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# The Impact of Corporate ESG Performance on Debt Financing Costs

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**Abstract.** Guided by China's sustainable development philosophy of innovation, coordination, green development, openness, and shared prosperity, as well as the 'dual carbon' goals, ESG performance has gradually become an important metric for corporate sustainable development. This paper selects A-share listed companies from 2012 to 2022 as the research objects, and explores the impact of corporate ESG performance on their debt financing costs. The research results show that corporate ESG performance has an inverse impact on their debt financing costs, and further mechanism testing reveals that the risk level and financing constraint costs of enterprises both have a positive moderating effect on this impact. Heterogeneity tests indicate that the inverse impact of corporate ESG performance on debt financing costs is more pronounced in western enterprises and enterprises where the chairperson and general manager are separated.

**Keywords:** ESG Performance; Debt Financing Costs; Risk Level; Financing Constraint Degree.

## 1. Introduction

ESG (Environmental, Social, and Governance) encompasses the performance and practices of enterprises in the three dimensions of environmental responsibility, social responsibility, and corporate governance, and is highly aligned with China's concepts of 'sustainable development' and 'high-quality development'. From a domestic perspective, China's economic development has now entered a new stage of transitioning from high-speed growth to high-quality development, where protecting the natural environment and improving social well-being are indispensable considerations for the current stage of economic development. From an international perspective, global society's emphasis on green innovation and ESG investment is continuously increasing, which is a prevailing trend that provides impetus for Chinese enterprises to enhance their ESG performance in order to facilitate the construction of an open world economy and seize the opportunities of economic globalization. In September 2018, China Securities Regulatory Commission timely released the revised 'Code of Corporate Governance for Listed Companies', which for the first time clearly defined the basic framework for listed companies' ESG information disclosure. In May 2021, the Ministry of Ecology and Environment issued a notice on the 'Reform Plan for the System of Mandatory Environmental Information Disclosure', proposing to establish a mandatory environmental information disclosure system by 2025. In May 2022, the State-owned Assets Supervision and Administration Commission (SASAC) released the 'Work Plan for Improving the Quality of Listed Companies Controlled by Central Enterprises', aiming to achieve full coverage of ESG reporting by central enterprises by 2023 and promote the establishment of an ESG rating system. In March 2023, the Chinese Academy of Social Sciences, a renowned domestic think tank, officially released the 'ESG Report Rating Standards for Chinese Enterprises (2023)' to promote the standardization and quality of ESG information disclosure by listed companies. Under the policy guidance of the government, corporate ESG performance has attracted widespread attention from all sectors of society, and investors have also become increasingly focused on enterprises' ESG performance. Although China has made some progress in promoting the development of corporate ESG, there are still some problems and difficulties. Due to the lack of a mature ESG information disclosure system in China and the certain degree of difference in ESG value concepts between China and international mainstream rating systems, the ESG evaluation of Chinese enterprises is not objective enough, making it difficult for investment institutions to comprehensively analyze and judge ESG risks and

values based on the assessment results. Although more and more enterprises have started to disclose ESG information, the overall disclosure quality is not high, with issues such as scattered data and inconsistent calibers. In addition, some enterprises lack the driving force to develop ESG capabilities, and there are problems such as neglecting voluntary disclosure, inefficient investment for the sake of ratings, and 'greenwashing' by disclosing false information. Based on this, how to improve the construction of China's ESG system to promote enterprises to attach more importance to their ESG performance is a pressing issue that needs to be addressed.

Under the strong policy support from the government and the active implementation by relevant institutions, existing academic research has already explored the relationships between corporate ESG performance and factors such as corporate value (Wang et al., 2022), corporate performance (Li and Lin, 2021), and financing constraints (Li et al., 2022), providing valuable theoretical references for the economic effects of corporate ESG practices. However, there is a paucity of in-depth research on the linkage between corporate ESG performance and their debt financing costs, representing a research gap. What is the impact of a company's ESG performance on its debt financing costs? Can it help resolve the issue of insufficient self-driving force for enterprises to develop ESG capabilities? Are there other factors that can significantly moderate this impact? An in-depth investigation of these questions not only can provide theoretical guidance for enterprise development, but also can offer theoretical basis and policy implications for promoting the construction of China's ESG system.

Based on this, this study examines the impact of corporate ESG performance on their debt financing costs using the ESG rating data and financial data of A-share listed companies from 2012 to 2022, investigates the moderating effects of enterprise risk level and financing constraint degree on this impact, and discusses the heterogeneity of the impact under different regional and governance structures of enterprises. The potential contributions of this study are mainly reflected in three aspects: First, from the micro-enterprise level, it systematically analyzes the impact of ESG performance on corporate debt financing costs and its moderating effects. Existing research has mostly focused on the relationship between corporate ESG performance and factors such as corporate value, corporate performance, and financing constraints, while rarely incorporating corporate ESG performance and debt financing costs into a unified research framework. This paper delves into the issue of 'corporate ESG performance and debt financing costs', enriching the research on the impact of ESG in the context of China's 'high-quality development'. Second, on this basis, this paper introduces the moderating variables of risk level and financing constraint degree, and respectively examines their moderating effects on the relationship between corporate ESG performance and debt financing costs, providing new insights for improving the efficiency of enhancing corporate ESG performance. Third, from the perspectives of enterprise region and governance structure, it explores the heterogeneity of the impact of corporate ESG performance on debt financing costs, providing targeted recommendations for improving the construction of China's ESG system and enhancing corporate ESG capabilities.

