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ESG Performance, Analyst Attention and Bond Credit Spread: Empirical Evidence from China

Xiaolu Hu[1,2], Pin Shen[1,2], Ruojie Cui[2,*]

[1]School of Accounting, Guangzhou College of Commerce, Guangzhou, Guangdong, 511363, China
[2]Faculty of Finance, City University of Macau, Taipa, Macao, 999078, China
[*]Corresponding author

Abstract: *ESG provides a comprehensive framework for the company's sustainable development and helps to realize the goal of "double carbon". In this article, we take A-share listed companies in China from 2014 to 2022 as a sample, empirically examines the impact of corporate ESG performance on bond credit spreads, and analyzes the relationship between ESG performance and bond credit spreads in light of analysts' attention. The main findings are: first, the ESG performance of enterprises and bond credit spreads show a significant negative correlation. This reflects that the bond market is able to recognize firms with better ESG performance and price their bond issues reasonably. Second, this paper finds that analysts' attention strengthens the negative correlation between firms' ESG performance and bond credit spreads, and analysts' multi-party transmission of information reduces the impact of the information asymmetry problem and improves the efficiency of the role of firms' ESG performance on bond credit spreads. Third, the moderating effect of analyst attention on the relationship between ESG performance and bond credit spreads is more pronounced in more market-oriented regions than in less market-oriented regions. This paper enriches the research related to green transition and bond market, and provides certain theoretical basis for promoting the high-quality development of China's bond market.*

Keywords: *ESG performance, analyst attention, bond credit spreads*

1. Introduction

At present, many countries are facing challenges brought by environmental changes while promoting economic growth, and issues such as climate change and environmental pollution have become the focus of people's attention and are highly valued by the government. In September 2020, China formally put forward the goal of achieving carbon peak by 2030 and carbon neutrality by 2060.As a management concept that takes into account environmental protection, social responsibility and corporate governance, ESG is in line with the spirit and concept of high-quality development of China's economy. ESG, as a management concept that takes into account environmental protection, social responsibility and corporate governance, is in line with the spirit of high-quality development of China's economy, and provides a comprehensive framework for sustainable development of the Company, which will help realize the "dual-carbon" goal and promote the transformation and upgrading of the domestic economy.

In recent years, China's capital market has continued to develop and improve, but compared with some developed countries and emerging markets, the proportion of bond financing in China is low and the market is not active enough. How to improve the information efficiency of the bond market and reflect the real situation of issuers with accurate pricing is the key to the further development of the bond market. Domestic scholars are more inclined to research on the stock market, and have achieved abundant research results, while the literature on the bond market is relatively lacking. Bond credit spreads can be regarded as the compensation demanded by bond investors for the issuer's default risk , which reflects the financing cost of enterprises in the bond market. In an efficient bond market, investors pay attention to the condition of the bond-issuing firms and are extremely sensitive to their information disclosure. A firm's ESG performance signals to the outside world that it has the potential for sustainable development, which may affect bond credit spreads.

As an important information intermediary in the capital market, analysts assume the dual roles of information reception and information transmission. On the one hand, analysts make personal or team judgments on macroeconomic conditions, industry development prospects and corporate value by

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collecting relevant information in the market, whether public or non-public; on the other hand, they pass market information to investors through public and non-public channels, which may effectively reduce the information asymmetry between the investment and financing parties, and have a certain guiding effect on the reasonable pricing of bonds.

The research significance of this paper is mainly reflected in the following: (1) Although there is some relevant literature on bond credit spreads, whether the bond market can recognize ESG-performing firms, and the specific mechanism of the role of the bond market remains to be further researched. (2) From the perspective of signaling theory, this paper considers the ESG performance of enterprises as a kind of signal, so as to examine the interpretation of this signal by bond investors, which enriches the literature on debt financing. (3) This paper shows that bond prices can recognize the ESG performance of enterprises, and investors can support enterprises with good ESG performance at a lower risk premium; for enterprises in need of financing, it is conducive to improving ESG performance and strengthening the ability of sustainable development. This paper provides a certain theoretical basis for improving the domestic multi-level capital market system and promoting the high-quality development of China's bond market.

