



The Impact of ESG Information Disclosure Quality on the Debt Financing Costs of China Companies

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Abstract. Based on data from A-share listed companies from 2014 to 2022, this paper empirically examines the impact of ESG disclosure quality on debt financing costs. The study finds that improving ESG disclosure quality significantly reduces debt financing costs, primarily by alleviating information asymmetry. Financing constraints amplify this effect, while high media attention mitigates it. After 2020, this effect intensified markedly and was more pronounced among non-state-owned enterprises. The findings provide empirical evidence for companies to optimize their ESG disclosures and for creditors to inform their decision-making.

Keywords: ESG information disclosure; debt financing cost; information asymmetry; financing constraints; non-state-owned enterprises

1 Introduction

Promoting the green and low-carbon transformation of economic and social development is a critical component in achieving high-quality growth ([8] Wang Zhixin and Zhang Lulu, 2026). Environmental, social, and governance (ESG) factors have increasingly become central to assessing corporate long-term value and risks ([1] Kaiqiang Chen and Jiawen Xu, 2026). China's capital market is predominantly driven by indirect financing; how creditors incorporate and weigh ESG information in their credit decisions is pivotal for directing financial resources toward green and sustainable sectors ([2] Guo Xinyu and Song Liangrong, 2025; [6] Ren Jiaxuan and Liu Xu, 2026). Meanwhile, China's ESG disclosure framework is undergoing a profound shift from "voluntary disclosure" to "mandatory disclosure," providing a unique quasi-natural experimental setting for academic research ([13] Zhang Jinsu, 2024).

Theoretically, ESG information, as crucial non-financial information, holds the potential to alleviate information asymmetry in capital markets ([14] Zhang Zhengyong and Dong Juan, 2017). Signal theory posits that by proactively disclosing high-quality ESG information, firms can convey positive signals to creditors regarding their outstanding sustainability capabilities and risk management proficiency, thereby reducing creditors' risk premium demands ([5] Lu Jiarui, 2023). However, whether the "financing effect" of ESG disclosure actually exists, what its underlying transmission mechanism is, and under what internal and external conditions this effect becomes most

pronounced, still require rigorous empirical verification grounded in the institutional context of China ([12] Yang Shuo et al., 2025; [11] Yang Junmin and Zuo Panrui, 2026; [4] Chengming Li and Shuhao Lai, 2026).

In light of this, this paper focuses on the ESG metric of "information disclosure quality" itself ([7] Wang Ke et al., 2025; [15] Yukun Zhao et al., 2026), utilizing data from A-share listed companies between 2014 and 2022 to systematically examine the following questions: First, whether ESG information disclosure quality significantly reduces corporate debt financing costs ([3] He Bingyu, 2026); Second, whether its mechanism operates by reducing information asymmetry ([14] Zhang Zhengyong and Dong Juan, 2017); Third, how factors such as financing constraints ([5] Lu Jiarui, 2023), media attention ([9] Lianghai Wu et al., 2025), and property rights structure ([10] Huashuo Yang et al., 2026) moderate this relationship; Fourth, whether the aforementioned effects were altered during the pivotal year of 2020.

2 Theoretical Analysis and Research Hypotheses

Under information asymmetry, creditors demand higher premiums to compensate for risks. High-quality ESG disclosure provides additional information on a company's environmental, social, and governance dimensions, enabling creditors to conduct a more comprehensive assessment of its long-term risks and sustainability capabilities. This reduces information acquisition and verification costs, alleviates concerns about future cash flows, and ultimately lowers debt financing costs. According to signal theory, proactive high-quality ESG disclosure serves as a positive signal to the market indicating sound management and controllable risks ([10] Huashuo Yang et al., 2026), helping companies build reputation capital in debt markets and secure more favorable credit terms. Based on this, the following hypothesis is proposed:

H1: The quality of corporate ESG information disclosure is negatively correlated with its debt financing costs.

ESG information serves as a crucial channel for mitigating information asymmetry ([14] Zhang Zhengyong and Dong Juan, 2017). High-quality disclosure enhances corporate information transparency, enabling creditors to more accurately assess various risks and long-term value. The improved information environment directly reduces creditors' monitoring and evaluation costs, which may translate into lower financing costs. Thus, information asymmetry is expected to play an intermediary role in this process.