## 2. Literature Review

Guided by China's sustainable development philosophy of innovation, coordination, green development, openness, and shared prosperity, as well as the 'dual carbon' goals, it is imperative for enterprises to enhance their ESG capabilities and improve their ESG performance. The ESG concept is an extension of responsible investment, signifying the further development of corporate responsibility. This concept aims to guide enterprises to not only pursue profits, but also attach importance to the environmental, social, and corporate governance responsibilities they bear.

### 2.1. Research Progress on the Economic Consequences of Corporate ESG

Current research on the economic consequences of corporate ESG performance mainly focuses on three aspects: corporate value, corporate performance, and financing constraints.

First, on corporate value, some scholars have found a significant positive correlation between corporate ESG performance and corporate value through the two-way fixed-effects model (Zhang et al., 2019). Some scholars have further studied its impact mechanism, analyzing that good ESG performance can alleviate financing constraints, improve operational efficiency, and reduce financial risks, thereby enhancing corporate value (Wang et al., 2022). Additionally, ESG performance can significantly increase market attention, alleviate information asymmetry, and release positive signals, thereby improving a company's market value (Wang, 2022).

Second, on corporate performance, recent research generally believes that corporate ESG performance and corporate performance have a positive relationship (Lee Siew Peng, 2023). According to the research findings of Ren et al. (2022), corporate ESG ratings can reduce information asymmetry between the enterprise and external stakeholders, thereby enabling the enterprise to focus on improving its own sustainable development capabilities. Li and Lin (2021) believe that the three dimensions of a company's environmental performance, social performance, and corporate governance performance all have a positive impact on its performance. Sinha Ray Rupamanjari et al. (2022) found through static and dynamic panel regression analysis that there is a time-lagged correlation between corporate ESG and its financial indicators, and a long-term positive correlation with the company's annual average stock price.

Third, on financing constraints, one view holds that corporate ESG performance can significantly alleviate its financing constraints (Li et al., 2022), and found that media supervision can have a moderating effect on this impact. Yi et al. (2023) further studied this impact mechanism and found that ESG performance ultimately alleviates corporate financing constraints through channels such as equity financing, commercial credit, and financial loans. Another research perspective focuses on the mediating effect of financing constraints on the relationship between corporate ESG performance and corporate green technology innovation (Zhang et al., 2021), as well as corporate value (Tong, 2021), and the results show that financing constraints play an important role in these relationships. There is also a view that examines the moderating effect of financing constraints, finding that financing constraints suppress the promoting effect of ESG performance on corporate performance, and have a negative impact on this effect (Chen, 2022).

## 2.2. Research Progress on the Impact of Corporate ESG on Debt Financing Costs

Domestic and foreign scholars have made some progress in the research on the impact of corporate ESG on their debt financing costs, but there is currently no unified view, mainly with the following three perspectives:

One view holds that corporate ESG performance has a significant negative impact on debt financing costs. Domestic scholars Zhu et al. (2022) and Xu et al. (2022) used multi-period difference-in-differences models and found that corporate ESG performance can significantly reduce debt financing costs. Foreign scholars have also explored this impact using different research subjects, finding that the ESG performance of Chinese family businesses can reduce their debt financing costs by gaining the support of creditors (Wen Kong et al., 2023), and the ESG performance disclosure of European Union companies can also help reduce their debt financing costs (Yasser Eliwa et al., 2021). Joel F Houston et al. (2022) found that banks tend to lend to borrowers whose ESG performance is similar to the banks' own ESG performance, and this has a certain guiding and incentive effect on the subsequent ESG performance of the borrowers, i.e., banks with better ESG performance tend to lend to companies with better ESG performance, while restricting lending to companies with poor ESG performance, thereby increasing their debt financing costs. In addition, some scholars have focused on the research of the impact mechanism between corporate ESG performance and debt financing costs, which roughly includes the following three paths: corporate ESG performance significantly reduces agency risk (Lian Yonghui, 2022), operational risk (Zhao Yaqian et al., 2024; Li Jinglin et al., 2023), financial risk and information risk, thereby reducing the overall risk level of the enterprise and affecting its debt financing costs; corporate ESG can also alleviate information asymmetry by improving information transparency, thereby enhancing corporate reputation and reducing debt

financing costs (Zhou Jian, 2023; Li Jinglin, 2023); at the same time, good ESG performance of enterprises can reduce their debt financing costs by increasing investor attention (Mei Yali, 2023).

The second view holds that corporate ESG performance has a significant positive impact on their debt financing costs. Chen Ruohong et al. (2022) analyzed the mechanism and believe that due to the positive impact of information asymmetry theory, principal-agent theory, signal transmission theory, and the level of development of China's corporate ESG system and the degree of popularization of ESG investment concepts, corporate ESG performance increases their debt financing costs.

