0.802	0.801	0.062
FSIZE	3,045	4.720	14.920	8.551	8.280	1.629
FAGE	3,045	-1.100	4.570	2.965	3.060	0.596
MTB	3,045	0.280	2.680	1.662	2.030	0.698
LEV	3,045	-0.280	0.650	0.400	0.430	0.140
PROF	3,045	-2.120	4.500	0.590	0.560	0.855
TANG	3,045	-1.450	0.870	0.456	0.510	0.273
LOSS		0.000	1.000	0.816	1.000	0.388
			1		0	
		2,497	82%	548	18%	

Note(s): See Table 2 for definitions of variables**Source(s):** Authors' own work

(MTB) has a mean and a median of 1.662 and 2.030, while leverage (LEV) has 0.400 and 0.430. Profitability (PROF) and tangibility (TANG) have means of 0.590 and 0.456 and medians of 0.560 and 0.510. A firm that reported any loss (LOSS) in the previous financial year has a mean and a median of 0.816 and 1.000.

Table 4 illustrates the Pearson correlation matrix among key variables. Debt financing cost is negatively associated with ESG pillars—environmental, social, and governance—suggesting that firms with ESG reporting quality experience lower debt financing costs. Similarly, investment efficiency is positively correlated with ESG performance pillars, indicating that ESG reporting quality enhances efficient capital allocation. Based on our expectations, overinvestment and underinvestment are negatively associated with ESG pillars and the cost of debt financing. ESG pillars also show correlations with firm size, firm age, and market-to-book value, indicating their relevance in broader financial and operational contexts. Overall, given the low-to-moderate correlations between independent variables, the matrix provides initial support for hypothesised relationships, and it is unlikely that collinearity will present an issue in our investigation.

5.2 Regression results

Table 5 presents the results of the LSDV regression for equation (1). We observe a negative and statistically significant correlation between the dependent variable, the debt financing cost (*DebtFinCost*), and the hypothesized variable, the ESG performance pillars. The results support hypothesis (H1) and are consistent with the notion that ESG performance disclosures enhance the quality of sustainability-related information in a company’s reports, providing lenders with more profound insights into the financial and non-financial factors that drive borrowers’ sustainability values. The significantly negative coefficients across all four ESG measures indicate that lenders reward firms with ESG reporting quality disclosures by offering lower lending costs, consistent with Eliwa et al. (2021). For control variables, we observe a positive correlation between firm size (*FSIZE*), profitability (*PROF*), and tangibility (*TANG*) with lower debt financing costs.

Table 6 represents the results of the moderating effect of ESG reporting quality on lower costs of debt financing and investment efficiency. We document that the effect of an aggregate ESG measure on the debt financing cost (*DebtFinCost*) shows a negative and significant coefficient, whereas the investment efficiency coefficient is positive and significant. For those firms with high-quality ESG reports, the coefficient of debt financing costs is -0.043 ($p < 0.10$), and its effect is given by $\beta_1 + \beta_3 = -0.043 + (-0.189) = -0.232$. The coefficient of firms’ lower debt financing costs (-0.043) is higher than the interaction effect (-0.232), suggesting that while high-quality ESG reports alone enhance investment efficiency, the moderating effect of lower debt costs reverses this association. This indicates that the association between lower costs of debt financing and ESG reporting may change investment behavior in a way that influences overall investment and financing decisions. We confirm hypothesis (H2). Regarding the control variables, we observe a positive correlation between market-to-book ratio (*MTB*) and tangibility (*TANG*) with investment efficiency. Leverage (*LEV*) and firm size (*FSIZE*), on the other hand, have a significant negative effect on investment efficiency.

This study further analyses whether the association between lower costs of debt financing and investment efficiency by reducing inefficiencies—overinvestment and underinvestment—is stronger for firms with high-quality ESG reports. In the case of overinvestment, the effect of lower costs of debt financing on overinvestment demonstrates a negative and significant coefficient, while the ESG coefficient shows a positively significant effect. For those firms with high-quality ESG reporting, the coefficient of lower costs of debt financing is -0.247 ($p < 0.10$), and its effect is given by $\beta_1 + \beta_3 = -0.247 + (-0.071) = -0.318$. The coefficient of firms’ lower debt costs (-0.247) is higher than the interaction effect (-0.318), which means that while ESG reporting quality alone appears to increase overinvestment, lower costs of debt financing moderate this relationship, resulting in reducing overall overinvestment issues. We confirm sub-hypothesis (H2a).

