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Article

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Do significant risk warnings in annual reports increase corporate bond credit spreads? Evidence from China



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ABSTRACT

Based on listed companies issuing bonds on the Shanghai and Shenzhen Stock Exchanges from 2007 to 2017, this study analyzes the relationship between significant risk warnings in Chinese companies' annual reports and corporate bond credit spreads. The main findings are as follows. First, in the Chinese market, "substantial warnings of significant risks" can significantly improve corporate bond credit spreads, reflecting the risk-warning effect; second, state-owned property rights weaken this effect, which only pertains to listed companies with poor risk management and low information quality; third, significant risk warnings increase investors' heterogeneous beliefs, also affecting credit spreads; and fourth, through textual analysis, it is found that the corporate bond credit spread is greater when the disclosed risk factors are more pessimistic and less similar to those of the previous year. The findings of this paper help to enrich the literature on credit spreads and risk disclosure.

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1. Introduction

The scale of the issuance of corporate bonds in China has grown rapidly since their pilot issuance in 2007. Issuing corporate bonds has become one of the most vital financing methods for listed companies and plays an increasingly important role in the Chinese financial system. "Credit spread" refers to the cost of corporate bond financing. How to reduce credit spreads to decrease financing costs is the core concern in the corporate bond market. Therefore, the factors thought to affect credit spreads have attracted the attention of scholars and the market. Studies have found that when determining bond credit spreads, in addition to credit risk

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compensation (Kidwell et al., 1984), incomplete and asymmetric information compensation (Duffie and Lando, 2001; Yu, 2005) plays an important role. Thus far, research on asymmetric information compensation has largely used financial information (Callen et al., 2009; Zhou et al., 2014). Few scholars have considered non-financial information, especially that found in the risk disclosure of annual reports. Non-financial information can enhance users' confidence in the reliability and authenticity of earnings information, thus improving the information environment and the efficiency of investment decisions (Li, 2010). However, as of yet there is no evidence that non-financial information affects corporate bond credit spreads. This study analyzes the effect of disclosed risk information, as found in companies' annual reports, on corporate bond credit spreads, filling an important research gap.

Sufficient, timely, and effective information disclosure is a necessary prerequisite for mature capital markets. In 2005, the U.S. first asked listed companies to discuss their significant risk factors on the start page (Item 1A) of their annual reports (10-K filings). In 2007, according to the guidance of the "The Content and Format Standards of Information Disclosure for Companies That Offer Securities to the Public No. 2-Annual Report," the China Securities Regulatory Commission (CSRC) required Chinese public companies to disclose as much information on their risk factors as possible in the "Management Analysis and Discussion" (MD&A) section of their annual reports to be in accordance with the principle of relevance. However, from the perspective of management, risk disclosure also represents a kind of risk because the consequences of that disclosure cannot be anticipated. Companies tend to adopt the strategy of "the less trouble the better" by disclosing a small degree of risk to hide a more significant degree of risk. In addition, the disclosure of risk information in annual reports has long been regarded as a formality involving filling out a template without including much real content (Fanning, 2015). In this light, the CSRC placed further demands on risk disclosure in 2012, requiring listed companies to make their disclosure information more prominent by positioning this section at the beginning of their annual reports and by structuring the "significant risk warnings" according to the principle of importance. This standard was proposed on the basis of a company's having already disclosed risk information, and attempted to address the complications and obfuscations common to the previous template. Therefore, compared with those in the United States, the requirements for risk disclosure in China's annual reports take the process one step further. In the wake of the CSRC's guidelines, the listed company's substantial risk factors are now more visible, making it easier to ascertain the disclosure's market effect. That is the unique advantage of Chinese data.

Do significant risk warnings in annual reports play a role? What is their effect on the corporate bond market? Without direct empirical evidence, research has mainly resorted to stock market data; evidence from the bond market is still rare. The effect of risk disclosure on the stock market, as gleaned from the results of empirical research, cannot be simply applied to the bond market, for the following three reasons. First, the bond market has a relatively fixed income, and so to minimize losses, bondholders tend to be sensitive to risk, focusing on more negative news than positive news, unlike stock investors, who tend to pursue "high-risk, high-yield" investments and are more concerned with positive news or upside risks. Defond and Zhang (2014) find that bond prices react much more quickly to "bad news" than to "good news," and that the "bad news" contained in bond prices is greater than that in stock prices. Theoretically, therefore, the effect of annual reports' risk disclosure on bond prices should be greater than on stock prices. Second, as different types of investors pay attention to different risk factors and interpret them differently, investors in the stock market and bond market may reach different conclusions about the disclosed information. Third, bond investors' demand for risk information is much higher than that of their counterparts in the stock market. Bond investors tend to exert greater effort in gathering and analyzing negative news. Institutional investors, which account for the vast majority of the Chinese bond market, have an advantage over individual investors in terms of the ability to acquire and process private information. Here, institutional investors seeking risk information are not limited to that which is commonly revealed in company announcements and reports. Meantime, whether and how individual bond investors can use such information remain unknown. This situation differs from the stock market, where individual investors dominate. For the reasons stated above, research findings about the stock market, despite its advances, cannot be directly applied to the bond market. The effect of the annual risk disclosure on the corporate bond market remains a topic for further study.

In addition, the corporate bond market provides a good information environment for us to study corporate bond credit spreads. Since the CSRC promulgated its “Guide to Piloting Corporate Bond Issuance” in 2007, China’s corporate bond market has achieved rapid and stable development. The growing demand for bond investment has intensified bond trading more than ever, and the liquidity of the bond market has also increased, which is important because only in a liquid market can information be efficiently integrated. Previous research on the bond market has come into question because of the lack of market liquidity. In contrast with other bond markets, the booming development of the corporate bond market provides a relatively good environment for the study of credit spreads.

This research was based on companies listed on the Shanghai and Shenzhen Stock Exchanges that issued bonds from 2007 to 2017, and it examined the relationship between the significant risk warnings of Chinese companies’ annual reports and the credit spread of their corporate bonds. We made four important findings. First, “substantial warnings of significant risks” can significantly narrow (improve) corporate bond credit spreads, which reflect the risk-warning effect, and this relationship remains after excluding the company’s fundamental risk, controlling sample self-selection, and conducting other robustness tests. Second, state-owned property rights weaken this effect, and “substantial warnings of significant risks” only affect companies with poor risk management capabilities and poor information quality. Third, the warnings affect credit spread by increasing the heterogeneity of investors’ beliefs, which is the incomplete intermediary effect of risk disclosure on credit spread. Fourth, through textual analysis, it is found that bond credit spreads are greater when the risk factors are more pessimistic and less similar to those of the previous year.

