Research on the Impact of ESG Performance of Electric Power Enterprises on Enterprise Financing Costs

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Abstract. This paper empirically examines the impact of ESG performance of power enterprises on their financing costs by constructing A fixed-effect model, combining the generalized moment estimation method of the system and the instrumental variable analysis method, based on 451 listed companies of A-share and H-share power enterprises from 2009 to 2024. The research results show that improving the ESG performance of enterprises is conducive to reducing the debt and equity financing costs of power enterprises. However, there are differences for power enterprises of different energy types. The ESG performance of new energy power enterprises has a greater promoting effect on reducing financing costs. Based on this, this paper puts forward relevant suggestions for traditional energy power enterprises and new energy power enterprises to improve ESG performance and reduce financing costs.

Keywords: Financing Cost, Power Companies, ESG Performance

1 Introduction

ESG has become a central pillar in the sustainable development strategy of enterprises. As a crucial factor in the operational development of power companies, financing costs may be influenced by improvements in ESG performance as firms shift from traditional development paradigms to more sustainable models.

Exploring the intrinsic link between ESG performance and the financing costs of power companies is of significant importance for optimizing corporate development strategies, achieving sustainable growth, and enhancing core competitiveness in the energy sector.

There are diverse mechanisms and transmission pathways through which ESG performance may influence financing costs in power companies (Bae et al., 2021)[1]. On the environmental dimension, power companies can improve their ESG environmental scores by increasing energy efficiency and the proportion of clean energy usage, thereby reducing carbon emissions (Zhang & Lucey, 2022)[2]. This may help avoid

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penalties from environmental regulation breaches, such as fines or shutdowns, and may qualify them for government subsidies, thus lowering the risk of default on debt.

In the social dimension, strong social responsibility performance helps reduce implicit costs, lower employee turnover, and mitigate social risks, contributing to a decrease in financing costs(Tan & Zhu, 2022)[3]. On the governance front, a sound corporate governance structure and effective internal control mechanisms can reduce operational risks, enhance market credibility, and ease access to financing (Guo et al., 2024)[4].

Currently, most studies on the determinants of financing costs in the power industry focus on financial indicators such as debt capacity and profitability, while relatively few examine the impact mechanism and effectiveness of ESG performance in this context. Therefore, this study selects a sample of 451 Chinese A-share and H-share listed power companies from 2009 to 2024. By analyzing the effects of ESG performance on both debt and equity financing costs, this research aims to offer insights and practical recommendations for power companies to enhance ESG practices, reduce financing costs, promote stable operations, and improve overall performance.

2 Theoretical Framework and Research Hypothesis

Based on the theories of information asymmetry and signaling effect, ESG performance can enhance corporate transparency and reduce the information asymmetry between investors and enterprises (Bilyay-Erdogan et al., 2024)[5]. Power companies with high ESG ratings send a market signal of being "low-risk and sustainable," which lowers investors' perceived probability of default and reduces uncertainty and the risk premium associated with financing due to insufficient information (Broadstock et al., 2021)[6].

The Environmental (E) dimension primarily focuses on the environmental impact of a company's operations, including carbon emissions, waste management, energy efficiency, and natural resource consumption. Power companies can alleviate investor concerns regarding risks associated with the dual-carbon policy ("carbon peaking and carbon neutrality") by strengthening environmental information disclosure. This, in turn, may provide advantages in financing terms such as interest rates, loan durations, and credit limits (Hoang, 2024)[7].

The Social (S) dimension emphasizes corporate social responsibilities, such as employee health and safety, supply chain relationships, product quality and safety, and community engagement. According to stakeholder theory, by addressing the needs of multiple stakeholders—including government, employees, and the broader public—power companies can enhance their social image and foster a favorable external environment. This helps improve their ability to secure long-term, low-cost capital (Cheng et al., 2014)[8].

The Governance (G) dimension pertains to corporate governance structures and management quality, including board composition, executive compensation, and risk management. By improving governance transparency, power companies can reduce investor concerns over potential financial misconduct, thus gaining greater market trust

and subscription rates, which in turn helps lower both equity and debt financing costs (Malik & Kashiramka, 2024)[9].

In summary, this study proposes the following hypothesis:

Improved ESG performance is negatively associated with the financing costs of power companies; that is, higher ESG performance significantly reduces financing costs.

