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Influencing Factors of Credit Spread of Corporate Bonds Issued by Real Estate Companies Based on Economic Cycle Theory

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Abstract: At present, the credit stratification trend of the real estate sector has increased the credit risk of real estate private enterprises after the “three red lines.” Although the credit spreads of corporate bonds issued by state-owned real estate companies are relatively stable, the credit spreads of private real estate companies have shown a significant increase. Therefore, it is necessary to research credit spreads of corporate bonds issued by real estate companies. As of August 31, 2021, the weighted average spread of all real estate entities is 802bp, and the weighted middle space of the real estate sector corresponds to an expected default rate of 7-8%. The real estate industry is involved in a wide range of areas related to the financial system. Therefore, under the government's macro-tone control, the hidden default rate in the current real estate market is more serious. Under the background of the economic cycle, many real estate companies in China have suffered credit rating downgrades due to the deterioration of their operating performance, making the credit risk of real estate more pessimistic. Therefore, research on the influencing factors of credit spreads can provide experience and reference for China's corporate bonds issued by real estate companies to a certain extent. This article takes the credit spreads of corporate bonds issued by real estate companies as the research object. The scope of the selected bond issuers is listed real estate companies. The research angles are macro-level, real estate industry level, and individual bond level. During December 2019, the trend characteristics of corporate bonds credit spreads in various economic cycle stages are analyzed, a multiple regression model is established, and the regression results are tested and analyzed. It is concluded that the credit spread of corporate bonds issued by real estate companies has counter-economic cycle characteristics. There are three main innovation points: one is an analysis based on the economic cycle theory, the other is the selection method of risk-free interest rates, and the third is the use of relevant industry-level influencing factors to complete the analysis.

1. Introduction

1.1 Research Background and Research Purpose

1.1.1 Research Background

In 2015, the new bond issuance management measures issued by the China Securities Regulatory Commission stipulated that bond issuers can include domestic and overseas listed companies, as well as non-listed companies (issuing private debt), resulting in an explosive growth in the issuance of corporate bonds. The types of bonds have also increased. According to relevant data in 2019, it has been verified that the distribution of corporate bonds can assist the company in obtaining direct financing. In 2019, there were 2,464 corporate bonds being issued, with the issuance amount reaching 2.54 trillion yuan, a year-on-year increase of 53% and accounting for 17.13% of China's total bond issuance. Therefore, research on the influencing factors of credit spreads can provide experience and reference for China's corporates to a certain extent.

As one of the pillar industries of the national economy, the real estate industry needs to issue corporate bonds to provide funding for it. With the state's policy of regulating the real estate industry in 2019 - the policy of "Houses are for living in, not for speculation", and from the strict "price limit and purchase restriction" policy to the current full implementation of "one city, one policy", which is to maintain the stable development of the real estate, the demand for funds in the real estate market has been decreased. From 2012 to 2014, the number and total scale of bond issuance in the real estate industry were not very high, and the degree of openness of the market was not optimistic enough. However, after the new bond issuance management regulations promulgated in 2015, the scale corporate bonds in real estate industry have been improved. Opportunities for development and further expansion of the use of bond issuance to finance are also increasing. According to Figure 1, the number and amount of overseas bonds issued by real estate companies in 2019 have increased significantly.

However, due to the relevant national policies, there are certain restrictions on real estate development financing under regulatory pressure. Some limitations have gradually emerged, such as in 2018, the "17 Provincial Real Estate Bonds" of the private placement bonds issued by Yunnan Real Estate Development and Operation Co., Ltd. defaulted due to the triggering of cross clauses and became the first default bond in the real estate industry. After that, there have been frequent bond defaults in the real estate industry, with a default amount of up to 4.6 billion yuan, and there are still ten bonds unavailable until 2021. Therefore, based on the background of the frequent occurrence of all the above defaults, this article uses the characteristics of the real estate industry's cycle, combined with the economic cycle theory, to analyze the bond credit risk of real estate companies, clarifying the impact of spreads from three dimensions-factors to provide a reference for related research.

