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# The Analysis of Repayment of Default Bonds: Evidence from China

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## Abstract

In March 2014, China's public offering bonds defaulted for the first time, this paper takes Chinese bond default and repayment data during 2014-2019, and investigates that implicit guarantee has a significant impact on the repayment of default bond. It shows the following findings: First, state-owned enterprises have a higher repayment rate after default than non-state-owned enterprises. Second, the stronger the comprehensive strength of the local government is, the higher the repayment rate will be after defaults. The higher the local government debt rate is, the higher the repayment rate will be after defaults. Third, the higher the bond rating, the higher the repayment rate of state-owned enterprise bonds compared with non-state-owned bonds. In low-rated bonds, the nature of enterprises has no significant impact on bond repayment. Finally, the paper investigates the impact of the event of "national launch of private enterprise bond financing support instrument in October 2018" on the repayment of default bonds, and finds that the impact of enterprise nature on bond repayment changes significantly before and after the event, which is consistent with the logic of other findings mentioned above.

**JEL classification numbers:** G31, G32, G33, H63
**Keywords:** Bond market, Default, Repayment, State-owned enterprise

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# 1. Introduction

As of September 12, 2019, 488 bonds have defaulted[2] since 11 Chaori bond failed to pay interest on time in March, 2014, which was the first default of China's public offering bonds. From that time, defaulted issuers expanded from private enterprises to state-owned enterprises, and the types of bonds expanded from corporate bonds to short-term financing bonds, ultra-short-term financing bonds, medium-term notes and other major market varieties. The frequency of default increased from once every few months to once every month or even several times a month. Under the circumstances that the global macroeconomic growth rate is slowing down[3] and some issuers have heavy debt burden, it is expected that enterprises will still face repayment difficulties in the future. According to international experience, when the economy is in a downward cycle, it is quite common for the bond market to have more defaults. According to standard & poor's statistics, during the financial crisis of 2007-2011, the default rate of the credit bond market increased sharply from 0.49% to 5.71%. Therefore, it is of great theoretical and practical significance to study Chinese bond default and its repayment.

Since 2014, default bonds have shown several characteristics. First, the types of default entities are different from those of international market. In international market, the issuers of defaulted bonds are mainly divided into three categories. The first is the "fallen angel". The original qualification is good and gradually slips into the abyss due to the bad influence of operations or some events. The second is "star of tomorrow", its original rating is speculative, and the business growth is good, but subsequent management is less than expected and there is a default. The third is some weaker subjects, in order to achieve leveraged buyouts and issue high-yield bonds, while the later economy or industry recovery is not satisfactory, the acquisition does not produce the income expected, and ultimately the debt repayment pressure is so large that a default occurs. The current default in Chinese market is mostly the first type. This is related to the fact that the Chinese market currently has higher bond issuance standards, and the subjects with weaker qualifications and better growth have difficulty in issuing bonds. Secondly, the frequency and scale of defaults have risen rapidly in recent years. The number of defaults in the first eight months in 2019 is close to 2018, and far exceeds that of 2014-2017.

Corresponding to the rapid increasing scale of default, the scale of repayment is also increasing. As of September 12, 2019, China’s bond market has a total default of 326 billion yuan, of which 30.17 billion yuan of principal has been paid, and 2.5

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[2] Types of default include failure to pay the principal on time, failure to pay interest on time, failure to pay the principal and interest on time, failure to pay back the sale on time, failure to pay back the sale and interest on time, failure to pay in advance, renewal of interest and interest, triggering cross-default , etc.

[3] In the Global Economic Outlook released by the World Bank in June 2019, the global economic growth rate in 2019 and 2020 will be lowered by 0.3 and 0.1 percentage points to 2.6% and 2.7%, respectively. The growth rate in 2019 will be the lowest growth rate since the financial crisis in 2008.

