An Empirical Analysis of the Impact of Environmental Accounting Information Disclosure on Corporate Financing Costs

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Abstract. Against the backdrop of the "dual carbon" targets and the rapid development of green finance, the influence of environmental accounting information disclosure on corporate financing decisions has become increasingly significant. This study selects Chinese A-share listed companies from 2018 to 2022 as the research sample and empirically examines the impact and underlying mechanisms of environmental accounting information disclosure on corporate financing costs from three dimensions: information asymmetry, corporate reputation, and risk perception. A comprehensive evaluation system of environmental information disclosure is constructed, encompassing disclosure quality, quantity, and timeliness. The weighted average cost of capital (WACC) is used to measure corporate financing costs. Multiple econometric methods—including fixed effects models, mediation effect models, instrumental variable approaches, and difference-in-differences (DID) analysis—are employed to ensure robust empirical findings. The results indicate a significant negative correlation between the level of environmental accounting information disclosure and corporate financing costs. Specifically, a one-standard-deviation increase in the environmental disclosure index is associated with a reduction of approximately 0.165 percentage points in financing costs. Among the disclosure dimensions, quality exerts the greatest impact, followed by quantity and timeliness, suggesting that investors prioritize the reliability of environmental information. Environmental information disclosure reduces financing costs through three channels: mitigating information asymmetry (contributing 27.6%), enhancing corporate reputation (18.4%), and improving risk perception (23.1%). The cost-reduction effect is more pronounced in private enterprises and heavily polluting industries.

Keywords: Environmental accounting information disclosure, Financing cost, Information asymmetry, corporate reputation, Risk perception.

1. Introduction

With the increasingly severe challenges posed by global climate change, environmental protection has become a critical issue that governments and enterprises worldwide must address. Under the strategic backdrop of China's "dual carbon" goals, the importance of corporate environmental information disclosure has become more prominent [1]. The Administrative Measures for the Legal Disclosure of Enterprise Environmental Information, officially implemented in February 2022, marks a new stage in the development of China's environmental information disclosure system. Environmental accounting information, as an important manifestation of corporate social responsibility, is not only closely linked to the sustainable development of enterprises but also directly affects their performance in capital markets [2].

Corporate financing cost, a key indicator of financial health, is influenced by various factors. In recent years, growing evidence suggests a strong connection between a company's environmental performance and its cost of capital [3]. Investors and creditors are no longer solely concerned with financial metrics; instead, they increasingly consider Environmental, Social, and Governance (ESG) factors when making investment decisions. Against this background, examining the mechanisms through which environmental accounting information disclosure affects corporate financing cost holds significant theoretical and practical value [4].

However, existing empirical studies on the relationship between environmental accounting information disclosure and corporate financing costs still exhibit certain limitations [5]. On the one

hand, most research focuses on the overall effect of environmental disclosure, lacking in-depth analysis of the heterogeneous impacts of different types of disclosures [6]. On the other hand, the transmission mechanisms by which environmental disclosure influences financing costs are underexplored, limiting the practical guidance such studies can offer. Therefore, this study selects Chinese A-share listed companies as the sample and applies empirical methods to systematically analyze the impact of environmental accounting information disclosure on corporate financing cost and further investigates the underlying mechanisms.

The innovations of this study are threefold: first, it constructs a comprehensive evaluation system of environmental disclosure encompassing three dimensions—quality, quantity, and timeliness—to provide a more holistic measure of disclosure performance; second, it employs multiple econometric methods to conduct robustness checks, ensuring the reliability of the conclusions; and third, it analyzes the transmission channels from the perspectives of information asymmetry, reputational mechanisms, and risk perception. The findings will offer theoretical support for enterprises in optimizing environmental disclosure strategies and reducing financing costs, while also providing empirical evidence for regulators to improve relevant policies.

2. Literature Review and Theoretical Foundation

2.1. Theoretical Mechanisms Linking Environmental Information Disclosure and Financing Cost

The impact of environmental accounting information disclosure on corporate financing cost can be interpreted from multiple theoretical perspectives. According to information asymmetry theory, environmental disclosure signals a firm's environmental risk management capabilities to the market, thereby reducing the information gap between firms and investors [7]. When firms proactively disclose detailed environmental data, investors can more accurately assess the environmental risks and potential liabilities faced by the firm, reducing the required risk premium. High-quality environmental disclosure contributes to building a responsible corporate image and enhancing corporate reputation—an important intangible asset that can offer competitive advantages. In capital markets, a good environmental reputation boosts investor confidence, lowers perceived risk, and subsequently reduces financing costs. Particularly in the context of rapid green finance development, firms with strong environmental performance are more likely to obtain preferential financing options such as green credit or green bonds.

