

Internal Corporate Governance Mechanism and Credit Spreads: Evidence for the Bond Market in China

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Abstract: With the incidents of corporate bond defaults continually emerging, the role of internal corporate governance in bond market has received more attention. In the research, 3265 corporate bonds issued by A-share listed companies in China from 2011 to 2020 are as research object and the dynamic panel one-step system Generalized Method of Moments is adopted to estimate the impact of four types of internal corporate governance mechanism on the credit spreads of corporate bonds. Regarding ownership structure, ownership concentration and state-owned enterprises have significantly negative relationship with credit spreads of corporate bonds. Concerning board governance, board size and CEO duality have significantly positive relationship with credit spreads, but the percentage of independent directors has opposite situation. Executive monetary compensation and information disclosure quality are significantly negative associated with bond credit spreads. The findings not only enrich the economic consequences of internal corporate governance mechanism and the factors affecting the cost of bond financing, but also provide implications for investors, firms and regulators in bond market and promote sustainable development of bond markets in China.

Keywords: Credit Spreads of Corporate Bonds; Ownership Structure; Board Governance; Executive Compensation; Information Disclosure Quality; China

1. Introduction

Bond financing as one of the important financing methods can effectively alleviate enterprise financing constraints and over-reliance on bank loans. Recently, bond market has developed rapidly in China, which has become the world's second largest bond market after the U.S. bond market and promoted the development of the real economy (Wu et al., 2021). However, with the increase of bond issuance scale, the possibility of defaults also continually increases, attracting widespread attention from market participants. Since 2014, the corporate bonds, like the eleven super day bond unable to pay the principal and interest, first broke the rigidity of the payment system in China. In 2021, about 786 corporate bonds default

and the default amount reaches 430.558 billion yuan (Wu et al., 2021). The frequent defaults have brought losses to investors, threaten financial market stability, and impede the healthy development of bond market. How to protect the interests of investors has become a key issue in maintaining the stability of the bond market and promoting the healthy development of the bond market.

Corporate governance has been recognized as an effective mechanism to protect the interests of investors. The optimization of the internal governance structure guarantees the successful operation of corporate governance, improves effectiveness of the capital allocation and boost the performance and value of the company (Wang et al., 2019). According to Bai et al.(2005), internal corporate governance mechanism incorporate ownership structure, board governance, executive compensation, and information disclosure. The ownership structure is mainly relied on the organizational structure of the corporate to affect the business behaviour and an appropriate ownership structure is one of the most crucial strategies for maximizing enterprise value (Waheed and Malik, 2019). Moreover, board governance refers to the board of directors' behavior in governing the company's development plan and executive decisions (Jantadej and Wattanatorn,2020). Furthermore, executive compensation incentive mechanisms guide senior management to make different business decisions in the interest of shareholders and affect the credit decisions of financial organizations. What's more, more reliable information represents a higher level of corporate governance, which can protect the interests of investors (Li et al., 2021). Credit spreads of corporate bonds are frequently utilized to compensate investors for the default risk of corporate bonds and are considered as the cost of financing of the corporate bonds (Wu et al., 2021; Li et al., 2021). In the Chinese market and economic system environment, evaluating the relationship between internal corporate governance mechanism and corporate bond credit spreads can reduce the corporation's capital cost, manage credit risk of the firms, gain greater competitive advantages and promote the improvement of the bond market.

Prior researches mainly estimated the relationship between corporate governance and bond financing costs, particularly in the bond market of the developed country (Bhojraj and Sengupta, 2003; Lu and Lee, 2021). As a developing country, the market and institutional environments in China are significantly different from those of developed countries. Furthermore, prior studies from Zhou et al. (2017) have found that the relationship between corporate governance overall index obtained by principal component analysis method and the bond credit spreads via fixed effected model, but whether the internal mechanism including ownership structure, board governance, executive compensation and information disclosure can influence the credit spreads of corporate bonds or not is scarcely studied in-depth. Therefore, the research will further examine the relationship between internal corporate governance mechanisms and corporate bond credit spreads in the Chinese context.

In this research, 3265 corporate bonds issued by A-share listed companies in China during the period from 2011 to 2020 are as research object and the dynamic panel one-step system Generalized Method of Moments (GMM) is adopted to estimate the impact of specific internal corporate governance mechanisms, including ownership structure, board governance, executive compensation, and information disclosure quality, on the credit spreads of corporate bonds. With the regards to ownership structure, ownership concentration and State-Owned Enterprises (SOEs) have a more significant role in declining the credit spreads of corporate bonds. In the realm of board governance, the research shows that both board size and CEO duality exert positive influence on credit spreads, but a higher

percentage of independent directors promotes corporate bond financing. Moreover, this study sheds light on the influence of executive monetary compensation in listed companies, indicating its potential to reduce credit spreads. Furthermore, the findings provide empirical support on the positive impact of high-quality information disclosure, as demonstrated by the enterprise's issuing of a standard unqualified audit opinion, on lowering credit spreads for corporate bonds.

The contributions mainly include two aspects. First, this study enriches the relevant research on the economic consequences of internal corporate governance mechanisms including ownership structure, board governance, executive compensation and information disclosure quality. Earlier researches also mainly found that the internal corporate governance mechanisms can influence firm innovation (Sauerwald and Peng, 2013), and firm operating performance (Waheed and Malik, 2019). For instance, even though prior studies explore the relationship between the shareholding concentration and debt costs (Bradley et al., 2016), the findings are not uniform and focus mainly on the bond market of developed countries. For example, the current research on executive compensation incentives and information disclosure in China is mostly concerned with the stock market, but the study on the influence of executive compensation and information disclosure on the bond market is scarce. This paper explores the relationship between internal corporate governance mechanisms and corporate bond credit spreads from the perspective of principal-agent relationships. This comprehensive analysis of multiple internal corporate governance aspects contributes to a deeper understanding of the intricate dynamics that shapes credit spreads in the Chinese corporate bond market and extends the empirical research on the economic consequences of internal corporate governance mechanisms in emerging markets.