3 Empirical Research Design

3.1 Model Specification

Considering the time lag effect, the financing cost is not only affected by the current ESG performance and other factors, but also by the financing interest rate of the previous period itself. To solve the possible endogeneity problem between the financing cost and the ESG performance, this paper adopts the GMM estimation based on the dynamic panel data model and sets the following regression model. The names, symbols and definitions of the main model variables are shown in Table 1.

$$\mathrm{COST}_{i,t} = \beta_0 + \beta_1 \mathrm{COST}_{i,t-1} + \beta_2 \mathrm{ESG}_{i,t} + \beta_3 \mathrm{Controls}_{i,t} + \varepsilon_{i,t} \quad (1)$$

Dependent Variable: The ESG performance of power companies is measured using the comprehensive ESG score provided by the Wind database.

Independent Variables: The debt financing cost (D-COST) is measured by the ratio of interest expenses to interest-bearing liabilities. The equity financing cost (E-COST) is estimated using the Capital Asset Pricing Model (CAPM), expressed as:Using the Template.Among them, Rf is the risk-free rate of return, expressed by the 10-year Treasury bond yield, and βi measures the sensitivity of the volatility of a single power company's stock relative to the overall market volatility to reflect its systemic risk. Rm is the average market yield.

$$\mathrm{E-COST_i} = \mathrm{R_f} + \beta_i(\mathrm{R_m} - \mathrm{R_f}) \quad (2)$$

Control Variables: Drawing on previous studies (Fang et al., 2025)[10], this study incorporates a set of control variables that capture other key factors influencing the financing costs of power companies. These include:

a) *Firm Size (SIZE): Measured as the natural logarithm of total assets.*
b) *Leverage Ratio (Ratio): Calculated as total liabilities divided by total assets.*
c) *Return on Equity (ROE): Defined as net income divided by shareholders' equity.*
d) *Ownership Type (SOE): A binary variable equal to 1 if the firm is state-owned, and 0 otherwise.*

Table 1. Variable Definitions

Variable Name	Symbol	Definition
ESG Performance	ESG	ESG composite score from Wind database

Debt Financing Cost	D-COST	Interest expense / Interest-bearing debt
Equity Financing Cost	E-COST	CAPM-based equity cost estimate
Firm Size	SIZE	Logarithm of total assets
Leverage Ratio	Ratio	Total liabilities ÷ Total assets
Return on Equity	ROE	Net income ÷ Shareholders' equity
Ownership Type	SOE	1 if state-owned enterprise, 0 otherwise

3.2 Data Sources and Sample Selection

This study utilizes panel data from Chinese A-share and H-share listed companies in the power sector spanning from 2009 to 2024. The power industry sample includes 451 firms across various sub-sectors such as coal-fired power generation, solar power, wind power, power grid operations, and electrical equipment manufacturing. To minimize the potential influence of outliers on the regression results, all continuous variables are winsorized at the 1st and 99th percentiles.

4 Empirical Results

4.1 Baseline Regression Results

Table 2 presents the regression outcomes analyzing the impact of ESG performance on the financing costs of power companies. The results indicate that the ESG composite score is significantly negatively associated with the cost of debt financing. In contrast, the coefficient for equity financing cost is positive but statistically insignificant. This disparity in outcomes may be attributed to potential endogeneity issues within the model.

Table 2. The Impact of ESG Performance on the Financing Costs of Power Companies

Variable Name	D-COST	E-COST
ESG	-0.312***	0.394
	(0.091)	(0.045)
SIZE	-0.282**	-0.265***
	(0.004)	(0.004)
Ratio	0.136***	0.114**
	(0.000)	(0.000)
ROE	-0.337*	-0.392**
	(0.023)	(0.022)
SOE	-0.256**	-0.174**
	(0.000)	(0.000)
Observations	402	395

4.2 Analysis of Instrumental Variables and System GMM Models

Considering the endogeneity problem, this paper selects government subsidies (GS) as the instrumental variable. The Wald test value of the exogenous null hypothesis indicates that it is significant at the 1% confidence level. Meanwhile, the F-value in one stage of the two-stage estimation method is also significant. Therefore, the instrumental variable and the explained variable are exogenous. The empirical test results show that no weak instrumental variable is produced. Based on the analysis of the GMM model, in the regression results with a lag of one period, the AR (1) statistic is significant, while the AR (2) statistic is not significant. This indicates that there is no second-order autocorrelation in the difference of the perturbation term. Therefore, the assumption that there is no autocorrelation in the perturbation term is accepted. The Hansen test statistics were also not significant. Therefore, the optimal lag order in the GMM model of this system was confirmed as the first order.

Table 3 shows the regression results based on the GMM model and after adding instrumental variables. The coefficients of the ESG composite score on both debt financing cost and equity financing cost are significantly negative, demonstrating that improving ESG performance can significantly reduce both types of financing costs for power companies.