billion yuan of interest has been paid. Which means, a total of 32.67 billion yuan has been paid, accounting for 10% of the amount of default, the increasing amount of repayment provides an opportunity for us to study the characteristics of default bond repayment. Studying the repayment of default bonds has the following significant meanings. First, Chinese bond market has developed rapidly in recent years. As of the end of August 2019, the size of the market has reached 93.2 trillion yuan, becoming an extremely important component of Chinese capital market, studying the problem of repayment after default is conducive to reducing the panic in the market and has a positive effect on the smooth operation of China's bond market. Second, for investors, the repayment after default is positive for both reducing investment loss of original investors and increasing investment income of new entrant. Third, for issuers, after a default in the bond market, due to fears that a certain industry has credit problems, some investors may choose not to participate in this industry any more, resulting in refinancing difficulties of certain enterprises, analysis of bond default repayments will help companies with better credit qualifications and solvency to continue completing financing. Fourth, for regulators, research on bond default repayments can help reduce the spread of risks and enhance the stability of the macro financial environment. The People's Bank of China also used the column in the China Financial Stability Report (2016) to discuss the default of the bond market.

The rest of the paper is structured as follows. The second section is literature review and research hypothesis, the third section is research data and model, the fourth section is empirical results, and the fifth section is conclusion.

## 2. Literature review and research hypothesis

In literature review, we start from two aspects: debt default and financial distress, and price recovery after debt default.

### 2.1 Debt default and financial distress

As for the problem of debt default and financial distress, Fitzpatrick (1932) compared 13 indicators of normal and failing companies and found that net profit/net asset and net asset/liability were the two indicators with the highest discriminating ability. Due to the lack of more advanced statistical tools at that time, the paper mainly compares the indicators of normal and failed enterprises. This situation continued until the 1960s, when Beaver (1966) proposed "univariate analysis" in his paper. By analyzing the mean value and changing trend of 30 indicators of normal companies and failed companies in the first five years, he explored the prediction effect of each indicator on financial distress and found that net profit/liability had the best prediction effect. Altman (1968) first used Multiple Discriminant Analysis (MDA) in his famous paper to predict the bankruptcy of a company, and named it as the "z-score" model. Article analyzed working capital/total assets, retained earnings/total assets and earnings before interest and tax/total assets, the book value of the shares/liabilities, sales income/total assets as

predictors to calculate the Z value of each company, and accordingly to determine Z-value range of normal company and insolvent company, and then judge whether the bankruptcy will occur in the base year by the Z value calculated in previous years. Ohlson (1980) used the multivariate logistic regression to improve the MDA method. Overcoming the above assumptions of variables, the problem of predicting corporate financial crisis is transferred to know certain financial data, and the probability of crisis could be calculated. Altman (1977, 2000) improved the original model and proposed the ZETA model in the selection of data and the determination of the demarcation point between the bankrupt company and the normal company. Compared with the MDA model, the model firstly adds new variables, increases the income stability index to measure the risk of the enterprise, secondly, it selects more industries indicators besides the manufacturing industry, and the third is the use of prior probability and the cost of the first and second types of errors to determine the demarcation point, which is more accurate than MDA. From the 1990s to the beginning of the 21st century, some scholars used artificial neural network to predict the default probability of enterprises (Coats, Fant, 1993), but overall, the prediction effect of this method was not stable.

In terms of sample analysis, the study on corporate bankruptcy was mainly focused on the United States at first, but later scholars gradually expanded the sample to other countries. Wu and Lu (2001) study Chinese listed companies, Al Zaabi and Obaid Saif (2011) used z-score model to predict the bankruptcy of major Islamic Banks and found that this model could have a good prediction of Banks. On the judgment indicators side, Bellovary, Giacomino, and Akers (2007) reviewed the articles on corporate bankruptcy prediction from 1930 to the beginning of the 21st century and found that the good prediction model can have as few as two dependent variables and as many as 21 dependent variables, the increase in the number of variables does not necessarily mean better prediction. Almamy, Aston, Ngwa (2016) added cash flow indicator (operating cash flow/total liabilities) based on Altman's Z-score model, predicting financial crisis in the UK from 2000 to 2013, and found that after joining this indicator, the model can have better predictive power.