Our study contributes to the literature in several ways. First, we find that the substantial warnings of significant risks has increased investors’ heterogeneous beliefs and thus increased corporate bond credit spreads, which plays a risk-warning role. This contradicts the findings of [Chiu et al., \(2017\)](#) in the U.S. stock market, concluding that risk factors in Item 1A improve the transparency of financial reporting and therefore reduce credit default swap (CDS) spreads. Our findings supplement the literature on the economic consequences of risk disclosure. Second, we advance research on how non-financial information affects corporate bond credit spreads. There is little research evidence regarding how risk information disclosure affects credit spreads, and we fill that research gap. Third, in response to poor disclosure practices, the newly issued “The Content and Format Standards of Information Disclosure for Companies That Offer Securities to the Public No. 2-Annual Report” of 2015 relaxed companies’ mandatory disclosure of significant risk warnings, but our research emphasizes the usefulness of such warnings in providing a decision-making basis for China’s regulatory authorities as they develop more effective disclosure measures, strengthen their supervision over risk disclosure, and promote the healthy growth of capital markets.

2. Literature review and hypothesis development

2.1. Research on risk information disclosure

Research on risk information disclosure in annual reports has been based mostly based on company cases, special industries ([Beattie, 2004](#)), or small samples ([Rajgopal, 1999](#)). With the development of data mining technology over the past decade, more and more research has used the content analysis method to undertake textual analysis of disclosure content, often excavating information that had been buried deeply in the text and exposing it to the light of day.

In recent years, the use of textual analysis of risk information disclosure has focused on the stock market, addressing on the value relevance of disclosure content, the ability to predict a company’s risk level, and the effects of risk disclosure on investors’ risk perception. [Li \(2006\)](#) finds that the number of risk keywords is negatively correlated with future earnings and future market returns. [Kravet and Muslu \(2013\)](#) examine investors’ perceptions of the risk disclosure of annual reports, finding a relative positive correlation between change in the frequency of risk statements and the volatility of future stock returns, the abnormal trading volume of the 3-day window period, and bias corrected analyst forecasts are relatively positively correlated. When the risk disclosed by the enterprise exceeds the industry average, the correlation is weakened, indicating that most of the information disclosed by the enterprise belongs to the template type, with a lack of the company’s own special information disclosure. [Campbell et al. \(2014\)](#) and [Hope et al. \(2016\)](#) suggest that the types and traits

of risk factors are related to the company's risk and affect market performance, showing that the level of a company's disclosed risk can reflect and predict its actual risk. Investors incorporate disclosed risk information into the stock price, causing it to react accordingly. [Fanning \(2015\)](#) tests whether lowering the threshold of risk disclosure can affect investors' risk perception in an experimental way. The study concludes that the risk perception of people with targeted performance goals is less likely to be lowered by disclosed risk information or by the lengthy disclosure of generally unimportant risks. Also, that study finds that short-term investors are the ones most vulnerable to management's disclosure strategies because shorter-term investors need to consider risk to a greater extent. [Filzen and Peterson \(2015\)](#) finds that management may adjust policy in the face of risk disclosure and has a "wait and see" attitude in the face of uncertainty disclosure. Companies that are small or non-profit, along with high-risk companies running on credit, are more sensitive to factors of risk and uncertainty, and increases in those factors exert stronger effects on company policy than they decreases. [Chiu et al. \(2017\)](#) suggest that annual risk disclosure improves the transparency of financial reporting and reduces CDSs. In addition, for companies with greater information uncertainty and default probability, risk disclosure can help investors evaluate potential risks and make forecasts of future performance. [Elliott et al. \(2015\)](#) provide evidence on the correlation between disclosed risk information and company policy. Studies have shown that increased risk disclosure can explain changes in the company's financial policies such as those relating to debt ratios, investment, R&D, employees, dividend policy, cash holdings, and stock purchases. Moreover, these changes in financial policies are sensitive to changes in company size, profitability, and credit ratings.

Research has found that incremental change of disclosed risk information is negatively correlated with future earnings and positively correlated with market volatility and bias corrected analyst forecasts. That is, disclosed risk information can be used to predict a company's future risk, enhance the ability of capital market investors to identify risk, and reduce information asymmetry. Such research has mostly addressed the U.S. stock market, and [Chiu et al.'s \(2017\)](#) research also involves the U.S. CDS market. However, regarding the Chinese market, CDSs have just recently been launched and their development has been marked by instability. In addition, research findings about the American market cannot be applied to the Chinese market. Therefore, studies are needed to test the effects of Chinese companies' risk information disclosure, as found in their annual reports, on the corporate bond market.

2.2. Research on risk information and corporate bond credit spreads

With the rapid development of the corporate bond market in recent years, bond credit spread has become a focal point of research in macroeconomics and microfinance. [Duffie and Lando \(2001\)](#) propose that credit spreads can be influenced by the following two factors: corporate default risk and information asymmetry between investors and listed companies. Those two factors have also been the focus of numerous studies on corporate bond credit spreads.

"Default risk" refers to the risk of bond repayment resulting from uncertainty over the company's future cash flow. Here, the literature shows great interest in the role of "uncertainty." [Jiang et al. \(2005\)](#) and [Zhou et al. \(2014\)](#) show that information uncertainty affects corporate bond credit spreads. [Leng et al. \(2015\)](#) discover that role of loan guarantees in default risk affects corporate bond credit spreads. [Wu and Wang \(2016\)](#) investigate the disclosure of environmental information by heavy-polluting industries, and find that the level of such disclosure was significantly positively correlated with credit spreads for the listed companies showing poor environmental performance. [Wang and Gao \(2017\)](#) explore the effect of customer concentration risk on the credit spreads of secondary market bonds, concluding that the greater the company's fundamental risk, the greater the bond default and the greater the bond credit spread.

Regarding information risk, [Duffie and Lando \(2001\)](#) argue that information asymmetry can lead investors to different understandings of company value, such that they have different expectations of the term structure of corporate credit spreads. [Yu \(2005\)](#) finds that the quality of accounting information is negatively correlated with bond credit spreads: the higher the information quality, the smaller the credit spread. [Zhou et al. \(2010\)](#) review the literature on corporate bond credit risk from the perspective of information asymmetry. [Zhou et al. \(2014\)](#) empirically test how information asymmetry between corporate bond issuers and investors affects corporate bond credit spread via the ratio of intangible assets to the book value of total assets. [Zhou et al. \(2016\)](#)

confirm that the disclosure of social responsibility can reduce information asymmetry and thus reduce corporate bond credit spreads.

