

VIX's Impact on Chinese Corporate Bond Default

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Abstract. In recent year, Chinese corporate bond default rate continues to grow. Besides international and domestic affects, infection of external risks could cause changes in Chinese corporate bond market. Regarding this issue, this paper investigates the systematic mechanism of global risk infection through the study of VIX's impact on Chinese Corporate bond default. More specifically, this paper uses VIX index to measures the global risk, and separately use the amount and dollar amount of Chinese corporate bond default rate to measure the condition of the Chinese corporate bond market. The findings of this study show that the default index rises with the increase of the VIX index.

Keywords: VIX; Corporate bond; Default rate; Linear regression.

1. Introduction

The VIX value represents the expected volatility of the S&P 500 over the next 30 days based on the weighted sum of implied volatility attributes of the S&P 500's current and next month in-the-money and out-of-the-money options. [1] Implied volatility is an estimate of the actual volatility by investors in the options market, which has been reflected in the pricing process of options. The higher the implied volatility, the more volatility in the expected future stock price, the more likely the option is to be exercised, and therefore the higher its price. Conversely, the lower the implied volatility, the lower the option price. When the market is in a downward trend, the panic of investors intensifies. Due to certain threshold and liquidity difficulties in short selling of stocks, the demand for buying and selling derivatives to hedge risks increases. On the other hand, the divergence of investors' views on the future trend also stimulates the demand for buying derivatives. So, the price of derivatives gets higher, the implied volatility gets higher, and the corresponding VIX gets higher. When the market is in a rising trend, the panic of investors is weakened, the demand for hedging risks is reduced, and it is easier to buy the target to obtain profits [2]. The demand for buying subscribed derivatives is reduced, and the price of corresponding derivatives is lower, the implied volatility is lower, and the corresponding VIX is also lower [3].

The current situation of corporate bond default in China is in a poor state. Due to the impact of covid-19, many Chinese enterprises have lost their business capacity. In the market, many changes need to occur, resulting in a great demand for cash. Due to the low liquidity of cash, many enterprises are facing bankruptcy. In the first half of 2021, as many as 11 enterprises defaulted on their bonds, with a total bond stock of 95 billion yuan, compared with 17 and 92 billion yuan in the same period last year. The number of defaults has decreased, but the scale of defaults is still expanding. The average stock of domestic bonds of defaulting enterprises at the time of default in 2021 was RMB 8.7 billion, which was 1.6 times that of the previous year, 3 times that of 2017 and 9 times that of 2015 (the year in which state-owned enterprise bonds defaulted for the first time). Most credit events occur in state-owned enterprises, private enterprises and financial and credit institutions with great influence, such as brilliance Automobile Group Holding Co., Ltd., Ziguang Group Co., Ltd., Henan energy and Chemical Group Co., Ltd. Since 2018, more state-owned enterprises have defaulted. They have a larger market share and are more likely to cause losses. The cumulative scale of defaulted bonds of state-owned enterprises has reached 1 / 4 of the total scale of undue bonds of state-owned enterprises in Liaoning Province, 1 / 6 of Qinghai Province and 1 / 10 of Henan Province.

The reasons why enterprises have experienced a sharp increase in pressure are as follows. First, capital pressure is high, the possibility of risk transmission multiplication increases. Private enterprise income drops sharply but rigid expenditure is still in, anti - risk ability is poor as a whole. The

COVID-19 outbreak is a multi-dimensional capital test for private enterprises, most of which are basically stagnant and have a large number of idle staff, but they still need to pay rent, salaries, five social insurance and housing fund, and provide appropriate subsidies to employees who stick to their posts during the epidemic. Private enterprises, small and micro enterprises especially, are primarily asset-light enterprises. On the condition that the production does not provide the ability to make a recovery under multiple pressures, there will be a low possibility that the cash flow of most enterprises could last more than a quarter or even half a month. The capital problem has become the most critical and urgent issue facing private enterprises. Additionally, private enterprises also face financial problems that may lead to both vertical and horizontal transmission. Vertical transmission is relevant to risks that fluctuate the supply chain; Horizontal transmission is related to guaranteeing relations between enterprises, which will lead to local crises [4].