With respect to Chinese bond pricing, Wang and Chen (2015) studied the yield of China's LGFV((Local Government Financing Vehicles) bonds, they used the government implicit guarantee variable, bond's own characteristic variables, the purpose of raising, macroeconomics and investor expectations variables. They found in the more developed regions, the government's implicit guarantee can significantly reduce the issuance interest rate, while the purpose of raising has no significant impact on interest rates. In underdeveloped regions, the conclusion is exactly the opposite. Wang, Zhang and He(2015), when studying the risk premium of short-term financing bills, selected five types of risk indicators to test the relationship between different types of risks and bond premiums, which were market risk, credit risk, operational risk, financial risk and a comprehensive risk indicator that combined all of the above factors. It found that all risk indicators are positively correlated with premium, and most of them are significant. Gao and Zou (2015) did not take risk spread as a dependent variable in the study of corporate

bond pricing mechanism, but instead used risk-free interest rate as an independent variable and selected credit risk, liquidity risk and macro systemic risk. Huang, Zhu and Chen（2017）studied default bonds and rating agencies, and found that rating agencies tend to overestimate bond ratings, but this will ultimately lead to a decline in their own rating share.

### 2.2 The repayment of default bond

Altman, Kishore (1996) studied the price performance of different types of bonds (senior secured, senior unsecured and subordinated) after default in different industries, and found that issuers having more tangible and liquid assets, in less competitive industry, would have higher recovery rate. Utilities had the highest average repayment rate of 70.47%. Altman, Brady, Resti and Sironi (2005) studied the relationship between bond default and price recovery after default. Different from the previous study, the article used the repayment rate as the dependent variable. Macro-variables such as bond default rate, change of default rate, number of high-yield bonds, GDP and stock index return are used as independent variables, and univariate and multivariate regression are used respectively to find recovery rate and default rate is inversely proportional. Jankowitsch, Nagler and Subrahmanyam (2014) went one step further and studied more types of post-default repayment issues. The article selected bond characteristics, company characteristics and macroeconomic variables, and found that bonds with larger issuance, shorter maturity and higher coupon rate had higher recovery rate after default, the company having higher equity market value and lower leverage ratio had higher recovery rate, and the bond recovery rate was higher when the default rate of the whole market was lower. At the same time, it found that bond price was the lowest when defaults occurred, about 35% of face value, and that day's trading volume was the highest.

### 2.3 Research hypothesis

Based on the above analysis, we find that previous literatures mainly focus on the financial indicators of enterprises with default bond. In addition to financial indicators, some recent literatures may focus on variables such as bond characteristics, but they are basically limited to the credit spread of a single bond. The contributions of this paper are mainly as follows: firstly, the paper uses the actual default bond data from 2014 to September 2019 in Chinese bond market as research sample to discuss the issue of default repayment, which may have practical guiding significance, secondly, based on the analysis of the existing financial indicators, this paper discusses the role of state-owned enterprise attributes and implicit guarantee on bond repayment, thirdly, this paper also discusses some influence channels behind the SOE attributes.

Generally speaking, after a state-owned enterprise defaults, since the shareholders are often local governments, the enterprise can sometimes get some support, thus promoting the repayment of the default bond. On the contrary, when a non-state-owned enterprise defaults, it may only have to repay by its own efforts. We propose hypothesis 1.

**H1**: State-owned enterprises have a higher repayment rate after default than non-state-owned enterprises.

The government may need both the ability and the willingness to support default bond repayments. Generally speaking, the provinces with a stronger comprehensive strength may have stronger ability to support repayment, and the provinces with a higher debt rate may have higher willingness to support in order not to affect the financing of other bond issuers in the same province. For this reason, we propose hypothesis 2.

**H2**: The stronger the comprehensive strength of the local government is, the higher the repayment rate will be after defaults. The higher the local government debt rate is, the higher the repayment rate will be after defaults.

When governments choose to rescue, they may have different attitudes towards b different rating bond. For bonds with higher ratings, investors may have higher recognition. Compared with bonds with lower ratings, failure to pay after default will have a greater negative impact on the image of the local government, and the government has more willingness to rescue. This leads to hypothesis 3.

**H3**: The higher the bond rating, the higher the repayment rate of state-owned bonds compared with non-state-owned bonds after default. In low-rating bonds, the nature of enterprises has no significant impact on bond repayment.