Secondly, this research enriched relevant research on the factors affecting corporate bond credit spreads. The previous researches mainly explored the impact of executive experience (Lin et al., 2018), the innovation level (Hsu et al., 2015), corporate social responsibility and corporate operating risk (Merton, 1974) on the credit spreads. Nonetheless, there is relatively little research on the effect of internal corporate governance mechanisms on corporate bond credit spreads. For example, Kabir et al. (2013) found that a rise in executive monetary compensation exerts no influence on bond yield spread in UK. However, there is negative relationship between them in China. As a major developing country, Chinese market and institutional environment is significantly different from that of developed countries. The overall findings provide empirical evidence for re-examining the rationality of internal corporate governance mechanism, and expand the research perspective on the factors affecting credit spreads of corporate bonds.

The remainder of this research is organized as follows. Section 2 incorporates theoretical analysis and research hypotheses. Section 3 explains methodology. Section 4 presents the empirical results and discussion. Section 5 concludes with policy implications, limitations of the study, and guidance for future studies.

2.Theoretical analysis and research hypothesis

2.1 Theoretical analysis

In the middle of the 20th century, as the division of corporate ownership and management powers became more common in American businesses, the principal and agent issue started to gain academic interest. The main problem with agency theory is that the principal cannot be certain that the agent's actions are in line with his or her goals. Therefore, two types of agency conflict in modern companies emerge. Firstly, the interest conflict of

company owners and managers exists (Jensen and Meckling,1976). Shareholders hoped that management will make efforts to increase shareholder wealth. Nonetheless, managers maximize their interests by engaging in on-the-job consuming and excessive remuneration and diversify their wealth rather than just investing in one firm. Therefore, the value of enterprises could be seriously damaged. Secondly, the interest conflict between business owners and creditors emerges (Jensen and Meckling,1976). Bond investors have difficulty in directly participating in the production and operation of the company. However, managers may take excessive dividends, asset sales or extreme investment and financing actions to maximize profits, which could damage the bond investors interests.

2.2 Research hypothesis

2.2.1 Ownership structure

The ownership structure can usually be explained in two ways. First, the quantity of equity can be presented by ownership concentration (Liu et al., 2019b). Second, the quality of equity can be shown by the nature of ownership.

The ownership concentration demonstrates the control of the majority shareholder and their motivation to partially interfere with creditors' interests. A moderate ownership concentration can reduce agency conflicts between shareholders and management, but it exacerbates disputes between major shareholders and minority shareholders and creditors (Chatterjee and Bhattacharjee,2020). The greater the concentration of ownership, the more power the dominant shareholder has over the board of directors and the company's management (Chatterjee and Bhattacharjee,2020). The greater the incentive to usurp the interests of small and medium-sized shareholders and creditors, the better the conditions for usurpation (Liu et al., 2019b). For instance, risky investment decisions are made to transfer creditor wealth and new debt is issued at the expense of existing creditors (Liu et al., 2019b). As a result, bond investors are more likely to experience agency conflicts when shareholding concentration is higher (Liu et al., 2019b). Moreover, the risk of bond investments and a risk compensation required is higher, so the credit spreads of corporate bonds will be larger. Thus, this study proposes the following hypothesis:

H1a: The ownership concentration has a positive relationship with the credit spreads of corporate bonds.

Enterprises in China are classified as state-owned and non-state-owned based on the nature of ownership (Hu et al., 2021). State-owned enterprises serve more societal purposes than private businesses do, such as assuring local employment and tax revenue, and they receive government guarantees and support from a variety of sources (Hu et al., 2021). Additionally, the state-owned business has a strong financial incentive to oversee corporate agents, so agency expenses are reduced (Hu et al., 2021). Furthermore, the quality of information disclosure, such as internal control assurance reports, can be improved to some extent in state-owned enterprises (Liu et al., 2019a). In addition, the government typically chooses to bail out when a state-owned enterprise defaults (Liu et al., 2019a). For example, the government coordinates bank funding to alleviate the liquidity crisis of the firm, so the default risk and potential loss of interest faced by creditors can reduce (Liu et al., 2019a). Meanwhile, bond investors also consider the background and nature of the shareholders of the bond issuers and their creditworthiness if they make investment decisions. State-owned businesses have higher overall creditworthiness than private businesses because they receive implicit government assurances and credit support (Liu et al.,2019a). Therefore, the default

risk and the risk compensation required by corporate bond investors are lower. Then the credit spreads of corporate bonds decline. It results in the following hypothesis.

H1b: There is a negative relationship between SOEs and credit spreads of corporate bonds.

2.2.2 Board governance

Board governance, as an essential component of corporate governance, is the governance behaviour of the board of directors for the development strategy and executive decisions of the firms. The board size, the proportion of independent directors, and CEO duality can affect the board governance of the corporate to a large extent.

The board of directors as an executive body for the daily operation of the firm facilitates operational choices under the stringent control of a corporate system (Sheikh et al.,2017). Principal-agent theory contends that the board of directors, as the protector of shareholders' interests, must efficiently manage and oversee the company's operations. As a result, companies typically have fewer board members to increase their flexibility (Orozco et al., 2018). When there are too many board members, it is easier to be controlled by a few people. As a result, oversight becomes less effective, and the likelihood of group fraud for personal gain rises, reducing corporate value. Moreover, a smaller board composition also supports an effective and sensible decision-making process. When the board of directors has too many members, it will slow down the flow of information and decrease its effectiveness in addressing crucial business concerns, which will be detrimental to the organization that values speed and efficiency. Too many board members raise the possibility of member conflicts of interest, which weakens the team's cohesiveness and impairs the decision-making process (Puni and Anlesinya,2020). Therefore, the risk compensation required by bond investors (Puni and Anlesinya,2020) and the bond credit spreads can rise when board size increases. This research will propose the following hypotheses.

H2a: There is a positive relationship between board size and the credit spreads of corporate bonds.