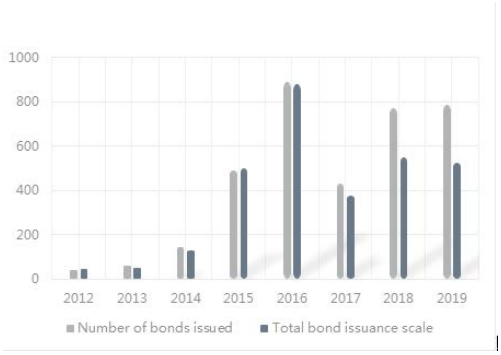

Fig.1 Statistics of Corporate Bond Issuance in the Real Estate Industry from 2012 to 2019(Unit: Billion)

1.1.2 Research Significance

Unlike other industries, the real estate industry is capital-intensive and requires sustainable development with the support of a large amount of capital. In recent years, due to the government's macro-control of the real estate industry, the demand for funds in the real estate industry has increased. Therefore, in combination with the real estate industry's periodicity and characteristics, as one of the significant bond issuance industries. It is meaningful to do research on corporate bonds issued by real estate companies. This study is mainly based on the economic cycle theory to study the credit spreads of corporate bonds issued by real estate companies and also provides some suggestions for the company's direct financing.

1.2 Research Method and Structure of This Article

This article takes the credit spreads of corporate bond issued by real estate companies as the research object while its scope of the selected bond issuers is listed companies in the real estate industry. This research will start from three perspectives - the macroeconomics level, the real estate industry level and the individual bond level, select multiple economic indicators respectively and quantify them. Specifically, it will use a multivariate linear regression model to test and analyze the characteristics of the trend in credit spreads of corporate bonds in various economic cycle stages from January 2018 to December 2020, and the data was obtained through Wind and National Bureau of Statistics.

2. Theory and Literature Review

2.1 Theoretical Overview

Structured modeling was developed as a comprehensive response to the perceived shortcomings of modeling systems available in the 1980s, of which the theoretical foundation is formalized by Geoffrion (1989), who presents a rigorous semantic framework that deliberately avoids committing to a representational formalism. The framework shares some common points with some ideas in the computer science literature on knowledge representation, programming language design, and semantic data modeling, which is specifically designed for modeling OR/MS and related field practices (Geoffrion, 2013). It is a systematic way of thinking about models and their implementations. Black and Scholes (1973) created a preliminary structural model, explaining how contingent claims are used for the value of stocks and debt. This model was further modified to be B.S model by Merton (1974), which was regarded as the most classic structural model for corporate bonds pricing and is widely used in corporate bonds pricing, credit risk management, and other fields. The structural model can conclude that the factors that affect credit spreads can be divided into the following aspects: risk-free interest rates, corporate assets, and bankruptcy costs.

2.2 Business Cycle Theory

Kydland and Prescott (1982) state that the true business cycle theory is based on the assumption of great volatility and business cycle fluctuations may be driven by real factors. They described how to build a numerical stochastic general equilibrium model of the American economy. The real estate industry is now in a transitional stage from a mature period to a recession period.

2.3 Credit Spread

Credit spreads are usually used to predict the future economic effects of practitioners and policy making. The "financial accelerator" theory proposed by Bernanke and Gertler (1989) states that the

increase in external financing premiums would increase borrowing costs, reduce borrowers' cost, and limit overall economic activities. Gilchrist and Zakrajšek (2012) show that the deterioration of the reputation of companies will affect the expansion of credit spreads and the supply will also be affected. Therefore, the validity of credit spreads as a predictor of economic activity is derived (Mueller 2009). Gilchrist et al. (2009) constructed a “GZ spread” based on company-level data and argue that credit spreads have great predictive power for future economic activities. Kobayashi (2017) focused on Japanese credit spreads at the company level and show the goodness of fit of the research model by summarizing company-based spreads. Therefore, research on credit spreads of corporate bonds can not only understand its influencing factors, but also clearly simulate some activities of financial intermediaries.

3. Variable Selection

3.1 Selection of Explained Variables

The research object of this article is credit spreads, and the selected range is corporate bonds issued by listed real estate companies.