On October 22, 2018, the executive meeting of the State Council "decided to set up a bond financing support tool for private enterprises", and on the same day, the People's Bank of China held a meeting to "guide the establishment of a bond financing support tool for private enterprises to stabilize and promote bond financing for private enterprises"[4]. We adopted the event study method (Wang and Xu, 2019), taking October 22 as the boundary to study the repayment of default bonds from January 2018 to August 2019. Before October 22, 2018, we predict that the state-owned enterprise bonds repayment rate was significantly higher than non-state-owned enterprises, after October 22, 2018, because the support for private enterprise increases (including the support of Banks and bond markets, etc.), the nature of the enterprise for bonds pay no significant impact on the repayment, so as to further verify the meaning of implicit guarantee for repayments after defaults. This leads to hypothesis 4.

**H4**: Before the establishment of the government support tool, the repayment rate of state-owned bonds after default was higher than that of non-state-owned bonds. After the establishment, the nature of enterprises had no significant impact on the bond repayment.

[4] http://www.pbc.gov.cn/goutongjiaoliu/113456/113469/3649346/index.html

# 3. Research data and model

## 3.1 Data

In this paper, the defaulted bonds from March 2014 to September 2019 are selected as the research samples, excluding convertible bonds and ABS. After removing the samples that are lack of data, 410 research samples are collected from Wind database.

## 3.2 Model

With respect to the model, to test our hypothesis, we build the following one.

$$Repayment_i = \alpha_0 + \alpha_1 SOE_i + \alpha_2 Control\ \mathrm{var}_i + \varepsilon_i \quad (1)$$

The dependent variable is the repayment rate of the default bond i, defined as (paid principal + paid interest) / (default principal + default interest), and the independent variable SOE is a dummy variable of "whether it is a state-owned enterprise or not", which equals to 1 when the enterprise is SOE and 0 when it is not. The control variables include the bond quantity issued (refer to quantity, unit: 100 million), listed company (refer to whether the enterprise is listed or not, dummy variable, listed=1, non-listed = 0), the guarantee feature (refer to whether the enterprise is guaranteed or not, dummy variable, guaranteed=1, Otherwise=0), callable terms (call, refer to whether the bond has callable terms, dummy variable, with callable clause=1, otherwise 0), putable terms (put, refer to whether the bond has putable terms, dummy variable, with putable terms=1, otherwise 0), the issuer's cash flow characteristics (cashflow, net cash flow from operating activities / total liabilities), size characteristics (asset, refer to the issuer’s total assets, units: 100 million), in which cash flow and total assets data are used of the year before the issuer defaults.

# 4. Empirical results

## 4.1 Descriptive statistics

**Table 1: Sample summary statistics**

| Variables | Obs | Mean | St.Dev. | Min | Max |
|---|---|---|---|---|---|
| Repayment | 410 | 0.10 | 0.29 | 0.00 | 1.00 |
| SOE | 410 | 0.11 | 0.31 | 0.00 | 1.00 |
| quantity | 410 | 8.59 | 6.34 | 0.10 | 60.00 |
| listed | 410 | 0.24 | 0.43 | 0.00 | 1.00 |
| guarantee | 410 | 0.17 | 0.38 | 0.00 | 1.00 |
| call | 410 | 0.04 | 0.20 | 0.00 | 1.00 |
| put | 410 | 0.45 | 0.50 | 0.00 | 1.00 |
| cashflow | 410 | 0.01 | 0.12 | -1.10 | 0.25 |
| asset | 410 | 475.55 | 517.78 | 2.71 | 3061.13 |
| This table reports the descriptive statistics of the sample, repayment is dependent variable and others are independent and control variables, we list their mean, standard deviation, min and max value. Quantity and size' s unit is 100 million. | | | | | |

According to the statistical results, the average repayment rate of the default bonds is 10%[5], and the default bonds of SOE account for 11% and listed companies account for 24%. Quantity has a mean 8.59 and asset has a mean 475.55.

[5] Among them, there are 36 fully repaid (repayment=1) and 12 are partially repaid.