Whether the board can carry out its oversight and advisory responsibilities also depends on the composition of the board (Teti et al.,2016). Since the board of directors represents the interests of shareholders, it has the power to influence management decisions, which could lead to a conflict of interest between the board of directors and the administration (Teti et al.,2016). To avoid this situation, outside directors are created. These outside directors are usually not closely linked to management and are independent (Makhlouf et al.,2018). Therefore, it is generally thought that more outside directors can improve oversight and consultation (Makhlouf et al.,2018). More independent directors are more suited to perform board tasks, so the higher percentage of outside directors reduce company capital cost (Jantadej and Wattanatorn, 2020). Then, the credit spreads decrease. Thus, the hypothesis will be as follows.

H2b: The percentage of independent directors has a negative relationship with the credit spreads of corporate bonds.

CEO duality makes executives more motivated to utilize their position for personal gain, which lowers the company's long-term value (Wijethilake and Ekanayake,2020). Moreover, CEO duality makes it difficult for the Supervisory Board and the Board of Directors to carry out duties like assessing and removing the CEO, which can easily result in the corporate internal control system failing (Sayanolu, 2020). Besides, the powers of the board of directors are easily undermined (Sayanolu, 2020). Overall, the board is susceptible to

control by the managing director, which results in significantly less effective board and greater governance costs (Ballester et al., 2020), and increases the bond financing cost and credit spreads.

H2c: CEO duality has a positive relationship with the credit spreads of corporate bonds.

2.2.3 Executive compensation

There will be a conflict of interest between shareholders and management in the case of a separation of powers, which can be reduced by compensation incentives (Kabir et al., 2013). An effective incentive strategy links the interests of shareholders and management. The management's operating results are used as an evaluation metric for compensation incentives (Kabir et al., 2013). When operations do well, the management's salary will rise. However, when the operating outcomes are bad, the management's salary will decline. In this way, the moral hazard and adverse selection behaviour of the management are avoided to some extent, and the agency cost decreases. Then, the management compensation mechanism can greatly lower listed businesses' agency costs. The alignment of interests and aims between shareholders and management promotes the long-term growth of the corporation and reduces the risk of creditors (Bolton et al., 2015) and the credit spreads of corporate bonds. Hence, this research presents the following hypothesis.

H3: Executive compensation has a negative relationship with the credit spreads of corporate bonds.

2.2.4 Information disclosure quality

To guarantee that the financial information provided by managers can honestly reveal the enterprise's true financial situation, external auditors are required to provide assurance services, and disclose the audit results. The third-party auditor will examine the audited entity's financial statements in accordance with the most recent auditing standards and offer an audit opinion. Audit opinions are often classified as a standard and unqualified audit opinions and non-standard audit opinions (Bai et al., 2005).

Creditors consider auditing while making investment decisions and frequently analyze the firm's audited financial records for the previous few years. The audit opinion issued has an impact on the financial decision of creditors and bond credit spreads. If the company receives a standard unqualified audit opinion, it means that its financial statements are in accordance with the most recent accounting framework and accounting standards and that its financial position and cash flow have been accurately reflected (Khuong et al., 2021). The CPA performing the audit will adhere to the necessary standards and procedures, and the information provided will be favorable (Khuong et al., 2021). The company issued with such an audit opinion will increase creditors' degree of confidence, which will help them make investment decisions and lower credit spreads. However, if an organization receives a non-standard audit opinion, it sends a negative message. The degree of information asymmetry rises and creditors have less confidence in the statements. Moreover, the risk of the business's operations could rise. Investors will inevitably seek higher bond yields from the issuing corporate (Akerlof, 1970). Thus, this study makes the following assumptions.

H4: The quality of information disclosure has a negative relationship with the credit spread of corporate bonds.

The overall research framework is as follows in Figure 1.

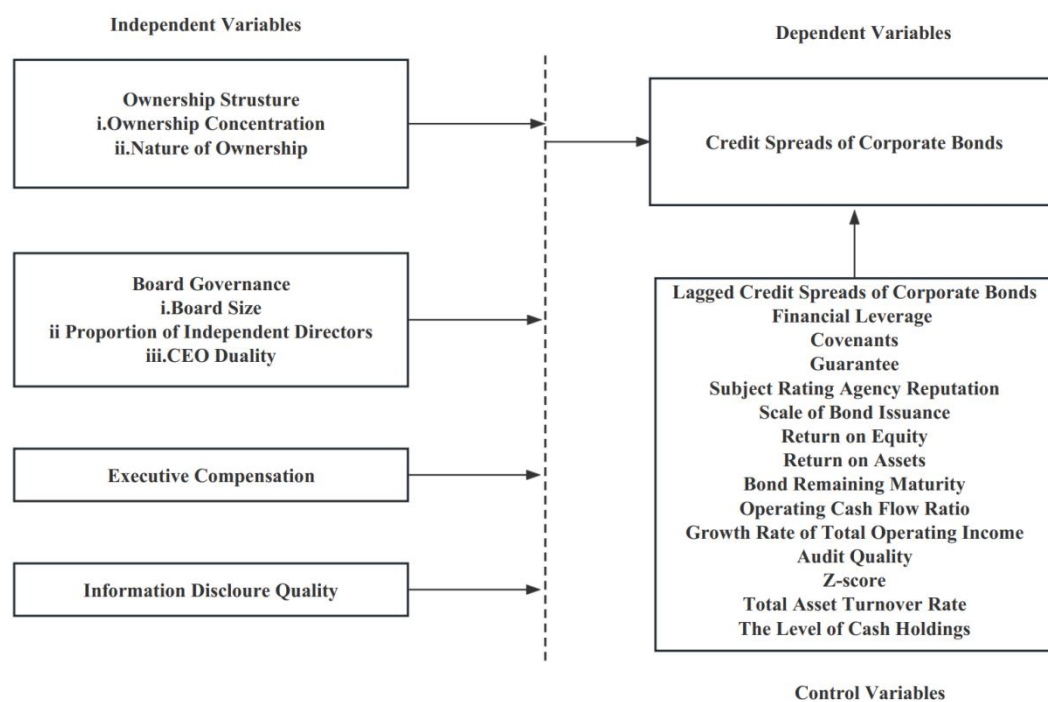


Figure 1 Research Framework

3. Methodology

3.1 Data source and sample selection

The initial sample comprising of 4780 listed corporate bonds in China from 2011-2020 in China. Then exclude 27 floating rate bonds, 74 bonds issued by financial companies, 554 bonds with negative credit spreads, 365 missing bond or financial data, 166 ST or *ST bonds, so 3594 listed corporate bonds meet the requirements. Data of listed corporate bonds matches with data on the corporate governance, and the 329-missing data on internal corporate governance mechanism are excluded. Hence, the observations of unbalanced panel data are 3265 from 2011 to 2020. The data on Treasury bond yields depends on the standard maturity information of the Treasury bond yield curve from the China Bond Information Network. Other data are obtained by Wind and CSMAR. To reduce the impact of outliers, winsorize the continuous variables by 1% up and down.

