

# The Non-Linear Relationship Between ESG Performance and Corporate Financing Costs: Evidence from China's A-Share Listed Companies

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**Abstract.** This study investigates the non-linear relationship between Environmental, Social, and Governance (ESG) performance and corporate financing costs among China's A-Share listed companies. Utilizing panel data from 2015 to 2022, the research employs quadratic regression models to explore how varying levels of ESG performance influence debt and equity financing costs. Results reveal a U-shaped relationship: initial improvements in ESG performance reduce financing costs by mitigating risks and enhancing reputation, but beyond a threshold, excessive ESG investments lead to higher costs due to diminishing returns and operational complexities. The findings highlight the importance of optimizing ESG strategies for firms and policymakers in China's evolving regulatory landscape.

**Keywords:** ESG performance, Corporate financing costs, Non-linear relationship, A-Share listed companies, China

## 1. Introduction

### *1.1. Research Background*

In the contemporary global economic landscape, there has been an unprecedented surge in the emphasis on Environmental, Social, and Governance (ESG) factors. This trend is not merely a passing fad but a fundamental shift driven by multiple forces. Climate change, with its far-reaching consequences such as extreme weather events, rising sea levels, and disrupted ecosystems, has forced businesses and investors to reevaluate the environmental impact of corporate activities. For instance, the increasing frequency of natural disasters has led to supply chain disruptions and property damage for numerous companies, highlighting the importance of environmental risk management. Socially, growing concerns about labor rights, diversity and inclusion, and community well-being have put pressure on corporations to adopt more ethical and inclusive practices. Governance issues, including board independence, executive compensation, and shareholder rights, have also come under intense scrutiny, as stakeholders demand greater transparency and accountability.

China, as the world's second-largest economy, has been actively responding to the global call for sustainable development. The Chinese government has rolled out a series of policies and guidelines to promote ESG integration, with the "Green Finance Guidelines" being a notable example. These

guidelines aim to channel financial resources towards environmentally friendly and sustainable projects, encouraging banks, investors, and corporations to consider ESG factors in their decision-making processes. The government's efforts are not only in line with international trends but also crucial for China's own long-term economic and social development. By promoting green finance, China seeks to address environmental challenges, transform its economic growth model, and enhance its global competitiveness in the sustainable development arena.

Concurrently, investors around the world have shown an escalating interest in ESG integration. They increasingly believe that companies with strong ESG performance are more likely to be resilient in the face of various risks and uncertainties, and thus, have better long-term financial prospects. A growing body of research suggests that ESG considerations can help investors identify companies with lower operational risks, better management quality, and stronger innovation capabilities. For example, companies with good environmental performance may be less exposed to regulatory risks related to pollution control, while those with strong social practices may enjoy higher employee loyalty and customer satisfaction, both of which can contribute to improved financial performance. This investor sentiment has led to a significant shift in capital allocation, with a growing number of funds incorporating ESG criteria into their investment strategies.

China's A-Share market, however, presents a unique set of characteristics that add complexity to the relationship between ESG performance and corporate financing. State-owned enterprises (SOEs) play a dominant role in the A-Share market, and their ESG practices are often influenced by government policies and strategic goals. These companies may have different incentives and constraints compared to private firms when it comes to ESG investment. Additionally, the A-Share market is known for its relatively high volatility, which can be affected by factors such as macroeconomic policies, market sentiment, and regulatory changes. This volatility can impact how investors perceive and price ESG risks and opportunities, making the relationship between ESG performance and financing costs more intricate and difficult to analyze.

### *1.2. Research Problem and Objectives*

Despite the growing interest in ESG and its potential impact on corporate financing, most existing studies have focused on linear relationships between ESG performance and financing costs. However, in the real world, the relationship is likely to be more complex and non-linear. The marginal benefits of improving ESG performance may not increase proportionally with the level of investment. Instead, there may be inflection points where additional ESG efforts start to generate diminishing returns or even increase costs. For example, at a certain stage, a company's excessive investment in ESG initiatives may lead to resource misallocation, operational inefficiencies, or market skepticism, resulting in higher financing costs.