Environmental information disclosure also reflects the level of a firm's environmental risk management. Studies have shown that proactive environmental risk management reduces both systematic and idiosyncratic risks, thereby lowering the cost of capital [8]. By disclosing environmental investments, pollution control measures, and related activities, firms signal their commitment to managing environmental risks, which helps alleviate investor concerns about potential environmental liabilities. In light of increasingly stringent environmental regulations, such risk management capabilities play an increasingly important role in shaping financing outcomes.

2.2. Research Hypotheses

Based on the above theoretical analysis, this study proposes the following hypotheses. Environmental accounting information disclosure influences corporate financing cost through multiple mechanisms, primarily by reducing information asymmetry and improving risk perception. When firms enhance their level of environmental disclosure, investors and creditors gain better insights into the firm's environmental performance and associated risks, thereby lowering the risk premium demanded due to information gaps. At the same time, proactive disclosure sends a strong signal of a firm's commitment to sustainable development, attracting long-term investors and optimizing the investor structure [9].

Given that different dimensions of environmental information may have heterogeneous impacts, the study further refines its hypotheses. The quality, quantity, and timeliness of disclosure may

influence financing cost through distinct pathways. Disclosure quality reflects the reliability and relevance of information; high-quality information is more likely to be recognized by the market. Disclosure quantity captures completeness; comprehensive information allows for a more thorough evaluation. Timeliness affects the decision usefulness of information; timely disclosures are of higher value. Therefore, it is expected that all three dimensions will be negatively correlated with financing cost, though the strength of their impacts may vary.

Moreover, the effectiveness of environmental information disclosure may be moderated by firm-specific characteristics and external conditions. In environmentally sensitive industries, the importance of such disclosure is elevated, potentially enhancing its effects. In regions with higher marketization levels, information transmission is more effective, which may amplify the role of disclosure. For state-owned enterprises, the signaling function of disclosure may differ from that in private firms due to their greater social responsibility obligations. These moderating effects will be tested in the empirical analysis.

3. Research Design and Data Description

3.1. Sample Selection and Data Sources

This study selects A-share listed companies in China from 2018 to 2022 as the research sample. This period spans the implementation of the Administrative Measures for the Legal Disclosure of Enterprise Environmental Information, making it suitable for analyzing the policy's effects on disclosure practices. Sample selection adheres to the following principles: financial sector firms are excluded due to their unique business models and regulatory environments; ST and *ST firms are removed to avoid interference from financial distress; and firms with severe data deficiencies are excluded to ensure the validity of the empirical analysis.

Environmental information disclosure data are obtained through a combination of manual collection and text analysis. The research team systematically reviewed annual reports, CSR reports, environmental reports, and sustainability reports of sample firms to extract relevant environmental accounting information. Financial data are mainly sourced from the CSMAR and Wind databases to ensure accuracy and completeness. Corporate governance data are sourced from the CNRDS database, while macroeconomic data are drawn from the National Bureau of Statistics. To enhance data quality, all continuous variables were winsorized at the 1% and 99% percentiles to mitigate the influence of outliers.

3.2. Variable Definition and Measurement

The dependent variable in this study is corporate financing cost, measured primarily by the weighted average cost of capital (WACC). Additionally, industry fixed effects and year fixed effects are included to control for sectoral characteristics and temporal trends. Definitions and descriptions of main variables can be shown in Table 1.