2.3. Hypothesis development

According to the above research, risk disclosure tends to have two effects on the stock market: improving investors' perception of corporate risk (Kothari et al. (2009); Kravet and Muslu, 2013) and reducing information asymmetry between investors and companies (Campbell et al., 2014; Chiu et al., 2017). This conclusion also applies to the bond market. The regulators' original intention in establishing criteria for risk disclosure was to provide investors with more valuable information for use in risk assessment and investment decisions, thus reducing information asymmetry between listed companies and investors and promoting price discovery in the bond market. The more the information disclosed in significant risk warnings elaborates on the risk factors, the less the information asymmetry and the smaller the corporate bond spread. However, the disclosure criteria for issuing a "Significant Risk Warning" were formulated with precisely that intention: warning investors about risk. Sometimes a company faces significant risk but fails in its obligation to disclose it. However, if that risk is somehow revealed, or if its underlying elements erupt into real crisis, then the market punishes the company, and soon afterwards, the CSRC punishes the company's management.¹ Once a company has disclosed its significant risk factors, the greater the indicated risk, the greater the investors' risk perception, which is a condition inevitably requiring a higher risk premium and one that can be expected to increase the bond credit spread.

The main effect of significant risk warnings on the corporate bond market—that is, its intended effect—is to reduce information asymmetry, thereby reducing the bond credit spread, and to improve the investor's risk perception, thereby also improving the bond credit spread. Each of these causal links needs further testing. Considering the poor quality of risk disclosure in China, most warnings contain little information and do not function as warnings of substantial risk, despite their wordiness.

Based on this, we propose the following hypotheses under H1.

H1a. Substantial warnings of significant risks narrow (improve) corporate bond credit spreads (the information effect hypothesis).

H1b. Substantial warnings of significant risks widen (worsen) corporate bond credit spreads (the pre-warning effect hypothesis).

The state-owned property rights and their implicit guarantees to a company may weaken both the information effect and pre-warning effect of risk disclosure in the corporate bond market. An explanation can be found in the political and financial support of the state, and state-owned property rights enables state-owned enterprises (SOEs) have a particular reputational effect. Even the company's financial statements are inaccurate, or even if the bond is unpayable due to poor management, the government is likely to take responsibility and inject state funds, representing what some have called a governmental "blood transfusion." This governmental role offsets the auditor's role in verifying the authenticity of financial statements and internal control quality (Fang and Chen, 2015). The implicit guarantees behind SOEs, which lower risk perception, reduce investors' concerns, and, in turn, weaken the pre-warning effect. However, in the absence of the government's implicit guarantees, non-SOEs are subject to the pressure to disclose risk, and the majority of bond investors may raise their risk awareness to avoid risking their investment. For them, solvency and the reliability of financial information reliability are concerns. Therefore, for non-SOEs, the effect of risk disclosure on narrowing (improving) corporate bond credit spreads is enhanced. On the contrary, implicit guarantees of SOEs highlight the value of risk information in reducing information asymmetry and investor risk compensation, which lead to a narrowing of corporate credit spreads. To this end, this paper proposes hypothesis H2:

¹ There are not a few companies that have been punished for failing to fully disclose risk. Dayou Energy (code 600403) and its controlling shareholder did not disclose significant risks in 2017. The chairman of the controlling shareholder was fined 600,000 yuan and imposed a 10-year market ban by the CSRC.

H2. State-owned property rights reinforce the effect of “substantial warnings of significant risks” on narrowing corporate bond credit spreads, and weaken the effect of such warnings on widening credit spreads.

3. Research design

3.1. Data and sample

For China, risk disclosure in annual reports began in 2007, the same year as the pilot issuance of the corporate bond. Therefore, this paper is based on all A-share listed companies from 2007 to 2016. We use computer programs to extract the “Significant Risk Warnings” segment from the annual reports, and eliminate the samples that cannot be extracted due to the disclosure format or to extraction standards, and finally obtain 21224 items for risk information disclosure. We retain the listed companies in the Shanghai and Shenzhen Stock Exchanges that issued bonds from 2007 to 2017, and eliminate duplicate bonds and bonds with missing data. After merging the risk disclosure sample, the final study sample includes observations on 2516 items consisting of 947 bonds issued by 568 listed companies. The other variables in this paper are taken from the CSMAR and WIND databases. To avoid the influence of extreme values, this research winsorizes all continuous variables at the 1% level, controls the industry and annual effects for all regressions, and conducts cluster processing in the company dimension.

3.2. Definitions of variables

3.2.1. Credit spread

In our research, Spread equals the yield of the bond at the end of the year minus the yield of the Treasury bond that has the same remaining maturity at the end of the year. The missing yield of a certain year’s Treasury bond is calculated by interpolation.²

3.2.2. Risk information disclosure in annual reports

The Disclosure Rule of Significant Risk in 2012 was developed to avoid a company disclosing just enough information to meet the requirements of the standard form and the content is template. The requirement of including “Significant Risk Warnings” in annual reports was designed to offer more information to investors than the previous “Possible Risk Factors” mandated in 2007. This paper focuses on the effect of substantial risk disclosure on the bond market.

This study uses content analysis to measure significant risk indicators. First, we extract the “Possible Risk Factors” segment from the MD&A section with Python. Then, through reading and analysis, the significant risk prompts are divided into two groups: “substantial warnings of significant risk” and “non-substantial warnings of significant risks,” according to whether the risks are the same as in “Possible Risk Factors” of the MD&A section. The basis of the classification is as follows: substantial warnings of significant risks are long, detailed, and not entirely consistent with or different from the risk factors in the MD&A; meantime, non-substantial warnings of significant risks are those warnings that simply remind investors to refer to information in the MD&A, or whose risk factors are exactly the same as those in the MD&A, or whose level of risk seems insignificant. According to this classification, we set our variable as “substantial warning of significant risks” (*SubstanTip*). When the warning is substantive, the value is 1; otherwise, the value is 0.³

² Treasury yields are obtained through the website of China Central Depository & Clearing Co., Ltd., or constructed by the linear interpolation method to get the interest rate of the same remaining maturity.

³ The disclosure of significant risk warnings began in 2012, so the values of *SubstanTip* that take 1 happen after 2012, but the sample period of this paper runs from the beginning of the risk disclosure policy in 2007. In this way, the samples that reveal substantial significant risks can be compared not only with the un-sampled sample, but also with samples that disclose the risk factor only to the board of directors without warning of significant risk, making the conclusion more reliable. In the following robustness test, the pre-2012 samples are also excluded.

3.2.3. Control variables

Referring to Griffin et al. (2014), we control the influencing factors of the credit spread structure model, debt ratio (*Lev*), risk-free interest rate (*Spot*), return on total assets (*ROA*), credit rating (*Rate*), and company size (*Size*), with reference to Callen et al. (2009). According to Zhou (2014), we control the bond term (*Term*) and the bond issuance scale (*Lnum*). Stock liquidity (*Illiq*) is controlled, and the bankruptcy index (*Zscore*) is controlled to control the risk facing the company, considering that bond liquidity has a greater effect on change in bond prices.