2. Literature review and hypothesis development

Based on the theory of information asymmetry, in the bond market, bond investors are unable to participate in corporate management decisions and are at an information disadvantage, and they need to screen the risk situation and predict the development prospects of the enterprise from other aspects, so as to demand a reasonable yield to maturity. Positive signaling and information disclosure can enhance investor confidence and reduce the degree of information asymmetry between bond investors and bond-issuing enterprises, thus reducing the risk of bond default. This paper argues that ESG, as a business philosophy that balances environmental protection, social responsibility and corporate governance, has ratings that can comprehensively measure the degree of a company's sustainable development. Good ESG performance generates ethical and reputational capital[1] and positively affects financial performance and firm value[2][3] , helping to reduce the information asymmetry between investors and firms and to improve the efficiency of market resource allocation. Companies with more complete ESG disclosure can transmit a positive signaling effect to the outside world[4]. Bond investors can receive the signal and judge that such a company has lower default risk and more competitive future development, which in turn reduces bond financing costs. Thus we propose the first research hypothesis:

Hypothesis 1: Controlling for other factors, corporate ESG performance significantly reduces bond credit spreads of listed companies.

Lin et al. (2013)[5] found that there is a significant negative correlation between the number of analysts following a listed company and bond credit spreads. Under the policy objective of "dual carbon" and the concept of sustainable development, analysts are likely to pay more attention to companies with good ESG performance, which indirectly strengthens the efficiency of corporate ESG performance on bond credit spreads. On the one hand, listed companies with better ESG performance will be considered to have stronger development potential and investment value, attracting analysts' attention, which in turn will increase the firm's reputational capital and visibility through analysts' information transfer. It has been found that reputation capital has a significant inhibitory effect on the moral hazard of enterprises and can reduce the risk of corporate default. The increase in analyst attention reduces the difficulty of stakeholders' information acquisition, and good ESG performance interpreted by analysts expands the scope of external cognition of the corporate image, increases corporate reputational capital, and makes bond investors willing to accept lower risk compensation, thus reducing bond credit spreads. On the other hand, analyst attention has a monitoring effect. Good ESG performance indirectly attracts more investors' attention by attracting analysts to follow it, and the monitoring role of stakeholders is strengthened. The multiple transmission of information by analysts reduces the impact of information asymmetry phenomenon on the market, which may strengthen the negative correlation between corporate ESG performance and bond credit spreads.

This leads to the second research hypothesis of this paper:

Hypothesis 2: Controlling for other factors, more analyst attention can strengthen the negative relationship between corporate ESG performance and bond credit spreads.

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3. Research design

3.1. Key variables

(1) Explained Variables

Bond credit spread (CS): CS is the explanatory variable of this paper, i.e., the credit spread of corporate bonds.CS is the difference between the yield to maturity of corporate bonds and the yield of treasury bonds with the same remaining maturity. For the missing yield to maturity of treasury bond in a certain year, it is calculated by interpolation method.

(2) Explanatory variables

ESG performance (ESG): The ESG rating indicators of listed companies by CSI Index Information Service Co., Ltd. are used, which is based on the international standard ESG evaluation system and adds Chinese characteristics of the measurement indicators, such as the quality of information disclosure, violation of laws and regulations, and the company's precise poverty alleviation indicators. The index system dynamically tracks and evaluates all A-share listed companies, and is divided into nine grades: AAA, AA, A, BBB, BB, B, CCC, CC, C. This paper assigns 9, 8 .....1 points to each of the nine grades, and the higher the score, the better the ESG performance of the company. The higher indicates that the company's ESG performance is better.

(3) Control variables

This paper refers to the relevant research of Zhou Hong (2018)[6] and other scholars, and selects control variables as shown in Table 1:

Table 1: List of variable definitions

Variable name	Symbol	Explanatory variable
Bond rating	ratevalue	Assignment of value to bond rating
Bond remaining maturity	term	The year in which the bond matures minus the year in which it is observed
Return on Assets	ROA	Net profit/average balance of assets
Firm size	Size	Natural logarithm of total assets at the end of the period
Total liabilities/total assets	Lev	Ratio of debt financing
Top5 Shareholding Ratio	Top5	Shareholding Ratio of Top5 Shareholders' Shareholding to Total Share Capital
TobinQ	TobinQ	Ratio of market value to replacement value of capital
Audit Opinion	Opinion	1 if the audit result of the annual financial statements is a standard unqualified opinion, otherwise 0.
Whether the two positions are combined	Dual	Whether the chairman and general manager are combined
Year of listing	FirmAge	Ln (current year - year of listing + 1)
Analyst attention	AnaAttenV	Number of tracking analysts per listed company per year
Industry dummy variable	Industy	Based on the “Guidelines on Industry Classification of Listed Companies (2012)” of the China Securities Regulatory Commission.
Year Dummy variable	Year	Controlling for the effect of different years