3.2 Variables

The dependent variable is credit spreads of corporate bonds. Moreover, the independent variables are ownership concentration, the nature of ownership, board size, the proportion of independent directors, CEO duality, executive compensation and information disclosure quality. Furthermore, the corporate bond credit spread is a dynamic process, where the current credit spreads depend on prior credit spreads (Afonso and Kazemi, 2018). Thus, lagged credit spread is also included. Besides, other control variables also include financial leverage, the operating cash flow ratio, growth rate of total operating income, return on equity, return on assets, audit quality, Z-score, total asset turnover rate, the level of cash holdings from company level (Douglas et al., 2016) and Guarantee, Covenants, subject rating agency reputation, scale of bond issuance, bond remaining maturity from bond level (Gong et al., 2017; Hsu et al., 2015). All of these variables are presented in Table 1.

Table 1 Definitions of Variables

Variable	Definitions	Unit
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Credit Spreads of Corporate Bonds (CreditSpread)	The yield to maturity of the bond at issuance minus the yield to maturity of the corresponding Treasury bond of the same period	%
Ownership Concentration (FirstShare)	The shareholding percentage of the first largest shareholder	Ratio
The Nature of Ownership (SOE)	A dummy variable which takes the value of one if the bond issuer is a state-owned enterprise and zero otherwise	0,1
Board Size (BoardSize)	The total number of board members	Number
The Proportion of Independent Directors	The number of independent directors divided by the total number of board members	Ratio
CEO Duality (Duality)	A dummy variable which takes the value of one for the combination of chairman and general manager and zero otherwise	0,1
Executive Compensation (ECOM)	Natural logarithm of the sum of the top three executive compensation	RMB
Information Disclosure (AudOpinion)	A dummy variable taking the value of one for high disclosure quality when the auditor issues a standard unqualified opinion and zero otherwise	0,1
Lagged Credit Spreads of Corporate Bonds ($CreditSpread_{i,t-1}$)	The yield to maturity of the bond at issuance minus the yield to maturity of the corresponding Treasury bond of the same period at time t-1	%
Financial Leverage (Lev)	Total debt divided by total assets	Ratio
Guarantee (Guarantee)	A dummy variable which takes the value of one when the bond has any type of partial or entire guarantees and zero otherwise	0,1
Covenants (Covenants)	A dummy variable which takes the value of one for any type of partial or entire special terms and conditions and zero otherwise	0,1
Subject Rating Agency Reputation (Reputation)	A dummy variable which takes the value of one when the rating agency engaged is China Chengxin International or United Credit Suisse and zero otherwise	0,1
Scale of Bond Issuance (Scale)	Natural logarithm of the total amount of bond issue	Number
Return on Equity (ROE)	Net profit divided by average shareholders' equity	Ratio
Bond Remaining Maturity (BRM)	The time remaining for the bond to survive	Year
The Operating Cash Flow Ratio (Cfo)	Net cash flows from operating activities divided by total assets	Ratio
Growth Rate of Total Operating Income (Growth)	Operating income gap divided by prior period operating income	Ratio
Audit Quality (Big4)	A dummy variable takes the value one if a firm is audited by a Big Four auditor and zero otherwise	0,1
Z-score (ZScore)	Altman(1968) Z	Number
Total Asset Turnover Rate (TAT)	Sales revenue divided by average total assets	Ratio
Return on Assets (ROA)	Net profit divided by total assets	Ratio
The Level of Cash Holdings (Cash)	Cash and financial assets held for trading divided by total assets	Ratio

Source: Author's compilation from Wind and CSMAR.

3.3 Empirical model

The current research uses a system GMM technique to study the dynamic model of credit spreads of corporate bonds, which includes lagged credit spreads due to persistent corporate bond yield over time. Based on Monte Carlo studies, two-step estimators in dynamic panel data models have been found to exhibit improved efficiency, although the enhancement in efficiency might be relatively constrained (Blundell and Bond, 1998). Furthermore, these estimators could potentially be associated with biased asymptotic errors. In contrast, the one-step System GMM method yields standard errors with a high degree of precision (Guru and Yadav, 2019), thus motivating choice to present parameter estimates utilizing this particular approach in this research.

In this research, the dynamic credit spreads model is used to estimate the influence of corporate governance on credit spreads. In model (1), (2), (3), (4), (5), (6), and (7), the influence of ownership concentration, the nature of ownership, board size, the proportion of independent directors, CEO duality, executive compensation or information disclosure on the credit spreads is denoted respectively. Model (8) incorporates ownership concentration, the nature of ownership, board size, the proportion of independent directors, CEO duality, executive compensation and information disclosure together as the independent variables.

