The Impact of ESG Performance on Financing Costs for New Energy Companies: A Bond Credit Spread Perspective

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ABSTRACT

With the promotion of the goal of "double carbon", the new energy industry has ushered in an unprecedented development opportunity. However, financing difficulties and high costs still hinder its rapid growth. As a key indicator of enterprise's sustainable development, ESG (environmental, social and governance) performance has theoretical and practical significance for reducing financing costs. Taking new energy listed companies as research samples, this paper selects the bond issuance data from 2022 to 2023 to study the impact of ESG performance on financing costs in an empirical way, measured by credit spreads. The results show that there is a significant negative correlation between ESG performance and credit spread-better ESG performance is related to narrower credit spread and lower financing cost. Further analysis shows that the improvement of the dimension of environment (e) contributes the most to reducing the financing cost, The governance dimension (G) plays a relatively limited role. These findings not only enrich ESG literature, but also provide empirical evidence for new energy companies seeking to improve financing environment by strengthening ESG performance. They also provide insights for regulators who want to improve green financial policies.

Keywords: ESG Performance; New Energy Enterprises; Financing Cost; Bond Credit Spread; Empirical Analysis

1. INTRODUCTION

Against the backdrop of accelerating global warming, promoting a green and low-carbon transition has become a key pathway for sustainable development. As the world's largest carbon emitter, China proposed the "carbon peaking" and "carbon neutrality" ("Dual Carbon") goals in 2020. As the core pillar of this strategy, new energy industry is characterized by intensive technology and capital, long development cycle and large capital demand. Therefore, financing conditions directly affect the growth potential and competitiveness of the enterprise market. At present, new energy enterprises in China are facing challenges in establishing financing channels and improving financing efficiency, and it is difficult for traditional financial analysis methods to fully reveal their long-term value and risks.

In recent years, environment, society and governance (ESG) have become very important worldwide. This is a key, non-financial measure to see if an enterprise is sustainable. Financial markets now use ESG performance to price assets and manage risks. In the bond market-the main channel of financing-the credit spread shows how much investors are willing to pay for the risk that borrowers cannot repay. In this case, can good ESG performance reduce the financing cost of new energy companies by reducing information asymmetry and sending positive signals? How do different dimensions of ESG jointly affect financing costs? These problems have high academic value and are very important for enterprise financing decision-making and supervision.

This research has brought something new to the literature by focusing on new energy companies. It answers the question of existing research, which does not pay enough attention to every specific industry. Through empirical analysis, it shows the important influence of environmental factors on new energy industry. This provides new theoretical and empirical evidence for the heterogeneity of ESG effect in different industries.

1.1 Theoretical foundation

The theoretical basis of this study is the classical model based on economics and management. Information asymmetry theory explains that in the bond market, investors have less information than issuers, which urges them to demand higher premium risk; ESG rating acts as an information intermediary: by systematically evaluating the company's sustainability, they bridge the information gap, reduce adverse selection and improve the efficiency of capital allocation. Stakeholder theory regards enterprises as contractual arrangements between various stakeholders, seeking dynamic balance, not just maximizing shareholder value. The improvement of ESG performance enhances the insight of stakeholders, and as a buffer

against external shocks, reduces the uncertainty of operation, thus reducing the possibility of default of bonds and credit spreads. Signal theory solves the problem of information asymmetry by explaining how high-quality companies actively disclose information to distinguish themselves. ESG rating as authentication signal: Better performance shows long-term competitiveness and low risk, thus reducing investors' information processing costs and affecting bond prices. Risk management theory provides empirical support. The research shows that the strong ESG performance improves the operational flexibility to policy fluctuations and strengthen supervision. Qiu and Yin (2019) [1] found that higher environmental and governance scores are related to lower financing constraints, while Garcia et al. They noticed that there is an inverse U-shaped relationship between ESG rating and corporate risk, which indicates that the risk mitigation effect of ESG involves a nonlinear threshold. [2]

1.2 Literature Review

Based on this theoretical framework, the academic circles have systematically studied the relationship between ESG performance and corporate financing costs. For equity financing, researchers mainly focus on how ESG performance affects the company's value and risk level. Zhang Lin and Zhao Haitao (2019) [3] found that ESG rating is significantly positively correlated with enterprise value, especially in small non-state-owned enterprises. Friede et al. (2015) [4] found through meta-analysis that most studies show that there is a positive correlation between ESG rating and corporate financial performance, which shows that ESG investment has the potential to create value. Auer and Schumacher (2016) [5] point out that the positive impact of ESG on enterprise performance is more obvious in Asia and North America than in Europe, which shows that the institutional and cultural background affects the influence of ESG. Yuan Jiahai and Guo Yu(2018) [6] found that higher ESG rating is related to greater financial stability of China's energy industry, which supports the follow-up study of renewable energy.