Table 4. Pearson correlation matrix

Variables	InvEff	Over.	Under.	ENV.	SOC.	GOV.	ESG aggr.	DebtFin cost	FSIZE	FAGE	MTB	LEV	PRO	TANG	LOSS
InvEff	1														
Over.	0.012**	1.000													
Under.	0.087*	−0.085***	1.000												
Environment	−0.035***	−0.019***	−0.092***	1.000											
Social	−0.032***	0.024**	−0.110***	0.730	1.000										
Governance	−0.012***	−0.007***	−0.011***	0.576	0.516	1.000									
ESG aggr.	−0.042***	−0.004***	−0.099***	0.848	0.852	0.819	1.000								
DebtFinCost	0.118	−0.066***	0.123	−0.045***	−0.044***	−0.089***	−0.076***	1.000							
FSIZE	0.069*	−0.028***	0.043**	0.007***	0.006***	−0.033***	−0.015***	0.669	1.000						
FAGE	−0.005***	−0.026***	0.112	−0.011***	−0.017***	−0.020***	−0.012***	0.077*	0.126	1.000					
MTB	0.119	0.012**	−0.029***	−0.037***	−0.038***	−0.003***	−0.036***	0.052*	0.063*	−0.058***	1.000				
LEV	−0.161***	0.010**	−0.009***	−0.029***	−0.050***	−0.011***	−0.008***	−0.538***	−0.771***	−0.009***	−0.342***	1.000			
PROF	−0.005***	0.008***	−0.051***	−0.019***	−0.044***	−0.027***	−0.028***	−0.121***	−0.272***	0.011**	−0.006***	0.197	1.000		
TANG	0.149	0.046**	0.067*	0.022**	0.029**	−0.060***	−0.003***	0.517	0.610	0.020**	−0.017***	−0.501***	−0.211***	1.000	
LOSS	0.047**	−0.013***	0.031**	−0.098***	−0.094***	−0.078***	−0.109***	0.056*	0.053*	0.061*	0.285	−0.107***	0.034	−0.040***	1.000

Note(s): * = statistically significant at less than 0.10 level

** = statistically significant at less than 0.05 level

*** = statistically significant at less than 0.01 level

Source(s): Authors' own work

Table 5. Direct effect of ESG reporting quality on lower debt financing costs

Variables	1	2	3	4
Environmental	−0.420* (0.237)			
Social		−0.356* (0.207)		
Governance			−0.508** (0.257)	
ESG aggregate				−0.196** (0.091)
FSIZE	0.068*** (0.007)	0.066*** (0.007)	0.067*** (0.007)	0.067*** (0.007)
FAGE	0.001 (0.010)	0.000 (0.010)	0.000 (0.010)	0.000 (0.010)
MTB	0.032 (0.021)	0.033 (0.021)	0.034 (0.021)	0.033 (0.021)
LEV	−0.058 (0.088)	−0.088 (0.087)	−0.079 (0.087)	−0.074 (0.087)
PROF	0.018** (0.007)	0.017** (0.007)	0.017** (0.007)	0.017** (0.007)
TANG	0.132*** (0.028)	0.130*** (0.028)	0.126*** (0.028)	0.130*** (0.028)
LOSS	0.016 (0.016)	0.016 (0.016)	0.016 (0.016)	0.015 (0.016)
LSDV R-squared	0.479	0.479	0.480	0.480
Within R-squared	0.470	0.470	0.471	0.472
LSDV F	54.969	54.928	55.115	55.249
P < F	0.000	0.000	0.000	0.000
Industry dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Observations	609	609	609	609

Note(s): See Table 2 for definitions of variables
* = statistically significant at less than 0.10 level
** = statistically significant at less than 0.05 level
*** = statistically significant at less than 0.01 level

Source(s): Authors' own work

For the case of underinvestment, the effects of lower costs of debt financing on underinvestment demonstrate a negative and significant coefficient, while the ESG coefficient is positive and significant. For firms with high-quality ESG disclosures, the coefficient of lower debt costs is -0.704 ($p < 0.05$), and its effect is given by $\beta_1 + \beta_3 = -0.704 + (-0.551) = -1.255$. The effect of lower debt costs (-0.704) is greater than the interaction effect (-1.255), suggesting that ESG reporting quality alone increases underinvestment, whereas lower debt costs moderate this association. The results confirm the hypothesis (H2b), indicating that ESG reporting quality strengthens the association between lower costs of debt financing and reduced underinvestment.

5.3 Robustness check

The presence of associated omitted variables may impact our findings' reliability. Certain observable or unobservable characteristics of firms may impact both debt costs and ESG disclosures. To address potential endogeneity issues, we use change analysis and the generalized method of moments (GMM) approach.

Table 6. The moderating effect of ESG reporting quality on lower debt financing costs and investment efficiency, overinvestment and underinvestment

Variables	Investment efficiency	Overinvestment	Underinvestment
DebtFinCost	−0.043* (0.023)	−0.257* (0.135)	−0.704** (0.355)
ESG aggregate	0.138*** (0.037)	0.194* (0.107)	0.100* (0.060)
DebtFinCost * ESG aggregate	−0.189** (0.085)	−0.104*** (0.031)	−0.551** (0.234)
FSIZE	−0.042*** (0.013)	−0.000 (0.024)	0.111 (0.091)
FAGE	0.003 (0.017)	−0.027 (0.034)	0.109 (0.142)
MTB	0.302*** (0.099)	−0.018 (0.045)	0.477 (0.395)
LEV	−0.379*** (0.145)	0.200 (0.247)	0.452 (0.975)
PROF	0.007 (0.012)	−0.000 (0.024)	0.025 (0.095)
TANG	0.144*** (0.047)	0.236*** (0.089)	0.210 (0.463)
LOSS	0.010 (0.027)	0.020 (0.070)	−0.547* (0.198)
LSDV R-squared	0.094	0.086	0.233
Within R-squared	0.079	0.061	0.150
LSDV F	5.162	3.634	2.018
P < F	0.000	0.000	0.008
Industry dummies	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
Observations	609	439	169