H2: The quality of ESG information disclosure reduces debt financing costs by alleviating information asymmetry.

This effect is moderated by multiple contextual factors. Enterprises with higher financing constraints typically face more severe information asymmetry and financing difficulties, rendering ESG information more valuable as a marginal signal; consequently, their ability to reduce financing costs may be stronger ([5] Lu Jiarui, 2023). Media attention serves as an external information channel and supervisory mechanism, potentially enhancing the incremental informational value of ESG disclosures ([9] Lianghai Wu et al., 2025). Due to implicit guarantees, state-owned enterprises may

exhibit weaker sensitivity of their financing costs to ESG signals compared to non-state-owned enterprises. The 2020 COVID-19 pandemic and the "dual carbon" goals highlighted non-financial risks, leading to stricter regulatory policies that may structurally increase the market weight of ESG information ([8] Wang Zhixin and Zhang Lulu, 2026). Based on these findings:

H3a: Strengthened financing constraints negatively impact the quality of ESG information disclosure on debt financing costs.

H3b: Reduced media attention diminishes the negative impact of ESG disclosure quality on debt financing costs.

H3c: The negative impact of ESG disclosure quality on debt financing costs is more pronounced in non-state-owned enterprises.

H3d: After 2020, the quality of ESG information disclosure has exerted a stronger effect on reducing debt financing costs.

3 Research Design

3.1 Sample and Data

This study uses China A-share listed companies from 2014 to 2022 as the initial sample, with the actual regression period covering 2015–2022 (as the explanatory variables are lagged by one period). ESG disclosure quality data are sourced from the Bloomberg ESG Disclosure Score Database, which measures the transparency and completeness of corporate disclosures across environmental, social, and governance dimensions, with scores ranging from 0 to 100. Financial and corporate governance data are obtained from the Guotai An Database. Government subsidy data are derived from the CSMAR Financial Statement Notes Database. Analyst forecast data are sourced from the CSMAR Analyst Forecast Database. The marketization index employs the China provincial marketization index compiled by Fan Gang et al.

The sample selection process was as follows: (1) Exclusion of companies in the financial sector; (2) Exclusion of ST and *ST companies; (3) Exclusion of samples with missing key variables. All continuous variables were censored at the 1% and 99% quantiles to eliminate the influence of outliers. Ultimately, 1,316 company-year observations were obtained, involving 628 listed companies.

3.2 Variable Definitions

- Dependent variable: Debt financing cost
- Core explanatory variable: ESG information disclosure quality (L_ESG_Trans)
- Mediating variable: Information asymmetry (Analyst_Disb)
- Regulatory variables: Financing constraints (Fin_Constraint), Media coverage (Media_Coverage), and ownership nature (SOE)
- Control variables include: company size (Size), debt-to-asset ratio (Lev), return on total assets (ROA), revenue growth rate (Growth), tangible asset ratio (Tang), whether audited by the Big Four (Big4), board size (Board), dual-executive position

(Dual), top shareholder ownership percentage (Top1), independent director ratio (Indep), and operating cash flow ratio (Cashflow). Specific variable definitions are provided in Table 1.

Table 1. Variable Definitions and Measurements

Type of variable	Variable symbol	Measure
Explained variable	Cost_Debt	Financial expenses/Average interest-bearing liabilities
Core Explanatory Variable	L_ESG_Trans	Bloomberg ESG Disclosure Score / 10 (one-period lag)
Metavariable	Analyst_Dis	Analyst EPS forecast dispersion / forecast mean
Regulated variable	SOE	State-owned enterprise = 1; otherwise = 0
	Polluting_Ind	Heavy pollution industry = 1; otherwise = 0
	Marketization	Fan Gang Marketization Index (lagged by one period)
	Media_Coverage	ln (number of news reports + 1) (lagged by one period)
	Fin_Constraint	SA Index (lagged by one period)
Controlled variable	Size	Ln(total assets)
	Lev	Total Liabilities / Total Assets
	ROA	Net Profit / Total Assets
	Growth	(Current Period – Previous Period)/Previous Period's Operating Revenue
	Tang	Tangible Assets / Total Assets
	Big4	Four major audits = 1; otherwise = 0
	Board	ln (Number of board members)
	Dual	Chairman also serves as General Manager = 1; otherwise = 0
	Top1	Shareholding ratio of the largest shareholder
	Indep	Number of independent directors/Number of board members
	Cashflow	Net cash flow from operating activities / Total assets
Fixed effect	Year FE	Year dummy variable