### 4.2 Regression results

#### 4.2.1 Analysis of the impact of the enterprise's nature on repayment

**Table 2: The SOE impact on repayment regression**

| Variables | （1） | （2） | （3） | （4） |
|---|---|---|---|---|
| | Repayment | Repayment | Repayment | Repayment |
| SOE | 0.116** | 0.100** | 0.119*** | 0.108** |
| | （2.543） | （2.124） | （2.610） | （2.276） |
| quantity | | -0.002 | | -0.005* |
| | | （-1.088） | | （-1.736） |
| listed | | -0.023 | | -0.026 |
| | | （-0.682） | | （-0.769） |
| guarantee | | -0.014 | | -0.012 |
| | | （-0.352） | | （-0.302） |
| call | | -0.097 | | -0.102 |
| | | （-1.353） | | （-1.421） |
| put | | -0.032 | | -0.021 |
| | | （-1.089） | | （-0.680） |
| cashflow | | | 0.082 | 0.103 |
| | | | （0.702） | （0.885） |
| asset | | | 2.61E-05 | 4.91E-05 |
| | | | （0.940） | （1.468） |
| c | 0.085*** | 0.135*** | 0.071*** | 0.123*** |
| | （5.651） | （4.298） | （3.518） | （3.815） |
| Obs | 410 | 410 | 410 | 410 |

Notes: This table presents regression results for repayment and SOE with 410 samples from 2014 to 2019. Independent variable is the repayment. T-statistics are reported in parentheses. *, ** and *** stand for significance at 10%, 5% and 1% levels, respectively.

Table 2 shows the impact of enterprise nature (SOE or not SOE) on repayment after default. We make a total of four groups of analysis, each of which including enterprise nature (SOE) variable to test hypothesis 1. In regression 1, only SOE variable is included, in regression 2 and 3, bond property variables and enterprise financial variables are added respectively; in regression 4, all variables are added.
From the results, the nature variables (SOE) of the enterprises are all significantly positive, indicating that the repayment rate of state-owned enterprise bonds after default is significantly higher than that of non-state-owned enterprises, which verifies hypothesis 1, that is, the bonds of state-owned enterprises have higher repayment rate relative to non-state-owned enterprises. From the four groups of regressions, the coefficient of the SOE variable is between 0.1 and 0.12, that is,

state-owned enterprise bonds are 10%-12% higher than the non-state-owned enterprise in repayment rate after defaults. Looking at other variables, the larger the bond issuance, the more difficult it is to pay after default. However, the larger the bond issuance, the better its image in the debt financing market, which is conducive to its refinancing and repayment of bonds. In total, the impact is negative and the degree of significance is low. In terms of listing, listed companies have more financing channels, which are conducive to their financing and debt repayment. However, listed companies may also conduct more equity pledge financing. When the stock market falls, it is easy to meet its margin calls and it will bring more risk to their liquidity chain (such as 2018). This will bring uncertainty to the repayment of default bonds. Furthermore, guarantees, callable and putable terms, financial cash flows and size indicators do not have a significant impact on their repayment.

### 4.2.2 Study on the impact of government's comprehensive strength and debt ratio on the repayment of default bonds

According to hypothesis 1, after the default of a state-owned enterprise, the shareholder is usually the local government or local state-owned assets supervision and administration commission, which can give some support to the enterprise. This forms an effect of "implicit guarantee" and promotes the repayment process of defaulted bonds. This section will explore the channel of this effect.

$$Repayment_i = \alpha_0 + \alpha_1 GDP_i + \alpha_2 Debt - ratio_i + \alpha_3 Control\ \mathrm{var}_i + \varepsilon_i \qquad (2)$$

$\mathrm{GDP_i}$ and $\mathrm{Debt} - ratio_i$ represent the GDP and debt ratio of the province where the default bond i is located.

For provinces with stronger economic strength and higher debt ratio, the "implicit guarantee" and support for their enterprises may be stronger. We use GDP to represent their economic strength, and the local government debt[6] /GDP to represent their debt ratio. Data source is Wind database.

In formula (2), the repayment rate and the control variables are the same with formula (1). Considering that the 2018 repayment number is the largest in recent years, the GDP and debt-ratio use the data of the provinces at the end of 2017 (In the robustness test, we will also examine the data of 2016 and 2018). The regression results are as follows.

[6] Local government debt refers to the debt that local governments and affiliated institutions directly borrow, default or provide credit support such as guarantee and buyback for project construction. This includes debts for which local governments are liable to repay, debts for which they are liable to guarantee, and some other related debts.