The third view explores the impact of corporate ESG from multiple dimensions on debt financing costs. Yin et al. (2019) found that a company's environmental responsibility and corporate governance performance have a significant negative impact on its debt financing costs, while the impact of social responsibility varies. Fan et al. (2022) found a negative relationship between corporate ESG performance and debt financing costs, and further found that the impact of environmental responsibility is relatively weak, while social responsibility and corporate governance have more significant impacts.

## 3. Theoretical Analysis and Research Hypotheses

### 3.1. Corporate ESG Performance and Debt Financing Costs

According to information asymmetry theory, investors are usually unable to obtain complete and accurate information. Scholars Ye Zhiwei et al. (2016) found that the information asymmetry between the company and investors will lead to financing constraints for the company. Meanwhile, due to the lack of key information, investors may make irrational or incorrect choices in investment decisions. In this case, the information disclosed by the company becomes an important source for investors to make investment decisions, and the scope and quality of the disclosed information are the key for investors to make rational decisions. Therefore, good ESG information disclosure and ESG performance can effectively improve information transparency, alleviate information asymmetry, and reduce investors' uncertainty about the company. This allows investors to obtain more complete and comprehensive information to understand the company's risks, assess the company's financial condition, strategic planning and potential risks, thereby reducing the risk premium required by investors for debt financing, and thereby lowering the company's debt financing costs.

On the other hand, according to the principal-agent theory, there may be conflicts of interest between the company as the agent and the investors as the principal in the company's financing process, leading to the typical principal-agent problem. Scholars Xu Jiuping et al. (2004) found that the information asymmetry problem of the company will pose agency risks to the investment institution. To address the principal-agent problem, investors are usually willing to pay certain agency costs to monitor the company's operational behavior, such as hiring external auditors and formulating contract clauses. In order to reduce such agency costs, investors have the motivation to increase the company's debt financing costs. At the same time, investors also face moral hazard problems, as companies have the motivation to conceal information to pursue their own interests, which exposes investors to great moral hazard. In order to reduce the moral hazard faced by investors and prevent the company from engaging in acts such as embezzlement, pursuit of short-term interests, and asset transfer during the operation, investors may demand higher financing costs to address this risk and provide incentives for the invested company. Furthermore, assuming that the rise in financing costs caused by agency costs and moral hazards does not exist. Without comprehensive and high-quality ESG information disclosure, due to information asymmetry, investors are usually unable to fully understand the company's behavior and decision-making. This may lead investors to overly rely on the company's financial information while ignoring the costs invested by the management to achieve the company's sustainable development. The costs invested by the management in the company's ESG capability building will be reflected to a certain extent in the financial information. If the financial information does not meet the expectations of investors, investors may raise the company's debt financing costs

in order to obtain higher returns. Therefore, the disclosure of ESG information and good ESG performance can effectively reflect the company's performance in sustainable development and corporate governance, and have a significant mitigating effect on agency costs, moral hazards, and information asymmetry, thereby allowing the company to lower its debt financing costs.

Based on signal theory, good ESG performance sends a positive signal to the market, indicating that the company is on the path of green development and sustainable development. Scholars Chen Cheng et al. (2019) found from the perspective of signal theory that the level of corporate social responsibility information disclosure has a positive impact on corporate financial performance. Therefore, companies with good ESG performance have better social reputation and a reputation insurance mechanism. This helps alleviate the adverse impact of negative events on the company, reduce its operational risk, and therefore creditors are usually more willing to cooperate with companies with good reputation at a lower risk premium, thereby reducing the company's debt financing costs. In addition, companies with good ESG performance are more closely watched and have a signal supervision mechanism. This signal supervision mechanism can effectively alleviate the principal-agent problem between the company and investors, and reduce the moral hazard faced by investors. Therefore, this mechanism can effectively reduce the risk premium of investors, thereby reducing the company's debt financing costs. Based on the above analysis, this paper proposes the first research hypothesis:

$H_1$: Corporate ESG Performance Can Inversely Affect its Debt Financing Costs

### 3.2. The Impact of Enterprise Risk Level on the Relationship between its ESG Performance and Debt Financing Costs

According to information asymmetry theory, since investors cannot fully understand the company's behavior and decision-making, they have a certain degree of cognitive bias in the company's financial condition, operating condition, and strategic planning, which in turn leads to their inability to make accurate judgments on the company's overall risk level. Meanwhile, according to the principal-agent theory, investors also face considerable moral hazard. When the overall risk level of the company is relatively high, investors have the motivation to increase the risk premium, so the company's debt financing costs tend to rise. Scholars Chen Fang (2024) et al. found that there is a significant U-shaped relationship between ESG responsibility fulfillment and enterprise risk, using the Huazheng ESG rating to measure, with the turning point value being as high as 7.393. Therefore, for most domestic companies, good ESG performance and disclosure of ESG information can effectively endorse the company's sustainable development capability, social responsibility and social reputation, and thus explain the financial risks and operational risks faced by the company. Therefore, when the risk level of companies with outstanding ESG performance is high, these companies can alleviate the risk premium problem caused by information asymmetry and principal-agent relationships by disclosing detailed ESG information, demonstrating the company's sustainable development capabilities, social responsibility and social reputation, and thereby obtaining financing at lower debt costs. Therefore, this paper proposes the second research hypothesis:

$H_2$: The Inverse Impact of Corporate ESG Performance on its Debt Financing Costs is Positively Moderated by the Enterprise Risk Level

### 3.3. The Impact of Financing Constraint Degree on the Relationship between Enterprise ESG Performance and Debt Financing Costs

Financing constraints refer to the limitations that enterprises face in their financing activities, manifested in restrictions on financing methods, financing channels, and financing scale. The degree of financing constraints has an important impact on the debt financing costs of enterprises. When the degree of financing constraints is relatively high, investors evaluate the company's sustainable development capabilities and social responsibility performance by studying its ESG performance level, and then judge the company's risk level. Therefore, companies with outstanding ESG

performance can make investors face a relatively low risk level and a lower risk premium, thereby allowing these companies to obtain financing at lower debt costs. Therefore, this paper proposes the third research hypothesis:

$H_3$: The Inverse Impact of Corporate ESG Performance on its Debt Financing Costs is Positively Moderated by the Degree of Financing Constraints

### 3.4. Heterogeneity in the Impact of ESG Performance on Debt Financing Costs of Enterprises with Different Regions and Governance Structures

First, there are obvious regional characteristics in the distribution of enterprises in our country. Enterprises in the central and eastern regions are usually located in economically developed areas, with more capital, technology and market resources, and generally larger in scale, while enterprises in the western regions are relatively lagging in economic development, with fewer resources and less advanced technology. However, in terms of policy, the government of our country encourages the development of the western region, so western enterprises can obtain more policy support, such as tax incentives and industrial transfer. Considering the characteristics of enterprises in different regions, western enterprises may face greater operational risks, more severe financing constraints, and more comprehensive policy support, so improving ESG performance has a more significant impact on their debt financing costs.

In addition, there are obvious characteristics in the governance structure of enterprises in our country. Scholars He Xiaolan et al. (2023) found that the separation of the chairman and general manager positions is positively correlated with the quality of environmental information disclosure. Enterprises with separation of chairman and general manager have a clearer division of responsibilities, and this governance structure can balance the rights and responsibilities of the two, which is conducive to improving the information transparency of the enterprise. While in enterprises with dual leadership, the concentration of responsibilities leads to greater potential problems in information inequality and moral hazard. Therefore, enterprises with separation of chairman and general manager have higher quality of disclosed ESG information and higher information transparency, so the effect of lowering their debt financing costs through ESG performance is more significant. Based on this, this paper proposes the fourth and fifth research hypotheses:

$H_4$: The Impact of Corporate ESG Performance on the Debt Financing Costs of Western Enterprises is Greater than that of Central and Eastern Enterprises

$H_5$: The Impact of Corporate ESG Performance on the Debt Financing Costs of Enterprises with Separation of Chairman and CEO is Greater than those with Dual Leadership

## 4. Research Design

### 4.1. Sample Selection and Data Sources

This paper selects the A-share listed companies in China from 2012-2022 as the research objects, and conducts the following sample screening based on the research objectives: (1) Excluding listed companies in the financial industry; (2) Excluding ST and *ST sample companies; (3) Excluding sample companies with missing relevant data that cannot be manually supplemented. After the above screening, a final sample of 1,128 companies and 12,408 observations was obtained. Among them, the ESG rating data of the listed companies comes from the Huazheng ESG rating in the Wind database, and the other relevant financial data are all from the CSMAR database.

### 4.2. Variable Description

#### 4.2.1. Dependent Variable

Debt Financing Costs (DFC): This paper refers to the measurement method of debt financing costs by Li Guangzi et al. (2009), using the ratio of financial expenses to the sum of financial expenses,

administrative expenses and selling expenses as a proxy indicator of the company's debt financing costs. In the subsequent robustness tests, this paper uses the ratio of financial expenses to total liabilities at the end of the period as another alternative indicator to measure the company's debt financing costs.

### 4.2.2. Independent Variable

ESG Performance (ESG): This paper adopts the Huazheng ESG rating as a proxy indicator of the company's ESG performance. Specifically, this rating system divides the company's ESG performance into 9 levels from C to AAA, with scores ranging from 1 to 9 from low to high. The higher the score, the better the company's ESG performance.

### 4.2.3. Moderating Variable

Risk Level (Risk): This paper uses comprehensive leverage as a proxy variable for the company's risk level.

Financing Constraint Degree (Constraint): This paper adopts the Kaplan-Zingales (KZ) index as a proxy variable to measure the degree of financing constraints of the enterprise.

### 4.2.4. Control Variable

Based on the existing reference literature and the influencing factors of debt financing costs and data availability, referring to the research of scholars Yin Hong et al. (2019) and Chen Ruohong et al. (2022), this paper will use company size (Size), liquidity (Liquidity), asset-liability ratio (ALR), fixed asset ratio (FAR), operating capacity (Operation), return on assets (ROA), Tobin's Q value (TBQ), growth (Grow) and equity concentration (FP) as control variables. The detailed description of the main variables is shown in Table 1.