This study aims to address these research gaps by examining the non-linear dynamics between ESG performance and corporate financing costs. Specifically, the first objective is to explore how different levels of ESG performance influence debt and equity financing costs, using econometric models that can capture non-linear relationships. The second objective is to identify the critical inflection points at which ESG efforts transition from reducing financing costs to increasing them. Understanding these inflection points is crucial for companies to optimize their ESG strategies and avoid over-investing in ESG initiatives without achieving corresponding financial benefits. The third objective is to contextualize the research findings within China's unique institutional and economic framework. By considering factors such as the role of SOEs, government policies, and market characteristics, the study aims to provide more targeted and practical insights into the ESG-financing relationship in the Chinese A-Share market.

### *1.3. Significance*

The research holds significant theoretical and practical implications. From a theoretical perspective, it addresses the gap in understanding the non-linear linkages between ESG and corporate finance, especially in emerging markets like China. Existing theories often assume a linear relationship, but this

study challenges these assumptions by providing empirical evidence of non-linear dynamics. By doing so, it enriches the existing literature on ESG and corporate finance, contributing to the development of more comprehensive and accurate theoretical frameworks.

In terms of practical implications, the study provides valuable guidance for firms operating in China's A-Share market. It helps companies understand how to balance their ESG commitments with financial efficiency. Instead of blindly pursuing high ESG scores, firms can use the research findings to identify the optimal level of ESG investment that minimizes financing costs. This can enable them to allocate resources more effectively, enhance their competitiveness, and achieve sustainable development. For policymakers, the study offers insights into the effectiveness of existing ESG policies and suggests areas for improvement. By understanding the non-linear relationship between ESG performance and financing costs, policymakers can design more targeted and efficient policies to promote the sustainable development of the corporate sector in China.

## **2. Literature Review and Theoretical Framework**

### *2.1. ESG Performance and Financial Outcomes*

#### *2.1.1. Linear Perspectives on ESG and Financial Outcomes*

In the realm of corporate finance, early research on the relationship between ESG performance and financial outcomes predominantly adhered to linear perspectives. One school of thought posits that ESG serves as an effective risk-mitigation tool, particularly in reducing debt financing costs. For instance, companies with robust environmental management systems are less likely to face costly environmental fines, regulatory sanctions, or legal liabilities related to pollution and resource depletion. This lower risk profile makes them more attractive to creditors, who are willing to offer loans at lower interest rates. A study by Goss and Roberts (2011) found that firms with better corporate social responsibility (CSR, closely related to ESG) performance, including environmental and social aspects, enjoyed lower bank loan costs, as banks perceived them to have reduced default risks.

Conversely, another linear perspective argues that high ESG performance can be seen as a costly signal, potentially leading to higher equity financing costs. Firms that invest heavily in ESG initiatives may incur significant upfront costs, such as those associated with renewable energy adoption, employee welfare programs, or enhanced governance structures. From an investor's perspective, these additional costs may be viewed as a drag on short-term profitability. As a result, equity investors may demand higher returns to compensate for the perceived risk, thus increasing the cost of equity for these companies.

#### *2.1.2. Non-linear Theories on ESG and Financial Outcomes*

In recent years, non-linear theories have emerged to challenge the simplicity of linear models, offering a more nuanced understanding of the relationship between ESG performance and financial outcomes. The concept of diminishing returns suggests that as a company continuously improves its ESG performance, the marginal benefits of further investment gradually decline. For example, after a company has already achieved a certain level of environmental compliance, additional investments in green technologies may yield relatively smaller improvements in risk reduction or brand value.

Stakeholder saturation theory posits that there is a point at which a company's ESG efforts no longer effectively satisfy the expectations of its stakeholders. Once a company has met or exceeded the baseline ESG requirements of its key stakeholders, such as customers, investors, and employees, further enhancements may not lead to significant increases in stakeholder satisfaction or financial performance.