3.3. Empirical model

To test the research hypothesis, this paper constructs an empirical model:

$$Spread_{i,t+1} = a_0 + b_1 RiskDisclosure_{i,t} + Controls_{i,t} + \varepsilon. \quad (1)$$

Of these variables, $Spread_{i,t+1}$ in model (1) is the explanatory variable in this paper, which is the debt credit spread of the company in $t + 1$ years. Also, $RiskDisclosure_{i,t}$ is the current indicator of risk disclosure used to examine its effect on corporate credit spreads. Finally, $Controls_{i,t}$ is the current control variable, as defined above.

4. Empirical test and analysis

4.1. Descriptive statistics

Table 1 provides descriptive statistics for the main variables. The variables are grouped according to whether the company has a significant risk, and the mean and variance of the two groups of samples are counted separately. The statistical results show that the average value of the bond credit spread is significantly larger for the companies that announced substantial warnings than for the companies that did not, which is basically consistent with the pre-warning effect hypothesis in H1b. The sample of substantive prompts is much smaller than the sample without substantive prompts, indicating that the company has a lower willingness to issue substantive risk warnings. In addition, companies that disclose significant risk warnings tend to be smaller, have lower debt ratios, lower credit ratings, and higher liquidity, which are characteristics not unlike companies that do not issue substantial risk warnings. In summary, in the descriptive statistics of two groups, it is impossible to see any obvious difference in their companies' fundamental risk.

Table 1
Descriptive statistics.

Variable	Without substantial warnings			With substantial warnings			Difference diff
	N	mean	Sd	N	mean	sd	
<i>Spread</i>	324	2.590	1.597	2174	1.957	1.607	0.632***
<i>Size</i>	324	22.88	1.124	2174	23.10	1.184	-0.225***
<i>Lev</i>	324	0.539	0.156	2174	0.568	0.150	-0.028***
<i>ROA</i>	324	0.111	0.197	2174	0.118	0.156	-0.007
<i>Rate</i>	324	6.939	0.564	2174	7.024	0.580	-0.085**
<i>Term</i>	324	6.087	0.824	2174	6.208	1.369	-0.121
<i>Spot</i>	324	5.435	1.365	2174	5.503	1.256	-0.068
<i>Lnum</i>	324	2.529	0.598	2174	2.548	0.635	-0.019
<i>Illiqd</i>	324	1.659	2.275	2174	2.182	2.470	-0.523***

* indicate that the estimated coefficient is statistically significant at the 10% levels, respectively.

** indicate that the estimated coefficient is statistically significant at the 5% levels, respectively.

*** indicate that the estimated coefficient is statistically significant at the 1% levels, respectively.

4.2. Correlation analysis

The results of the regression of the Pearson correlation coefficient are listed in Table 2. It can be seen from Table 3 that *SubstanTip* is positively correlated with the *Spread* of the next issue, with a coefficient of 0.133, and it is significant at the 1% level. This suggests that corporate bonds have higher credit spreads when there is a substantial warning of significant risks. This finding is consistent with the pre-warning effect hypothesis H1b, further validating the hypothesis inference. The company size *Size*, profitability *ROA*, credit rating *Rate*, bond maturity *Term*, issue size *Lnum*, and liquidity deficiency *Illiqd* are all significantly negatively correlated with credit spreads, and the interest rate of Treasury bond is significantly positively correlated with spreads.

4.3. Analysis of results

4.3.1. Test on Hypothesis 1: substantial warnings of significant risks and corporate bond credit spreads

Columns (1) and (2) of Table 3 list the results of the regression of substantial warnings of significant risks and bond credit spreads. The results show that whether or not the control variables are added, they are significantly positively correlated at the 1% level. The coefficient decreases from 0.469 to 0.426 after adding the control variables, but the significance remains unchanged. One of the original intentions of risk information disclosure is to induce a pre-warning effect, and the second is to alleviate the information asymmetry between investors and companies and thus reduce capital costs. According to the results, after revealing the substantial warnings of significant risks, the credit spread of corporate bonds widened significantly, thus supporting the pre-warning effect of hypothesis H1b, and negating the information effect hypothesis H1a, due to the weaker rationale for mitigating information asymmetry. One explanation of the findings of this study is that management that does not deliberately disclose significant risks becomes subject to severe punishment from the CSRC, and perhaps even criminal prosecution. Therefore, as soon as the company faces significant risk, management is placed in a position in which the risk from the authorities is greater than the risk from the market, and thus they become more inclined to disclose. Substantial warning of significant risks, being mandatory, is valued by bond investors, who regard the disclosure as revealing the most important risk factors in the company's future business development. Another explanation is that *SubstanTip*, the explanatory variable used in China, refers to the reports that are significantly different than the risk disclosure of the "Significant Risk Warning" section of the MD&A. Compared with the frequency of words and sentences relating to "risk" in previous studies, this measurement method pays more attention to the information content of risk disclosure, and it also better reflects more recently added risk factors. Investors are likely demand a higher risk premium of companies that have made substantial risk warnings, which suggests that substantial warning of significant risks can enhance bond investors' risk perception. This may explain why the findings of this paper are inconsistent with those of foreign studies.

Table 2
Pearson Correlation Coefficient.

	Spread	SubstanTip	Size	Lev	ROA	Rate	Term	Spot	Lnum	Illiqd
Spread	1.000									
SubstanTip	0.133***	1.000								
Size	-0.436***	-0.064***	1.000							
Lev	0.013	-0.059***	0.128***	1.000						
ROA	-0.113***	-0.023	0.052***	-0.571***	1.000					
Rate	-0.278***	-0.045**	0.479***	-0.001	0.067***	1.000				
Term	-0.099***	-0.036*	0.316***	0.126***	-0.065***	0.238***	1.000			
Spot	0.204***	-0.018	-0.338***	0.042**	-0.095***	-0.502***	-0.046**	1.000		
Lnum	-0.158***	-0.011	0.557***	0.117***	0.015	0.559***	0.257***	-0.474***	1.000	
Illiqd	-0.300***	-0.070***	0.234***	0.048**	-0.109***	-0.003	0.164***	0.103***	-0.064***	1.000

* indicate that the estimated coefficient is statistically significant at the 10% levels, respectively.

** indicate that the estimated coefficient is statistically significant at the 5% levels, respectively.

*** indicate that the estimated coefficient is statistically significant at the 1% levels, respectively.

Table 3
Substantial warnings of significant risks and bond credit spreads.