Note(s): See Table 2 for definitions of variables

* = statistically significant at less than 0.10 level

** = statistically significant at less than 0.05 level

*** = statistically significant at less than 0.01 level

Source(s): Authors' own work

5.3.1 Change analysis. We conduct the change analysis using the following model:

$$\begin{aligned} \Delta \text{DebtFinCost}_{i,t} = & \text{ESG}_{i,t} + \Delta \text{FSIZE}_{i,t} + \Delta \text{FAGE}_{i,t} + \Delta \text{MTB}_{i,t} + \Delta \text{LEV}_{i,t} + \Delta \text{PRO}_{i,t} \\ & + \Delta \text{TANG}_{i,t} + \Delta \text{LOSS}_{i,t} + \varepsilon_{i,t} \end{aligned} \quad (4)$$

Where $\Delta \text{DebtFinCost}_{i,t}$ is the first difference of the cost of debt financing variable. The *ESG* represents the overall score for the environmental, social, and governance pillars, calculated using the Refinitiv magnitude matrix (LSEG, 2022). The control variables used in equation (4) are the first difference from the control variables used in equation (1). Table 7 presents the regression results. For the variable of interest, we provide evidence of a coefficient that is both negative and statistically significant. Our findings suggest that when firms provide ESG reporting quality for the first time, their debt financing costs is likely to decrease compared to the previous year.

5.3.2 Generalized method of moments (GMM). To carry out the GMM analysis, we employ dynamic panel data model to estimate the debt financing costs and investment efficiency as instrumental variables, following the methods proposed by Arellano and Bond (1991) and

Table 7. Regression of ESG performance on debt financing costs

Variables	DebtFinCstost
ESG (First year)	−0.190** (0.090)
ΔFSIZE	0.068*** (0.007)
ΔFAGE	0.000 (0.010)
ΔMTB	−0.000 (0.010)
ΔLEV	−0.057 (0.076)
ΔPROF	0.017** (0.007)
ΔTANG	0.133*** (0.028)
ΔLOSS	0.011 (0.016)
R Square	0.477
Adjusted R ²	0.470
F	68.508
P < F	0.000
Industry dummies	Yes
Year dummies	Yes
Observations	609

Note(s): ESG = total scores across environmental, social, and governance pillars, as measured using Refinitiv Eikon format and Refinitiv magnitude matrix (LSEG, 2022); ΔFSIZE = change in firm size (natural logarithm of the total assets); ΔFAGE = change in firm age (natural logarithm of the firm’s age); ΔMTB = change in the market-to-book ratio (market value of equity/book value of equity); ΔLEV = change in the total debt divided by total assets; ΔPROF = change in profitability (earnings before interest and taxes/total assets); ΔTANG = change in asset tangibility (tangible fixed assets/total assets); and ΔLOSS = change in a dummy variable that evaluates “1” if the firms reported any loss in the previous financial years and 0 otherwise

* = statistically significant at less than 0.10 level
** = statistically significant at less than 0.05 level
*** = statistically significant at less than 0.01 level

Source(s): Authors’ own work

Blundell and Bond (1998). We analyse the effects of ESG reporting quality on lower cost of debt financing and propose the following model.

$$\begin{aligned} DebtFinCost_{it} = & \alpha_i + \beta_1 ESG_{it} + \beta_2 FSIZE_{it} + \beta_3 FAGE_{it} + \beta_4 MTB_{it} + \beta_5 LEV_{it} + \beta_6 PRO_{it} \\ & + \beta_7 TANG_{it} + \beta_8 LOSS_{it} + \beta_9 INDUSTRYDUMMIES_{i,t} \\ & + \beta_{10} YEARDUMMIES_{i,t} + \varepsilon_{it} \end{aligned} \tag{5}$$

In this model, cost of debt financing is used as an instrument variable. According to Roodman (2009), the Hansen/Sargan statistics for over-identifying restrictions for estimations are statistically significant in the AR(1) test but not statistically significant in the AR(2) test, suggesting that the instruments used in the dynamic system GMM specifications are valid. The GMM results in Table 8 indicate that there is a significant correlation for how ESG reporting quality affects lower costs of debt financing, which supports our main findings (Equation (1)).

Table 8. GMM estimation of the direct effect of ESG reporting quality on lower debt financing costs

Variables	1	2	3	4
Environmental	−0.230* (0.135)			
Social		−0.296** (0.120)		
Governance			−0.449*** (0.151)	
ESG aggregate				−0.136** (0.058)
FSIZE	0.070*** (0.004)	0.070*** (0.005)	0.070*** (0.004)	0.070*** (0.004)
FAGE	−0.001 (0.010)	0.000 (0.010)	0.000 (0.010)	0.000 (0.010)
MTB	0.002 (0.010)	0.002 (0.010)	0.002 (0.010)	0.002 (0.010)
LEV	−0.021 (0.041)	−0.027*** (0.046)	−0.029*** (0.044)	−0.025*** (0.042)
PROF	0.017*** (0.005)	0.017*** (0.005)	0.017*** (0.005)	0.017*** (0.005)
TANG	0.132*** (0.029)	0.132 (0.030)	0.127 (0.029)	0.130 (0.029)
LOSS	0.009 (0.012)	0.009 (0.012)	0.008 (0.012)	0.009 (0.013)
AR (1)	−2.572**	−2.571**	−2.574**	−2.572**
AR (2)	0.973	0.941	0.921	0.923
SARGAN TEST	566.514	564.960	565.011	566.180
Industry dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Observations	595	595	595	595

Source(s): Authors' own work

Therefore, the estimations are valid and uncorrelated with the error variables, and the results are consistent with the primary analysis.