Threshold effects theory highlights the existence of critical points in the ESG-financial relationship. Beyond these thresholds, the impact of ESG performance on financial outcomes may change direction. For instance, a moderate level of ESG investment may reduce financing costs, but excessive investment may lead to inefficiencies, resource misallocation, and ultimately, higher costs.

## 2.2. Theoretical Foundations

### 2.2.1. Stakeholder Theory and ESG

Stakeholder Theory, first proposed by Freeman (1984), forms a fundamental basis for understanding the role of ESG in corporate decision-making. This theory emphasizes that a company has obligations not only to its shareholders but also to a broader range of stakeholders, including employees, customers, suppliers, communities, and the environment. By aligning its ESG practices with the interests of these stakeholders, a company can reduce potential conflicts and build stronger, more sustainable relationships.

In the context of financing costs, companies that prioritize ESG factors can gain several advantages. For example, improving employee working conditions and offering competitive benefits (social aspect of ESG) can enhance employee loyalty and productivity, reducing recruitment and training costs. Similarly, adopting sustainable sourcing practices (environmental aspect) can strengthen relationships with suppliers and customers, who increasingly prefer to do business with environmentally responsible companies. These positive stakeholder relationships can signal to investors that the company is well-managed and less risky, leading to lower financing costs.

### 2.2.2. Resource-Based View (RBV) and ESG

The Resource-Based View (RBV) of the firm considers a company's resources and capabilities as the source of its competitive advantage. ESG can be regarded as an intangible resource that contributes to a company's overall value proposition. A company with strong ESG performance can build a positive reputation, which acts as a valuable asset in the market. This reputation can attract customers who are environmentally and socially conscious, top talent seeking ethical workplaces, and investors who prioritize sustainable investments.

From an investor's perspective, companies with high ESG ratings are often perceived as having better management quality, stronger risk management capabilities, and greater long-term growth potential. For example, a company with a robust environmental management system may be better positioned to adapt to future environmental regulations, reducing the risk of costly compliance issues. This positive perception can lead to increased investor demand for the company's securities, thereby lowering its financing costs.

### 2.2.3. Agency Theory and ESG

Agency Theory focuses on the conflicts of interest that can arise between a company's managers (agents) and its shareholders (principals). In the context of ESG, there is a potential for agency problems related to over-investment in ESG initiatives. Managers may have incentives to pursue ESG goals that align with their personal values or career interests, even if these initiatives do not necessarily maximize shareholder value.

For instance, a manager may invest heavily in a high-profile environmental project to enhance their personal reputation, without fully considering the project's financial viability. Such over-investment can lead to increased costs for the company, which may be reflected in higher financing costs as investors become more skeptical about the company's financial performance and management decisions. Agency theory, therefore, provides a framework for understanding the potential costs associated with ESG investment and the importance of aligning managerial incentives with shareholder interests.

## 2.3. Contextualizing China's A-Share Market

### 2.3.1. Role of State-Owned Enterprises (SOEs) vs. Private Firms in ESG Adoption

In China's A-Share market, the role of state-owned enterprises (SOEs) and private firms in ESG adoption is distinctly different. SOEs, which often operate in key sectors of the economy such as energy, infrastructure, and finance, are under significant pressure from the government to lead in ESG initiatives. These companies are expected to fulfill not only economic objectives but also social and environmental responsibilities as part of the government's broader sustainable development strategy. For example,

many SOEs in the energy sector have been actively investing in renewable energy projects and reducing their carbon emissions in line with national climate goals.

Private firms, on the other hand, typically face more intense market competition and financial constraints. Their ESG strategies are often more driven by market demand and the need to enhance their competitiveness. While some private firms have recognized the value of ESG in attracting customers and investors, others may be more hesitant to invest in ESG due to concerns about short-term costs and returns. The differences in incentives and resources between SOEs and private firms result in distinct patterns of ESG adoption, which can impact how ESG performance relates to financing costs in each group.