Second, the special credit bailout policy still has liquidity discrimination and poor transmission. For a long time, due to identity discrimination, private enterprises contributed more than 60% to GDP, but the loan balance only accounted for 40%, and small and micro enterprises accounted for less than 10% of the loan balance. Under the impact of the epidemic, private enterprises are facing a more severe survival test than state-owned enterprises due to a series of problems such as production suspension, cash flow interruption and contract default. Although China has issued policy guidance to help enterprises tide over difficulties through directional credit support, banks, as the main issuer of credit, have low risk preference under the consistent policy requirements of preventing systemic risk, and private enterprises, especially those facing the possibility of bankruptcy, often find it difficult to get loans due to high risks. Loans are actually going to relatively sound companies rather than those most in need of financial bail-outs [5].

Third, due to the deterioration of the external environment, some manufacturing supply chains may move out. As the virus spread across the globe, countries-imposed controls on the movement of people and trade in goods. Though the world health organization gave high affirmation of epidemic prevention in China, and called for it is not necessary to implement restrictions, there are still some countries adopted a series of negative blockade measures, mainly including limited personnel entry, the entry and exit, trade in goods and quarantine and other prohibited items, trump the government even publicly said the spread of pneumonia outbreak help jobs back to the United States. Although the remarks and measures of some countries go against international humanitarian principles, the export issue caused by the epidemic should still be taken seriously. In the short term, enterprises face economic pressure due to the failure of production recovery and order default. However, if the supply capacity cannot be restored in time and the demanders adjust the supply channel, in the medium and long term, part of China's manufacturing industry chain may migrate or even flow out of China as a whole [6].

In order to analyze the default condition of Chinese corporate bonds, this paper selects the VIX Index to measure the global risk index and establishes a linear regression model to test the impact of the global risk index on the default amount and default quantity of corporate bonds. The rest of this paper includes literature review, introduction of model methods, interpretation of results and conclusions.

2. Literature review

To detect the causal effect of VIX and Chinese corporate bond default, it is necessary to understand each term involved. Whaley's paper provides a generally acknowledged introduction to the Chicago Board Option Exchange's Market Volatility Index, VIX [3] It stated that to appreciate the usefulness of VIX, investors must understand the exact meaning of the index, thus can avoid misunderstandings and misconception. It pointed out that the index is significant when we consider the corresponding history and financial and economic environment. While Whaley's work provided a solid theoretical foundation for the researched topic, most existing papers about VIX focus on the forecasting and modeling. There are various ways for measurement, some conventional and some novel, however,

they are all highly mathematical and over complicated for general business application. Other researchers examine the index in general or test its validity. Few research has been conducted to measure of correlation between the index to other business-related aspects. One of the purposes of this paper is to provide a conclusive statement that can be directly used to demonstrate the effect of the index to one specific rate of Chinese corporate bond default and make further predictions and suggestions.

Giesecke and colleagues established long-term, continuous studies on the default crisis and risk. Their work on corporate bond default risk examined the period from 1866 to 2008 [4] and found that the corporate bond market has gone worse than those experienced during the Great Depression because of the repeatedly suffered clustered default events. Its analysis on the causes and examinations of the economy provides inspiring information for my research. Unfortunately, Giesecke and colleagues didn't mention the VIX in this paper, however, the three major predictors for the default rates it gave, stock returns, stock return volatility, and changes in GDP, did indicate to VIX. Their finding could lead to causal explanation to the possible relationship between VIX and the default rate, or it at least provide directions for further research. Their other inspiring work, macroeconomic effects of corporate default crisis: A long-term perspective, examined the economic impact from a macro perspective [5]. Conclusively, their research shares the same interest of the default of corporation bond, and although we differ on specified topics, they provide excellent foundation and divergent thinking.

During my research, yet enormous number of papers choose Chinese market as their demographics, most papers present findings of modeling of the default rate or corporate bond market and returns. None of them conduct correlational or causal research specially on Chinese corporate bond default with VIX, which makes it innovative and valuable.

3. Data and methodology

This paper took the number and dollar amount of the Chinese corporation default and used VIX index to measure the global risk index. The time period is from June 2018 to December 2020. Data came from WIND database. Figure 1 is the changing tendency of default numbers and VIX index.