$$CreditSpread_{it} = \beta_0 + \beta_1 CreditSpread_{it-1} + \beta_2 FirstShare_{it} + \beta_k \sum Controls_{k,it} + u_i + \varepsilon_{it} \quad (1)$$

$$CreditSpread_{it} = \beta_0 + \beta_1 CreditSpread_{it-1} + \beta_2 SOE_{it} + \beta_k \sum Controls_{k,it} + u_i + \varepsilon_{it} \quad (2)$$

$$CreditSpread_{it} = \beta_0 + \beta_1 CreditSpread_{it-1} + \beta_2 BoardSize_{it} + \beta_k \sum Controls_{k,it} + u_i + \varepsilon_{it} \quad (3)$$

$$CreditSpread_{it} = \beta_0 + \beta_1 CreditSpread_{it-1} + \beta_2 INDEP_{it} + \beta_k \sum Controls_{k,it} + u_i + \varepsilon_{it} \quad (4)$$

$$CreditSpread_{it} = \beta_0 + \beta_1 CreditSpread_{it-1} + \beta_2 Duality_{it} + \beta_k \sum Controls_{k,it} + u_i + \varepsilon_{it} \quad (5)$$

$$CreditSpread_{it} = \beta_0 + \beta_1 CreditSpread_{it-1} + \beta_2 ECOM_{it} + \beta_k \sum Controls_{k,it} + u_i + \varepsilon_{it} \quad (6)$$

$$CreditSpread_{it} = \beta_0 + \beta_1 CreditSpread_{it-1} + \beta_2 AudOpinion_{it} + \beta_k \sum Controls_{k,it} + u_i + \varepsilon_{it} \quad (7)$$

$$CreditSpread_{it} = \beta_0 + \beta_1 CreditSpread_{it-1} + \beta_2 FirstShare_{it} + \beta_3 SOE_{it} + \beta_4 BoardSize_{it} + \beta_5 INDEP_{it} + \beta_6 Duality_{it} + \beta_7 ECOM_{it} + \beta_8 AudOpinion_{it} + \beta_k \sum Controls_{k,it} + u_i + \varepsilon_{it} \quad (8)$$

$CreditSpread_{it}$, $FirstShare_{it}$, SOE_{it} , $BoardSize_{it}$, $INDEP_{it}$, $Duality_{it}$, $ECOM_{it}$ and $AudOpinion_{it}$ respectively denote credit spreads of corporate bonds, ownership concentration, the nature of ownership, board size, the proportion of independent directors, the combination of two positions, executive compensation and the information disclosure in the corporation i at time t . $Controls_{k,it}$ denotes a series of control variables in the corporation i at time t . β_0 denotes intercept of the equation and β_1, \dots, β_k implies the coefficients of independent or control variables. u_i represents time-invariant unobservable heterogeneity and ε_{it} is the error term.

4. Results and discussion

4.1 Descriptive statistics

Table 2 represents the descriptive statistics for the variables. The average value of credit spreads of corporate bonds (CreditSpread), 3.165%, shows that the yield to maturity at the time of bond issuance is 3.165 percentage points higher than the yield to maturity of the corresponding treasury bond. Thus, companies need to take on more risk and the cost of bond financing is at a relatively high level. The median of credit spread is 2.136%, which is same to the findings of 2.49% of Gong et al. (2017) and indicates that corporate spreads of the most companies are in the low to medium range. The range of CS from 0.0854% to 45.95% and the standard deviation (5.398%) indicate that credit spreads of various corporate bonds have big disparities and particularly a few companies have very high bond credit risk.

The average value of FirstShare is 37.94%, which denotes that the average level of equity concentration of listed companies in China is about 37.94%. Thus, the equity is relatively concentrated and in a normal level and the largest shareholder of the firm does not occupy a particularly dominant position. The mean of SOE is 54.6%, so more than half of the bond-issuing enterprises are state-owned companies. The average BoardSize is 9 and the board size ranges from 5 to 15 at a more reasonable level, which is in line with company law in China. The average percentage of independent directors (INDEP) was 37.38%, which satisfies the minimum criterion set by the Securities and Regulatory Commission of China of having at least one-third independent directors in listed businesses. The mean value of 15.6% for Duality show that there are 15.6% companies where the chairman of the board is also the managing director in the sample listed companies, so the majority of companies have separation of the chairman and managing director positions. The standard deviation, minimum and maximum of ECOM is separately 0.816, 13.14 and 17.13, so the situation of unequal distribution of compensation and income still exists in China. The mean value of information disclosure quality (AudOpinion) was 0.978, showing that the vast majority of the companies are issued with a standard unqualified audit opinion and they tend to operate normally and produce truthful financial reports and accounting information. The results of control variables are almost similar to previous studies.

Table 2 Descriptive Statistics

VARIABLES	Obs	Mean	SD	Min	Max	Median
CreditSpread	3,265	3.165	5.398	0.0854	45.95	2.136
FirstShare	3,265	37.94	16.37	7.820	80.65	36.60
SOE	3,265	0.546	0.498	0	1	1
BoardSize	3,265	9.213	1.965	5	15	9
INDEP	3,265	37.38	5.564	33.33	57.14	35.71

Duality	3,265	0.156	0.363	0	1	0
ECOM	3,265	14.75	0.816	13.14	17.13	14.66
AudOpinion	3,265	0.978	0.148	0	1	1
Lev	3,265	58.69	15.82	19.67	90.52	59.14
Covenants	3,265	0.725	0.447	0	1	1
Guarantee	3,265	0.392	0.488	0	1	0
Reputation	3,265	0.231	0.421	0	1	0
Scale	3,265	20.62	0.814	18.52	22.97	20.62
ROE	3,265	6.744	11.98	-63.77	31.40	7.210
BRM	3,265	5.247	1.475	3	10	5
Cfo	3,265	4.375	5.897	-14.26	18.39	4.483
Growth	3,265	12.62	27.70	-48.47	132.2	9.284
Big4	3,265	0.172	0.378	0	1	0
ZScore	3,265	1.590	0.878	-0.385	4.496	1.430
TAT	3,265	60.08	45.21	6.410	234.4	48.03
ROA	3,265	2.688	4.170	-17.18	13.49	2.546
Cash	3,265	12.95	7.926	1.231	43.09	11.59

Source: Author's compilation from Wind and CSMAR.

4.2 Pairwise correlation

The pairwise correlation of the key variables is shown in Table 3. The multicollinearity among variables should be checked as they might be highly correlated and might cause multicollinearity problems. The results indicate that the correlation among the variables is below 0.8, so the multicollinearity does not exist in this study (Kennedy, 2008).