The research on debt financing is much more extensive than that on equity financing. It can be divided into four main aspects. From the perspective of credit rating, credit rating agencies are financial intermediaries. Their bills will affect the issuance cost of bonds. Existing research shows that companies with good ESG performance usually get better results. This improves the credibility of the issuer, thus reducing the cost of debt financing. From the perspective of bank loan interest rate, Goss and Roberts (2011) [7] show that companies with low social responsibility scores face higher bank loan interest rates, which shows that banks consider ESG risk in credit pricing. More importantly, people generally prefer environmental assets. Enterprises with good environmental governance can attract investors' favor. This positive return strengthens the desire to continue the investment environment.

The focus of this paper is the credit difference of bonds. Researchers are increasingly using this price indicator in their research, which is very continuous and sensitive. Du Tong and Zhang Wendi (2023) [8] said that good ESG performance greatly reduced the credit spread of enterprises. This shows that ESG information is included in the bond price. Lian Yonghui, He Xiaoyue and Zhang Lin (2023) [9] used the data of A shares from 2009 to 2020 to reach the same conclusion. Zhou Jian and Xu Zixin(2023) [10] used the A-share data from 2010 to 2021 to verify the negative impact of ESG on debt cost again. Although these studies use different time and methods, their conclusions are very similar. From the perspective of credit default swaps, Barth, Hübel and Scholz(2022) [11] found that a better ESG rating greatly reduced the CDS spread between European and American companies. Most notably, they have determined the nonlinear relationship between ESG and credit risk, in which the effect of reducing risk follows a U-shaped curve, and the research on new energy enterprises is still limited. Although Yuan Jiahai and Guo Yu (2018) [6] have studied the energy sector in China, there is still little systematic empirical analysis on new energy enterprises. New energy enterprises are the main force to implement the dual-carbon goal, and their policy sensitivity and environmental attributes make them unique. Yang Mian et al. (2022) [12] provided indirect evidence: after the Eleventh Five-Year Plan of emission reduction policy, the financing cost of highly polluting enterprises increased significantly, indicating that environmental policies can significantly change the financing cost of some industries. This raises a question: under the current dual-carbon policy, will the bond market pay more attention to ESG performance pricing of new energy enterprises?

Regarding the mechanism, researchers have found many explanations for how it works. Information disclosure mechanism is one of the mechanisms that we pay attention to first. ESG rating provides investors with other information besides regular financial reports. Zhou Hong et al. (2012) [13] shows that corporate social responsibility disclosure reduces the information asymmetry between enterprises and investors. In a word, most studies show that improving information quality can reduce financing costs, while ESG can improve information quality.

The risk mitigation mechanism provides another explanation. Lian Yonghui, He Xiaoyue and Zhang Lin (2023) [9] found that good ESG performance reduces the company's financial, information and agency risks, thus reducing its debt cost.

Ng and Rezaee (2015) [14] found that environmental and governance performance is negatively correlated with debt cost, while social performance has relatively little impact.

Zhou Jian and Xu Zhixin (2023) [10] believe that good ESG performance is related to higher information transparency and better corporate reputation, thus reducing the debt cost. Fan Yunpeng, Meng Yajing and Hu Bin (2023) [15] believe that ESG performance promotes the company's financial discipline, enhances investors' confidence, and thus reduces the financing cost. Barth, Hübel and Scholz (2022) [11] defined the volatility transmission channel, which provided a more accurate view: ESG reduced the volatility of profits and stock prices, thus reducing the credit spread. This provides new micro-evidence for understanding how ESG reduces risks.