We further estimate the moderating effects of ESG reporting quality on the association between lower costs of debt financing and investment efficiency, overinvestment and underinvestment. We propose the following model.

$$\begin{aligned}
 InvEff_{it} = & \alpha_i + \beta_1 ESG_{it} + \beta_2 DebtFinCost_{it} + \beta_3 (ESG_{it} \times DebtFinCost_{it}) + \beta_4 FSIZE_{it} \\
 & + \beta_5 FAGE_{it} + \beta_6 MTB_{it} + \beta_7 LEV_{it} + \beta_8 PROF_{it} + \beta_9 TANG_{it} + \beta_{10} LOSS_{it} \\
 & + \beta_{11} INDUSTRYDUMMIES_{it} + \beta_{12} YEARDUMMIES_{it} + \varepsilon_{it}
 \end{aligned} \quad (6)$$

Table 9 shows the test for first-order correlation is statistically significant in AR (1), while the second-order correlation is not significant in AR (2) suggesting that the instruments used in the dynamic system GMM specifications are valid and are not correlated with the error term (Roodman, 2009). The GMM results in Table 9 also support our main findings (Equation (2)), confirming that ESG reporting quality significantly influences the association between lower costs of debt financing and investment efficiency. Both overinvestment and underinvestment are significantly mitigated in firms with lower costs of debt financing and high-quality ESG disclosures. Therefore, the estimations are valid and consistent with the primary analysis.

Table 9. GMM estimation of the moderating effect of ESG reporting quality on debt financing costs and investment efficiency, overinvestment and underinvestment

Variables	Investment efficiency	Overinvestment	Underinvestment
DebtFinCost	−0.036* (0.019)	−0.203*** (0.051)	−0.779** (0.380)
ESG aggregate	0.138*** (0.044)	0.203*** (0.044)	0.173*** (0.059)
DebtFinCost * ESG aggregate	−0.189** (0.086)	−0.102*** (0.014)	−0.764*** (0.230)
FSIZE	−0.036*** (0.008)	−0.004 (0.023)	0.158 (0.120)
FAGE	0.004 (0.017)	−0.020 (0.049)	0.057 (0.142)
MTB	0.296*** (0.105)	0.014* (0.008)	0.520 (0.380)
LEV	−0.297*** (0.068)	0.274 (0.271)	0.957 (1.116)
PROF	0.014 (0.015)	0.003 (0.002)	0.015 (0.129)
TANG	0.140*** (0.034)	0.231*** (0.052)	0.137 (0.470)
LOSS	0.003 (0.020)	0.034 (0.043)	−0.502** (0.256)
AR (1)	−2.562**	−1.945*	−3.072***
AR (2)	0.660	0.010	0.243
SARGAN TEST	569.487	414.348	87.019
Industry dummies	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
Observations	595	431	143

Source(s): Authors' own work

5.4 Discussion of the results

Our empirical study highlights the impact of ESG reporting quality on debt financing decisions and investment efficiency by reducing both overinvestment and underinvestment. Consistent with prior studies (e.g. [Shi et al., 2024](#); [Eliwa et al., 2021](#); [Apergis et al., 2022](#)), we observe that firms with ESG reporting quality are rewarded with lower borrowing costs, corroborating Hypothesis (H1). In the context of emerging markets, where companies share information voluntarily for lower borrowing costs, high-quality ESG disclosures play a critical role in mitigating information asymmetry between firms and lenders, thereby lowering the costs of capital ([Dhaliwal et al., 2011](#); [Shi et al., 2024](#)).

While previous studies suggest that corporate social performance may increase debt costs due to additional monitoring or compliance concerns ([Magnanelli and Izzo, 2017](#); [Suto and Takehara, 2017](#)), our findings provide a contrasting perspective. Specifically, ESG reporting quality appears to function as a credibility-enhancing mechanism that signals transparency and long-term orientation to debt providers. From a theoretical perspective, this finding aligns with the study's framework, which posits that enhanced information environments improve capital allocation by strengthening trust between firms and financial stakeholders. As such, high-quality ESG disclosures facilitate more favorable financing conditions and strengthen lender–borrower relationships ([Darsono et al., 2025](#); [Shi et al., 2024](#)).

Extending prior studies (e.g. [Magnanelli and Izzo, 2017](#); [Suto and Takehara, 2017](#); [Maaloul et al., 2023](#); [Zamir et al., 2022](#)), the results also support Hypothesis (H2) by demonstrating that high-quality ESG reporting enhances investment efficiency. By reducing financing constraints

and information risks, ESG disclosures help firms avoid inefficient capital allocation decisions, including both overinvestment and underinvestment (H2a and H2b). This finding is consistent with studies showing that improved transparency and disclosure quality mitigate agency problems and information asymmetry (Xue *et al.*, 2023; Gomariz and Ballesta, 2014; Al-Hiyari *et al.*, 2023).

Overall, the results suggest that ESG reporting quality does not only lower financing costs but also improves the decision-usefulness of information for debt markets. High-quality ESG disclosures enable firms to benefit from lower costs of debt financing while enhancing their corporate reputation (Maaloul *et al.*, 2023), which, in turn, improves information usefulness to attract debt markets (Muttakin *et al.*, 2020). By signalling lower risk and stronger governance, firms enhance their credibility, enabling access to more efficient debt financing and supporting optimal investment decisions (Apergis *et al.*, 2022; Eliwa *et al.*, 2021; Suttipun, 2023). These findings support the theoretical argument that ESG reporting quality serves as a key informational and governance mechanism that links sustainability reporting to financial decision-making and investment efficiency in emerging market settings.