Table 3 Correlation Matrix

	CreditSpread	FirstShare	SOE	BoardSize	INDEP	Duality	ECOM	AudOpinion
CreditSpread	1							
FirstShare	-0.09	1						
SOE	-0.142	0.35	1					
BoardSize	-0.057	0.106	0.191	1				
INDEP	-0.020	0.101	0.083	-0.346	1			
Duality	0.022	-0.099	-	-0.171	0.050	1		
ECOM	-0.060	-0.111	-	0.093	0.033	0.100	1	
AudOpinion	-0.217	0.032	0.037	0.020	0.020	-0.043	0.070	1

Note: This table provides the correlation among the main variables.

4.3 Regression Results

Table 4 presents the results regarding the impact of corporate governance on credit spreads of corporate bonds via dynamic credit spread model (Eq.1, 2,3,4,5,6,7 and 8). The required diagnostic tests for dynamic panel GMM were found to be appropriate. The results indicate that there is not a second-order serial correlation (AR2). Meanwhile, the Hansen test statistics for instrument over-identification were not rejected at standard significance levels, so the instruments are reliable and well-specified.

First, in Table 4 Column (1) shows a significantly negative link between ownership concentration and credit spreads of corporate bonds at 1% exists. Therefore, the higher ownership concentration leads to lower the credit spreads of corporate bonds from 2011 to 2020 in China. The possible reason is as follows. The higher concentrated the shareholding, the more shareholders have the motivation to monitor the operator's business decisions (Wang, 2022). The shareholders can quickly identify the operator's behavior of withholding unfavorable news, which reduces the moral hazard and adverse selection brought on by the harm to the company's interests (Wang, 2022). Then the principal-agent cost between the company owner and the operator declines and the likelihood of negative news being hidden also declines (Wang, 2022). The bond investment risk and the risk compensation required are lower, so the credit spreads of corporate bonds will have reduced. Thus, **this finding is not in line with the hypothesis(H1a)**.

Second, a significantly negative effect of SOEs on credit spreads of corporate bonds at 1% level in Column (2). The coefficient of -25 shows that compared with private companies, state-owned companies issued bonds leads to 25% decrease in credit spreads of corporate bonds. **The findings are in accordance with the hypothesis(H1b)**. The possible reason is that state-owned businesses are more creditworthy than private ones due to implicit government assurances and backing for credit (Liu et al., 2019a). The risk compensation required by bond investors and credit spread of corporate bonds are lower. Nonetheless, Khlif et al.(2015) hold the opposite view and believe that the state-owned enterprises can easily make the cost of equity capital increase comparing with private firms. They found that state-owned businesses ought to be held accountable by the government. These firms are unable to adequately supervise and discipline managers, and there is a problem with insider control leading to moral hazard and adverse selection. Then the interests of shareholders can be violated.

Third, the results indicate a significantly positive influence of the number of board members on credit spreads of corporate bonds at 1% level in Column (3). The coefficient of board size indicates that one board member increase in listed companies results in 1.03% increase of credit spreads. **It is in line with the hypothesis(H2a)**. An increase of board members leads to the interest conflicts among members, which impairs the leadership team's unity and interferes with the decision-making process' efficiency (Puni and Anlesinya, 2020). Thus, the risk compensation needed by bond investors and the credit spreads of corporate bonds can rise. The similar results in the other Asian countries have been demonstrated by Chiang et al. (2013) who show that there is a positive link between the board size and credit risk.

Fourth, a significant negative link between the proportion of independent directors and credit spreads of corporate bonds in Column (4). The coefficient of -0.5 indicates that 10% rise in the proportion of independent directors results in 5 percent decrease in the credit spreads. Thus, listed companies with higher proportion of independent directors in China have lower credit spreads, which **is consistent with the hypothesis(H2b)**. The possible reason is that independent directors perform their oversight and consulting duties with greater effectiveness (Makhlouf et al., 2018) and are better suited to perform board responsibilities (Jantadej and Wattanatorn,2020). The finding is same to the research of Boateng et al.(2019). Nonetheless, the results are in strong contrast with the research of Lu and Boateng(2018), which indicates that board independence has positive link with credit risk in U.K..

Fifth, a significantly positive influence of the CEO duality on the credit spreads of corporate bonds at 1% level in Column (5). The coefficient (10.6) of CEO duality indicates that the combination of chairman and general manager leads to a rise of 10.6% in credit spreads

of corporate bonds. The board is susceptible to the managing director's control, which results in a considerably less effective board and higher governance costs (Ballester et al.,2020). Then, the credit spreads increase. **Thus, this finding is line with the hypothesis(H2c)**. The similar result is found in Canada, the US, and the UK by Lewellyn and Muller-Kahle(2012) who show a positive link between CEO duality and credit risk .

Sixth, the significant negative influence of executive compensation on the credit spreads at 1% level in Column (6). Thus, a rise of the top three executive money compensation can reduce the bond credit spreads in China during the period between 2011 and 2020. A rise of the top three executive money compensation can significantly decline the agency cost and make the alignment of interests and goals between shareholders and managements, which promotes the sustainable growth of the corporate and lowers the risk of creditors (Bolton et al.,2015). **This finding is agreement with the hypothesis(H3)**. However, Kabir et al.(2013) found that executive monetary compensation has no impact on bond yield spread.

Seventh, a significant negative influence of information disclosure quality on credit spreads of corporate bonds at 1% level of significance in Column (7). The coefficient (-6.7) of information disclosure indicates that the credit spreads decline 6.7% if the auditor issues a standard unqualified opinion. If the firm receives a standard unqualified audit opinion, it means that its financial statements comply with the most recent accounting standards and system and that its financial status and cash flow have been correctly reported (Khuong et al., 2021). Such companies are easily trusted by creditors, so the credit spreads reduce. **Thus, this result is agreement with the hypothesis(H4)**.

Finally, the combined effect of ownership concentration, nature of ownership, board size, the percentage of independent directors, CEO duality, executive compensation, information disclosure on credit spreads of corporate bonds in Column (8) has almost the same results to the Column (1), (2), (3), (4),(5),(6) and (7). **The results are not in line with hypothesis (H1a) and are consistent with hypothesis (H1b),(H2a),(H2b), (H2c),(H3) and (H4)**.