Table 1. Definitions and Descriptions of Main Variables

Variable Type	Variable Name	Symbol	Definition
Dependent Variable	Weighted Average Cost of Capital	WACC	Weighted average of equity and debt capital costs
	Cost of Debt	COD	Interest expense / Interest-bearing debt
	Cost of Equity	COE	Calculated based on the CAPM model
Independent Variable	Environmental Disclosure Index	EDI	Comprehensive score (0–100)
	Disclosure Quality	EDI_Qual	Score for quality dimension
	Disclosure Quantity	EDI_Quan	Score for quantity dimension
	Disclosure Timeliness	EDI_Time	Score for timeliness dimension
Control Variable	Firm Size	Size	Ln(Total assets)
	Financial Leverage	Lev	Total liabilities / Total assets
	Profitability	ROA	Net profit / Total assets
	Growth	Growth	Revenue growth rate
	Ownership Type	SOE	State-owned = 1, others = 0
	Board Size	Board	Number of board members
	Independent Directors	Indep	Independent directors / Total board members
	CEO Duality	Dual	CEO is also board chair = 1, others = 0

3.3. Model Specification

To examine the impact of environmental accounting information disclosure on corporate financing cost, this study constructs the following baseline regression model:

$$WACC_{i,t} = \beta_0 + \beta_1 EDI_{i,t} + \Sigma \beta_j Control_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t} \quad (1)$$

To further explore the impact of different dimensions of environmental disclosure, the following extended model is constructed:

$$WACC_{i,t} = \alpha_0 + \alpha_1 EDI\_Qual_{i,t} + \alpha_2 EDI\_Quan_{i,t} + \alpha_3 EDI\_Time_{i,t} + \Sigma \alpha_j Control_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t} \quad (2)$$

In this model, the environmental disclosure index is decomposed into three dimensions—quality, quantity, and timeliness—to investigate their heterogeneous effects on financing cost. Additionally, to test for potential nonlinear relationships, the squared term of the environmental disclosure index is introduced to examine whether there exists an optimal level of disclosure.

Considering the potential endogeneity between environmental information disclosure and financing cost, the study employs an instrumental variable (IV) approach. The average environmental disclosure level of other firms within the same industry is selected as the instrumental variable. This choice is justified by the fact that firms in the same industry face similar environmental regulatory pressures and market conditions, making their disclosure behavior correlated. However, the disclosure level of peer firms does not directly affect the financing cost of the focal firm, thus satisfying the exogeneity condition. Furthermore, the lagged value of the environmental disclosure index is used in robustness checks to mitigate potential reverse causality.

3.4. Descriptive Statistics

The descriptive statistics of the sample firms reveal the fundamental characteristics of environmental information disclosure and financing costs among Chinese listed companies. The average weighted average cost of capital (WACC) is 8.42%, with a standard deviation of 2.31%, indicating substantial variation in financing costs across firms. The average cost of debt financing is 4.85%, while the average cost of equity financing is 10.23%, consistent with the theoretical expectation that the cost of equity exceeds that of debt.

Significant differences in environmental disclosure levels exist among firms with different characteristics. The average EDI for state-owned enterprises (48.92) is significantly higher than that of private enterprises (38.41), which may be attributed to the greater social responsibility obligations of SOEs. Firms in heavily polluting industries have a higher average EDI (51.37) compared to those in non-polluting sectors (39.85), reflecting the influence of environmental regulatory pressures. Large enterprises (top 25% by total assets) exhibit an average EDI of 56.72, whereas small enterprises (bottom 25%) average only 31.48, indicating a clear scale effect. Regionally, firms in eastern China have a higher average EDI (45.83) than those in the central (40.27) and western regions (36.94), which is consistent with regional disparities in economic development and environmental awareness.

4. Empirical Results and Analysis

4.1. Baseline Regression Results

Table 2 reports the baseline regression results on the impact of environmental accounting information disclosure on corporate financing costs. Model (1) includes only the core explanatory variable and industry and year fixed effects. The coefficient of the Environmental Disclosure Index (EDI) is -0.0124, which is significant at the 1% level, providing preliminary evidence for the negative relationship between environmental disclosure and financing cost.

In Model (2), after adding firm-specific control variables, the coefficient of EDI is -0.0098 and remains significant at the 1% level. Model (3) further controls for corporate governance variables, and the coefficient of EDI is -0.0087, still significant at the 1% level. These results indicate that even after controlling for various influencing factors, the negative effect of environmental disclosure on financing cost remains robust.