Variable	Spread				
	OLS	Add control variables	Differential regression	Control risk level	Remove the sample with risk announcement
	(1)	(2)	(3)	(4)	(5)
SubstanTip	0.496*** (3.75)	0.426*** (3.41)	0.495*** (4.19)	0.435*** (3.49)	0.361*** (2.83)
Size		-0.340*** (-8.97)	-0.333*** (-4.56)	-0.344*** (-9.25)	-0.324*** (-8.40)
Lev		0.419 (1.39)	0.58 (1.21)	0.468 (1.54)	0.243 (0.82)
ROA		0.086 (0.41)	-0.36 (-1.53)	0.157 (0.74)	-0.048 (-0.24)
Rate		-0.194** (-2.13)	-0.07 (-0.67)	-0.197** (-2.16)	-0.216** (-2.33)
Term		-0.009 (-0.35)	0.04 (1.17)	-0.01 (-0.41)	0.005 (0.22)
Spot		0.117*** (3.14)	-0.02 (-0.47)	0.115*** (3.09)	0.107*** (2.79)
Lnum		0.066 (0.83)	0.217** (2.22)	0.092 (1.11)	0.046 (0.56)
Illiqd		0.112 (0.6)	0.055*** (3.28)	0.097 (0.53)	0.117 (0.62)
SdRet				2.688*** (3.9)	
EDR				1.37 (1.08)	
Zscore				-0.002* (-1.67)	
Constant	2.471*** (6.44)	10.321*** (9.94)	-0.376* (-1.76)	10.245*** (9.89)	10.134*** (9.53)
Obs	2516	2516	2041	2516	2476
AdjR-sq	0.095	0.184	0.02	0.19	0.177
F	10.94	14.58	2.998	13.3	13.61

* indicate that the estimated coefficient is statistically significant at the 10% levels, respectively.

** indicate that the estimated coefficient is statistically significant at the 5% levels, respectively.

*** indicate that the estimated coefficient is statistically significant at the 1% levels, respectively.

4.3.2. Robustness test

To ensure the reliability of the results, this paper carries out the following robustness test.

- (1) Perform differential regression. Compared with the disclosed risk factors, the changes of disclosure often contain more abundant information. For this reason, the differential regression model is used to test the effect of the substantial warnings of significant risks on changes in bond credit spreads. Column (3) of Table 3 shows the results of differential regression. The results show that when the company makes substantial disclosures of significant risks, the increase in the credit spread of corporate bonds is improved, further testing the findings of this paper.
- (2) Exclude the effect of the company's risk level

The company's risk level has a direct effect on the credit spread of bond. The article above also points out that companies that disclose substantial prompts of significant risks may also be those with relatively high risk, that is, those for which risk level affects risk disclosure. To this end, it is necessary to rule out

the effect of the company's fundamental risk level on the research findings. We mainly use the following two methods.

First, we control the company's risk level. Column (4) of Table 3 adds the company's stock price volatility (*SdRet*), performance downside risk (*EDR*), and bankruptcy index (*Z-score*)⁴ on the basis of column (2). These three indicators represent the company's market risk, operational risk, and credit risk. The regression results show that the explanatory variables are significant as always; that is, in the case of controlling the company's risk level, the disclosure of substantial hints of significant risks can still significantly widen the bond credit spread. Creditors are more concerned about the substantive warnings of significant risks, enhancing risk perception and requiring a higher risk premium through the substantive warnings.

Second, we remove the samples of risk warning announcements. For some extreme risk factors in significant risk warnings, such as delisting risks, major losses, and other serious risks, companies normally admit that their risk levels are relatively high. Such cases inevitably lead to increasing market volatility and bond credit spreads. The influence of such extreme situations on the findings here needs to be eliminated. The listing rules of the Shenzhen Stock Exchange require listed companies to separately disclose their risk warning notice and identify significant risk situations, such as those resulting from breaking the law, mergers and acquisitions, and large losses. The failure to do so can lead to being punished by both the law and the market. Therefore, companies that have issued previous risk warning announcements are likely to have higher risk levels. This study obtains the risk warning announcements of all listed companies during the sample period from the "Juchao Information" website and deletes these samples before regression. The regression results are shown in column (5) of Table 3. The results remain unaffected even after removing a company's extreme risk status. The explanatory variables are significant at the 1% level, indicating that the extreme risk status has no significant effect on the findings of this study.

(3) Replace the dependent variable

The dependent variable credit spread is obtained by using the value calculated at the end of each year. This examines the long-term effects of risk information disclosure on the corporate bond market. It is not known whether information disclosed in annual reports in the bond market has the same effect in the short run. Therefore, we calculate the bond credit spread *Spread_d* from the bond yield on the first trading day after the annual report is disclosed, and then conduct a regression. The test results are shown in column (1) of Table 4. The coefficients of the explanatory variables are significant at the 5% level and the signs are consistent with the above test. The results show that investors in the bond market pay close attention to significant risk warnings in annual reports. After the first day of the annual report disclosure, the significant risk warning information is integrated into the bond market price.

(4) Propensity score matching (PSM)

Companies having made substantial warnings may show wide bond credit spreads because of other traits, so there is a problem of sample self-selection. We therefore try to reduce the effect of the problem by PSM. For companies that did not announce substantial warnings, we conduct one-to-one neighbor matching to identify the sample company closest to the experimental group company in the aspects of the control group. The resulting samples are combined with the control group before regression. The results are shown in columns (2) and (3) of Table 4 below: the regression coefficient of the explanatory variables is significantly positive regardless of whether the control variable is added, indicating that sample self-selection has a minimal influence on our conclusion.

⁴ *SdRet*, the standard deviation of stock price fluctuations in one year; *EDR*, downside risk of performance, according to the model of Konchichki et al. (2016), is obtained by calculating the difference between the actual accounting earning and the expected accounting earning, measuring the possibility of declining company's performance and reflecting the downside risk of performance better than other past indicators of operational risk. *Zscore*, the bankruptcy index, measures the risk of bankruptcy. The greater the value, the greater the risk.

Table 4
Other robustness tests.

Variable	Replace the dependent variable Spread_p (1)	PSM Spread (2)	IV stage 1 SubstanTip (3)	IV stage 2 Spread (4)	Exclude samples before 2012 Spread (5)
SubstanTip (IV_SubTip)	0.207** (2.23)	0.451*** (3.72)		1.514*** (4.38)	0.353*** (4.52)
Ind_SubTip			0.587*** (10.97)		
Top1RiskDisc			0.041** (2.27)		
Size	-0.469*** (-5.42)	-0.267*** (-8.71)	-0.005 (-0.64)	-0.500*** (-15.44)	-0.412*** (-11.18)
Lev	-0.337 (-0.35)	0.128 (-0.45)	-0.202*** (-3.74)	0.258 (1.04)	0.451* (1.71)
ROA	-1.681*** (-2.72)	-0.411* (-1.83)	-0.088* (-1.75)	-0.812*** (-3.66)	-0.549** (-2.53)
Rate	-0.694** (-2.01)	-0.345*** (-4.04)	-0.016 (-1.06)	-0.379*** (-5.91)	-0.214*** (-2.63)
Term	-0.047 (-0.83)	-0.011 (-0.47)	-0.004 (-0.68)	0.019 (0.8)	0.025 (0.99)
Spot	0.126* (1.84)	0.113*** (3.28)	-0.001 (-0.18)	0.135*** (4.91)	0.201*** (5.29)
Lnum	0.133 (1.37)	0.022 (0.3)	0.01 (0.65)	0.482*** (7.57)	0.243*** (3.12)
Illiqd	0.097 (1.01)	0.017 (1.33)	-0.003 (-1.12)	-0.137*** (-11.23)	0.067 (0.72)
Constant	15.689*** (3.52)	9.848*** (12.24)	0.401** (2.33)	14.193*** (18.41)	10.301*** (8.95)
Obs	2516	648	2516	2516	1999
AdjR-sq	0.058	0.091	0.076	0.219	0.399
F(IV F)	14.58	36.01	20.48	78.4	49.67