Table 0 Impact of Corporate Governance on Credit Spreads of Corporate Bonds

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>CreditSpread_{i,t-1}</i>	0.8*** (0.191)	0.57** *	0.96** *	1.05** *	0.98** *	0.72** *	0.86** *	0.33** (0.157)
FirstShare	-							-
SOE	0.6***	-25*** (9)						1.3***
BoardSize			1.03** *					17.75* 1.961* (1.179)
INDEP				-				-
Duality				0.5***				0.728* 15.612 *
ECOM					10.6** *			-
AudOpinion						-14*** (5.222)		0.61** -37***
Lev	-0.025 (0.083)	0.146 (0.503)	0.028 (0.026)	-0.053 (0.085)	-0.227 (0.175)	0.006 (0.236)	0.021 (0.094)	6.7*** (12.07)

Covenants	-4.073 (1.65)	16.96* *	0.847 (0.536)	0.312 (0.588)	- 12.128	77.799 (51.91)	-4.733 (8.606)	-2.819 (70.99)
Guarantee	-24.94 (16.9)	24.5** *	-0.107 (0.378)	0.085 (0.457)	-0.522 (6.636)	30.3** (17.36)	-1.038 (7.855)	- 78.479
Reputation	-6.658 (4.256)	13.64* *	1.272 (3.234)	3.459 (3.409)	-0.338 (0.668)	35.89* *	-0.426 (4.709)	-3.593 (5.847)
Scale	2.724 (2.858)	8.207* *	-1.065 (0.782)	-0.429 (0.72)	-1.015 (1.632)	11.124 (8.553)	-0.833 (1.403)	7.46 (11.35)
ROE	-0.1** (0.06)	-0.6** (0.257)	- 0.07**	-0.081 (0.104)	0 (0.051)	- 0.168*	-0.051 (0.031)	-0.335 (0.255)
BRM	2.505 (1.999)	-21*** (7.561)	-0.182 (0.119)	-0.122 (0.145)	0.654 (1.176)	-28*** (9.485)	-0.4 (2.116)	4.016 (2.567)
Cfo	-0.148 (0.254)	0.707* *	0.048 (0.037)	0.229 (0.226)	0.213 (0.177)	1.061 (0.737)	0.605* *	1.1*** (0.406)
Growth	-0.012 (0.012)	0.042 (0.076)	0.009 (0.04)	0.05 (0.038)	0.01 (0.008)	0.153* (0.089)	0.008 (0.007)	0.096 (0.067)
Big4	-0.364 (11.77)	4.496 (7.464)	2.695 (4.294)	3.063 (4.111)	-2.529 (1.753)	29.11 (19.76)	-1.468 (3.768)	8.289 (25.20)
ZScore	-2.666 (7.116)	-3.971 (9.719)	0.714 (0.568)	-1.755 (1.867)	-4.214 (3.799)	-2.205 (4.788)	-0.706 (7.547)	-3.373 (9.954)
TAT	0.056 (0.037)	-0.008 (0.09)	-0.009 (0.007)	0.022 (0.017)	0.029 (0.031)	0.018 (0.075)	-0.011 (0.023)	0.036 (0.129)
ROA	0.407 (0.26)	1.714 (1.104)	0.032 (0.087)	0.043 (0.391)	-0.037 (0.211)	0.153 (0.543)	-0.028 (0.195)	0.351 (0.942)
Cash	0.066 (0.107)	-0.153 (0.145)	0.014 (0.028)	0.079 (0.059)	-0.226 (0.144)	-0.219 (0.792)	0.133* (0.08)	0.002 (0.207)
Constant	-30.75 (57.5)	- 77.047	10.558 (12.59)	28.546 *	47.13 (39.67)	43.83 (176.8)	27.397 (76.58)	102.40 8
Observations	2394	2394	2394	2394	2394	2394	2394	2394
AR(1) [p-value]	0.000	0.001	0.000	0.001	0.000	0.006	0.000	0.000
AR(2) [p-value]	0.707	0.669	0.956	0.985	0.107	0.130	0.389	0.122
Hansen test of over-identifying restrictions [p-value]	0.350	0.217	0.106	0.109	0.230	0.242	0.102	0.948

Note: This table shows the results of dynamic credit spreads model (Eq.1,2,3,4,5,6,7, and 8) adopting panel one-step system GMM estimator. Robust standard errors are in parentheses. ***p<0.01, **p<0.05, *p<0.1.

4.4 Robustness checks

4.4.1 Alternative measures for corporate governance

In Table 5, ownership concentration is measured by Herfindahl index (**Herfindahl**), which is the sum of the squares of the shareholdings of the top five largest shareholders (Shahab et al., 2020). The results of the dynamic credit spread model in Column (1) of Eq.1 and in Column (4) of Eq.8 via Herfindahl index as an alternative measurement for the concentration of ownership.

Furthermore, it suggests the results of the dynamic credit spread model in Column (2) of Eq.3 and Column (3) of Eq.8 via board size dummy variable as an alternative measurement for board size. According to Ahmed et al. (2006), the dummy variable of board size takes the value of 1 if greater than or equal to its average value and zero otherwise (**BoardSizeDum**).

The diagnostic tests for GMM were confirmed to be satisfactory. The ownership

concentration has a consistent significant negative impact on credit spreads in Column (1) and (4). Board size has a consistent significant positive influence on credit spreads in Column (2) and (3). Therefore, these result are in line with the above studies and are robust.

Table 5 Alternative Measures for Corporate Governance

Variables	Model 1	Model 3	Model 8	Model 8
	(1)	(2)	(3)	(4)
<i>CreditSpread</i> _{<i>i,t-1</i>}	0.892*** (0.245)	0.884*** (0.147)	0.326** (0.155)	0.455*** (0.15)
Herfindahl	-0.576*** (0.165)			-1.339*** (0.43)
FirstShare			-1.24*** (0.41)	
SOE			-16.114* (9.385)	-21.814*** (6.804)
BoardSizeDum		8.795*** (3.299)	8.92* (5.14)	
BoardSize				1.531* (0.902)
INDEP			-0.939** (0.474)	-0.589* (0.355)
Duality			14.553* (8.196)	15.484** (7.717)
ECOM			-9.715** (3.823)	-5.812*** (2.247)
AudOpinion			-38.428*** (12.353)	-33.673*** (10.351)
Controls	YES	YES	YES	YES
Constant	21.556 (123.33)	-6.186 (38.568)	116.994 (202.292)	-51.773 (156.923)
Observations	2394	2394	2394	2394
AR(1) [p-value]	0.003	0.000	0.000	0.000
AR(2) [p-value]	0.685	0.910	0.156	0.361
Hansen test of over-identifying restrictions[p-value]	0.135	0.677	0.957	0.615

Note: This table shows the results of dynamic credit spreads model (Eq. 1, 3 and 8) adopting panel one-step system GMM estimator. Controls represents all control variables, which are same to Table 4. Robust standard errors are in parentheses. ***p<0.01, **p<0.05, *p<0.1.