Table 2. Baseline Regression Results

Variable	Model (1)	Model (2)	Model (3)	Model (4)
EDI	-0.0124*** (0.0019)	-0.0098*** (0.0017)	-0.0087*** (0.0016)	—
EDI_Qual	—	—	—	-0.0105*** (0.0024)
EDI_Quan	—	—	—	-0.0068*** (0.0021)
EDI_Time	—	—	—	-0.0052** (0.0023)
Size	—	-0.3142*** (0.0453)	-0.2987*** (0.0441)	-0.2956*** (0.0438)
Lev	—	2.8734*** (0.2156)	2.7982*** (0.2098)	2.7654*** (0.2087)
ROA	—	-8.9542*** (1.2314)	-8.7235*** (1.2087)	-8.6789*** (1.2001)
Growth	—	0.5421** (0.2187)	0.5198** (0.2134)	0.5087** (0.2115)
Control Vars	No	Firm-specific	All	All
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	12,856	12,856	12,856	12,856
Adjusted R^2	0.156	0.287	0.312	0.318

*Note: Robust standard errors in parentheses; ***, *, and * denote significance at the 1%, 5%, and 10% levels, respectively.

From an economic perspective, a one-standard-deviation increase in the EDI (18.94) leads to a reduction in financing cost of approximately 0.165 percentage points (0.0087 × 18.94). Considering the average financing cost among sample firms is 8.42%, this reduction represents a 1.96% decrease—economically meaningful.

Model (4) decomposes the environmental disclosure index into three dimensions. The results show that: The coefficient for disclosure quality (EDI_Qual) is -0.0105 and significant at the 1% level,

the coefficient for disclosure quantity (EDI_Quan) is -0.0068 and also significant at the 1% level, the coefficient for disclosure timeliness (EDI_Time) is -0.0052 and significant at the 5% level. All three dimensions are negatively associated with financing costs, but the magnitudes vary. Disclosure quality has the strongest effect, indicating that investors place greater value on the reliability and

relevance of environmental information. Disclosure quantity ranks second, reflecting the importance of completeness. Disclosure timeliness has a smaller yet still significant impact, suggesting that timely information also contributes to lowering financing costs.

4.2. Heterogeneity Analysis

Differences in firm characteristics and external environments may lead to heterogeneous effects of environmental information disclosure. This study conducts subgroup tests from three perspectives: ownership structure, industry characteristics, and regional differences. Table 3 presents the results of the heterogeneity analysis. This may be due to the inherent financing advantages of state-owned enterprises, which make the marginal effect of disclosure less pronounced; in contrast, private firms face greater financing constraints, so environmental disclosure more effectively mitigates information asymmetry.

Table 3. Heterogeneity Analysis Results

Variable	Ownership Structure	Industry Characteristics	Regional Differences
	SOEs	Private Firms	Heavy-Polluting Industries
EDI	-0.0064** (0.0027)	-0.0112*** (0.0021)	-0.0138*** (0.0029)
Controls	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes
Obs.	5,234	7,622	3,688
Adj. R^2	0.298	0.324	0.336
Group Difference Test	$\chi^2 = 4.82$**	$\chi^2 = 7.91$***	$\chi^2 = 2.14$

Regional analysis shows that the EDI coefficient for firms in eastern China (-0.0096) is slightly larger than that in the central and western regions (-0.0071), though the intergroup difference is not statistically significant. This indicates that the financing cost reduction effect of environmental disclosure is relatively consistent across regions, possibly due to the national integration of capital markets, which ensures similar information transmission mechanisms. However, considering the larger sample size and generally higher disclosure levels in the eastern region, the results for this region are more robust.

4.3. Mechanism Tests

To better understand the mechanisms through which environmental information disclosure affects financing cost, this study examines three transmission channels: information asymmetry, corporate reputation, and risk perception. A mediation analysis framework is adopted. First, the effect of environmental disclosure on each mediator is tested; then the mediator is included in the baseline model to observe changes in the EDI coefficient.

For the information asymmetry mechanism, analyst forecast dispersion is used as a proxy. The results show that environmental information disclosure significantly reduces analyst forecast dispersion (coefficient = -0.0823, $p < 0.01$), indicating that disclosure helps reduce information asymmetry among market participants. When forecast dispersion is included in the baseline model, its coefficient is significantly positive (0.0542, $p < 0.01$), while the EDI coefficient drops from -0.0087 to -0.0063 but remains significant. The Sobel test confirms the existence of a mediation effect, with the information asymmetry channel accounting for 27.6% of the total effect.