Note: All control variables use their one-period lagged values in the regression.

3.3 Model Specification

To test the main effect, this paper constructs the following two-way fixed-effects baseline model involving individuals and years:

$$CostDebt_{i,t} = \beta_0 + \beta_1 L_ESG_Trans_{i,t-1} + \sum_{k=1}^n \gamma_k Controls_{i,t-1}^{(k)} + \theta_t + \mu_i + \epsilon_{i,t} (1)$$

Here, μ_i and θ_t control for individual and annual fixed effects, respectively. The core coefficient β_1 is expected to be significantly negative to verify Hypothesis H1.

To examine the mediating role of information asymmetry, a stepwise approach was employed to construct the model. First, the impact of ESG disclosure quality on the mediating variable was tested; subsequently, this mediating variable was incorporated

into the benchmark model. The mediative path was validated by observing changes in the significance and magnitude of the core explanatory variable coefficients.

To test the moderating effect, the core explanatory variable and the interaction terms with each moderating variable (financing constraints, media attention, property rights nature, and time dummy variables) were sequentially added to the baseline model. The signs and significance of the interaction term coefficients were used to determine the direction and strength of moderation by each contextual factor.

4 Analysis of Empirical Results

Descriptive statistics(Table 2) reveal that the average debt financing cost is 0.052, while the average ESG disclosure quality score stands at 3.172 with a standard deviation of 0.958, indicating significant variations in disclosure quality among enterprises.

Table 2. Descriptive Statistics

Variable	Observations	Mean	Standard Deviation	Minimum	Median	Maximum
Cost_Debt	1316	0.052	0.042	0.002	0.044	0.297
L_ESG_Trans	1316	3.172	0.958	1.299	2.995	5.618
L_Size	1316	23.635	1.190	20.265	23.572	26.231
L_Lev	1316	0.552	0.161	0.067	0.560	0.894
L_ROA	1316	0.040	0.056	-0.248	0.036	0.225
L_Growth	1316	0.226	0.405	-0.567	0.152	2.591
L_Tang	1316	0.910	0.105	0.516	0.951	1.000
L_Big4	1316	0.110	0.313	0	0	1
L_Board	1316	2.358	0.263	1.609	2.303	3.296
L_Dual	1316	0.217	0.412	0	0	1
L_Top1	1316	0.366	0.160	0.085	0.341	0.741
L_Indep	1316	0.377	0.076	0.250	0.364	0.600
L_Cashflow	1316	0.052	0.066	-0.159	0.048	0.240
Analyst_Dis	1316	0.412	0.357	0.023	0.315	2.047
SOE	1316	0.454	0.498	0	0	1
Polluting_Ind	1316	0.328	0.470	0	0	1
L_Marketization	1316	9.445	1.816	4.587	9.732	12.390
L_Media_Coverage	1316	5.659	2.448	0.693	4.987	10.336
L_Fin_Constraint	1316	0.192	0.187	0.003	0.129	0.902

Note: Continuous variables were censored at the 1% and 99% quantiles.

In the correlation analysis(Table 3), the correlation coefficient between L_ESG_Trans and Cost_Debt was-0.204, which was statistically significant at the 1% level, preliminarily supporting the hypothesis of a negative correlation between the two variables.