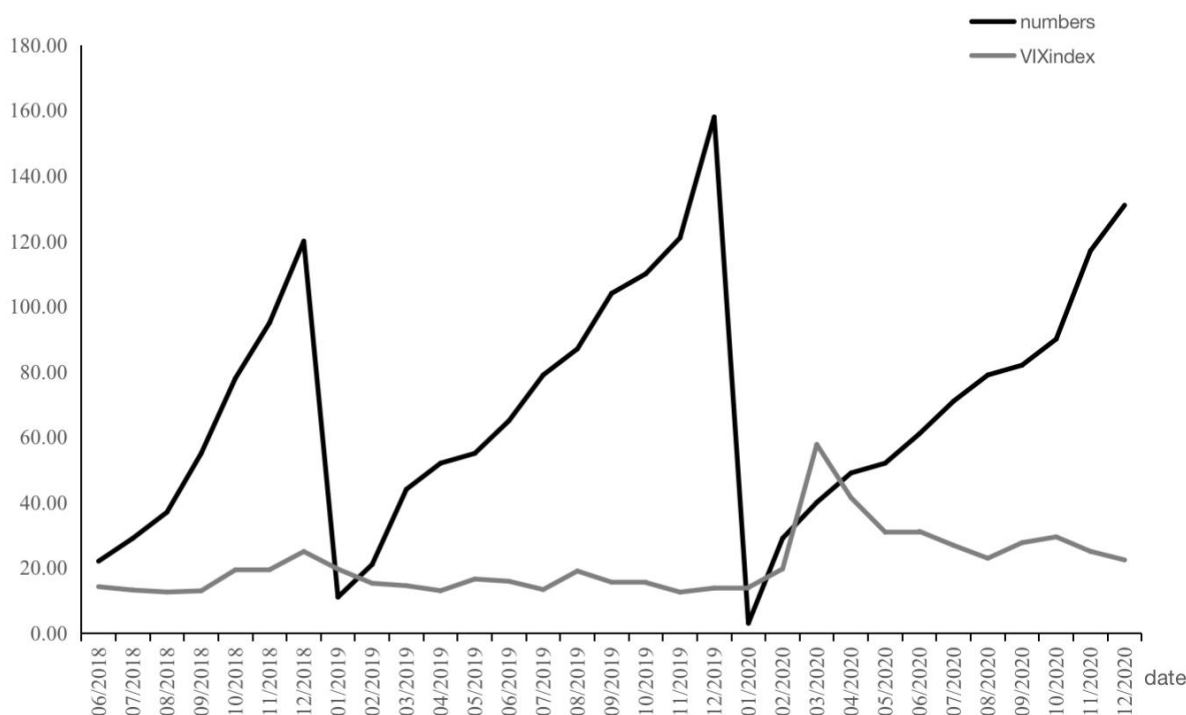


Figure 1. The changing tendency of default numbers and VIX index

In order to further test the relationship between the two, the ordinary least squares model is established in this paper. Ordinary Least Square estimation method (OLS) is the most common and basic estimation method for single equation linear regression model. The basic idea of OLS is to make model estimation possible by minimizing the sum of squares of residuals.

The specific model form is as follows:

$$\log default_t = \alpha_0 + \alpha_1 \log VIX_t + \varepsilon_t \quad (1)$$

Where $\log default_t$ is the explained variable of this paper, that is, the number of defaults of Chinese enterprises, to measure bond defaults. $\log VIX_t$ is the core explanatory variable of this paper, namely, the global financial risk index. α_0 is the constant term. α_1 is the key coefficient of this paper to measure the change of China's industrial production index caused by the change of a unit stock index. ε_t is the random error term.

4. Results

According to the above empirical model, this paper regresses the OLS model, and the results are shown in Table 1.

Table 1. regression results

Variable	logdefaultnumber	logdefaultamount
Log VIX	0.310	0.638
	(0.390)	(0.398)
constant	3.096	8.950
	(1.164)	(1.187)
F value	2.63	11.58
p value	0.4328	0.0000
R-squared	0.021	0.238

According to table 1, every percentage point change in the global risk index can increase the number of defaults of Chinese corporate bonds by 0.3 percentage points, although it is not statistically significant. However, every percentage point change in the global risk index can significantly increase the default amount of Chinese corporate bonds by about 0.6 percentage points. The change of global risk index will lead to the deterioration of the default of Chinese corporate bonds.

Overall, the number of cases of default is decreasing, but the heat of default is still rising. In terms of amount, the scale of default is still expanding. More defaulters and even high-profile enterprises have brought greater blows and challenges to the market and investors. With the rise of global risks, the impact of the weak ability of some local governments to provide support has been amplified. This is due to the uneven and tight financial distribution of local governments caused by the Covid epidemic, which further weakens the budget, thus reducing the controllable resources outside the budget for rescuing state-owned enterprises. This has led to more selective support for state-owned enterprises and a gradual increase in tolerance for default.