For the corporate reputation mechanism, the number of positive media reports is used as a proxy variable. Firms with higher levels of environmental disclosure receive more favorable media coverage (coefficient = 0.2145, $p < 0.01$), suggesting that strong environmental performance enhances reputation through media dissemination. The reputation variable has a significant negative impact on financing cost (-0.0234, $p < 0.05$), and after controlling for reputation, the EDI coefficient decreases to -0.0071. This channel accounts for 18.4% of the total effect, indicating that reputation is an important pathway through which disclosure reduces financing costs.

For the risk perception mechanism, stock return volatility is used as the proxy. Environmental information disclosure significantly reduces stock volatility (coefficient = -0.0416, $p < 0.01$), implying that comprehensive disclosure stabilizes market expectations and lowers perceived investment risk. Stock volatility is positively associated with financing cost (0.1827, $p < 0.01$); after controlling for this variable, the direct effect of EDI weakens but remains significant. The risk perception channel explains 23.1% of the total effect.

5. Extended Analyses

5.1. Nonlinear Relationship Test

There may be a nonlinear relationship between environmental information disclosure and financing cost. Insufficient disclosure fails to mitigate information asymmetry, while excessive disclosure may increase information processing costs and cause information overload. To test this, a squared term of the EDI was added to the baseline model. The results show that the linear term of EDI has a coefficient of -0.0156 ($p < 0.01$), and the squared term is 0.0001 ($p < 0.05$), suggesting an inverted U-shaped relationship.

The optimal level of environmental disclosure is estimated to be around 78 points. Beyond this level, the marginal benefit of additional disclosure diminishes. Given that the average EDI score among sample firms is only 42.67, most companies still have substantial room for improvement. Only 5.8% of firms exceed the optimal threshold, and these are mainly concentrated in regions and industries with strict environmental regulations. This finding provides a valuable reference for firms formulating disclosure strategies.

5.2. Dynamic Effects Analysis

The impact of environmental disclosure on financing cost may be lagged, as building environmental reputation takes time, and investors' reactions to information are not immediate. A distributed lag model was employed, incorporating contemporaneous and 1–3 period lagged EDI values. The contemporaneous effect is the strongest (coefficient = -0.0087), the first lag remains significant (-0.0054), the second lag is marginally significant (-0.0031), and the third lag is not significant. The cumulative effect reaches -0.0172, indicating that long-term impacts are stronger than short-term ones. Further analysis reveals that the persistence of environmental disclosure plays a critical role. Firms are grouped into three categories: consistently high disclosure (EDI above the median for three consecutive years), fluctuating disclosure, and consistently low disclosure. Firms with sustained high disclosure have financing costs 1.23 percentage points lower than those with persistently low disclosure, while the fluctuating group shows only a 0.52 percentage point reduction. This highlights the importance of continuity and stability in disclosure for gaining capital market recognition.

6. Conclusion

Using a sample of A-share listed companies in China from 2018 to 2022, this study systematically examines the impact of environmental accounting information disclosure on corporate financing costs and the underlying mechanisms. The findings reveal a significant negative relationship between the level of environmental accounting disclosure and financing cost: for each one standard deviation increase in the Environmental Disclosure Index (EDI), corporate financing cost decreases by approximately 0.165 percentage points. This result holds under a variety of robustness checks.

Among the disclosure dimensions, disclosure quality has the most pronounced impact, followed by disclosure quantity and timeliness, suggesting that investors place higher value on the reliability and relevance of environmental information. Mechanism analysis shows that environmental disclosure affects financing costs mainly through three channels: reducing information asymmetry

(accounting for 27.6% of the total effect), enhancing corporate reputation (18.4%), and improving risk perception (23.1%).

Heterogeneity analysis reveals that private firms and companies in heavily polluting industries benefit more from environmental disclosure. The implementation of mandatory disclosure policies in 2022 significantly enhanced the financing cost reduction effect of disclosure. Further analyses uncover an inverted U-shaped relationship between environmental disclosure and financing cost, with the optimal disclosure level around 78 points. However, most firms still fall short of this level, indicating substantial room for improvement. Moreover, the benefits of disclosure are persistent: firms that consistently maintain high levels of disclosure enjoy lower financing costs.

Importantly, reduced financing costs further stimulate environmental investments, reinforcing a positive feedback loop. This study contributes to the literature on the economic consequences of environmental accounting disclosure and provides empirical evidence to support both corporate strategy optimization and regulatory policy improvement.

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