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3.2. Data source

In this paper, the data of listed companies issuing bonds from 2014-2022 are selected as the initial sample, excluding B-share listed companies, financial companies and companies with missing data, as well as bonds issued by financial institutions, domestic and foreign simultaneously listed bonds, missing data and duplicate bonds. The bond data in this paper is from Wind database and all other data is from CSMAR database. We winsorize all continuous variables at the 1 % and 99% levels to avoid the influence of outliers.

3.3. Empirical models

In order to test the research hypothesis 1 of this paper, the empirical model (1) is constructed:

$$CS_{i,t} = \alpha_0 + \alpha_1 ESG_{i,t} + \alpha_2 \text{Controls}_{i,t} + \sum Industry + \sum year + \varepsilon_{i,t}$$

In order to test the research hypothesis 2 of this paper, the empirical model (2) is constructed:

$$CS_{i,t} = \beta_0 + \beta_1 ESG_{i,t} + \beta_2 ESG\_AnaAttenV + \beta_3 AnaAttenV + \beta_4 \text{Controls}_{i,t} + \sum Industry + \sum year + \varepsilon_{i,t}$$

4. Empirical results

4.1. Descriptive statistical analysis

Table 2 provides the descriptive statistics of the relevant variables in this paper. During the observation period, the average value of bond credit spread (CS) of the sample listed companies is 1.691, and the standard deviation is 1.271, with the maximum credit spread reaching 6.064 and the minimum only 0.002, indicating that there is a certain default risk in China's bond market, and that investors demand higher risk compensation for corporate bonds compared to treasury bond yields. In terms of ESG ratings, the average ESG rating of listed companies as a whole is 4.498, with a standard deviation of 1.325, which is generally a good performance.

Table 2: Descriptive Statistical Analysis.

Variable	N	Mean	SD	Min	p50	Max
CS	1042	1.691	1.271	0.00210	1.338	6.064
ESG	1042	4.498	1.325	0	4.750	6
AnaAttenV	1042	2.237	0.904	0.693	2.303	3.850
ROA	1042	0.0305	0.0375	-0.225	0.0243	0.234
TobinQ	1042	1.283	0.623	0.842	1.072	9.476
ratevalue	1042	4.236	1.078	0	5	5
term	1042	6.419	5.533	5	5	30
Opinion	1042	0.990	0.100	0	1	1
TOP5	1042	57.22	16.12	19.56	56.79	89.43
Lev	1042	0.625	0.151	0.166	0.652	0.960
Size	1042	24.58	1.437	21.21	24.55	27.15
FirmAge	1042	3.065	0.309	1.792	3.135	3.761
Dual	1042	0.173	0.378	0	0	1

4.2. Regression analysis

Table 3 reports the empirical results of model (1). In this case, the explanatory variable is the credit spread (CS) of corporate bonds and the explanatory variable is the ESG performance of firms. The results show that the regression coefficient of corporate ESG performance is -0.180 and is significant at the 1% level. It indicates the better the ESG performance of a firm, the lower the credit spread of the bond. The bond investors perceive the ESG performance of a firm as a positive signal and give a positive market response. This paper infers that investors believe that enterprises with better ESG performance have better development potential and lower default risk; moreover, under the national policy of encouraging enterprises to make better information disclosure, investors also attach more importance to the information content of ESG ratings.

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Table 3 also reports the empirical results of model (2). The results show that the coefficient of the cross-multiplier term between ESG performance and analysts' attention is -0.081 and significant at the 10% level, which is in line with the expectation of hypothesis two, i.e., analysts' attention strengthens the negative correlation between firms' ESG performance and bond credit spreads.