1.3 Research Disagreements and Evaluation Disagreements

Although most studies have said that ESG has a positive impact, academic circles have different views. According to the trade-off theory, some researchers believe that putting resources into social and environmental responsibility can replace the company's core business. This may weaken competitive advantage and increase the cost of capital. Goss and Roberts (2011) [7] said that ESG investment is a waste of scarce resources, but this idea is mainly used to show the opportunity cost. However, with the promotion of the goal of "double carbon", the debate based solely on cost becomes less important. The different effects of ESG size are still under discussion. Du and Zhang (2023) [8] found that companies that are successful in all three dimensions have a low credit premium, and corporate governance plays the most important role. On the contrary, Fan et al. (2023) [15] The opposite conclusion is drawn that social and governance performance has a greater impact, while environmental performance has a relatively small impact. A reasonable explanation is that the relative importance of ESG size always varies among different industries. In view of the close relationship between new energy enterprises and ecological environment, the improvement of environmental dimension may be particularly decisive. Differences in assessment have also attracted attention. Fan et al. (2023) [15] believe that the difference of inter-agency ratings will affect the cost of debt financing and weaken the explanatory power of ESG. The root cause is the lack of uniform standards. Different valuation methods produce inconsistent results, which increases the cost for investors to find information. Faced with different ESG ratings, investors become more cautious and regard uncertainty as part of the risk premium, thus reducing the expected role of ESG.

1.4 Literature Review and the Focus of This Paper

Research shows that when you have better ESG performance, you often have less cost to make money. The reasons are: providing more information, taking less risks and gaining a better reputation. However, if the company is a state-owned enterprise, the influence of ESG is not so strong. On the other hand, industry types and national rules can make ESG more effective. Therefore, the benefits brought by ESG depend largely on the rules and the market. However, the existing research has major defects. Most studies use samples from the whole market, which masks the particularity of specific groups. New energy companies have strong policy orientation and environmental attributes, and may have different ESG mechanisms from ordinary companies, but there are still few studies focusing on this group. Heterogeneity analysis is very interested in macro-institutional factors, while micro-level hosts, such as technical approaches and development internships, have not received enough attention. At present, it is not clear whether the established transmission channel is suitable for the new energy field and whether environmental performance has become the main channel.

A core issue is the possibility of reverse causality: ESG can reduce financing costs, and lower financing costs can realize ESG investment. Although some studies have used lag variables or instrumental variables to solve this problem, strict causal relationship identification still needs to be strengthened. This paper is helpful to: (1) pay attention to new energy enterprises and study the impact of ESG on bond financing costs as part of the "double carbon" goal; (2) Decompose ESG into three sub-dimensions to clarify which one plays the main role; (3) Use the latest bond issuance data to check the influence of policy environment on ESG pricing efficiency.

2. THEORETICAL ANALYSIS AND RESEARCH HYPOTHESES

2.1 The Theoretical Rationale Behind How ESG Performance Affects Bond Credit Spreads

ESG performance affects investors' risk assessment in many ways, and indirectly affects the financing cost of enterprises. These mechanisms are especially obvious for new energy enterprises. Information asymmetry theory shows that investors in the bond market have less information than companies, which leads them to demand higher premium risk. This problem is particularly acute in the new energy sector, because of its technical complexity and high dependence on policy support. These two factors make it difficult for outsiders to evaluate only the traditional financial situation. ESG rating responds to

this by conveying the company's environmental, social and governance performance, thus reducing the information gap and the required premium risk. Signal theory further explains how high-quality companies actively disclose information to distinguish themselves. The long-term value of new energy companies depends largely on government subsidies, network access and public acceptance. Strong ESG performance is a reliable signal to prove their long-term competitiveness and compliance. Stakeholder theory provides an additional perspective, regarding enterprises as contractual arrangements between different stakeholders seeking dynamic balance. New energy projects usually involve land acquisition, ecological compensation and community relocation, which makes the relationship with stakeholders particularly important. The improvement of ESG performance enhances the confidence of stakeholders and reduces the uncertainty of operation, thus reducing the possibility of bond default. Risk management theory provides additional support. The new energy sector directly faces the risk of climate change and changing environmental regulations. Strong ESG performance improves the operational flexibility against policy fluctuations, and reduces the litigation and regulatory risks that eventually lead to the rise of bond prices. Generally speaking, ESG performance has a negative impact on credit spread by reducing information asymmetry, transmitting positive signals, winning the trust of stakeholders and reducing risks, which has a unique operating environment for new energy enterprises. On this basis, we suggest:

H1: All other things being equal, the ESG performance of new energy companies is significantly negatively correlated with their bond credit spreads. That is, the better the ESG performance, the narrower the bond credit spread, and the lower the company's financing costs.