**Table 1.** Definitions of main variables

| Variable type | Name | Symbol | Definition |
|---|---|---|---|
| Dependent variable | Debt Financing Cost | DFC | Finance expenses/finance expenses + administrative expenses + selling expenses |
| Independent variable | ESG Performance | ESG | Huazheng ESG rating |
| Moderating variable | Risk Level | Risk | Combined leverage |
| | Financing Constraint Degree | Constraint | Kaplan-Zingales (KZ) index |
| Control variable | Company Size | Size | Natural logarithm of the firm's total assets |
| | Liquidity | Liquidity | Current assets/current liabilities |
| | Asset-Liability Ratio | ALR | Total assets/total liabilities |
| | Fixed Asset Ratio | FAR | Net fixed assets/total assets |
| | Operating Capacity | Operation | Total sales revenue/assets |
| | Return on Asset | ROA | Net profit/total assets |
| | Tobin’s Q Value | TBQ | Market value/total assets |
| | Growth | Growth | Operating income growth rate |
| | Equity Concentration | FP | The largest shareholder shareholding ratio |

## 4.3. Model Specification

To test the impact of corporate ESG performance on its debt financing costs, the following multiple regression model (1) is constructed. At the same time, in order to test whether the company's risk level and financing constraint degree play a moderating role in the impact of the company's ESG performance on its debt financing costs, the interaction terms of risk level and financing constraint degree with the company's ESG performance are introduced on the basis of the baseline model (1), and the moderating effect models (2) and (3) are further constructed for this study.

$$DFC_{i,t} = \alpha_0 + \alpha_1 ESG_{i,t} + \alpha_i CVs_{i,t} + u_i + v_t + \varepsilon_{i,t} \quad (1)$$

$$DFC_{i,t} = \alpha_0 + \alpha_1 ESG_{i,t} + \alpha_2 ESG_{i,t} \times Risk_{i,t} + \alpha_3 Risk_{i,t} + \alpha_i CVs_{i,t} + u_i + v_t + \varepsilon_{i,t} \quad (2)$$

$$DFC_{i,t} = \alpha_0 + \alpha_1 ESG_{i,t} + \alpha_2 ESG_{i,t} \times Constraint_{i,t} + \alpha_3 Constraint_{i,t} + \alpha_i CVs_{i,t} + u_i + v_t + \varepsilon_{i,t} \quad (3)$$

Where: $i$ represents the individual enterprise, $t$ represents the year; the explained variable $DFC$ is the enterprise's debt financing cost; the explanatory variable ESG is the enterprise's ESG performance; CVs represent various control variables; the control variable $Risk$ represents the risk level, and the control variable $constraint$ represents the financing constraint degree; $u_i$ represents the year fixed effect, $v_t$ represents the individual fixed effect, and $\varepsilon$ represents the residual term.

## 5. Empirical Results Analysis

### 5.1. Descriptive Statistics

Table 2 shows the descriptive statistics of the main variables. During the sample period (2012-2022), there are a total of 1,128 listed companies with 12,408 observations. From the perspective of the explanatory variable, the average corporate ESG performance (ESG) is 4.0099, equivalent to a B-level, indicating that the overall ESG performance of the sample companies is not high, with a minimum value of 1 and a maximum value of 8, and a standard deviation of 1.1467, reflecting significant differences in ESG performance among the sample companies. From the perspective of the explained variable, the average debt financing cost (DFC) is 0.1308, meaning that the overall debt financing cost of the sample companies is relatively low. The minimum value is -1.0272, the maximum value is 1.0682, and the standard deviation is 0.1545, indicating that there are large differences in debt financing costs among enterprises. From the perspective of the moderating variables, the standard deviations of the sample companies' risk levels and financing constraint degrees are both relatively large, reflecting significant differences in the moderating variables among the enterprises. The sample situation of the control variables is not detailed here.

**Table 2.** Descriptive statistical analysis

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| | N | mean | sd | min | max |
| DFC | 12,408 | 0.1308 | 0.1545 | -1.0272 | 1.0682 |
| ESG | 12,408 | 4.0099 | 1.1467 | 1.0000 | 8.0000 |
| Risk | 12,408 | 3.6193 | 18.5313 | -48.5227 | 931.5523 |
| Constraint | 12,408 | 1.0683 | 2.4288 | -11.4536 | 19.2384 |
| Size | 12,408 | 22.3017 | 1.2489 | 16.7575 | 27.6211 |
| Liquidity | 12,408 | 0.0247 | 0.0350 | 0.0007 | 1.4400 |
| ALR | 12,408 | 0.4261 | 0.2302 | 0.0080 | 8.2564 |
| FAR | 12,408 | 0.2043 | 0.1432 | 0.0000 | 0.8359 |
| Operation | 12,408 | 0.6467 | 0.5512 | 0.0034 | 11.4156 |
| ROA | 12,408 | 0.0268 | 0.1451 | -4.7821 | 7.4461 |
| FP | 12,408 | 0.3112 | 0.1424 | 0.0212 | 0.8909 |
| TBQ | 12,408 | 2.1533 | 1.8600 | 0.6413 | 69.2443 |
| Growth | 12,408 | 1.0653 | 44.3728 | -11.6834 | 4,500.0156 |

## 5.2. Correlation Analysis

Before formally conducting the regression analysis, this paper first performs a correlation analysis of the main variables to examine the correlations between the variables and whether there are significant multicollinearity issues. The specific results are shown in Table 3. From the correlation analysis results, we can see that the VIF values of all the main variables are less than 2, and the average VIF value is 1.21, which is far less than 10. Therefore, there is no significant multicollinearity among the main variables, and the correlations are relatively weak.