**Table 3: The GDP and debt-ratio impact on repayment regression**

| **Variables** | （1） | （2） | （3） | （4） |
|---|---|---|---|---|
| | **Repayment** | **Repayment** | **Repayment** | **Repayment** |
| GDP | 0.015** | | 0.026*** | 0.028*** |
| | （2.508） | | （3.915） | （4.147） |
| Debt-ratio | | 0.673*** | 1.082*** | 1.142*** |
| | | （2.667） | （4.020） | （4.163） |
| quantity | | | | -0.005* |
| | | | | （-1.736） |
| listed | | | | -0.006 |
| | | | | （-0.183） |
| guarantee | | | | -0.017 |
| | | | | （-0.443） |
| call | | | | -0.052 |
| | | | | （-0.732） |
| put | | | | -0.052** |
| | | | | （-1.781） |
| cashflow | | | | 0.182 |
| | | | | （1.574） |
| asset | | | | 4.58E-05 |
| | | | | （1.389） |
| c | 0.039 | -0.018 | -0.188*** | -0.163** |
| | （1.416） | （-0.405） | （-3.002） | （-2.338） |
| Obs | 410 | 410 | 410 | 410 |

Notes: This table presents regression results for repayment and GDP, Debt-ratio with 410 samples from 2014 to 2019. Independent variable is the repayment. GDP and debt-ratio represent the data of the province where the default bond is located. T-statistics are reported in parentheses. *, ** and *** stand for significance at 10%, 5% and 1% levels, respectively.

From the table 3, regression (1) and (2), it can be seen that both GDP and government debt ratio are positively correlated with repayment, which verifies hypothesis 2 that the stronger the comprehensive strength of the government is, the higher the government debt ratio is, the higher the repayment rate will be. When we put two factors in the regression in (3) and then add all control variables in (4), the significant level keeps. The government's economic strength and willingness to pay have raised the probability of repayment. The results of the other control variables are basically the same with the formula 1. In order to further verify that these two channels are more significant for SOE (state-owned enterprise), we added two interaction terms, namely GDP* SOE and debt ratio * SOE to have another test.

**Table 4: The further regression of GDP and debt-ratio impact on repayment**

| **Variables** | （1） | （2） | （3） | （4） |
|---|---|---|---|---|
| | **Repayment** | **Repayment** | **Repayment** | **Repayment** |
| GDP*SOE | 0.032** | 0.031** | | |
| | （2.155） | （2.065） | | |
| Debt-ratio*SOE | | | 0.288* | 0.324* |
| | | | （1.787） | （1.946） |
| GDP | | 0.029*** | | 0.031*** |
| | | （4.312） | | （4.455） |
| Debt-ratio | | 1.122*** | | 1.115*** |
| | | （4.103） | | （4.071） |
| Controls | No | Yes | No | Yes |
| Obs | 410 | 410 | 410 | 410 |
| Notes: This table presents further regression results for repayment and GDP* SOE, debt ratio * SOE with 410 samples from 2014 to 2019. Independent variable is the repayment. GDP and debt-ratio are the data of the province where the default bond is located. T-statistics are reported in parentheses. *, ** and *** stand for significance at 10%, 5% and 1% levels, respectively. | | | | |

In Table 4, (1) and (2), the interaction between GDP and SOE is significantly positive, that is, when the default enterprise is a state-owned, the local comprehensive strength has a greater positive impact on the bond repayment, which indicates that the local comprehensive strength indeed plays a greater role in promoting the default repayment in the bonds of state-owned enterprises. From table (3) and (4), the interaction term between the local debt ratio and SOE is significantly positive, which means that the promotion effect of the local debt ratio on the repayment of defaulted bonds is greater in the bonds of state-owned enterprises.

### 4.2.3 Repayment after default of different rating bonds

Among the 410 bonds in the full sample, 114 were rated AAA and AA+ when issuing, and 296 were rated AA or below when issuing[7]. The regression results of the two sub-samples are as follows.