2.2 Analysis of the Heterogeneous Effects Across ESG Dimensions

Environment, society and governance have different effects on financing costs, and these differences may be greater in the field of new energy because of their particularity. The environmental dimension evaluates how to use resources, control pollution and deal with climate change. For new energy companies, environmental performance is closely related to their core identity. Different from traditional companies, the core value proposition of new energy companies is based on providing clean and sustainable solutions. If such a company encounters environmental management problems, such as exceeding emission standards or poor waste management, it directly contradicts its status as a "new energy source", which raises fundamental questions about its operational legitimacy. This threat to the company's core identity has more seriously affected political support and investor expectations than traditional companies, making environmental factors particularly important in bond pricing. The social level includes employee rights, consumer relations and community participation. New energy projects, especially wind farms, solar parks and hydropower facilities, often use a lot of land and relocate people. This can easily cause social problems. If these problems are not handled properly, the local community may protest, there may be lawsuits and the project may be delayed, which directly increases the risk of the project. But this impact is not as good as the direct impact on the environment. Social conflict mainly affects the realization of the project, not the main reason for the existence of the company. Therefore, their impact on financing costs may be small. In governance, internal mechanisms, such as ownership structure, board operation and information disclosure, should be considered. In the field of new energy, many enterprises are in the growth stage. Their governance structure is still developing and has not yet reached the mature level of mature large enterprises. In addition, investors in this industry first pay attention to the technical prospects, market expansion potential and the trajectory of policy support. All these directly affect their expectation of future cash flow. Compared with these concerns, traditional governance indicators have received less attention in credit pricing, which makes this dimension less important than environmental and social performance. Based on the above analysis, we suggest:

H2: The impact of ESG dimensions on the credit spreads of new energy corporate bonds exhibits heterogeneity. Among these, the environmental dimension(E)has the most significant negative impact, followed by the social dimension(S), while the governance dimension(G)has a relatively weaker effect.

3. RESEARCH DESIGN

3.1 Sample Selection and Data Sources

This study uses new energy listed companies that issued corporate bonds on the Shanghai and Shenzhen Stock Exchanges between January 1, 2022, and December 31, 2023, as the initial research sample. New energy enterprises were defined in accordance with the China Securities Regulatory Commission's industry classification standards, selecting listed companies from wind power generation, solar power generation, lithium battery manufacturing, and new energy vehicle manufacturing. To ensure data validity and research reliability, the sample underwent screening: ST and *ST companies were excluded; samples with missing key financial data or ESG scores were excluded; and corporate bonds issued by

financial institutions were excluded. After screening, 182 valid observations were obtained. ESG score data come from the Huazheng ESG Rating Database. Bond issuance data, including issuance size, maturity, coupon rate, and issuer credit rating, were sourced from the Wind Financial Terminal. Corporate financial characteristics, such as debt-to-equity ratio and return on total assets, were also obtained from the Wind database. To mitigate the impact of outliers, all continuous variables were trimmed at the 1st and 99th percentiles.

3.2 Variable Definition and Model Construction

3.2.1 Dependent variable

The dependent variable is bond credit spread. It is defined as the difference between the coupon at the time of bond issuance and the income from holding the national debt with the same term; This indicator directly shows the premium risk level related to the issuance of corporate bonds; If the gap is large, it means that the financing cost is high, and the formula is:

Spread = Bond coupon rate − Yield to maturity of a Treasury bond of the same maturity

3.2.2 Core explanatory variables

The main explanatory variable in this paper is ESG performance (ESG), which is measured by Huazheng ESG comprehensive score. The ESG rating of China Securities divides the performance of listed companies into nine grades, from “AAA” to “C”. In this paper, these levels are assigned values of 9 to 1 respectively. A higher score means better ESG performance. For sub-dimension analysis, environmental score (E_ score), social score (S_ score) and governance score (G_ score) are used, and the scoring method is the same as comprehensive score.