Therefore, the calculation formula for credit spreads is:

$$\text{Bond issuance credit spread} = \text{bond coupon rate} - \text{interest rate of the same maturity national debt on the day of distribution} \quad (1)$$

3.2 Selection of Explanatory Variables

The explanatory variables are mainly divided into three levels: the macro level, the real estate industry level, and the individual debt level.

3.2.1 Macro-Level Influencing Factors

(1) Gross Domestic Product (GDP)

In economics, nominal GDP is the output value measured at the current price level, while the real GDP is the output value measured at the price level of a base year. Therefore, the real GDP is not affected by price changes during the year and is a relatively reliable indicator of social and economic welfare, which reflects the ability of the economy to meet people's needs and desires. The higher the real GDP, the higher the actual consumption power of people. Suppose the real estate companies is in a relatively good external environment. In that case, investors will have more funds, and external financing will be more friendly to the company, which will lead to a reduction in bond credit spreads to a certain extent. Therefore, this article selects the year-on-year GDP growth rate as the influencing factor X_1.

(2) Consumer Price Index (CPI)

This indicator is used to measure the relative changes in the price levels of consumer goods and services over time, and comprehensively reflects the changes in the prices of consumer goods and services purchased by residents. It is generally regarded as the degree of inflation. When inflation occurs due to a large increase in the CPI indicator, the central bank will control the amount of money delivered, and the central government will also introduce a tightening fiscal policy to reduce currency circulation in the market and reduce the scale of credit, thereby reducing the money supply in the financial market. The direct result is that companies need to pay more costs to get investment. This paper selects the monthly CPI year-on-year growth rate as the influencing factor X_2.

(3) Exchange rate

Exchange rate refers to the currency ratio between different countries, which is also a measure

that affects the issuance of foreign bonds in the capital market. When the exchange rate rises, credit spreads increase, but the continued rise will lead to foreign exchange inflows. In order to be able to effectively manage foreign exchange risk, the central bank uses a tight monetary policy to hedge, making the financing of real estate companies become complex and credit spreads decrease. By reviewing a large amount of literature and information, we found that there are few studies on the impact of credit spreads on real estate companies in terms of exchange rate as a factor, so this paper tries to explore the impact of exchange rate on credit spreads of real estate companies through empirical analysis. This paper selects the average exchange rate as the influencing factor X_3.

(4) Stock market yield

There are two types of investment in the capital market, namely stocks and bonds. For local investors, when the risk is relatively fixed, they will have confidence in the solvency of the enterprise, purchase products and provide funds for investment, which will increase the market yield of the enterprise and reduce the credit spread.

Therefore, in order to measure the comprehensive stock market yield of the two markets, the rise and fall of CSI 300 index X_4 in the 30 trading days before the issuance of local real estate companies' bonds is selected as the measurement index of stock market yield.

3.2.2 Influencing Factors at the Industry Level

(1) Completed real estate investment and development

The amount of completed real estate development investment, as an important indicator of the financing needs of real estate companies, will affect the future investment intensity of the real estate industry. In the long run, this indicates that the market of the real estate industry has development potential and better expected results, which can bring higher profits for real estate companies. The risk of default will be reduced; making the credit spreads decrease due to the reduced risk. Therefore, to better analyze the real estate industry as a dependent variable, this paper uses the cumulative amount of real estate development investment completed in the previous month of bond issuance (X_5).

(2) Commercial housing sales

Compared with other industries, the sales of extra commercial houses in the real estate industry has a greater impact on the credit interest difference of real estate debt of real estate investment companies. The recent government support increased the volume of new commodity housing transactions in the real estate market and allowed companies to access more funds, which may decrease the demand of issuing bonds. Therefore, this article adopts the monthly commercial housing sales (X_6).

(3) Land transaction price

The land transaction price is the transaction price of the right to use construction land. The real estate companies usually own rights to use the land. According to the industry's progress, the land-use right is traditionally obtained in the first half of the year, and development is carried out in the second half of the year. Therefore, an increase in land transaction price would decrease real estate companies’ cash flow and increase the intensity of the demand for capital by real estate companies, which would increase the credit spread. Therefore, this paper adopts the monthly land transaction price (X_7).