Our findings build on Zamir *et al.* (2022), who found that CSR disclosures are more effective in mitigating underinvestment than overinvestment. While their study highlights the role of sustainability disclosures in easing financial constraints, our results extend this perspective by showing that high-quality ESG reporting plays a moderating role in enhancing investment efficiency in firms with lower debt costs. Strengthening ESG transparency enhances investor confidence in debt markets, improves investment efficiency, and enables firms to secure more favorable financing—particularly in emerging markets, where disclosure incentives are critical.

6. Concluding remarks

6.1 Conclusion of the study

While corporate financing often relies on external funding, high-quality ESG disclosures can signal transparency and help reduce borrowing costs, particularly in emerging markets where firm motivations vary. Based on 609 firm-year observations from 2019 to 2023, our findings highlight the growing influence of ESG reporting on firm-level financial outcomes—specifically in lowering debt financing costs and improving investment decisions. Firms with high-quality ESG disclosures tend to have lower debt financing costs, reducing information asymmetry and signalling transparency in debt markets (Apergis *et al.*, 2022; Eliwa *et al.*, 2021; Suttipun, 2023). Extending prior studies (e.g. Magnanelli and Izzo, 2017; Suto and Takehara, 2017; Maaloul *et al.*, 2023; Zamir *et al.*, 2022), we find that ESG reporting quality enhances investment efficiency by mitigating inefficiencies in firms with lower debt financing costs. When corporate financing decisions favor debt over equity (Myers and Majluf, 1984) and traditional financing focuses on firm-specific financial factors (Myers, 2001; Modigliani and Miller, 1958), sustainability reporting can play a key role. Our results highlight that high-quality ESG disclosures influence firms' investment and financing outcomes, particularly in contexts where markets respond to sustainability signals.

6.2 Research, policy and practice implications

Our study sheds light on international reporting frameworks, providing new evidence from an emerging market context that high-quality ESG information can enhance firms' financial decision-making and market transparency in Thailand. As our analysis is based on single-country data, future research should examine emerging and developed markets to provide a more comprehensive understanding of how ESG reporting influences corporate finance outcomes. While this study focuses on ESG reporting quality and its effects on investment efficiency and debt financing costs, future studies may explore alternative financing structures, reporting mechanisms, and empirical settings to strengthen generalisability and international relevance.

Our findings provide valuable insights for regulators and policymakers considering the implementation of ESG reporting frameworks to enhance firms’ investment and financing decisions, foster long-term value creation, and promote market transparency. Such frameworks can also reduce information asymmetry between firms and lenders, supporting more efficient capital allocation. Policymakers could therefore encourage or mandate improved disclosure quality to enable responsible financing and strengthen financial stability.

For practical implications, the results highlight to corporate managers that ESG initiatives improve transparency and accountability while serving as a strategic tool for achieving lower debt financing costs. Enhancing ESG disclosure quality also helps reduce information asymmetry, signal lower default risk, and support more efficient investment decisions, thereby improving financing outcomes—particularly in capital-constrained environments. The results can be beneficial to debt markets and creditors, who may increasingly rely on sustainability disclosures in assessing credit risk when making lending conditions.

Appendix 1

Table A1. Data collection process

Step 1: ESG category score								
ESG pillars	Category	Industry sectors						
		AGR N = 60	CON N = 50	IND N = 110	PRC N = 118	RES N = 61	SER N = 160	TECH N = 50
Environmental	Emission	1	1	1	1	1	1	1
	Innovation	1	1	1	1	1	1	1
	Resource use	1	1	1	1	1	1	1
Social	Community	1	1	1	1	1	1	1
	Human rights	1	1	1	1	1	1	1
	Product responsibility	1	1	1	1	1	1	1
Governance	Workforce	1	1	1	1	1	1	1
	CSR strategy	1	1	1	1	1	1	1
	Management	1	1	1	1	1	1	1
	Shareholders	1	1	1	1	1	1	1
Note(s): Boolean data points with “Yes” is 1 or “No” is 0. 1 if a company’s environment performance is shown in its sustainability report and 0 otherwise								
Industry sectors: AGR = Agriculture and food industry, CON = Consumer products, IND = Industrial products, PRC = Property and construction, RES = Resources, SER = Services, TECH = Technology								
Source(s): Authors’ own work, adapted from the ESG category score (LSEG, 2022, p. 9)								

Step 2: ESG reporting themes and materiality matrix			
Pillar	Category	Themes	Weight method
Environmental	Emission	Emissions	Industry median
		Waste	Industry median
		Biodiversity	Transparency weights
		Environmental management systems	Industry median
	Innovation	Product innovation	Transparency weights
		Green revenues, research and development (R&D) and capital expenditures (CapEx)	Industry median
	Resource use	Water	Industry median
		Energy	Industry median
		Sustainable packaging	Transparency weights
		Environmental supply chain	Transparency weights
	(continued)		