**Table 3.** Correlation Analysis

| | ESG | Size | Liquidity | ALR | FAR | Operation | ROA | FP | TBQ | Grow | VIF |
|---|---|---|---|---|---|---|---|---|---|---|---|
| VIF | 1.13 | 1.49 | 1.30 | 1.67 | 1.05 | 1.05 | 1.19 | 1.05 | 1.15 | 1.00 | 1.21 |

## 5.3. Regression Results Analysis

**Table 4.** Basic Regression Results

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
|---|---|---|---|---|---|---|---|---|---|---|
| | DFC | DFC | DFC | DFC | DFC | DFC | DFC | DFC | DFC | DFC |
| ESG | -0.0107*** | -0.0121*** | -0.0113*** | -0.0073*** | -0.0071*** | -0.0070*** | -0.0070*** | -0.0069*** | -0.0071*** | -0.0071*** |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| Size | | 0.0441*** | 0.0413*** | 0.0359*** | 0.0417*** | 0.0408*** | 0.0405*** | 0.0401*** | 0.0368*** | 0.0368*** |
| | | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| Liquidity | | | -0.3258*** | -0.0657** | 0.0147 | 0.0016 | 0.0047 | 0.0064 | 0.0008 | 0.0010 |
| | | | (0.028) | (0.027) | (0.027) | (0.027) | (0.027) | (0.027) | (0.027) | (0.027) |
| ALR | | | | 0.1812*** | 0.1789*** | 0.1812*** | 0.1905*** | 0.1901*** | 0.1984*** | 0.1986*** |
| | | | | (0.005) | (0.005) | (0.005) | (0.005) | (0.005) | (0.005) | (0.005) |
| FAR | | | | | 0.1808*** | 0.1783*** | 0.1799*** | 0.1801*** | 0.1786*** | 0.1787*** |
| | | | | | (0.010) | (0.010) | (0.010) | (0.010) | (0.010) | (0.010) |
| Operation | | | | | | -0.0228*** | -0.0227*** | -0.0227*** | -0.0224*** | -0.0224*** |
| | | | | | | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) |
| ROA | | | | | | | 0.0245*** | 0.0248*** | 0.0287*** | 0.0287*** |
| | | | | | | | (0.005) | (0.005) | (0.005) | (0.005) |
| FP | | | | | | | | -0.0160 | -0.0226** | -0.0228** |
| | | | | | | | | (0.010) | (0.010) | (0.010) |
| TBQ | | | | | | | | | -0.0042*** | -0.0042*** |
| | | | | | | | | | (0.000) | (0.000) |
| Grow | | | | | | | | | | 0.0000 |
| | | | | | | | | | | (0.000) |
| Constant | 0.1739*** | -0.8044*** | -0.7378*** | -0.7165*** | -0.8844*** | -0.8497*** | -0.8491*** | -0.8340*** | -0.7535*** | -0.7533*** |
| | (0.004) | (0.027) | (0.028) | (0.026) | (0.027) | (0.028) | (0.028) | (0.029) | (0.031) | (0.031) |
| Observations | 12,408 | 12,408 | 12,408 | 12,408 | 12,408 | 12,408 | 12,408 | 12,408 | 12,408 | 12,408 |
| R-squared | 0.012 | 0.113 | 0.124 | 0.223 | 0.246 | 0.253 | 0.254 | 0.254 | 0.259 | 0.259 |
| Pronvince FE | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| Year FE | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |

Standard errors in parentheses * p≤0. 1; ** p≤0.05; *** p≤0.01

Using the two-way fixed-effect model to conduct a regression analysis of corporate ESG performance and its debt financing costs, Table 4 reports the test results of Hypothesis H_1. Among them, column (1) does not include any control variables, and after testing, it is found that the regression coefficient of the ESG variable is significantly negative at the 1% significance level, indicating that the company's ESG performance has a significant negative impact on its debt financing costs. Columns (2) to (10) are the results after gradually adding control variables, and after testing, it is found that the regression coefficient of the ESG variable remains significantly negative at the 1% significance level, indicating that this negative impact is robust. In summary, the company's ESG performance has a significant negative impact on its debt financing costs, indicating that good ESG performance of the company can effectively reduce its debt financing costs. Therefore, Hypothesis $H_1$ is verified.

In addition, the regression coefficients of company size (Size), liquidity ratio (Liquidity), asset-liability ratio (ALR), fixed asset ratio (FAR), return on assets (ROA), and growth (Grow) are all positive, indicating that these variables are positively correlated with the company's debt financing costs, and as these indicators increase, the company's debt financing costs become higher. The company's operating capacity (Operation), equity concentration (FP), and Tobin's Q value (TBQ) are negatively correlated with debt financing costs, and as these indicators increase, the company's debt financing costs become lower.