* indicate that the estimated coefficient is statistically significant at the 10% levels, respectively.

** indicate that the estimated coefficient is statistically significant at the 5% levels, respectively.

*** indicate that the estimated coefficient is statistically significant at the 1% levels, respectively.

(5) Instrumental variable (IV)

To avoid any potential endogeneity problems in the above research findings, this paper uses the instrumental variable to control. To ensure the exogenous nature of the instrumental variables, we use two instrumental variables to test: first, we take the mean value of whether the significant risks warnings are disclosed by other companies in the same industry (*Ind_SubTip*) as a tool variable; second, we do the same for whether to disclose substantial warnings of significant risk for the leading company in the same industry (*Top1RiskDisc*). On the one hand, studies have found that a company's information disclosure level is affected by the overall disclosure level of that industry (Campbell et al., 2014), but those levels appear to have no direct effect on the company's credit spread. On the other hand, due to the learning effect, the disclosure behavior of the leading companies in the same industry affect other companies' risk disclosure but not directly affect other companies' credit spreads. Therefore, both variables satisfy the selection condition of the tool variable.⁵ Columns (3) and (4) of Table 4 show the test results of the instrumental variable: column (3) is the first-stage regression, which regresses the instrumental variables and other exogenous variables on the explanatory variables, to find that the industry's disclosure level for substantial risk warnings *Ind_SubTip* is significantly positively correlated with the companies' substantive disclosure of significant risk; column (4) is the second-stage regression,

⁵ The selection of instrumental variables is checked by over-identification, and the instrumental variables are related to the independent variables.

regressing the first-stage regression fitting value *IV_SubTip* on credit spread, and the results are still significantly positive. The test results of the instrumental variables show that the findings of this paper are stable.

(6) Exclude samples before 2012

The CSRC's disclosure requirements for significant risk warnings began to be implemented in 2012, so we exclude the samples before 2012. We also consider the different effects on spreads from companies' substantial warnings and from companies' non-substantial warnings. The regression results are listed in column (5) of Table 4 and show that even if the samples before 2012 are excluded, the findings remain unaffected.

4.3.3. Test of Hypothesis 2: the effect of property rights

The effect of property rights on risk disclosure is mainly reflected in the implicit guarantees of state-owned enterprises. According to the research findings for Hypothesis 1, it is known that the substantial risk warnings entail the pre-warning effect, and whether state-owned property rights weaken that effect remains to be tested. Columns (1) and (2) of Table 5 show the results of group regression according to the nature of property rights. The effect of risk disclosure on credit spreads is mainly found in non-SOE enterprises, and hardly at all in SOE enterprises, even if there are some signs of the opposite. The table shows that state-owned property rights weaken the pre-warning effect, and that such risk-warning effect exists only in non-SOE enterprises, suggesting that in non-SOE enterprises, significant risk information has more relevance for corporate bond investors, being easier to integrate into bond prices with resulting effects on credit spreads. Thus, Hypothesis 2 is verified.

Table 5
Risk disclosure in annual reports, property rights, and bond credit spreads.

Variable	Spread	
	Property rights	
	SOE (1)	Non-SOE (2)
SubstanTip	-0.053 (-0.59)	0.535*** -4.27
Size	-0.255*** (-6.18)	-0.292*** (-4.03)
Lev	0.217 -0.63	0.624 -1.36
ROA	-0.373 (-1.40)	-0.046 (-0.14)
Rate	-0.249** (-2.35)	-0.087 (-0.56)
Term	0.019 -0.72	-0.015 (-0.16)
Spot	0.045 -1.14	0.181*** -2.74
Lnum	-0.018 (-0.23)	-0.101 (-0.56)
Illiqd	0.01 -0.41	0.012 -0.8
Constant	9.027*** -9.03	8.319*** -3.89
Obs	1169	1347
AdjR-sq	0.103	0.041
F	17.68	8.216

* indicate that the estimated coefficient is statistically significant at the 10% levels, respectively.

** indicate that the estimated coefficient is statistically significant at the 5% levels, respectively.

*** indicate that the estimated coefficient is statistically significant at the 1% levels, respectively.

Table 6
The adjustment effects of risk management capability.

Variable	Spread					
	Internal control level		Whether CEOs have risk management experience		Whether company has a risk management committee	
	High (1)	Low (2)	Yes (3)	No (4)	Yes (5)	No (6)
SubstanTip	0.001 (0.01)	0.572*** (4.12)	0.101 (0.50)	0.201** (2.54)	-0.294 (-1.15)	0.230*** (3.00)
Size	-0.279*** (-6.62)	-0.413*** (-5.80)	-0.429*** (-4.88)	-0.270*** (-7.03)	-0.207** (-1.97)	-0.299*** (-7.96)
Lev	-0.188 (-0.56)	-0.159 (-0.32)	-0.233 (-0.34)	0.131 (0.43)	-0.095 (-0.09)	0.064 (0.22)
ROA	-0.802*** (-2.96)	0.151 (0.44)	-0.212 (-0.36)	-0.378 (-1.64)	-0.817 (-0.74)	-0.381* (-1.75)
Rate	-0.451*** (-4.54)	-0.061 (-0.36)	-0.400** (-2.01)	-0.341*** (-3.58)	-0.660** (-2.26)	-0.325*** (-3.63)
Term	0.017 (0.61)	-0.103* (-1.68)	0.095** (2.44)	-0.083** (-2.33)	0.090 (1.38)	-0.015 (-0.51)
Spot	0.083** (2.16)	0.203** (2.44)	-0.030 (-0.40)	0.152*** (3.82)	-0.058 (-0.66)	0.128*** (3.33)
Lnum	0.027 (0.32)	0.089 (0.51)	0.074 (0.45)	0.082 (0.97)	-0.311 (-1.25)	0.053 (0.68)
Illiqd	0.029 (0.59)	0.055*** (2.87)	-0.005 (-0.11)	0.069*** (3.46)	0.033 (1.51)	0.072** (2.34)
Constant	11.202*** (11.04)	10.941*** (5.98)	14.165*** (7.07)	9.927*** (10.09)	12.132*** (4.52)	10.311*** (11.04)
Obs	1302	1214	348	2168	219	2297
AdjR-sq	0.135	0.044	0.129	0.087	0.093	0.087
F	26.37	7.951	7.401	26.74	3.788	28.42

* indicate that the estimated coefficient is statistically significant at the 10% levels, respectively.