Table A1. Continued

Step 2: ESG reporting themes and materiality matrix			
Pillar	Category	Themes	Weight method
Social	Community	A company's commitment to being a good citizen, protecting public health and respecting business ethics	Transparency weights
	Human rights	Human rights	Transparency weights
	Product responsibility	Responsible marketing	Transparency weights
		Product quality	Transparency weights
		Data privacy	Transparency weights
	Workforce	Diversity and inclusion	Transparency weights
		Career development and training	Transparency weights
		Working conditions	Transparency weights
		Health and safety	Transparency weights
	Governance	CSR strategy	CSR strategy
ESG reporting and transparency			
Structure (independence, diversity, committees)			
Management		Compensation	
		Shareholder rights	
		Takeover defences	

Note(s): Industry median = Materiality weighting is to be based on the relative proportion that a particular sector contributes to the overall gross number in the full ESG universe. Transparency weights = Boolean data points with “Yes” is 1 or “No” is 0. 1 if environmental information appears in firms’ sustainability reports, this is positive 1 and 0 otherwise

Source(s): Materiality matrix, themes and measurement methods (LSEG, 2022, pp. 10-11)

Step 3: Overall ESG score calculation and pillar score

Pillar	Category	Pillar weight	Industry sectors						
			AGR N = 60	CON N = 50	IND N = 110	PRC N = 118	RES N = 61	SER N = 160	TECH N = 50
Environmental	<u>Emission:</u>	0.36	0.90	0.82	0.82	0.97	0.91	0.83	0.67
	Emissions								
	Waste								
	Biodiversity								
	Environmental management systems								
	<u>Innovation:</u>	0.31	0.90	0.72	0.63	0.85	0.60	0.80	0.77
	Product innovation								
	Green revenues, research and development (R&D) and capital expenditures (Cap Ex)								
	<u>Resource use:</u>	0.33	0.87	0.72	0.78	0.84	0.73	0.80	0.77
	Water								
	Energy								
	Sustainable packaging								
	Environmental supply chain								
	Environmental pillar score		0.89	0.79	0.76	0.93	0.81	0.82	0.70

(continued)

Table A1. Continued

Step 3: Overall ESG score calculation and pillar score									
Pillar	Category	Pillar weight	Industry sectors		IND N = 110	PRC N = 118	RES N = 61	SER N = 160	TECH N = 50
			AGR N = 60	CON N = 50					
Social	<u>Community:</u> A company's commitment to being a good citizen, protecting public health and respecting business ethics	0.29	0.94	0.82	0.89	0.94	0.81	0.82	0.77
	<u>Human rights:</u> Human rights	0.21	0.82	0.74	0.70	0.89	0.88	0.61	0.80
	<u>Product responsibility:</u> Responsible marketing	0.22	0.92	0.74	0.70	0.7	0.82	0.75	0.69
	<u>Product quality</u>								
	<u>Data privacy</u>								
	<u>Workforce:</u> Diversity and inclusion	0.28	0.95	0.82	0.89	0.94	0.81	0.77	0.77
	Career development and training								
	Working conditions								
	Health and safety								
	Social pillar score		0.92	0.79	0.81	0.88	0.83	0.75	0.76
Governance	<u>CSRstrategy:</u> CSR strategy	0.33	0.95	0.82	0.9	0.97	0.84	0.84	0.74
	ESG reporting and transparency								
	<u>Management:</u> Structure (independence, diversity, committees)	0.29	0.82	0.74	0.63	0.66	0.64	0.79	0.71
	<u>Compensation</u>								
	<u>Shareholders:</u> Shareholder rights	0.38	0.99	0.82	0.88	0.94	0.87	0.80	0.72
Governance pillar score			0.93	0.80	0.82	0.87	0.79	0.81	0.73
Source(s): Authors' own work, adapted from the ESG score calculation and overall pillar score (LSEG, 2022, p. 22)									

Table A2. Calculation of ESG pillar scores

Pillar	Category	Category scores*	Category weights	Sum of category weights	Formula: sum of category weights	New category weights*	Formula: new category weights	Pillar scores	Formula: pillar scores
Environmental	Emission	0.90	0.32	0.90	(0.32 + 0.28 + 0.29)	0.36	(0.32/0.90)	0.89	0.33
	Innovation	0.90	0.28			0.31	(0.28/0.90)		0.28
	Resource use	0.87	0.29			0.33	(0.29/0.90)		0.28
Social			0.90	0.83	(0.24 + 0.17 + 0.18 + 0.24)			0.92	0.89
	Community	0.94	0.24			0.29	(0.24/0.83)		0.27
	Human rights	0.82	0.17			0.21	(0.17/0.83)		0.17
	Product responsibility	0.92	0.18			0.22	(0.18/0.83)		0.20
Governance	Workforce	0.95	0.24	0.81	(0.26 + 0.24 + 0.31)	0.28	(0.24/0.83)	0.93	0.27
			0.83						0.92
	CSR strategy	0.95	0.26			0.33	(0.26/0.81)		0.31
	Management	0.82	0.24			0.29	(0.24/0.81)		0.24
	Shareholders	0.99	0.31			0.38	(0.31/0.81)		0.38
			0.81						0.93

Note(s): Score range for ESG reporting quality—equal or above 0.75

Score range	Description
$0.00 \leq 0.25$	Indicates poor relative ESG performance and insufficient degree of transparency in reporting material ESG data publicly
$0.25 \leq 0.50$	Indicates satisfactory relative ESG performance and moderate degree of transparency in reporting material ESG
$0.50 \leq 0.75$	Indicates good relative ESG performance and above average degree of transparency in reporting material ESG
$0.75 \leq 1.00$	Indicates excellent relative ESG performance and high degree of transparency in reporting material ESG data publicly
Source(s): Authors' own work, adapted from the calculation process of pillar scores (LSEG, 2022, p. 13) and ESG score range and description (LSEG, 2022, p. 7)	