4.4.2 Alternative measures for credit spreads of corporate bonds

In Table 6, the credit spreads of corporate bonds as **CreditSpread1** is measured by the difference among the yield to maturity of the corporate bonds at issuance and the one-year fixed deposit rate. The dynamic credit spread model (Eq. 1, 2, 3, 4, 5, 6, 7, 8) adopting **CreditSpread1** as alternative variables are shown. The required diagnostic tests for dynamic panel GMM were found to be appropriate. Therefore, ownership concentration, SOEs, the proportion of independent directors, executive compensation and information disclosure quality have significantly negative link with credit spreads; however, board size and CEO

duality have significantly positive link with credit spreads.

The result is in line with the findings utilizing the yield to maturity of the corporate bonds at issuance minus the yield to maturity of the corresponding Treasury bond of the same period as the dependent variable. This robustness check further demonstrates that ownership concentration, the nature of ownership, board size, the proportion of independent directors, CEO duality, executive compensation and information disclosure quality play important roles in credit spreads. The results are robust.

Table 6 Corporate Governance and Alternative Credit Spreads

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>CreditSpread</i> _{<i>i,t-1</i>}	0.9*** (0.16)	0.54** (0.222)	0.9*** (0.114)	1.1*** (0.201)	0.9*** (0.113)	0.8*** (0.282)	0.9*** (0.102)	0.305* (0.163)
FirstShare	-0.4*** (0.142)							-2*** (0.428)
SOE		-29*** (10.42)						-20** (9.882)
BoardSize			1.5*** (0.553)					2.17* (1.234)
INDEP				-0.5*** (0.18)				-0.81* (0.46)
Duality					9.8*** (3.601)			18.4** (8.889)
ECOM						-15*** (5.901)		-9.9** (4.018)
AudOpinion							-8*** (2.75)	-34*** (11.85)
Controls	YES	YES	YES	YES	YES	YES	YES	YES
Constant	-3.795 (36.94)	-106* (55.01)	16.045 (31.32)	32.1** (14.99)	37.895 (33.66)	57.238 (183.7)	23.967 (29.94)	119.33 (212.1)
Observations	2394	2394	2394	2394	2394	2394	2394	2394
AR(1) [p-value]	0.000	0.004	0.000	0.000	0.000	0.006	0.000	0.000
AR(2) [p-value]	1.000	0.309	0.618	0.944	0.233	0.131	0.624	0.132
Hansen test of over-identifying restrictions[p-value]	0.309	0.136	0.239	0.124	0.309	0.187	0.316	0.967

Note: This table shows the results of dynamic credit spreads model (Eq. 1, 2, 3, 4, 5, 6, 7 and 8) adopting panel one-step system GMM estimator. Controls represents all control variables, which are same to Table 4. Robust standard errors are in parentheses. ***p<0.01, **p<0.05, *p<0.1.

5. Conclusion

Corporate bonds issued by A-share listed companies in China during the period from 2011 to 2020 are as research object and the dynamic panel one-step system GMM is utilized to estimate specific internal mechanisms of corporate governance, including ownership structure, board governance, executive compensation, and information disclosure, on the

credit spreads of corporate bonds in this research. With the regards to ownership structure, ownership concentration and SOEs have a more significant role in declining the credit spreads of corporate bonds. In the terms of board governance, the study indicates that both board size and CEO duality have a significantly positive impact on credit spreads, but a higher percentage of independent directors promotes corporate bond financing. Moreover, this study sheds light on the influence of executive monetary compensation, indicating its potential to reduce credit spreads. Furthermore, the findings provide empirical support on the positive impact of high-quality information disclosure, as demonstrated by the enterprise's issuing of a standard unqualified audit opinion, on significantly lowering credit spreads for corporate bonds.

The practical implications mainly incorporates following three aspects. First, in terms of enterprises, bond credit spread is considered as one of the important responsibilities of firm financial management. The study on credit spread of corporate bonds can help firms decrease bond financing costs and manage credit risk. Then this study helps firms to increase their funding options and enhance their capital structure.

Second, with regards to investors, this study can make investors protect their interests more effectively. Investors will take into account how the internal company governance mechanisms affects credit spreads when making investment decisions. This assessment makes investors to accurately estimate the inherent risks related to corporate bonds, leading to more accurate investment strategies. This research can make investment risk of the investors reduce and the investment enthusiasm increase.

Third, regulators should improve their supervision by having a thorough understanding of credit spreads. Via the investigation of the influence of the internal corporate governance mechanisms on credit spreads, regulators get a more comprehensive understanding of the dynamics in the bond market. Regulators can effectively perform pre-event and post-event supervision to make market operate efficiently. Furthermore, regulators should attach importance to the quality of corporate governance in order to strengthen the bond market and the stability of the financial system in China.

The limitation of the research and suggestions of future study are as follows. First, the study primarily explores internal corporate governance, ignoring the external mechanisms such as the market for corporate control, legal framework, protection of the rights of small and medium-sized investors, and the degree of competition in product markets. Thus, these external factors might provide a more thorough understanding of the relationship between corporate governance and credit spreads. Future studies should take into account a more thorough investigation of corporate governance practices, taking into account both internal and external influences. Second, the current study does not in-depth explore the interaction term between internal corporate governance and credit spreads of corporate bonds. Future studies could expand the analysis to offer a more comprehensive understanding of the corporate governance' influence on bond pricing.

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