**Table 5: Repayment after default of different rating bonds**

[7] In Chinese bond market, AA or below are often regarded as high-yield rating.

| **Variables** | **Dependent variable is repayment** | | | |
|---|---|---|---|---|
| | **AAA and AA bond** | | **AA or below bond** | |
| SOE | 0.207** | 0.243** | 0.075 | 0.086 |
| | （2.467） | （2.484） | （1.379） | （4.147） |
| quantity | | -0.003 | | -0.001 |
| | | （-0.977） | | （-0.376） |
| listed | | -0.078 | | 0.018 |
| | | （-1.049） | | （0.441） |
| guarantee | | -0.053 | | -0.005 |
| | | （-0.504） | | （-0.137） |
| call | | -0.149 | | -0.135 |
| | | （-0.948） | | （-1.623） |
| put | | -0.064 | | -0.018 |
| | | （-0.773） | | （-0.511） |
| cashflow | | -0.289 | | 0.171 |
| | | （-0.339） | | （1.415） |
| asset | | 0.000** | | -0.000* |
| | | （2.364） | | （-1.775） |
| c | 0.084*** | 0.055 | 0.086*** | 0.153*** |
| | （2.844） | （0.671） | （4.887） | （3.889） |
| Obs | 114 | 114 | 296 | 296 |

Notes: This table presents repayment after default of different rating bonds. Independent variable is the repayment.114 were rated AAA and AA+ , and 296 were rated AA or below. T-statistics are reported in parentheses. *, ** and *** stand for significance at 10%, 5% and 1% levels, respectively.

From table 5, for high-rated bonds (AAA and AA+), SOE is significant regardless of whether or not the control variable is added. The repayment rate after the default of SOE bonds is higher than that of non-state-owned bonds (20.7%-24.3%), which is also higher than the full sample of 10-12% level. This verifies the first half of Hypothesis 3 (The higher the bond rating, the higher the repayment rate of state-owned bonds relative to non-state-owned bonds after default), and the total asset variable that is not significant in the whole sample is significantly positive now, indicating that the larger the asset size in the high-rated bond, the higher the repayment rate. In low-rated bonds (AA or below), the coefficient of SOE is not only smaller, but also is no longer significant, indicating that in low-rated bonds, the nature of the firm (SOE or non-SOE) has no significant impact on repayment, hypothesis 3 is verified.

### 4.2.4 The impact of the establishment of private enterprise bond financing support instruments on the repayment of defaulted bonds

The higher repayment rate of state-owned enterprises after default may come from more government support and implicit guarantees (through better debt restructuring programs or more local banks support), but after the State Council and the People's Bank of China. announced the establishment of the private enterprise bond financing support tools, the non-SOE enterprise financing and refinancing environment may be improved, so that the advantage of SOE may be no longer significant.

**Table 6: The impact of the establishment of private enterprise bond financing support instruments on the repayment of default bonds**

| Variables | dependent variable is Repayment | | | |
|---|---|---|---|---|
| | Before October 22, 2018 | | After October 22, 2018 | |
| SOE | 0.278*** | 0.264*** | -0.041 | 0.064 |
| | （4.298） | （3.739） | （-0.428） | （0.679） |
| Controls | NO | YES | NO | YES |
| c | 0.021 | 0.071 | 0.041*** | 0.010 |
| | （1.118） | （1.379） | （2.855） | （0.759） |
| Obs | 109 | 109 | 178 | 178 |

Notes: This table presents the impact of the establishment of non-SOE enterprise bond financing support instruments on the repayment of default bonds. We take October 22, the time the State Council and the People's Bank of China promulgating, as the boundary. Independent variable is the repayment. The whole sample are selected from January 2018 to August 2019, 109 samples are before the October 22(boundary day is included in the first subsample), and 178 are afterwards. T-statistics are reported in parentheses. *, ** and *** stand for significance at 10%, 5% and 1% levels, respectively.

From the results, before October 22, regardless of whether or not to add control variables, SOE repayment rate is significantly higher than non-state-owned bonds, the average ratio is 26-28 percentage points higher at 1% significance level. After October 22, 2018, the absolute value of SOE coefficient is greatly reduced, even to be negative when control variables are not added, and the coefficient is no longer significant whether or not the control variable is added, indicating that after policy, the enterprise nature (SOE or non-SOE) has no significant effect on bond repayment, which verifies hypothesis 4.

## 4.3 Robustness test

### 4.3.1 Research results without considering private offering bonds

Private placement bonds differ from publicly-funded bonds in terms of liquidity. At the same time, some investment institutions generally do not participate in the investment of private placement bonds due to internal risk control requirements. In order to make the research objects more suitable for the investment scope of most institutions in the market, we excluded private placement bonds in the first robustness test and observed the test results.