** indicate that the estimated coefficient is statistically significant at the 5% levels, respectively.

*** indicate that the estimated coefficient is statistically significant at the 1% levels, respectively.

4.3.4. Examination of adjustment effects

(1) Corporate's risk management capabilities

The purpose of risk management is to help a company better control risk and reduce risk levels. Therefore, the stronger the company's risk management capability, the lower the probability of significant risk events, and the smaller the effect on bond credit spread.

This paper uses the internal control levels of whether company executives have risk management experience, and whether the company has a risk management committee as an alternative to the company's risk management capabilities.⁶ According to the median of the above three variables, the samples are divided into high and low groups, and the group regression is also conducted separately to test the difference between the coefficients of the explanatory variables between the groups.

Table 6 lists the results of the three combinations of regression, and the results show the following: For a company with low internal control levels, low CEO risk management experience, and no risk management committee, the effect of significant risk warnings on bond credit spreads is stronger. The conclusion of the study shows that when a company's level of risk management is higher, the effect of significant risk warnings on credit spreads is weaker.

⁶ For the values of the following variables: internal control level, we use the Dibo internal control index; whether the company CEOs have risk management experience, we read the executive experience in the annual report by the textual analysis method, if CEOs have served in risk-related positions indicates risk experience; whether the company has a risk management committee, we search for a similar institution of the "risk management committee" in the full text of the annual report through textual analysis, and if it is found, it is considered to have a risk management committee.

(2) Influence of information quality

Information quality influences the relationship between risk disclosure and bond credit spreads. Investors estimate and judge the company's risk status accordingly. When the company's information quality is good and the information transparency is high, investors' estimates of the company's risk level are more accurate, and the disclosed information has less of an effect on investors. When the company has poor information quality and large information asymmetry, investors cannot accurately estimate the company's risk level. After disclosing a significant risk warning, there is the possibility of a difference between the actual situation and the bond investor's expectations, so the effect on bond credit spread is greater. We measure the quality of corporate information based on the degree of earnings management and the transparency of internal control information disclosure.

The degree of earnings management, as a measure of the quality of accounting information, indicates the degree of management's manipulation of accounting earnings. The more serious the earnings management, the lower the reliability of accounting information, and vice versa. The disclosure quality of internal control is obtained from the Dibo database in a separate process. The score can be used to objectively evaluate the disclosure quality of the company's internal control information. The higher it is, the better the quality.

Columns (1) and (2) of Table 7 show the results of group regression according to the degree of earnings management. Columns (3) and (4) of Table 7 are the results of group regression according to the disclosure quality of internal control information. The regression results for the two groups indicate that in the group with a high degree of earnings management and poor quality internal control information disclosure, substantial risk warnings have a more significant effect on the bond credit spread, while in the lower group there is no

Table 7
The adjustment effects of information quality.

Variable	Spread			
	Degree of earnings management		Quality of internal control disclosure	
	High (1)	Low (2)	High (3)	Low (4)
SubstanTip	0.312 ^{***} (-0.42)	-0.044 (2.92)	-0.014 (-0.14)	0.324 ^{**} (2.88)
Size	-0.291 ^{***} (-5.98)	-0.338 ^{***} (-6.47)	-0.338 ^{***} (-7.18)	-0.267 ^{***} (-5.03)
Lev	-0.092 (-0.23)	0.062 (0.16)	-0.361 (-1.02)	0.276 (0.65)
ROA	-0.398 (-1.45)	-0.514 (-1.47)	-0.773 ^{***} (-2.69)	-0.042 (-0.14)
Rate	-0.226 [*] (-1.91)	-0.485 ^{***} (-3.79)	-0.527 ^{***} (-5.09)	-0.109 (-0.75)
Term	-0.080 [*] (-1.69)	0.037 (1.18)	0.051 [*] (1.71)	-0.113 ^{**} (-2.25)
Spot	0.167 ^{***} (3.45)	0.046 (0.91)	0.030 (0.72)	0.216 ^{***} (3.64)
Lnum	-0.037 (-0.33)	0.123 (1.20)	0.086 (0.93)	-0.026 (-0.22)
Illiqd	0.048 ^{**} (2.21)	0.006 (0.34)	0.059 ^{***} (2.80)	-0.000 (-0.02)
Constant	10.158 ^{***} (7.74)	12.179 ^{***} (10.20)	13.126 ^{***} (11.65)	8.170 ^{***} (5.79)
Obs	976	1540	1069	1447
AdjR-sq	0.106	0.084	0.159	0.051
F	15.39	18.61	26.17	10.70

* indicate that the estimated coefficient is statistically significant at the 10% levels, respectively.

** indicate that the estimated coefficient is statistically significant at the 5% levels, respectively.

*** indicate that the estimated coefficient is statistically significant at the 1% levels, respectively.

correlation between the two. The findings of this study explain that the effect of such warnings are only found in companies with poor information quality.

4.3.5. Testing the effect mechanism

Economic theory maintains that risk disclosure increases the bond credit spread because it raises the investor's estimate of the company's risk level, leading the investor to demand a higher rate of return. Research shows that investors' heterogeneous beliefs influence risk asset prices [Zhang and Zhang \(2006\)](#), and risk information may also increase investors' heterogeneous beliefs. Therefore, we examine whether risk information disclosure improves credit spreads by improving investors' heterogeneity beliefs.

First, we set a model for regressing risk information disclosure *SubstanTip* on mediator variable heterogeneous beliefs. The regression results, listed in columns (1) and (2) of [Table 8](#), show that the substantial warnings of significant risk in China increases the bid-ask spread and leads to stock price volatility. This suggests that the material risk warning provides the information that causes a “panic,” raises the investor's risk awareness, and increases heterogeneous beliefs.

We further tests whether heterogeneous beliefs act as mediators of risk information disclosure affecting credit spreads. Columns (3) to (4) of [Table 8](#) list the tests for adding mediator variables to the main regression (see [Table 3](#)), that is, controlling the degree of significant risk prompts and heterogeneous beliefs in the same regression. The results show that the indicators of the two heterogeneous beliefs are significantly positively correlated, but while the significant risk warnings *SubstanTip* are still significantly positively correlated, the

Table 8
Testing the effect mechanism.