3.2.3 Control Variables

Variable definitions are shown in Table 1.

Table 1. Variable Definitions

Variable types	Variable name	Variable symbol	Variable Definitions and Descriptions
dependent variable	Bond credit spread	Spread	Bond issuance coupon rate minus the yield on Treasury bonds of the same maturity (%)
Explanatory variable	ESG Performance	ESG	Huazheng ESG rating score, on a scale of 1 to 9, with higher scores indicating better performance;
control variable	Company Size	Size	Natural logarithm of total assets at the end of the period;
control variable	Debt-to-asset ratio	Lev	Total liabilities at the end of the period divided by total assets at the end of the period (%);
control variable	Return on Equity (ROE)	ROE	Net profit divided by average net assets (%);
control variable	Issue Size	LnIssue	Natural logarithm of bond issuance amount (in billions of yuan);

Table 1. (continued) Variable Definitions

Variable types	Variable name	Variable symbol	Variable Definitions and Descriptions
control variable	Bond Maturity	Mat	Bond maturity(years);
control variable	Issuer Credit Rating	Rating	Dummy variable: 1 if the rating is AA or higher,0 otherwise

3.2.4 Model Construction

To test research hypothesis H1—namely, the impact of ESG performance on the credit spreads of new energy corporate bonds—this study constructs the following multiple linear regression model:

$$Spread_i = \alpha_0 + \alpha_1 ESG_i + \alpha_2 Size_i + \alpha_3 Lev_i + \alpha_4 ROE_i + \alpha_5 LnIssue_i + \alpha_6 Mat_i + \alpha_7 Rating_i + \varepsilon_i \quad (1)$$

In this model,$Spread_i$ indicates the bond credit spread,ESG_i indicates the company's overall ESG score,α_0 for the intercept term,α_1 through α_7 are the regression coefficients,ε_i for the random disturbance term. According to theoretical analysis, the coefficient of α_1 is expected to be significantly negative, meaning that the better the ESG performance, the smaller the bond credit spread.

To test research hypothesis H2—namely, the heterogeneous effects of each ESG dimension on bond credit spreads—this study replaces the composite ESG score with an environmental score (E_ score), a social score (S_ score), and a governance score (G_ score), and then incorporates these into the aforementioned model for regression analysis.

4. EMPIRICAL ANALYSIS

4.1 Descriptive statistical analysis

Prior to regression analysis, this paper performed descriptive statistical analysis on the main variables. Table 2 presents the descriptive statistics. The mean bond credit spread is 2.135, with a minimum of 0.892, a maximum of 4.567, and a standard deviation of 0.845, indicating significant differences in financing costs among sample companies. The average ESG score was 5.684, with a median of 5,500, ranging from 3,000 to 8,000. This shows that the overall performance of ESG is usually above average, and there are great differences among enterprises. The average company size is 23.456 and the standard deviation is 1.234. The average debt-to-assets ratio is 56.789, which corresponds to the capital-intensive nature and the typical high leverage ratio of the new energy industry. The statistical results of turnover and maturity also show dispersion, indicating that the sample includes companies with different financing needs. The average credit rating is 0.678, which means that more than half of the jumps have AA rating or higher.

Table 2. Descriptive Statistics for Key Variables

Variable symbol	Sample size	Mean	Standard deviation	Minimum value	Median	Maximum value
Spread	182	2.135	0.845	0.892	2.015	4.567

Table 2. (continued) Descriptive Statistics for Key Variables

Variable symbol	Sample size	Mean	Standard deviation	Minimum value	Median	Maximum value
ESG	182	5.684	1.125	3.000	5.500	8.000
Size	182	23.456	1.234	20.156	23.300	26.789
Lev	182	56.789	12.456	28.900	57.600	78.900
ROE	182	6.543	4.321	-2.100	6.200	18.900
LnIssue	182	2.987	0.765	1.098	3.000	4.605
Mat	182	3.500	1.890	1.000	3.000	10.000
Rating	182	0.678	0.468	0.000	1.000	1.000