Table 3: Basic regression analysis

	CS	CS
ESG	-0.180***	-0.046
	(-3.969)	(-0.424)
AnaAttenV_ESGwind		-0.081*
		(-1.771)
AnaAttenV		0.475**
		(2.095)
ROA	-0.478	-1.556
	(-0.349)	(-1.156)
TobinQ	-0.040	-0.041
	(-0.360)	(-0.374)
ratevalue	-0.128***	-0.090**
	(-3.084)	(-2.158)
term	0.049***	0.051***
	(8.431)	(8.697)
Opinion	-1.075**	-1.466***
	(-2.097)	(-3.275)
TOP5	-0.009***	-0.010***
	(-3.525)	(-3.643)
Lev	1.347***	1.547***
	(3.416)	(3.479)
Size	-0.120***	-0.176***
	(-2.746)	(-3.412)
FirmAge	-0.174	-0.308**
	(-1.305)	(-2.110)
Dual	0.142	0.153
	(1.387)	(1.369)
Year	Yes	Yes
Industry	Yes	Yes
Observations	1042	1042
R^2	0.341	0.363
Adjusted R^2	0.289	0.301
F	14.593	15.265

Robust t-statistics in parentheses. *** $p < 0.01$. ** $p < 0.05$. * $p < 0.1$.

4.3. Robustness test

In order to make the empirical results more real and reliable, we adopt the way of replacing the core variable for the robustness test, using data from 2018 to 2022 and replacing the ESG rating data released by CSI with the ESG score data released by WIND for the regression. The results is shown in Table 4. The ESG data released by the WIND company is significantly negatively correlated with corporate bond credit spreads, with a regression coefficient of -0.273, which is significant at the 1% significance level, i.e., the higher the ESG score, the lower the bond credit spreads, and analysts' concern reinforces the negative correlation between ESG performance and bond credit spreads, which suggests that the results of the previous study are more robust.

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Table 4: Robustness Tests

	CS	CS
ESGWind	-0.273***	0.189
	(-4.842)	(1.217)
AnaAttenV_ESGwind		-0.198***
		(-3.128)
AnaAttenV		1.391***
		(3.290)
ROA	-1.364	-5.246***
	(-0.724)	(-2.637)
TobinQ	-0.068	0.058
	(-0.470)	(0.416)
ratevalue	-0.062	-0.028
	(-1.435)	(-0.651)
term	0.056***	0.060***
	(8.854)	(9.789)
Opinion	-1.485***	-1.904***
	(-2.690)	(-4.968)
TOP5	-0.010***	-0.010***
	(-3.077)	(-2.690)
Lev	1.446**	1.621**
	(2.563)	(2.283)
Size	-0.047	-0.159**
	(-0.832)	(-2.262)
FirmAge	-0.194	-0.388*
	(-1.027)	(-1.766)
Dual	0.108	0.084
	(0.759)	(0.534)
Year	Yes	Yes
Industry	Yes	Yes
Observations	660	660
R^2	0.394	0.440
Adjusted R^2	0.337	0.373
F	13.421	17.089

Robust t-statistics in parentheses. *** $p < 0.01$. ** $p < 0.05$. * $p < 0.1$.

4.4. Heterogeneity analysis

The degree of marketization is a comprehensive indicator of the process of regional development and the level of economic development. Due to differences in social conditions, natural endowments, and geography across regions, the level of economic development, institutional constraints, and the degree of free flow of capital faced by firms in each region are not exactly the same. The higher the degree of marketization, the more obvious the utility of analysts' external monitoring and governance may be, and the analysts' attention is more likely to strengthen the negative correlation between firms' ESG performance and bond credit spreads compared to firms in regions with lower degree of marketization.

Therefore, according to the marketization index report of Fan Gang, this paper collects the total marketization index of the observation year as the static index to measure the marketization index, and distinguishes the two groups of the marketization degree by the median of the marketization index, then regresses according to the above two hypotheses. The results are shown in Tables 5, where Hypothesis 1 is still validated in the regression analysis for both subgroups, indicating that firms' ESG performance is negatively related to bond credit spreads regardless of the degree of marketization. However, the negative moderating effect of analyst attention on the relationship is only significant in the subgroup of regions with a higher degree of marketization.