Table 3. Instrumental Variable Regression

Variable Name	D-COST	E-COST
L.COST	0.821***	0.754***
	(0.185)	(0.162)
L2.COST	-0.141	-0.154
	(0.014)	(0.092)
ESG	-0.032***	-0.019***
	(0.065)	(0.072)
SIZE	-0.026**	-0.023***
	(0.004)	(0.004)
Ratio	0.012***	0.009**
	(0.000)	(0.000)
ROE	-0.029*	-0.035**
	(0.013)	(0.016)
SOE	-0.017**	-0.015**
	(0.000)	(0.000)
Observations	402	395
First-stage F	69.34***	72.65***
Wald test	21.17***	13.65***
AR (1)	-3.49***	-3.51***
AR (2)	-1.29	-1.44
Hansen	66.54	67.37

4.3 Further Analysis

To further investigate the impact of ESG performance on financing costs across different types of power companies, this study classifies listed firms based on their energy source. Firms categorized as new energy power companies are assigned a dummy variable of nature = 1, while traditional energy power companies are assigned nature = 0. Group regressions and interaction terms (nature × ESG) are employed to explore heterogeneous effects.

Traditional energy firms, constrained by issues such as stranded assets and high carbon emissions, tend to exhibit lower ESG performance compared to their new energy counterparts. As shown in Table 4, the coefficients of the interaction term nature × ESG in columns (3) and (6) are significantly negative. This indicates that higher ESG performance has a more pronounced effect in reducing both equity and debt financing costs for new energy power companies than for traditional energy firms.

Table 4. The Impact of ESG Performance on the Financing Costs of Traditional vs. New Energy Power Companies

Variable	D-COST			E-COST		
	(1) New Energy Firms	(2) Traditional Energy Firms	(3) Full Sample	(4) New Energy Firms	(5) Traditional Energy Firms	(6) Full Sample
L.COST	0.681***	0.796***	0.745***	0.731***	0.824***	0.772***
	(0.177)	(0.185)	(0.165)	(0.185)	(0.162)	(0.162)
ESG	-0.047**	-0.025**	-0.033**	-0.031*	-0.014*	-0.023**
	(0.082)	(0.011)	(0.080)	(0.011)	(0.009)	(0.016)
nature × ESG			-0.035**			-0.057**
			(0.133)			(3.917)
SIZE	-0.032**	-0.027***	-0.030**	-0.039***	-0.029**	-0.035***
	(0.004)	(0.006)	(0.003)	(0.004)	(0.007)	(0.002)
Ratio	0.019***	0.011**	0.016***	0.011**	0.007***	0.009**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ROE	-0.042*	-0.031**	-0.032*	-0.046**	-0.035*	-0.039**
	(0.015)	(0.011)	(0.012)	(0.015)	(0.013)	(0.014)
SOE	-0.018**	-0.014**	-0.017**	-0.017**	-0.011**	-0.014**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	198	204	402	193	202	395
First-stage F	64.69***	72.42***	81.32***	53.21***	49.23***	42.27***
Wald test	48.29***	36.23***	17.26***	13.36***	20.48***	13.69***

5 Conclusion and Implications

5.1 Conclusion

ESG performance can effectively reduce financing costs by mitigating information asymmetry and garnering stakeholder support. Empirical findings suggest that the better a power company's ESG performance, the more significant the reduction in its financing costs. However, this effect is not uniform across all energy types. The impact is particularly pronounced for new energy power companies, where improved ESG performance leads to more substantial reductions in both equity and debt financing costs.

5.2 Implications

Based on the empirical analysis of ESG performance and financing costs for A-share and H-share listed power companies in China, and considering the differentiated characteristics in carbon reduction challenges and policy preferences between traditional and new energy firms, the following implications are derived:

For Traditional Energy Power Companies: Efforts should focus on improving energy efficiency and reducing emissions through initiatives such as energy-saving retrofits, heating system upgrades, and operational flexibility improvements for coal-fired units. Investments in ultra-low emission technologies—including desulfurization, denitrification, and dust removal—should be increased. Enhanced environmental information disclosure and improved corporate governance mechanisms can further contribute to reducing both equity and debt financing costs.

For New Energy Power Companies: Enhancing the recyclability of wind turbine blades and photovoltaic panels, improving the efficiency and stability of clean energy generation, and advancing digital governance capabilities are key priorities. Monitoring of critical indicators such as carbon emissions and equipment failure rates should be strengthened to improve ESG performance. Additionally, financing support mechanisms such as green bonds can offer long-term, low-cost capital for new energy projects.

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