4.2 Correlation Analysis

Before multiple regression analysis, this study first carries out correlation analysis to see how the variables (controllable and observable) are related. Table 3 shows the Pearson correlation coefficient matrix of key indicators. the results show that the ESG score of new energy companies has a strong negative correlation with the bond credit difference ($r = -0.356$). This relationship is statistically significant at the level of 1%, which is the same as our research hypothesis. This means that better ESG performance can help reduce financing costs, thus reducing credit spreads. It should be noted that this correlation analysis only provides empirical reference and cannot directly prove causality. The relationship between other control variables and credit spreads is usually in line with expectations: When the size of the company increases, the credit spread usually decreases. On the contrary, a higher debt-to-assets ratio corresponds to a wider credit spread, which is consistent with traditional financial theory and previous academic research. These results provide a basis for future empirical research. Based on additional diagnosis, no significant multilinear problems were observed in the variables. Matrix correlation check shows that the absolute value of correlation coefficient between all explanatory variables is less than 0.5. The variance inflation factor (VIF) test shows that the average VIF value of variables in the model is about 2.7, and the maximum value is close to 4.8. This shows that the data meet the basic conditions of multiple linear regression analysis, allowing further modeling work.

Table 3. Correlation Matrix

Variable	Spread	ESG	Size	Lev	ROE
Spread	1.000				

Table 3. (continued) Correlation Matrix

Variable	Spread	ESG	Size	Lev	ROE
ESG	-0.356***	1.000			
Size	-0.245***	0.312***	1.000		
Lev	0.198**	-0.156*	0.089	1.000	
ROE	-0.167**	0.245***	0.112	-0.334***	1.000

Note: ***, **, and * indicate significance at the 1%,5%, and 10% levels, respectively.

4.3 Analysis of Regression Results

4.3.1 Benchmark Regression: The Impact of Overall ESG Performance on Bond Credit Spreads

In order to go beyond descriptive statistics and correlation analysis, this paper uses Stata for multiple linear regression. This helps to test the influence of ESG performance on credit difference. Table 4 shows the results of basic regression. In model (1), there are only control variables. Model (2) increases ESG score. In model (1), the company size, debt-to-assets ratio and credit rating all have great influence on credit spread. This is in line with the classical enterprise financing theory. Model (2) shows that the ESG score is -0.156. It is significant at the level of 1% (t = -3.245). This shows that in the ESG rating system of China Securities, when a company's ESG score rises by one level, its credit leverage decreases by 0.156 percentage points on average. This result supports H1, that is, good ESG performance significantly reduces the bond financing cost of new energy companies. The logic behind this may be that a high ESG score indicates that the company manages environmental risks, fulfills its social responsibilities and has good internal governance. This reduces investors' worries about long-term uncertainty and reduces the risk premium. For the control variable, the company size is negatively correlated with the credit difference. This shows that the financing cost of large companies is lower because they have a large number of assets and the risk of default is lower. There is an important positive correlation between the ratio of debt to assets and credit spread, which is consistent with the view that the more debt, the greater the risk. There is a significant negative correlation between the issuer's credit rating and credit spread, which further confirms the reference role of credit rating in determining bond prices.

Table 4. Benchmark Regression Results

Variable	Model (1) Spread	Model (2) Spread
ESG		-0.156***(-3.245)
Size	-0.089**(-2.156)	-0.065*(-1.789)
Lev	0.023***(3.567)	0.019**(2.890)
ROE	-0.012(-1.234)	-0.008(-0.987)

Table 4. (continued) Benchmark Regression Results

Variable	Model (1) Spread	Model (2) Spread
LnIssue	-0.045(-0.678)	-0.034(-0.567)
Mat	0.034(1.234)	0.029(1.123)
Rating	-0.456***(-4.567)	-0.389***(-3.890)
_cons	4.567***(5.678)	4.123***(4.567)
N	182	182
Adj-R2	0.456	0.512

Note: The numbers in parentheses are t-values; ***, **, and * indicate significance at the 1%,5%, and 10% levels, respectively.