(4) Real estate industry prosperity index

The prosperity index of real estate development is based on the theory of economic cycles, which reflects the prosperity and the market demand in the real estate market. On the one hand, as the development prosperity index increases, the subsequent profitability of real estate bonds is also more optimistic, the required spread compensation is relatively small, and the credit spread shrinks. On the other hand, the rise of the development prosperity index means the increase in the

government's investment funds and demand for real estate bonds, which gives a more confident signal to the investors. Therefore, in this paper the average value of the national real estate industry development prosperity index will be taken as X_8.

3.2.3 Influencing Factors at Individual Bond Level

(1) Issuance scale

The total amount of bond issuance for a specific issuer indicates the company's capital needs and the degree of liquid after the issuance. Generally, the larger the scale of the issuance, the higher the liquid. It will be easier for investors to buy and sell bonds, which will reduce credit spreads, and enterprises' solvency will also be improved. This paper selects the total amount of bond issuance as X_9.

(2) Issuance period

The bond issuance period will be affected by the interest rate on the date of issuance and listing. Generally, the longer the issuance period, the more uncertain the interest rate level changes. If the issuance period is extended, various risks will likely occur, which would increase the credit spread. This paper chooses the bond issuance period as X_{10}.

(3) Credit rating of individual bonds

The issuance of bonds by a company must go through a professional institution to conduct a credit rating on all aspects of it, which should affect the bond issuance interest rate and the issuance period. This paper introduces dummy variables to characterize the credit rating (X_{11}).

4. Empirical Analysis

4.1 Descriptive Analysis of Data

4.1.1 Data Source

This paper selects general corporate bonds issued by real estate companies from 2017 to 2019. The macro level and industry level data are mainly accessed from Wind and National Bureau of Statistics and the individual bonds level data are gained from Wind and Shanghai Stock Exchange and Shenzhen Stock Exchange.

4.1.2 Descriptive Analysis of Data

By screening the bond issuance data, excluding the bonds for which no relevant data can be obtained, and excluding abnormal data, a total of 214 valid bond issuance data were obtained. First, perform a descriptive statistical analysis on the selected data, and the results are shown in Table 1. The average bond credit spread is 2.61, the maximum is 4.87, and the minimum is 0.63.

Table 1 Descriptive Analysis of Data

		average	median	standard deviation	maximum	minimum
Explanatory variables	Y	2.45	1.86	1.52	5.39	0.46
The macro factors	X_1	6.58	6.51	0.33	7.10	6.10
	X_2	2.35	2.30	0.64	4.50	1.40
	X_3	8.38	8.30	0.34	10.40	8.00
	X_4	3.16	1.215	1.33	7.74	5.73
Industry factors.	X_5	1.47	0.22	7.60	23.44	-11.30
	X_6	1.39	0.00	25.46	49.40	-35.60
	X_7	10.16	1.030	1.13	11.90	6.90
	X_8	4.45	5.31	1.12	7.57	2.11

Individual debt factors	X_9	6.85	6.81	0.21	7.07	6.31
	X_{10}	101.71	101.38	0.48	101.98	101.50
	X_{11}	10.15	10.40	4.88	34.80	12.80

4.2 Empirical Analysis of Credit Spreads under the Economic Cycle Stage

From 2018 to 2020, the scale of credit bond issuance has grown steadily. From the perspective of industry distribution, the financial industry accounts for 55.03%, which has an absolute advantage, but the real estate industry has always been weak.