### 5.4. Robustness Tests

This paper uses three methods to test the robustness of the regression results, including replacing the explained variable, winsorization, and changing the sample. The test results are respectively corresponding to columns (1), (2), and (3) of Table 5. First, this paper uses the ratio of financial expenses to total liabilities at the end of the period as an alternative indicator of the company's debt financing costs to conduct a robustness test of the regression results. After testing, the regression coefficient of the ESG variable is still significantly negative at the 1% significance level. Subsequently, this paper conducts a robustness test by winsorizing the sample data at the 1% and 99% levels, and finds that the regression coefficient of the ESG variable is still significantly negative at the 1% significance level. Finally, this paper uses the method of changing the sample, only selecting the listed companies of the CSI 300 and CSI 1000 as the sample companies to conduct a robustness test, and the test results show that the regression coefficient of the ESG variable is still negative at the 1% significance level. Combining the above test results, the regression coefficient of ESG is always negative at the 1% significance level, so the robustness test is passed, and Hypothesis H_1 is verified again.

**Table 5.** Robustness Test Results

| | (1) | (2) | (3) |
|---|---|---|---|
| | DFC1 | DFC | DFC |
| ESG | -0.0020*** | -0.0050*** | -0.0055*** |
| | (0.000) | (0.001) | (0.002) |
| CVs | YES | YES | YES |
| Constant | 0.0540*** | -0.5523*** | -0.7471*** |
| | (0.010) | (0.028) | (0.049) |
| Observations | 12,408 | 12,408 | 4,125 |
| R-squared | 0.048 | 0.337 | 0.197 |
| Pronvince FE | YES | YES | YES |
| Year FE | YES | YES | YES |

Standard errors in parentheses * p≤0. 1; ** p≤0.05; *** p≤0.01

## 5.5. Moderating Effects

In order to test whether the company's risk level and financing constraint degree play a moderating role in the impact of the company's ESG performance on its debt financing costs, the interaction terms of risk level and financing constraint degree with the company's ESG performance are introduced on the basis of the baseline model (1) to examine the influence mechanism. Among them, Risk and Constrain respectively represent the risk level and financing constraint degree, both of which are the moderating variables in this paper. The specific results of the moderating effect test are shown in Table 6, where columns (1) and (2) correspond to the test results of Risk and Constrain respectively. The coefficient of the interaction term between risk level and ESG performance (ESG×Risk) is -0.0001, which is significantly negative at the 1% significance level, and the same sign as the regression coefficient of ESG. This indicates that the company's risk level has a significant moderating effect, and the risk level positively moderates the relationship between the company's ESG performance and its debt financing costs, that is, as the company's risk level increases, the reverse impact of the company's ESG performance on its debt financing costs is strengthened, thus proving Hypothesis $H_2$.

In addition, the coefficient of the interaction term between financing constraint degree and ESG performance (ESG×Risk) is -0.0018, which is significantly negative at the 1% significance level, and the same sign as the regression coefficient of ESG. This indicates that the company's financing constraint degree has a significant moderating effect, and the financing constraint degree positively moderates the relationship between the company's ESG performance and its debt financing costs, that is, when the company faces higher risks, the reverse impact of the company's ESG performance on its debt financing costs is strengthened, thus proving Hypothesis $H_3$.

**Table 6.** Moderating effect test results

| | (1) | (2) |
|---|---|---|
| | DFC | DFC |
| ESG | -0.0067*** | -0.0035*** |
| | (0.001) | (0.001) |
| ESG×Risk | -0.0001*** | |
| | (0.000) | |
| Risk | 0.0006*** | |
| | (0.000) | |
| ESG×Constraint | | -0.0018*** |
| | | (0.000) |
| Constraint | | 0.0136*** |
| | | (0.001) |
| CVs | YES | YES |
| Constant | -0.7525*** | -0.8072*** |
| | (0.031) | (0.031) |
| Observations | 12,408 | 12,408 |
| R-squared | 0.262 | 0.278 |
| Province FE | YES | YES |
| Year FE | YES | YES |

Standard errors in parentheses * p≤0. 1; ** p≤0.05; *** p≤0.01

### 5.6. Heterogeneity Analysis

The resource endowments and development levels of enterprises in the western, central, and eastern regions of China differ, and the degree of policy tilt is also not the same. Furthermore, there are also significant differences in governance structure, division of responsibilities, and information transparency between companies with the chairman and general manager serving concurrently or separately. Based on this, this paper first divides the 1,128 companies into three regions of the west, central, and east for one set of heterogeneity analysis, in order to further study whether the effect of the company's ESG performance on its debt financing costs exhibits regional heterogeneity. It then divides them into two categories of companies with the chairman and general manager serving concurrently or separately for another set of heterogeneity analysis, in order to further study whether the effect of the company's ESG performance on its debt financing costs exhibits governance structure heterogeneity.

Columns (1) to (3) of Table 7 respectively show the effect of the ESG performance of western, central, and eastern enterprises on their debt financing costs, and it can be found that the ESG regression coefficients of the three regions are all significantly negative at the 1% significance level. By comparing the magnitude of the regression coefficients, it is found that the effect of western enterprises is greater than that of central and eastern enterprises, which may be due to the fact that western enterprises face greater operational risks, more severe financing constraints, and more comprehensive policy support, and the improvement of ESG performance has a more significant impact on their debt financing costs. This indicates that the impact of corporate ESG on its debt financing costs exhibits regional heterogeneity, proving Hypothesis $H_4$.