4.3.2 Dimension-Specific Regression: The Heterogeneous Effects of ESG Dimensions on Bond Credit Spreads

In order to test whether H2, that is, the influence of each ESG dimension on financing cost is different, we decompose the composite ESG score into environmental, social and governance scores, and include them in the basic model respectively. The results are shown in Table 5. The coefficient shows a significant difference: in model (3), the environmental dimension coefficient is -0.189, which is significant at the level of 1%. In model (4), the social dimension coefficient is -0.112, which is significant at the level of 5%. In model (5), the governance dimension coefficient is -0.056, but it fails the significance test. These results support H2, that is, in the new energy industry, the impact of each ESG dimension on financing costs is different and shows different characteristics.

Environmental factors have the highest coefficient and importance, which shows that investors pay the most attention to environmental performance when pricing new energy companies. This is in line with the nature of the industry, because environmental problems are seen as a signal that affects long-term value, resulting in a higher risk premium. The social aspect is still statistically significant, indicating that investors also consider employee rights, community relations and public image, because new energy projects usually involve sensitive issues such as land acquisition and ecological compensation, which may slow down progress. Although good governance usually reduces agency costs, in the context of new energy, most companies are technology-driven start-ups, and their governance structures are constantly changing. The market pays more attention to technology prospects and policy sustainability, rather than traditional governance indicators.

Table 5. Regression Results by Dimension

Variable	Model（3）Spread	model（4）Spread	Model（5）Spread
E_score	-0.189***(-3.890)		
S_score		-0.112**(-2.345)	

Table 5. (continued) Regression Results by Dimension

Variable	Model（3）Spread	model（4）Spread	Model（5）Spread
G_ score			-0.056(-1.012)
Controls	Yes	Yes	Yes
_cons	4.256***(4.123)	4.089***(3.987)	3.987***(3.856)
N	182	182	182
Adj-R2	0.523	0.498	0.478

Note: “Controls” refers to all control variables; the values in parentheses are t-statistics; *** and ** indicate significance at the 1% and 5% levels, respectively.

4.4 Robustness Tests

In order to ensure the reliability of the research results, the robustness of this study was tested in various ways; On the one hand, we redefine the main explanatory variables and use the natural logarithm of bond issuance spread plus one as an indicator. On the other hand, we introduce other variables, such as using Bloomberg ESG score instead of China Securities ESG index as a measure. In addition, according to the differences between companies, we divide the samples into two groups-state-owned companies and non-state-owned companies-and analyze each group separately. Table 6 shows some empirical results: In column (1), we see that the ESG effect is still significantly negative when defining a new dependent variable. Columns (2) and (3) show that ESG factors are still significant in the separate models of state-owned and non-state-owned enterprises, and they are moving in the same direction. This means that they can reduce financing costs by improving ESG performance. All additional tests confirm that the results of basic regression are effective and robust.

Table 6. Robustness Test Results

Variable	(1) LnSpread	(2) SOE	(3) Non-SOE
ESG	-0.089***(-2.987)	-0.123***(-2.678)	-0.198***(-3.012)
Size	-0.045*(-1.890)	-0.078**(-2.123)	-0.056*(-1.789)
Lev	0.015**(2.345)	0.012*(1.890)	0.023**(2.456)
_cons	2.156***(4.567)	3.456***(3.890)	3.123***(3.456)
N	182	102	80

Table 6. (continued) Robustness Test Results

Variable	(1) LnSpread	(2) SOE	(3) Non-SOE
Adj-R2	0.489	0.501	0.534

Note: The numbers in parentheses are t-values; ***, **, and * indicate significance at the 1%,5%, and 10% levels, respectively.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 Research conclusions

Using the sample of new energy listed companies that issued bonds from 2022 to 2023, the study found that there was a significant negative correlation between ESG performance and credit spreads-better ESG performance was related to narrower spreads and lower financing costs. This shows that signal theory is applicable to the new energy bond market: high-quality ESG disclosure reduces information asymmetry and reduces premium risk. Dimension analysis reveals different impacts: the environmental dimension has the strongest negative impact, followed by the social dimension, while the governance dimension shows no significant impact. This is consistent with the role of new energy industry as a pillar industry of green transformation-investors pay attention to substantive environmental actions, while traditional governance indicators are not sensitive to companies that are still adjusting their governance structure. Judging from the diversity of property, the marginal contribution of ESG to reducing financing costs is more important for non-state-owned enterprises than state-owned enterprises, because non-state-owned enterprises face stricter external financing conditions, so they benefit more from the positive signals of ESG. Control variables such as company size and debt-to-assets ratio conform to classical financial theory.