References

- Akerlof, G.A. (1970), "The market for 'lemons': quality uncertainty and the market mechanism", *The Quarterly Journal of Economics*, Vol. 84 No. 3, pp. 488-500, doi: [10.2307/1879431](https://doi.org/10.2307/1879431).
- Al-Hiyari, A., Ismail, A.I., Kolsi, M.C. and Kehinde, O.H. (2023), "Environmental, social and governance performance (ESG) and firm investment efficiency in emerging markets: the interaction effect of board cultural diversity", *Corporate Governance: The International Journal of Business in Society*, Vol. 23 No. 3, pp. 650-673, doi: [10.1108/CG-03-2022-0133](https://doi.org/10.1108/CG-03-2022-0133).
- Apergis, N., Poufinas, T. and Antonopoulos, A. (2022), "ESG scores and cost of debt", *Energy Economics*, Vol. 112, pp. 1061-1086, doi: [10.1016/j.eneco.2022.106186](https://doi.org/10.1016/j.eneco.2022.106186).
- Arellano, M. and Bond, S. (1991), "Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations", *The Review of Economic Studies*, Vol. 58 No. 2, pp. 277-297, doi: [10.2307/2297968](https://doi.org/10.2307/2297968).
- Biddle, G.C., Hilary, G. and Verdi, R.S. (2009), "How does financial reporting quality relate to investment efficiency?", *Journal of Accounting and Economics*, Vol. 48 No. 2, pp. 112-131, doi: [10.1016/j.jacceco.2009.09.001](https://doi.org/10.1016/j.jacceco.2009.09.001).
- Bilyay-Erdogan, S., Danisman, G.O. and Demir, E. (2024), "ESG performance and investment efficiency: the impact of information asymmetry", *Journal of International Financial Markets, Institutions and Money*, Vol. 91, 101919, doi: [10.1016/j.intfin.2023.101919](https://doi.org/10.1016/j.intfin.2023.101919).
- Blundell, R. and Bond, S. (1998), "Initial conditions and moment restrictions in dynamic panel data models", *Journal of Econometrics*, Vol. 87 No. 1, pp. 115-143, doi: [10.1016/S0304-4076\(98\)00009-8](https://doi.org/10.1016/S0304-4076(98)00009-8).
- Darsono, D., Dwi, R., Abas, T. and Clarisa, T.Y. (2025), "The relationship between ESG, financial performance, and cost of debt: the role of independent assurance", *Cogent Business and Management*, Vol. 12 No. 1, 2437137, doi: [10.1080/23311975.2024.2437137](https://doi.org/10.1080/23311975.2024.2437137).
- Dhaliwal, D.S., Li, O.Z., Tsang, A. and Yang, Y.G. (2011), "Voluntary nonfinancial disclosure and the cost of equity capital: the initiation of corporate social responsibility reporting", *The Accounting Review*, Vol. 86 No. 1, pp. 59-100, doi: [10.2308/accr.00000005](https://doi.org/10.2308/accr.00000005).
- Eliwa, Y., Aboud, A. and Saleh, A. (2021), "ESG practices and the cost of debt: evidence from EU countries", *Critical Perspectives on Accounting*, Vol. 79, 102097, doi: [10.1016/j.cpa.2019.102097](https://doi.org/10.1016/j.cpa.2019.102097).
- Ellili, N.O.D. (2022), "Impact of ESG disclosure and financial reporting quality on investment efficiency", *Corporate Governance: The International Journal of Business in Society*, Vol. 22 No. 5, pp. 1094-1111, doi: [10.1108/CG-06-2021-0209](https://doi.org/10.1108/CG-06-2021-0209).
- Fazzari, S.M., Hubbard, R.G., Petersen, B.C., Blinder, A.S. and Poterba, J.M. (1988), "Financing constraints and corporate investment", *Brookings Papers on Economic Activity*, Vol. 1988 No. 1, pp. 141-206, doi: [10.2307/2534426](https://doi.org/10.2307/2534426).
- Glazerman, G. and Cohen, J. (2020), "'Non-financial' is a misnomer, but doesn't have to be a missed opportunity", *Journal of Applied Corporate Finance*, Vol. 32 No. 2, pp. 108-116, doi: [10.1111/jacf.12410](https://doi.org/10.1111/jacf.12410).
- Gomariz, F.C. and Ballesta, J.P.S. (2014), "Financial reporting quality, debt maturity and investment efficiency", *Journal of Banking and Finance*, Vol. 40, pp. 494-506, doi: [10.1016/j.jbankfin.2013.07.013](https://doi.org/10.1016/j.jbankfin.2013.07.013).
- Haml, F. and Vágnerová Linnertová, D. (2024), "How do ESG controversies moderate the nexus between ESG performance and cost of capital? Evidence from European listed companies", *Managerial Finance*, Vol. 50 No. 10, pp. 1727-1746, doi: [10.1108/MF-12-2023-0762](https://doi.org/10.1108/MF-12-2023-0762).
- Kotsantonis, S., Pinney, C. and Serafeim, G. (2016), "ESG integration in investment management: myths and realities", *Journal of Applied Corporate Finance*, Vol. 28 No. 2, pp. 10-16, doi: [10.1111/jacf.12169](https://doi.org/10.1111/jacf.12169).
- La Rosa, F., Liberatore, G., Mazzi, F. and Terzani, S. (2018), "The impact of corporate social performance on the cost of debt and access to debt financing for listed European non-financial firms", *European Management Journal*, Vol. 36 No. 4, pp. 519-529, doi: [10.1016/j.emj.2017.09.007](https://doi.org/10.1016/j.emj.2017.09.007).