Table 3. Pearson correlation coefficient matrix

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) Cost_Debt	1												
(2) L_ESG_Trans	-0.2	1											
(3) L_Size	-0.2	0.45	1										
(4) L_Lev	-0.0	0.01	0.40	1									
(5) L_ROA	-0.0	0.12	-0.0	-0.4	1								
(6) L_Growth	-0.0	0.10	0.04	-0.0	0.28	1							
(7) L_Tang	-0.0	0.01	0.12	0.22	-0.0	-0.1	1						
(8) L_Big4	-0.0	0.26	0.32	0.01	0.03	-0.0	0.00	1					
(9) L_Board	-0.0	0.02	0.15	0.08	-0.0	0.01	0.02	0.05	1				
(10) L_Dual	0.01	0.02	-0.0	-0.0	0.00	0.08	-0.0	-0.0	-0.1	1			
(11) L_Top1	-0.0	0.03	0.25	0.08	0.06	0.01	0.14	0.18	0.07	-0.1	1		
(12) L_Indep	-0.0	0.01	-0.0	-0.0	0.05	0.02	0.03	-0.0	-0.0	0.05	-0.0	1	
(13) L_Cashflo	0.01	0.17	0.02	-0.2	0.42	0.07	-0.0	0.07	0.00	-0.0	0.05	0.04	1

Note: *** indicates significance at the 1% level. The lower triangle shows the Pearson correlation coefficient.

As demonstrated in Table 4, the mean Variance Inflation Factor (VIF) was 1.29, with all values below 2, confirming the absence of significant multicollinearity in the model.

The benchmark regression employs a two-way fixed-effects model incorporating both individual and annual variables. As shown in Table 5, after controlling for factors such as firm size and profitability, the coefficient for L_ESG_Trans is -0.022, which is statistically significant at the 1% level. This indicates that each one-unit improvement in ESG disclosure quality reduces corporate debt financing costs by an average of approximately 2.2 percentage points, thereby confirming Hypothesis H1.

Table 4. VIF test results

Variable	VIF	1/VIF
L_Size	1.85	0.542
L_Lev	1.64	0.611
L_ROA	1.60	0.624
L_ESG_Trans	1.40	0.713
L_Cashflow	1.26	0.794
L_Big4	1.18	0.849
L_Growth	1.14	0.877
L_Top1	1.14	0.878
L_Tang	1.11	0.904
L_Board	1.06	0.947
L_Dual	1.04	0.960
L_Indep	1.02	0.979
Mean VIF	1.29	

Note: A VIF <10 indicates no significant multicollinearity.

Table 5. Benchmark regression results (fixed-effects model)

Variable	(1)	(2)	(3)	(4)
L_ESG_Trans	-0.023*** (0.004)	-0.022*** (0.004)	-0.022*** (0.004)	-0.022*** (0.004)
L_Size		-0.001 (0.004)	0.001 (0.004)	0.001 (0.004)
L_Lev		0.018 (0.017)	0.007 (0.016)	0.008 (0.016)
L_ROA			-0.040 (0.025)	-0.048* (0.028)
L_Growth			-0.004 (0.003)	-0.004 (0.003)
L_Tang			0.015 (0.034)	0.013 (0.035)
L_Big4			0.009 (0.009)	0.009 (0.009)
L_Board				-0.005 (0.005)
L_Dual				0.002 (0.004)
L_Top1				-0.006 (0.018)
L_Indep				0.013 (0.018)
L_Cashflow				0.020 (0.023)
Annual/Individual FE	yes	yes	yes	yes
N	1316	1316	1316	1316
R ² (within)	0.161	0.163	0.172	0.174

Note: *p<0.1, **p<0.05, ***p<0.01. The values in parentheses represent the cluster robust standard error (calculated at the enterprise level).

The mediation effect test focuses on the information asymmetry pathway. Table 6's regression results show that the coefficient of *L_ESG_Trans* for information asymmetry is -0.091 , which is statistically significant, indicating that high-quality ESG disclosure effectively reduces analyst forecast divergence. When information asymmetry is incorporated into the debt cost model, its coefficient becomes significantly positive, while the absolute value of the *L_ESG_Trans* coefficient decreases but remains significant, confirming that information asymmetry exerts a partial mediating effect and validating Hypothesis H2.