Variable	Regression on mediator		Add mediator to main regression	
	SdRet (1)	Sprd (2)	(3)	Spread (4)
Sd_Ret			0.199*** (2.87)	
spread				0.012* (1.96)
SubstanTip	0.002*** (15.37)	3.987*** (24.29)	0.430*** (3.38)	0.421*** (3.32)
Size	-0.001*** (-28.36)	0.687*** (11.97)	-0.319*** (-7.59)	-0.342*** (-8.81)
Lev	-0.002*** (-7.97)	-2.412*** (-7.77)	0.335 (1.07)	0.384 (1.26)
ROA	-0.000 (-1.49)	3.622*** (20.28)	-0.153 (-0.66)	-0.002 (-0.01)
Rate	0.000 (0.71)	-0.035 (-0.11)	-0.226** (-2.30)	-0.204** (-2.19)
Term	-0.000 (-1.00)	-0.407*** (-3.73)	-0.001 (-0.02)	-0.005 (-0.22)
Spot	0.000 (0.64)	-0.053 (-0.36)	0.161*** (3.55)	0.119*** (3.19)
Lnum	-0.000 (-1.56)	-0.796** (-2.54)	0.080 (0.86)	0.068 (0.83)
Illiqd	0.003 (1.18)	-0.502*** (-10.28)	0.109*** (2.76)	0.090*** (2.59)
Constant	0.059** (20.28)	-2.012 (-0.72)	9.701*** (8.35)	10.331*** (9.97)
Obs	22,421	22,526	2516	2516
AdjR-sq	0.361	0.190	0.182	0.185
F	289.0	139.6	13.77	13.91
Sobel Z	-	-	4.45 (0.002)	2.21 (0.023)

* indicate that the estimated coefficient is statistically significant at the 10% levels, respectively.

** indicate that the estimated coefficient is statistically significant at the 5% levels, respectively.

*** indicate that the estimated coefficient is statistically significant at the 1% levels, respectively.

Table 9
Tone, similarity, and credit spread.

Variable	Spread			
	OLS	Add control variables	OLS	Add control variables
	(1)	(2)	(3)	(4)
Tone_neg	0.187* (1.68)	0.260*** (2.76)		
similarity			-0.248*** (-3.00)	-0.404*** (-5.86)
Size		-0.521*** (-16.32)		-0.514*** (-15.65)
Lev		-0.203 (-0.90)		-0.296 (-1.34)
ROA		-0.891*** (-4.72)		-0.954*** (-4.95)
Rate		-0.392*** (-5.77)		-0.387*** (-5.74)
Term		0.036* (1.70)		0.034 (1.64)
Spot		0.121*** (4.27)		0.130*** (4.63)
Lnum		0.428*** (7.32)		0.429*** (7.26)
Illiqd		-0.156*** (-12.88)		-0.160*** (-13.15)
Constant	1.915*** (34.97)	15.268*** (20.70)	2.194*** (32.44)	15.513*** (20.67)
Obs	2358	2358	2328	2328
AdjR-sq	0.001	0.303	0.003	0.309
F	2.815	115.9	9.004	118.6

* indicate that the estimated coefficient is statistically significant at the 10% levels, respectively.

** indicate that the estimated coefficient is statistically significant at the 5% levels, respectively.

*** indicate that the estimated coefficient is statistically significant at the 1% levels, respectively.

regression coefficient and significance are lower than prior to the inclusion of the mediator variable (Table 3), and they all pass Sobel Z test. This indicates that in cases of substantial warnings of risk, the bid-ask spread and stock price volatility partially affect corporate bond credit spreads.

4.4. Further analysis: tone, similarity, and credit spread

As an indicator of substantial warnings of significant risks, *SubstanTip* considers the information content of the prompt to a certain extent but does not explore the content of the risk information. There are fewer samples of disclosure in significant risk hints, and their length is usually very short, making in-depth textual analysis inconvenient. Also, the risk description paragraph in the MD&A involves a large number of companies with many more risk factors, more information content, and greater length. In this regard, we attempt to examine the content of risk factors in the MD&A from the perspectives of tone and considering the degree of similarity with the previous year's disclosure

The risk description paragraph is extracted by Python, and the negative tone of the risk factor segment (*Tone_neg*)⁷ and the similarity to the previous year's disclosure (*Similarity*)⁸ are constructed. Table 9 shows the regression results. The negative tone of the risk factor is partly correlated with credit spread, indicating

⁷ The negative tone of the risk factor passage in the "Significant Risk Warning" (*Riskneg*) is calculated as the number of negative vocabulary/total words.

⁸ With reference to Brown and Tucker (2011), the similarity between the risk factor segment this year and that of the previous year (*Similarity*), is measured by constructing a vector cosine. The greater the similarity, the lower the information content, and vice versa.

that the more negative the tone, the higher the credit spread. The lower the similarity between the risk descriptions of the two years, the greater the credit spread, with similarity being significantly negatively correlated with credit spread. That is, the richer the information content of the risk paragraph in the current year, the greater the bond spread. It can be seen that the more new information that is included in the risk disclosure, and the more negative the management's attitude, the greater the unforeseen risk factors, resulting in bond investors requiring higher risk compensation.

5. Conclusion

In 2012, the CSRC requested that listed companies should increase the disclosure of “significant risk warnings” in their annual reports. However, there have been no studies on whether this new requirement has produced meaningful information or whether such content affects bond investors. This paper takes listed companies in the Shanghai and Shenzhen Stock Exchanges that issued bonds from 2007 to 2017 as samples, and analyzes, for the first time in this research field, the relationship between the significant risk warnings in these Chinese companies' annual reports and corporate bond credit spreads. The main findings of this paper are as follows. First, the substantial warnings of significant risks can significantly improve corporate bond credit spreads, reflecting the risk-warning effect. Second, state-owned property rights weaken this effect, which only pertains to listed companies with poor risk management and low information quality. Third, significant risk warnings increase investors' heterogeneous beliefs, also affecting credit spreads. Fourth, through textual analysis, it is found that the corporate bond credit spread is greater when the disclosed risk factors are more pessimistic and less similar to those of the previous year.

The findings of this paper indicate that investors incorporate the risk information of annual reports into bond prices. We approach risk information disclosure indicators differently from previous researchers, as seen in our focused content analysis, which provides unique evidence for research into risk correlation. In addition, this study provides empirical evidence for the effect of non-accounting information on the bond market. The requirements found in “The Content and Format Standards of Information Disclosure for Companies That Offer Securities to the Public No. 2-Annual Report,” issued in 2015, relaxed companies' mandatory disclosure of significant risk warnings, but our research highlights the importance of significant risk warnings for bond investors evaluating corporate risk for China's regulatory authorities attempting to strengthen their supervision of risk disclosure and significant risk warnings.

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