- LSEG (2022), "Environmental, social and governance scores from REFINITIV", LSEG (London Stock Exchange Group) business.
- Maaloul, A., Zéghal, D., Ben Amar, W. and Mansour, S. (2023), "The effect of environmental, social, and governance (ESG) performance and disclosure on cost of debt: the mediating effect of corporate reputation", *Corporate Reputation Review*, Vol. 26 No. 1, pp. 1-18, doi: [10.1057/s41299-021-00130-8](https://doi.org/10.1057/s41299-021-00130-8).
- Magnanelli, B.S. and Izzo, M.F. (2017), "Corporate social performance and cost of debt: the relationship", *Social Responsibility Journal*, Vol. 13 No. 2, pp. 250-265, doi: [10.1108/SRJ-06-2016-0103](https://doi.org/10.1108/SRJ-06-2016-0103).
- Modigliani, F. and Miller, M.H. (1958), "The cost of capital, corporation finance and the theory of investment", *The American Economic Review*, Vol. 48 No. 3, pp. 261-297.
- Muttakin, M.B., Mihret, D., Lemma, T.T. and Khan, A. (2020), "Integrated reporting, financial reporting quality and cost of debt", *International Journal of Accounting and Information Management*, Vol. 28 No. 3, pp. 517-534, doi: [10.1108/IJAIM-10-2019-0124](https://doi.org/10.1108/IJAIM-10-2019-0124).
- Myers, S.C. (2001), "Capital structure", *The Journal of Economic Perspectives*, Vol. 15 No. 2, pp. 81-102, doi: [10.1257/jep.15.2.81](https://doi.org/10.1257/jep.15.2.81).
- Myers, S.C. and Majluf, N.S. (1984), "Corporate financing and investment decisions when firms have information that investors do not have", *Journal of Financial Economics*, Vol. 13 No. 2, pp. 187-221, doi: [10.1016/0304-405X\(84\)90023-0](https://doi.org/10.1016/0304-405X(84)90023-0).
- Roodman, D. (2009), "How to do Xtabond2: an introduction to difference and system GMM in stata", *The Stata Journal*, Vol. 9 No. 1, pp. 86-136, doi: [10.1177/1536867X0900900106](https://doi.org/10.1177/1536867X0900900106).
- Sengupta, P. (1998), "Corporate disclosure quality and the cost of debt", *The Accounting Review*, Vol. 73 No. 4, pp. 459-474.
- SET (2015), *Company Listed in the Stock Exchange of Thailand*, The Stock Exchange of Thailand, available at: <http://www.set.or.th> (accessed 25 August 2023).
- SET (2022), *SET Information Services: SETSMART*, The Stock Exchange of Thailand, available at: <https://www.set.or.th/en/services/connectivity-and-data/data/web-based> (accessed 25 December 2023).
- Shi, Y., Zheng, S., Xiao, P., Zhen, H. and Wu, T. (2024), "ESG performance and cost of debt", *China Journal of Accounting Research*, Vol. 17 No. 4, 100390, doi: [10.1016/j.cjar.2024.100390](https://doi.org/10.1016/j.cjar.2024.100390).
- Spence, M. (1973), "Job market signaling", *The Quarterly Journal of Economics*, Vol. 87 No. 3, pp. 355-374, doi: [10.2307/1882010](https://doi.org/10.2307/1882010).
- Suto, M. and Takehara, H. (2017), "CSR and cost of capital: evidence from Japan", *Social Responsibility Journal*, Vol. 13 No. 4, pp. 798-816, doi: [10.1108/SRJ-10-2016-0170](https://doi.org/10.1108/SRJ-10-2016-0170).
- Suttipun, M. (2023), "ESG performance and corporate financial risk of the alternative capital market in Thailand", *Cogent Business and Management*, Vol. 10 No. 1, pp. 1-13, doi: [10.1080/23311975.2023.2168290](https://doi.org/10.1080/23311975.2023.2168290).
- Tanjung, M. (2023), "Cost of capital and firm performance of ESG companies: what can we infer from COVID-19 pandemic?", *Sustainability Accounting, Management and Policy Journal*, Vol. 14 No. 6, pp. 1242-1267, doi: [10.1108/SAMPJ-07-2022-0396](https://doi.org/10.1108/SAMPJ-07-2022-0396).
- Xue, R., Wang, H., Yang, Y., Linnenluecke, M.K., Jin, K. and Cai, C.W. (2023), "The adverse impact of corporate ESG controversies on sustainable investment", *Journal of Cleaner Production*, Vol. 427, 139237, doi: [10.1016/j.jclepro.2023.139237](https://doi.org/10.1016/j.jclepro.2023.139237).
- Zamir, F., Shailer, G. and Saeed, A. (2022), "Do corporate social responsibility disclosures influence investment efficiency in the emerging markets of Asia?", *International Journal of Managerial Finance*, Vol. 18 No. 1, pp. 28-48, doi: [10.1108/IJMF-02-2020-0084](https://doi.org/10.1108/IJMF-02-2020-0084).

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