Table 6. Mediation Effect Test

Variable	A(1) Analyst Disp	A(2) Cost Debt
<i>L_ESG_Trans</i>	-0.091^{***} (0.024)	-0.021^{***} (0.004)
<i>Analyst_Disp</i>	-	0.006^{**} (0.003)
<i>L_Size</i>	0.145^{***} (0.039)	-0.000 (0.004)
<i>L_Lev</i>	-0.023 (0.159)	0.008 (0.016)
<i>L_ROA</i>	-1.057^{***} (0.398)	-0.042 (0.028)
<i>L_Growth</i>	-0.034 (0.031)	-0.004 (0.003)
<i>L_Tang</i>	0.026 (0.256)	0.012 (0.035)
<i>L_Big4</i>	0.192^{**} (0.083)	0.008 (0.009)
<i>L_Board</i>	-0.007 (0.062)	-0.005 (0.005)
<i>L_Dual</i>	0.030 (0.044)	0.001 (0.004)
<i>L_Top1</i>	-0.020 (0.201)	-0.006 (0.018)
<i>L_Indep</i>	-0.302 (0.193)	0.015 (0.017)
<i>L_Cashflow</i>	-0.287 (0.309)	0.022 (0.022)
Annual/Individual FE	yes	yes
N	1316	1316
$R^2(\text{within})$	0.142	0.178

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. The values in parentheses represent the cluster robust standard error.

This section tests the moderating effects hypothesis for the H3 series. Table 7 shows that the $\text{ESG} \times \text{FC}$ interaction term coefficient is significantly negative, supporting H3a,

indicating that financing constraints amplify the cost-reduction effect of ESG disclosure. This occurs because firms with higher financing constraints face greater information asymmetry, thereby enhancing the marginal signaling value of ESG disclosures. The ESG×Media interaction term coefficient is significantly positive, supporting H3b, suggesting that heightened media attention mitigates the main effect, as media serves as an alternative information channel that pre-disseminates some ESG-related information, reducing the incremental information content of formal disclosures. While the directions of other moderating variables (e.g., property rights structure) align with expectations, they lack statistical significance, thus providing insufficient support for H3c.

Table 7. Results of Regulatory Effects

Variable	(1)SOE	(2)Polluting	(3)Market	(4)Media	(5)FC
L_ESG_Trans	-0.023*** (0.004)	-0.019*** (0.004)	-0.022*** (0.005)	-0.027*** (0.005)	-0.019*** (0.003)
SOE	-0.035** (0.014)				
ESG×SOE	0.004 (0.003)				
Polluting_Ind		-0.004 (0.012)			
ESG×Polluting		-0.005 (0.003)			
Market_high			-0.003 (0.014)		
ESG×Market			0.001 (0.004)		
Media_high				-0.024* (0.014)	
ESG×Media				0.008* (0.005)	
FC_high					0.027** (0.012)
ESG×FC					-0.008** (0.003)
controlled variable	yes	yes	yes	yes	yes
Annual/Individual	yes	yes	yes	yes	yes
FE					
N	1316	1316	1316	1316	1316
R ² (within)	0.180	0.180	0.174	0.181	0.183

Note: *p<0.1, **p<0.05, ***p<0.01. The values in parentheses represent the cluster robust standard error.

The grouped regression results in Table 8 indicate that the cost-reduction effect of ESG in non-state-owned enterprises (coefficient-0.025) is significantly stronger than

that in state-owned enterprises (coefficient-0.013), aligning with the theoretical expectation that non-state-owned enterprises derive greater value from ESG signals amid stricter financing constraints. No significant difference was observed between heavily polluting and non-heavily polluting industries, demonstrating the cross-industry stability of this effect.

Table 8. Group Regression

Variable	(1) State-owned	(2) Non-state-owned	(3) Severe pollution	(4) Non-severely polluted
L_ESG_Trans	-0.013*** (0.004)	-0.025*** (0.005)	-0.022*** (0.006)	-0.022*** (0.005)
Controlled Variable	yes	yes	yes	yes
Annual/Individual FE	yes	yes	yes	yes
N	597	719	432	884
R ² (within)	0.107	0.244	0.371	0.155

Note: *p<0.1, **p<0.05, ***p<0.01. The values in parentheses represent the cluster robust standard error.