From the perspective of defaulting enterprises, as more cases of default are disposed of in court reorganization, people are more familiar with the options, procedures and results after default. This further reduces the uncertainty and unimaginability of default events and makes the defaulting enterprises more capable of evaluating and undertaking default. During the epidemic, the debt pressure will be significantly increased due to the weakened operating capacity. At this point, the need for enterprise financing capacity, namely by virtue of "blood transfusion" to tide over difficulties. As the trading environment of most enterprises has undergone severe changes and the credit risks of upstream and downstream trading partners have become increasingly severe, credit prevention and control are of vital importance [10].

5. Conclusion

In recent years, China's bond market has developed rapidly, especially in the face of extremely unstable bond market, there are opportunities and challenges in bond development. Credit default is common in China's bond market. The rise of default index is an inevitable phenomenon when the bond market develops to a certain stage. With the development of the bond market, at present, China has basically had the conditions and ability to deal with and digest the default risk. To build a more standardized bond market, legal constraints are indispensable. We should adopt diversified risk dispersion channels and constantly improve the supervision system. Therefore, this paper puts forward the following suggestions:

Firstly, enterprises shall be established immediately to build a "default risk" firewall. On the one hand, they must pay in full as soon as possible to complete the delivery of overseas orders. On the one hand, enterprises are encouraged to actively take legal actions for any potential defaulting overseas orders, procurement, or further requisition of submission guarantee. To prevent further loss, they could either use the expected default rules or cancel the contract delivery obligation. At the same time, enterprises should look inward, prepare for a rainy day, study domestic consumer demand after the epidemic, work hard on product research and development and effective supply, and actively research and develop marketable innovative products to lead the transformation and upgrading of enterprises.

Secondly, enterprise should strengthen the protection mechanism for creditors in case of bond default and enhance the confidence of bond investors. Increased penalties for negligence and fraud by underwriting and credit rating agencies; Requiring bond issuers to improve the timeliness of information disclosure, monthly announcement of major financial data; Draw lessons from the experience of foreign bond markets, introduce debt repayment security clauses such as cross default, accelerated repayment and restrictive clauses, improve the effectiveness of the bondholders' meeting system, and provide investors with more personalized and diversified protection measures.

Thirdly, government should further improve the financial environment. It is necessary to give full play to the information advantages of local banking and insurance regulatory bureaus and financial services offices, and treat enterprises that default on their debts differently. We will provide liquidity support to enterprises holding high-quality assets but experiencing temporary difficulties, actively coordinate with each other, encourage multiple channels to resolve the debt crisis, and prevent banks from withdrawing loans from exacerbating their difficulties. Enterprises with broken capital chains or long-term losses that have completely lost their solvency due to violations of laws and regulations shall resolutely liquidate and withdraw.

Fourthly, government should strengthen counter-cyclical macro policy adjustments. On fiscal policy, government will further accelerate the issuance of local government bonds, moderately increase the government debt ratio, and speed up the construction of key infrastructure projects. In terms of monetary policy, government will use various monetary policy tools to maintain abundant market liquidity, make certain that market interest rates stay at a low level, and guide LPR to continue to decline. On condition that the epidemic brought impacts that exceed our expectations, lowering benchmark interest rates on deposits and loans should be taken into consideration by the government.

Finally, enterprise should emphasize credit quality and broaden financing channels. On the one hand, for enterprise at different stages of development, in addition to actively encouraging local governments to provide support and help them to list on the SME Board and science and Technology Innovation Board, more market-oriented funds should be guided to enter the over-the-counter market to increase the liquidity of enterprise transactions. , on the other hand, to enrich the form of OTC market, in addition to regional equity trading market, trading counter market, can learn the foreign advanced experience, explore establishing electronic trading market, new market dealer market, the "pink sheets" market, etc., for those who did not achieve profitability, revenue is not high, and even continuing losses are promising small and medium-sized enterprises provide direct financing services. In addition, we should promote the coordinated and interconnected development of the multi-level capital market, support the issuance of bonds by small and medium-sized enterprises, expand the pilot

program for the application of directional convertible bonds and the pilot program for innovative and entrepreneurial bonds, and expand the diversified financing channels for small and medium-sized enterprises from multiple angles and at multiple levels.

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