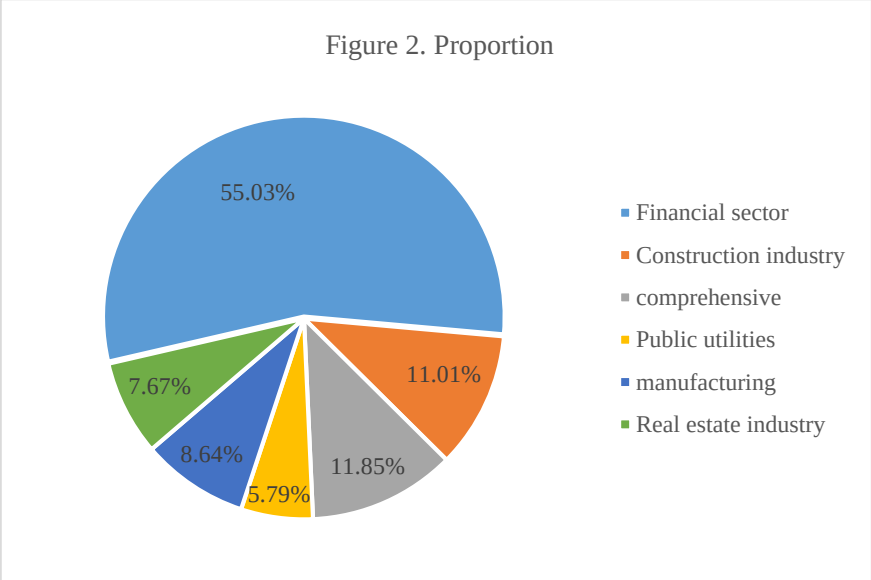

Fig.1 Proportion

Source: Wind, Capital Securities

The trend data of corporate bonds credit spreads in various economic cycle stages from 2018 to December 2019 are accessed from Wind, National Bureau of Statistics and other websites, as follows Table 2:

Table 2 Issuers Whose Ratings Have Been Downgraded in the Real Estate Sector Since 2018

Business name		Rating date	Rating	Rating outlook	Last rating date	Last rating	Enterprise Nature
Subject rating downgraded	Beijing Huaye Capital Holdings Co., Ltd.	2018/10/11	CC		2018/10/8	BBB-	Private Enterprise
	Beijing Huaye Capital Holdings Co., Ltd.	2018/10/12	C		2018/10/10	CC	Private Enterprise
	Gogo Investment Co., Ltd.	2018/11/20	BBB		2018/11/19	A	Private Enterprise
	Ningbo Nongyi Technology Co., Ltd.	2018/12/25	B	Negative	2018/12/11	A+	Wholly Foreign Owned Enterprise
	Houyi Shares Co., Ltd.	2018/12/24	C		2018/12/7	BBB	Foreign companies
	Yuzhou	2018/6/26	AA-	Stablize	2017/6/28	AA	

	Investment Corporation						
	Zhonghong Investment Co., Ltd.	2018/10/22	C	Negative	2018/6/27	CCC	Private Enterprise

Source: Wind, Everbright Securities Research Institute

Table 3 Issuers Whose Ratings Have Been Upgraded for the Real Estate Sector Since 2018

Business name		Rating date	Rating	Rating outlook	Last rating date	Last rating	Enterprise Nature
Subject rating up graded	Austrian Intercontinental Co., Ltd.	2019/5/24	AAA	Stablize	2018/8/14	AA+	Joint ventures
	Joy City Technology Green Co., Ltd.	2019/3/11	AAA	Stablize	2018/10/23	AA+	Central state-owned enterprise
	Shidifen Co., Ltd.	2018/5/17	AAA	Stablize	2017/6/28	AA+	Joint ventures
	Everbright Dongbao Ingredients Co., Ltd.	2018/6/25	AA+		2017/6/21	AA	Central state-owned enterprise
	Guangming Real Estate Jiguo Shares Fan Co., Ltd.	2018/7/17	AA+	Stablize	2017/7/27	AA	Local state-owned enterprise
	Guangzhou Times Technology Stock Pantian Co., Ltd.	2018/6/4	AA+	Stablize	2017/7/18	AA	Private Enterprise
	Guangzhou Fudai Holding Committee Co., Ltd.	2019/5/10	AAA	Stablize	2019/1/8	AA+	Private Enterprise
	Hopson Chuangzhan Dyeing & Closing Co., Ltd.	2018/6/14	AAA	Stablize	2017/6/21	AA+	Private Enterprise
	Fantasia Group (China)Co., Ltd.	2018/6/22	AA+	Stablize	2017/6/13	AA	Foreign companies
	Hua Gen Real Estate (Group) Co., Ltd.						
	Dufa Real Estate Soft Group Limited Official Sentence	2018/7/30	AA	Stablize	2017/7/25	AA	Local state-owned enterprise
	Jinke Real Estate Construction Co., Ltd.	2019/6/17	AAA	Stablize	2018/12/14	AA+	Local state-owned enterprise
	Seichuang Real Estate Group Co., Ltd.	2018/6/15	AAA	Stablize	2017/5/24	AA+	Private Enterprise
	Shangling Daming City Enterprise Co., Ltd.	2019/5/23	AAA	Stablize	2018/6/27	AA+	Central state-owned enterprise
	Shanghai Shimao Co., Ltd.	2018/4/10	AA.		2017/6/22	AA	Foreign companies
	Shenzhen New Nanshan Holdings Co., Ltd.	2019/4/30	AAA	Stablize	2019/2/22	AA*	Foreign companies
	Sichuan Jiguang Development Co., Ltd.	2018/5/28	AA+		2017/6/16	AA	Central state-owned enterprise
	Sichuan Leanguang	2018/2/6	AA.	Stablize	2017/6/23	AA	Private