The sample regression analysis in Table 9 shows that the cost-reduction effect of ESG has significantly intensified since 2020, reaching approximately three times the previous level. This confirms that under the combined impact of the COVID-19 pandemic and the "dual-carbon" policies, the weight of ESG information in credit decision-making has increased, with its signaling value and market pricing function becoming more prominent due to strengthened regulatory oversight.

Table 9. Sample-based Regression: Using 2020 as the cutoff year

Variable	(1) 2014-2019	(2) 2020-2022
L_ESG_Trans	-0.020** (0.008)	-0.059*** (0.012)
Controlled variable	yes	yes
Annual/Individual FE	yes	yes
N	821	495
R ² (within)	0.094	0.504

Note: *p<0.1, **p<0.05, ***p<0.01. The values in parentheses represent the standard error.

5 Robustness and Endogeneity Tests

This paper validates the reliability of its conclusions through a series of robustness tests. Even after replacing the debt financing cost metric, using the Huazheng ESG rating as an alternative variable, and applying the PSM method to mitigate sample selection bias, the core findings remain robust, and the results are detailed in Table 10.

Table 10. Robustness Test

Variable	(1)Replace DV	(2)5% tail reduction	(3)Heckman	(4)OLS	(5)RE
L_ESG_Trans	-0.003*** (0.000)	-0.017*** (0.002)	-0.009*** (0.002)	-0.010*** (0.002)	-0.013*** (0.002)
controlled variable	yes	yes	yes	yes	yes
fixed effect	Individual + Year	Individual + Year	Industry + Annual	Industry + Annual	year
IMR			0.010**		
N	1316	1316	5970	1316	1316
R ²	0.442	0.224		0.116	

Note: *p<0.1, **p<0.05, ***p<0.01. The values in parentheses represent the standard error.

To address potential endogenous issues, this study constructed a Difference-in-Differences (DID) model using the 2020 enhanced environmental information disclosure policy as a quasi-natural experiment. The results shown in Table 11 demonstrate that the policy shock significantly reduced debt financing costs for enterprises in heavily polluting industries by improving ESG disclosure quality. Overall, the findings are robust and reliable.

Table 11. Endogenous Treatment

Variable	(1)DID	(2)DID+ESG	(3)IV-2SLS
DID	-0.009** (0.004)	-0.004 (0.004)	
L_ESG_Trans		-0.021*** (0.004)	-0.003 (0.002)
Controlled variable	yes	yes	yes
Year FE	yes	yes	yes
Individuality FE	yes	yes	
Trade FE			yes
First-stage F			1029.24
N	1316	1316	1179
R ² (within)	0.099	0.175	

Note: *p<0.1, **p<0.05, ***p<0.01. The values in parentheses represent the standard error.

6 Conclusions and Implications

This paper empirically examines the impact of ESG information disclosure quality on the debt financing costs of China listed companies. The study finds that improving ESG information disclosure quality significantly reduces corporate debt financing costs, an effect primarily achieved through alleviating information asymmetry. Heterogeneity analysis indicates that this effect is more pronounced in firms with higher financing

constraints and non-state-owned enterprises, but is mitigated by high media attention and has strengthened significantly since 2020.

The conclusions of this study offer significant insights. For enterprises, it is crucial to prioritize the quality of ESG information disclosure, utilizing it as an effective tool to reduce financing costs and convey positive signals—particularly important for non-state-owned enterprises and those facing higher financing constraints. For creditors, the quality of corporate ESG information disclosure should be incorporated into credit risk assessment systems to enable more accurate pricing. For regulatory authorities, efforts should continue to refine ESG disclosure standards and mandatory disclosure frameworks, guiding capital market resources toward green and sustainable sectors.

This study also has certain limitations. The measurement of ESG information disclosure quality primarily relies on third-party ratings; future research could incorporate methods such as text analysis for multidimensional evaluation. The study sample covers data up to 2022, and given the comprehensive implementation of mandatory ESG disclosure policies, their long-term effects require ongoing monitoring. Future research could further examine how ESG information disclosure impacts the costs of different types of debt instruments.

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