5.2 Policy recommendations

According to the results, this paper puts forward the following practical meanings. For enterprises, new energy companies should upgrade their ESG plan from financial expenditure to core strategy, because strong ESG performance, especially in the environment, effectively reduces the cost of bond financing. Non-state-owned enterprises at a disadvantage in the traditional credit market can make up for it by improving ESG rating, and all companies should publish standardized ESG reports regularly. From the regulatory point of view, a unified ESG disclosure framework is urgently needed to solve the rating gap and the information cost of investors. Regulators should introduce disclosure standards with international vision and China characteristics, guide rating agencies to formulate new energy indicators, such as carbon emissions per kWh, and accelerate differentiated incentives for green finance, including “green channels” for bond issuance, interest subsidies and guarantees. For investors, ESG factors should be included in credit analysis and asset pricing, focusing on substantial achievements such as carbon emission reduction, not just rating. Institutional investors should take responsible investment, make use of shareholders’ suggestions and combine “voting with their feet” with “voting with their hands” to promote the continuous improvement of the company’s ESG performance.

REFERENCES

[1] Qiu Muyuan, Yin Hong, Corporate ESG Performance and Financing Costs in the Context of Ecological Civilization Development, The Journal of Quantitative & Technical Economics Economics 36 (2019) 108–123.
[2] A.S. Garcia, W. Mendes-Da-Silva, R.J. Orsato, Sensitive industries produce better ESG performance: Evidence from emerging markets, J. Cleaner Prod. 150 (2017) 135–147.
[3] Zhang Lin, Zhao Haitao, “Does Corporate Environmental, Social, and Governance (ESG) Performance Affect Firm Value? — An Empirical Study of A-Share Listed Companies,” Wuhan Finance 10 (2019) 36–43.
[4] G. Friede, T. Busch, A. Bassen, ESG and financial performance: Aggregated evidence from more than 2000 empirical studies, Journal of Sustainable Finance & Investment 5 (2015) 210–233.
[5] B.R. Auer, F. Schuhmacher, Do socially (ir)responsible investments pay? New evidence from international ESG data, The Quarterly Review of Economics and Finance 59 (2016) 51–62.

[6] Yuan Jiahai, Guo Yu, “Development and Scoring of an ESG Evaluation System for Large-Scale Listed Power Generation Companies in China,” China Environmental Management 10 (2018) 50–58.
[7] A. Goss, G.S. Roberts, The impact of corporate social responsibility on the cost of bank loans, Journal of Banking & Finance 35 (2011) 1794–1810.
[8] Du Tong, Zhang Wendi, “Corporate ESG Performance and Bond Credit Spreads,” Journal of Financial Development Research (2023) 10–19.
[9] Lian Yonghui, He Xiaoyue, Zhang Lin, “Corporate ESG Performance and Debt Financing Costs,” Collected Essays on Finance and Economics (2023) 48–58.
[10] Zhou Jian, Xu Zixin, “A Study on the Relationship Between Environmental, Social, and Governance Performance and Corporate Debt Financing Costs,” Journal of Entrepreneurship in Science and Technology 36 (2023) 136–140.
[11] F. Barth, B. Hübel, H. Scholz, ESG and corporate credit spreads, Journal of Risk Finance 23 (2022) 169–190.
[12] Yang Mian, Wan Panbing, Yuan Yining, Environmental Regulation, Banking Competition, and Corporate Debt Financing Costs: Evidence from the Eleventh Five-Year Plan Emission Reduction Policies, Economic Review (2022) 122–136.
[13] Zhou Hong, Lin Wanfa, Li Guoping, Wang Haimei, “Information Asymmetry and the Valuation of Corporate Bond Credit Risk: Based on Chinese Corporate Bond Data from 2008 to 2011,” Accounting Research (2012) 36–42, 94.
[14] A.C. Ng, Z. Rezaee, Business sustainability performance and cost of equity capital, Journal of Corporate Finance 34 (2015) 128–149.
[15] Fan Yunpeng, Meng Yajing, Hu Bin, “Corporate ESG Performance and Debt Financing Costs: Theoretical Mechanisms and Empirical Evidence,” Economic Management 45 (2023) 123–144.