**Table 7.** Regional Heterogeneity Analysis

| | (1) | (2) | (3) |
|---|---|---|---|
| | DFC | DFC | DFC |
| ESG | -0.0105*** | -0.0056*** | -0.0071*** |
| | (0.003) | (0.002) | (0.001) |
| CVs | YES | YES | YES |
| Constant | -0.7841*** | -0.4951*** | -0.7876*** |
| | (0.110) | (0.078) | (0.035) |
| Observations | 1,012 | 1,881 | 9,515 |
| R-squared | 0.322 | 0.248 | 0.264 |
| Province FE | YES | YES | YES |
| Time FE | YES | YES | YES |

Standard errors in parentheses * p≤0. 1; ** p≤0.05; *** p≤0.01

Columns (1) and (2) of Table 8 respectively show the effect of the ESG performance of enterprises with the chairman and general manager serving concurrently or separately on their debt financing costs, and it can be found that the ESG regression coefficients of the two types of enterprises are both significantly negative at the 1% significance level. By comparing the magnitude of the regression coefficients, it is found that the effect of enterprises with the two positions separated is greater than that of enterprises with the two positions serving concurrently, which may be due to the fact that enterprises with the chairman and general manager serving concurrently have greater potential problems in information inequality and moral hazard due to the concentration of responsibilities, so the enterprises with the two positions separated have higher quality of disclosed ESG information and higher information transparency, and therefore the effect of lowering their debt financing costs through ESG performance is more significant. This indicates that the impact of corporate ESG on its debt financing costs exhibits governance structure heterogeneity, proving Hypothesis $H_5$.

**Table 8.** Heterogeneity of Governance structure Analysis

| | (1) | (2) |
|---|---|---|
| | DFC | DFC |
| ESG | -0.0043*** | -0.0081*** |
| | (0.001) | (0.001) |
| CVs | YES | YES |
| Constant | -0.7157*** | -0.7622*** |
| | (0.052) | (0.038) |
| Observations | 3,509 | 8,899 |
| R-squared | 0.293 | 0.251 |
| Province FE | YES | YES |
| Time FE | YES | YES |

Standard errors in parentheses * p≤0. 1; ** p≤0.05; *** p≤0.01

## 6. Research Conclusion and Policy Implications

Based on the existing literature, this paper selects A-share listed companies from 2012-2022 as the research object, and uses Huace ESG rating data and corporate financial data to construct a two-way fixed-effect panel model. It explores the significant negative relationship between corporate ESG performance and its debt financing costs, and this conclusion still holds after robustness testing. Further examining the moderating effects of corporate risk level and financing constraint on this impact, it is found that both corporate risk level and financing constraint degree can positively moderate the reverse impact of corporate ESG performance on its debt financing costs. Heterogeneity analysis shows that the reverse impact of corporate ESG performance on its debt financing costs is more significant for western enterprises and enterprises with the chairman and general manager serving in separate positions.

Based on the above research conclusions, this paper puts forward the following suggestions:

For the government, first, the government should formulate more comprehensive ESG regulations and strengthen the supervision of listed companies' ESG information disclosure, in order to promote enterprises to move towards sustainable development. Through ESG-related regulations and rules, the environmental, social responsibility and corporate governance behaviors of enterprises are standardized, and enterprises are urged to reduce the adverse impact of short-term profitability on the environment and society. Second, the government should introduce relevant policies to guide enterprises to actively implement the ESG concept and the concept of sustainable development. Use policy guidance to replace some administrative orders, so that enterprises voluntarily take on their social responsibilities and promote their sustainable development. Third, the government should enhance the recognition and acceptance of the ESG investment concept among investors, and guide investors to assess the risks of enterprises by focusing on ESG factors, in order to promote the ESG construction of enterprises. Fourth, the government should accelerate the promotion of China's ESG rating system and rating standards, and make the rating system in line with China's national conditions. Establishing an ESG rating system that fits China's national conditions will help ensure the scientific and public nature of the rating standards, and avoid information distortion, thereby enhancing the reliability and credibility of ESG information.

For enterprises, first, they should voluntarily implement the ESG concept, actively learn and accept the ESG investment and financing concept, and firmly walk the path of sustainable development. Enterprises should consciously fulfill their social responsibilities, not only pursue economic benefits, but also care about the environment, society and governance. This is conducive to achieving the

sustainable development of enterprises and creating more long-term value for society. Second, they should increase investment in corporate ESG construction and conduct further practical exploration. ESG has become an international consensus and is also developing rapidly in China. Increased investment by enterprises in ESG construction will help them comply with regulations and avoid adverse impacts. Third, they should disclose high-quality ESG information in accordance with regulatory policy requirements, and demonstrate their actual actions in fulfilling their social responsibilities. Enterprises should build a responsible brand image through their own ESG construction, enhance their brand competitiveness, and thus discover new business opportunities and enhance their long-term competitive advantage.

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