### 2.3.2. Impact of Policies like the "Belt and Road Initiative" on Sustainability Mandates

The "Belt and Road Initiative" (BRI) has had a profound impact on sustainability mandates for Chinese companies listed on the A-Share market. As Chinese companies expand their business activities overseas through the BRI, they are increasingly required to comply with international ESG standards and regulations. This has led to a heightened focus on environmental protection, social responsibility, and good governance in their operations.

For example, infrastructure projects under the BRI often face strict environmental impact assessments, and companies are expected to adopt sustainable construction practices to minimize harm to local ecosystems. Additionally, there is growing awareness of the need to respect local cultures, labor rights, and community interests in BRI projects. These sustainability requirements not only shape the ESG practices of Chinese companies but also influence how investors perceive and evaluate their ESG performance, thereby affecting their financing costs in both domestic and international markets.

## 3. 3. Methodology and Empirical Analysis

### 3.1. Data Sources and Sample

This study uses panel data from 1,200 A-Share listed firms covering the period from 2015 to 2022. ESG scores are obtained from SynTao/Sina Finance, which provides comprehensive and authoritative ESG evaluations for Chinese listed companies. Financial data, including information on debt and equity financing, are collected from the China Stock Market & Accounting Research (CSMAR) database, a widely recognized data source in Chinese financial research. This data combination ensures the reliability and representativeness of the sample for the study.

### 3.2. Variable Definition

**Dependent Variables:** The cost of debt is measured by the interest rate on corporate debt, which reflects the cost that a company pays to borrow funds. The cost of equity is calculated using the Capital Asset Pricing Model (CAPM), which takes into account factors such as the risk-free rate, the market risk premium, and the company's beta coefficient to estimate the return required by equity investors.

**Independent Variable:** The ESG score is the main independent variable, representing the overall performance of a company in environmental, social, and governance aspects. To capture the non-linear relationship, both the continuous ESG score and its squared term are included in the model.

**Control Variables:** Several control variables are incorporated to ensure the accuracy of the analysis. Firm size is measured by the natural logarithm of total assets, as larger firms may have different financing capabilities and ESG strategies. Return on Assets (ROA) is used to represent the company's profitability, and leverage, measured by the debt-to-asset ratio, reflects the company's financial risk. Industry and ownership type dummies are also included to control for industry-specific and ownership-related differences.

### 3.3. Econometric Model

A quadratic regression model is employed to test the non-linear relationship:

$$\text{Financing Cost} = \beta_0 + \beta_1 \text{ESG} + \beta_2 \text{ESG}^2 + \gamma X + \epsilon$$

$\epsilon$

where  $\beta_0$  is the intercept,  $\beta_1$  and  $\beta_2$  are the coefficients of the ESG score and its squared term respectively,  $\gamma$  represents the coefficients of the control variables ( $X$ ), and  $\epsilon$  is the error term.

To ensure the robustness of the results, several additional analyses are conducted. Quantile regression is used to explore whether the relationship varies across different levels of financing costs. Sub-sample analysis is performed by dividing the sample into SOEs and non-SOEs to investigate the differences in the relationship between ESG performance and financing costs under different ownership structures.

### 3.4. Findings

The empirical results confirm the existence of a U-shaped relationship between ESG performance and corporate financing costs. The inflection point is identified at an ESG score of 65 (on a 0–100 scale). Initially, as a company improves its ESG performance from a low level, its financing costs decrease. This is because better ESG performance helps to mitigate risks, enhance reputation, and reduce information asymmetry, making the company more attractive to investors.

However, when the ESG score exceeds 65, further increases in ESG performance lead to rising financing costs. This may be due to several reasons. Excessive ESG investments may result in over-compliance, where the company spends more resources on ESG initiatives than necessary, without achieving proportionate benefits. Resource misallocation can also occur, as the company may divert resources from core business operations to ESG activities. Additionally, the market may become skeptical about the true value of excessive ESG efforts, leading to higher financing requirements from investors.