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Table 5: Heterogeneity analysis

	More market-oriented areas	Less market-oriented areas	More market-oriented areas	Less market-oriented areas
	(1)	(2)	(3)	(4)
ESG	-0.159***	-0.208**	-0.026	0.033
	(-2.852)	(-2.287)	(-0.190)	(0.132)
AnaAttenV_ESG			-0.095*	-0.104
			(-1.697)	(-0.952)
AnaAttenV			0.603**	0.552
			(2.116)	(1.100)
ROA	-0.495	-1.466	-2.511	-1.134
	(-0.280)	(-0.568)	(-1.457)	(-0.396)
TobinQ	0.007	-0.089	-0.044	-0.009
	(0.047)	(-0.394)	(-0.333)	(-0.037)
ratevalue	-0.089**	-0.202*	-0.037	-0.229*
	(-1.964)	(-1.721)	(-0.836)	(-1.783)
term	0.051***	0.043***	0.053***	0.051***
	(7.616)	(4.242)	(7.910)	(4.466)
Opinion	-1.353**	-0.816**	-1.909***	-0.862**
	(-2.059)	(-2.310)	(-3.794)	(-2.179)
TOP5	-0.009***	-0.012**	-0.010***	-0.013**
	(-2.855)	(-2.121)	(-3.038)	(-2.332)
Lev	0.930*	1.886**	1.276**	1.465*
	(1.822)	(2.559)	(2.199)	(1.824)
Size	-0.110**	-0.086	-0.215***	-0.073
	(-2.109)	(-0.815)	(-3.386)	(-0.687)
FirmAge	-0.096	-0.177	-0.237	-0.228
	(-0.582)	(-0.644)	(-1.306)	(-0.825)
Dual	0.232*	-0.197	0.240*	-0.172
	(1.859)	(-0.900)	(1.772)	(-0.757)
Year	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes
Observations	731	311	731	311
R^2	0.322	0.469	0.363	0.489
Adjusted R^2	0.257	0.334	0.286	0.335
F	9.188	8.954	11.458	7.372

5. Conclusions and recommendations

5.1. Conclusions of the study

In this paper, we analyzes the impact of corporate ESG performance on bond credit spreads through empirical research, and the findings include the following aspects.

(1)Firstly, corporate ESG performance is significantly negatively correlated with bond credit spreads, i.e., the better the ESG performance of a company, the lower the credit spread of the bonds it issues. This reflects that the bond market is able to recognize companies with better ESG performance and give reasonable pricing to the bonds issued by them. (2)Secondly,we finds that analyst attention can strengthen the negative correlation between corporate ESG performance and bond credit spreads, which reflects the external monitoring and governance role of analysts. Good ESG performance helps to increase analysts' attention in the market, which can increase firms' reputational capital and visibility through analysts' messaging, making bond investors willing to accept lower risk compensation and thus reducing bond credit spreads more significantly. (3) Thirdly, the moderating effect of analyst attention on the relationship between ESG performance and bond credit spreads is more pronounced in more market-oriented regions than in less market-oriented regions.

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5.2. Recommendations for countermeasures

(1) It is recommended that government departments continue to introduce policies to improve relevant rules and guidelines for ESG information disclosure, strengthen guidance and supervision, adopt mandatory disclosure measures for some important information, and encourage companies to voluntarily disclose underlying ESG information. In addition, government departments can collaborate with relevant departments and organizations to establish a comprehensive and comprehensive ESG evaluation and disclosure system, providing convenience for investors and third-party institutions to obtain and discern information. Furthermore, relevant industry standards such as pollution emissions and energy consumption standards should be formulated and published, and penalties for incomplete and fraudulent information disclosure should be increased.

(2) For bond-issuing companies, they should actively respond to the national requirements on sustainable development in recent years and emphasize environmental protection, social responsibility and corporate governance in their daily operations; state-owned enterprises and large companies should also take the lead in proactively disclosing ESG-related reports, and gain the favor of the regulators and investment institutions by improving the company's ESG performance and practicing the concept of sustainable development. Enterprises should deepen the concept of sustainable development, actively assume social responsibility and strengthen information disclosure management. As the main force of economic development, enterprises should abandon the short-sighted development concept of "profit-oriented" and the pursuit of economic profits, establish a sense of the overall situation, long-term awareness and sustainable development, and take into account social benefits while pursuing economic benefits, proactively, timely and comprehensively disclose ESG-related information and significant matters, and effectively protect shareholders, consumers, employees and other stakeholders. The Company shall proactively, timely and comprehensively disclose ESG-related information and significant matters, effectively safeguard the rights of shareholders, consumers, employees and other stakeholders to know, participate and supervise, and create favorable conditions for the long-term development of the Company.

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