**Table 7: Robustness test of research without considering private offering bonds**

| **Variables** | **（1）** | **（2）** | **（3）** | **（4）** |
|---|---|---|---|---|
| | **Repayment** | **Repayment** | **Repayment** | **Repayment** |
| SOE | 0.138*** | 0.121** | | |
| | （2.641） | （2.206） | | |
| GDP | | | 0.038*** | 0.043*** |
| | | | （4.473） | （4.811） |
| Debt-ratio | | | 1.354*** | 1.406*** |
| | | | （4.409） | （4.522） |
| Controls | NO | YES | NO | YES |
| c | 0.094*** | 0.137*** | -0.254*** | -0.232*** |
| | （5.190） | （3.563） | （-3.607） | （-2.949） |
| Obs | 317 | 317 | 317 | 317 |
| Notes: This table presents the robustness test of research results without considering private offering bonds. Independent variable is repayment. The whole sample is 317. T-statistics are reported in parentheses. *, ** and *** stand for significance at 10%, 5% and 1% levels, respectively. | | | | |

From the test results, the SOE coefficient of samples without private debt is significantly positive in both (1) and (2), which is the same as the full sample. It is also the same for the GDP and debt ratio test of (3) and (4). This supports the conclusions mentioned above.

### 4.3.2 Local GDP and government debt ratio data are selected in 2016 and 2018 respectively

When discussing the impact of the comprehensive strength of the government and the government debt ratio on the repayment of defaulted bonds, we used the data of the provinces at the end of 2017. In the robustness test, we used the data of 2016 and 2018 respectively.

**Table 8: Robustness test of GDP and government debt ratio**

| **Variables** | （1） | （2） | （3） | （4） | （5） | （6） |
|---|---|---|---|---|---|---|
| | **2016** | | | **2018** | | |
| GDP | 0.019*** | | 0.031*** | 0.016*** | | 0.023*** |
| | （2.711） | | （4.117） | （2.643） | | （3.659） |
| Debt-ratio | | 0.650** | 1.143*** | | 0.614*** | 0.861*** |
| | | （2.389） | （3.909） | | （2.742） | （3.731） |
| Controls | YES | YES | YES | YES | YES | YES |
| Obs | 410 | 410 | 410 | 410 | 410 | 410 |

Notes: This table presents the robustness test that local GDP and government debt ratio data are selected in 2016 and 2018 respectively. Independent variable is repayment. The whole sample is 410. T-statistics are reported in parentheses. *, ** and *** stand for significance at 10%, 5% and 1% levels, respectively.

From the data of 2016 and 2018, the government's comprehensive strength (GDP) and debt-ratio both remain significant at the statistical level of 1% or 5%, which supports the conclusion of the article.

## 5. Conclusion

This paper attempts to study the problem of repayment after default in China's bond market from the perspective of the nature of the enterprise. Using the data from 2014 to 2019, this paper discusses the influencing factors and mechanism, and obtains the following conclusions. First, state-owned enterprises have a higher repayment rate after default than non-state-owned enterprises, and on average, the former ones are 10%-12% higher. Second, the higher repayment rate of state-owned enterprise bonds may come from more implicit guarantee by local government by means of economic strength and willingness to pay debts. Studies have shown that the stronger the government's overall strength, the higher the repayment rate of local bonds after default, the higher the government debt rate, the higher the repayment rate. Third, for different rating bonds, the government's willingness to help may be different. The higher the bond rating, the higher the repayment rate of state-owned bonds compared with non-state-owned bonds after default. In low-rated bonds, the nature of enterprises has no significant impact on bond repayment. Finally, this article uses the "non-SOE enterprise financing support tool establishment" as a research example, finding that before it occurs, the repayment rate of state-owned bonds after default was higher than that of non-state-owned bonds, but after the establishment, the nature of the enterprise has no significant impact on bond repayment. This may come from the increased support for non-SOE companies and further explains the impact of implicit guarantee mechanisms on the repayment of default bonds. The contribution of this paper has two aspects. On the one hand, it

uses the latest and most comprehensive Chinese bond market default data to study the repayment problem and the influence mechanisms, this is conducive for us to reduce panic and helpful for some issuers to keep their financing. Second, it offers a thought for investors, they can selectively participate in the post-default bond market, and select suitable targets with high repayment to improve investment returns.

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