	Hairdressing Co., Ltd.						Enterprise
	I love my home Latech Group Co., Ltd.	2018/5/24	AA+		2017/10/17	AA	Private Enterprise
	Time Real Estate Co., Ltd.	2018/7/26	AA	Stablize	2017/10/16	AA-	Private Enterprise
	Cinda Real Estate Co., Ltd.	2018/3/5	AA+		2017/5/26	AA	Central state-owned enterprise
	Xuhuai Group Co., Ltd.	2018/4/12	AA+		2017/6/28	AA	Central state-owned enterprise
	Xu Ke Cong Yong Co., Ltd.	2018/4/13	AAA	Stablize	2018/2/12	AA+	Private Enterprise
	Yunnan Dizhong Industry Development Co., Ltd. Yiren Company	2018/4/17	AAA	Stablize	2018/2/14	AA+	Private Enterprise

Then, take the data average of the current month's credit spread in the above sample as the current month's credit spread sample to obtain an incomplete sample of the credit applied from January 2018 to December 2019.

4.3 Empirical Results

Use Excel to process the above samples, and get the trend chart of real estate value-added growth, CPI year-on-year growth and credit spreads, as shown in Figure 2:

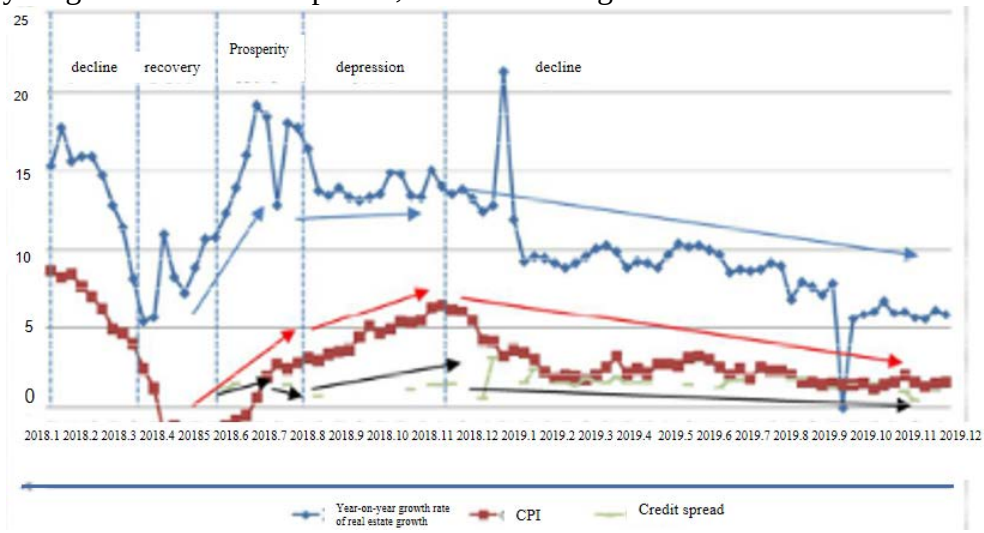

Fig.2 Real Estate Value-Added Year-on-Year Growth Rate, Cpi Year-on-Year Growth Rate and the Trend of Credit Spreads over the Same Period Comparison

(1) Credit spreads narrowed significantly from the fourth quarter of 2018, but the relative distribution of issuers did not change significantly. Since 2018, economic growth has slowed down, there is some deflationary momentum, and the macro economy has shown a depression and recessionary phase, but credit spreads have declined.