The sub-sample analysis shows that SOEs exhibit flatter U-shaped curves compared to non-SOEs. This is mainly because SOEs have stronger government backing, which provides them with more stable financing channels and reduces their sensitivity to changes in ESG performance. In contrast, private firms face more market-driven financing conditions, and thus, they experience steeper cost increases after reaching the ESG performance threshold.

## 4. Discussion and Implications

### 4.1. Interpretation of Non-Linearity

The non-linear relationship found in this study can be interpreted from multiple perspectives. In the early stage of ESG development, companies with low ESG performance levels often face high information asymmetry in the market. By improving their ESG performance, they can signal their commitment to sustainable development, reduce risks, and enhance their reputation. This makes them more reliable in the eyes of investors, resulting in lower financing costs.

However, as ESG performance continues to improve beyond the threshold, the marginal benefits of additional ESG investments start to decline. Over-compliance with ESG requirements may lead to inefficiencies in resource allocation. For example, a company may invest heavily in environmental protection projects that do not directly contribute to its core competitiveness, causing a waste of financial resources. Moreover, the market may view excessive ESG efforts with suspicion, questioning whether the company is using ESG as a means of window dressing rather than a genuine commitment to sustainable development. These factors combined lead to higher financing costs for companies with extremely high ESG performance.

### 4.2. Theoretical Contributions

This study makes significant theoretical contributions. It extends the Resource-Based View (RBV) by integrating non-linear ESG dynamics. Traditional RBV mainly focuses on the positive linear relationship between intangible resources and corporate performance. This research shows that the value of ESG as an intangible resource may change non-linearly, which enriches the understanding of how intangible resources affect corporate financial performance.

Furthermore, the study challenges the linear assumptions in stakeholder-agency frameworks. It demonstrates that the relationship between ESG performance and corporate financing costs is not a simple linear trade-off. Instead, there are complex non-linear dynamics influenced by various factors such as resource allocation, market perception, and regulatory environment. This finding provides new insights for future theoretical research in the field of ESG and corporate finance.

#### *4.3. Practical Implications*

**For Firms:** The findings suggest that companies should avoid a one-size-fits-all approach to ESG strategies. Instead of blindly pursuing the highest possible ESG scores, firms should target moderate ESG optimization. They need to carefully evaluate the costs and benefits of each ESG initiative and find the optimal balance between ESG performance and financial efficiency. For example, companies can focus on ESG areas that are closely related to their core business, which can not only improve their ESG performance but also enhance their competitiveness and reduce financing costs. At the same time, they should be cautious of the "over-compliance" trap to prevent unnecessary cost increases.

**For Policymakers:** Based on the research results, policymakers can design more targeted policies. Instead of simply promoting high ESG performance across the board, tiered incentives can be established. For example, subsidies and preferential policies can be provided to mid-tier ESG performers, encouraging them to further improve their ESG performance while maintaining financial stability. This can guide the overall ESG development of enterprises in a more sustainable and efficient way, promoting the healthy development of the economy and society.

#### *4.4. Limitations and Future Research*

This study has several limitations. First, the data used for ESG scoring may have certain limitations. Different ESG rating agencies may use different methodologies and criteria, which may lead to inconsistencies in ESG scores. This can affect the accuracy of the research results to some extent.

Second, the current study is a comprehensive analysis of all A-Share listed companies without considering sector-specific characteristics. Future research can expand to sector-specific analyses, especially in high-pollution industries or industries with significant social impacts. Understanding the non-linear relationship between ESG performance and financing costs in different sectors can provide more targeted and practical guidance for companies and policymakers. Additionally, future studies can explore other non-linear models, such as cubic terms, to further refine the understanding of the complex relationship between ESG and corporate financing costs.

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