(2) The year-on-year growth rate of real estate value and CPI have both declined. The widening of credit spreads did not reflect good macroeconomic expectations. On the contrary, credit bond investors demanded higher credit spreads.

4.4 Empirical Analysis of Multiple Regression Models

Table 4 Stepwise Regression Process

model	R^2	R^2 after adjustment	Errors in standard estimates	F
1	0.481	0.484	1.09250	0.000
2	0.607	0.603	0.95351	0.000
3	0.640	0.645	0.70014	0.002
4	0.731	0.720	0.80043	0.001
5	0.743	0.728	0.79160	0.011
6	0.764	0.771	0.83020	0.012

Further, multiple covariance tests and multiple regression analysis were performed on the variables in the above treatment results, and the following results were obtained.

Table 5 Regression Analysis of Stepwise Regression Results

MODEL	Unnormalized coefficient	Normalization coefficient	t	F	VIF
content	-26.170		-1.821	0.070	
X_{11} (Debt Rating)	0.671	0.271	3621	0.000	1.327
X_3 (Exchange rate)	0.088	0.137	-1.621	0.000	1.303
X_{10} (Issuance Period)	-0.172	-0.126	-1.100	0.001	1.217
X_9 (Issuance scale)	0.017	0.130	1.327	0.001	1.321
X_8(Real Estate Industry Prosperity Index)	0.160	0.113	2.537	0.012	1.708
X_2 (National Consumer Price Index (CPI))	0.527	0.169	1.421	0.016	1.401

The results of the analysis in Tables 5 show that all the explanatory variables in the model become significant; the value of the coefficient of determination is 0.753, which is larger than the hypothesis; and the F-value increases from 27.24 to 59.39, which significantly enhances the overall significance test of the model. The regression equation was obtained as follows.

$$Y=-26.170+0.527X_2+0.088X_3+0.160X_8+0.017X_9-0.172X_{10}+0.671X_{11} \quad (2)$$

The results of the analysis show that among the 10 explanatory variables selected at three levels, macro-level factors have a less significant impact on credit spreads, including GDP indicators, which are not significant, and significant exchange rates; industry-level factors are not significant, and individual bonds have a significant impact on credit spreads. Therefore, it can be seen that micro-level factors such as real estate companies and personal bonds, which are related to bond repayment, have a more significant impact on bond credit spreads.

5. Conclusions

From the perspective of economic cycle theory, the higher the local government GDP and general fiscal budget revenue, the lower the credit spread of corporate bonds issued by local real estate companies, and the higher level of local government, the smaller the influence of individual factors on the credit spread. The empirical results are consistent with the assumptions.

Therefore, this paper takes the credit spreads of corporate bonds issued by real estate companies as the research object, refers to the existing literature of relevant credit spreads and10 explanatory variables were selected from three levels of factors, and then stepwise regression method was used for further empirical analysis. The final result is that the factors that have a significant impact on the

credit spread of corporate bonds issued by real estate companies include the real estate industry prosperity index, company asset scale, company credit rating, bond credit rating, bond issuance scale and issuance period. As far as I am aware, as the administrative level of local government investment companies rises, the impact of macro factors has become more significant. This may be because the local real estate companies have better qualifications as the level of local government increases. Corporate bonds issued by real estate companies are an essential part of China's bond market. Because of the recently frequent defaults of corporate bonds, its high risks have become one of the main topics of the financial conference of Chinese government. Therefore, it is of great practical significance to study the factors affecting the credit spreads of corporate bonds issued by real estate companies.

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