
Research on the Influence of Information Accuracy on the Coupon Rate of Local Government Special Bonds in China

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Abstract: The pilot policy of revenue bonds for special project implemented in June 2017 is essentially a transition from "packaged issuance" to "unpacked issuance", which has improved the information accuracy in terms of identifying municipal and county local governments in China. In order to examine the impact of information accuracy on the coupon rate of local government special bonds, this paper regards the pilot policy as a quasi-natural experiment and conducts an empirical study by using the propensity score matching method. The empirical conclusions show that the increased accuracy of information due to the pilot policy has significantly increased the coupon rate of China's local government special bonds. However, increasing the information accuracy blindly may trigger the "Matthew Effect" and increase the financing costs of local governments continuously, which is not conducive to the sustainable development of China's local government special bonds. Therefore, it is necessary to strengthen the management of optimal information accuracy and increase the intensity of information disclosure, so as to realize the financing restriction mechanism of China's local government special bonds market under the balance of the interests between market entities and the government.

Keywords: Local Government Special Bonds, Information Asymmetry, Information Accuracy, Information Disclosure

1. Introduction

Since the implementation of the new Budget Law in 2014, issuing local government bonds has become the only legal method of debt financing for China's local governments. Among them, the scale of local government special bonds has exceeded general bonds since 2019 and will continue to expand. Local government special bonds is playing an irreplaceable role in counter cyclical adjustment such as supplementing the weak board, stabilizing investment and promoting development in China. However, at the initial stage of development, due to the problems of provincial government issuing bonds on behalf of lower local government, package issuing, incomplete information disclosure, invalid information rating and lack of information intermediary, serious information asymmetry exists among investors and issuers. In June 2017, the pilot issue of revenue bonds for special project has improved the information accuracy in terms of subdividing project categories, clarifying repayment subject, balancing project revenue and expenditure, then alleviated the information asymmetry between investors

and issuers to a certain extent.

Based on the quasi natural experiment of issuing revenue bonds for special project in June 2017, this paper explores the impact of information accuracy on the pricing of China's local government special bonds, and puts forward suggestions to alleviate the information asymmetry in the local government special bonds market. The innovations of this paper are as follows: first, it demonstrates in detail the impact of information accuracy on the coupon rate of China's local government special bonds; second, it puts forward suggestions to promote the sustainable development of China's local government special bonds from the aspects of information accuracy and information disclosure.

2. Literature Review

The problem of information asymmetry in municipal bond market has been confirmed. Peng et al (2004) found that information asymmetry problem exists in the municipal bond market [1]. In particular, the revenue bonds which depend on

future income of specific projects to repayment face more serious information asymmetry than general bonds, and investors will demand more risk compensation, which leads to the yield of revenue bonds higher than that of general bonds. As far as China's local government bonds market is concerned, Wang Zhiguo (2015) thought that because local governments have information advantages, the implicit guarantee of central government not only improves the credit rating of local government bonds, but also causes the moral hazard of hiding information of local governments [2]. Yin Qihua and Chen Zhibin (2018) pointed out that because of the principal-agent contractual relationship existing between governments at all levels, superior government faces greater information asymmetry and moral hazard when allocating bond resources [3].

Due to the problem of information asymmetry, the municipal bond market is inefficient [4]. Improving information accuracy, strengthening information disclosure and increasing fiscal transparency are important measures to alleviate information asymmetry in the municipal bond market. The problem of information accuracy first emerged in the field of financial assets. DeMarzo (2005) and Coval (2009) studied the relationship between information accuracy and trading behavior of structured financing and financial asset risk respectively [5, 6]. In view of China's local government bonds market, Wang Yongqin et al. (2015) proposed that there is an inverted U-shaped relationship between market liquidity and information accuracy in China's local government bonds market, and excessive increase of information accuracy will lead to adverse selection [7]. Then, Liu Lezheng and Jiang Xiaowan (2019) found that improving the information accuracy of local government special bonds will improve the issuing interest rate and liquidity level [8].

In addition, some researches have also verified the impact of information disclosure, financial transparency and other factors on the price and liquidity of municipal bonds. Fairchild and Koch (1998) found that in states with mandatory disclosure requirements, the cost of unlisted municipal bonds is reduced by about 14 basis points compared with states without disclosure requirements [9]. Schultz (2012) showed that improving transparency after transaction can significantly reduce the spread of municipal bonds [10]. Zhou Yongmei (2018) found that the higher the financial transparency, the lower the financing cost of local government bonds [11]. In addition, Wang Chongjin and Cui Feng (2020) draw the conclusion that improving financial transparency can significantly inhibit the local government's borrowing behavior based on the trading data of urban investment bonds [12]. In addition, Wang Yongqin et al. (2015), Schultz (2012), Andersen et al (2014) put forward countermeasures from the perspectives of strengthening information accuracy management, increasing information disclosure and improving financial transparency to alleviate information asymmetry [13].

Overall, the information asymmetry of municipal bonds and measures such as increasing information accuracy and information disclosure to alleviate the information asymmetry have been deeply studied. However, due to the immature

development of China's local government special bonds market and the low level of marketization, there are few studies on the information asymmetry of local government special bonds. Only a few studies examined the policy effect of information accuracy, and the relevant research has not kept up with the pace of practical development.

3. Institutional Background and Research Hypothesis

3.1. Institutional Background

The local government special bonds in China refer to the bonds issued by the governments of provinces, autonomous regions and municipalities directly under the central government for the public welfare projects with certain income, and the government funds or special income corresponding to the certain projects shall be used to repay the principal and interest within a certain period of time. As of June 30, 2020, China has issued 3249 local government special bonds, with an issuance scale of 10726.218 billion yuan and an average coupon rate of 3.52%. Divided by the purpose, the newly issued special bonds, replacement special bonds and refinancing special bonds were 9410.183 billion yuan, 1275.894 billion yuan and 49.239 billion yuan respectively. Among the newly issued special bonds, ordinary special bonds and revenue bonds for special project were 4997.144 billion yuan and 440.3939 billion yuan respectively according to the source of repayment funds.

3.1.1. The Institutional Basis of Asymmetric Information of China's Local Government Special Bonds

Currently, information asymmetry of China's local government special bonds is serious due to the imperfect management systems. Firstly, the provincial government issued bonds and relented to the municipal and county governments, causing investors to equate provincial subject credit with bond credit, and fail to correctly identify the default risk of bonds. Secondly, ordinary special bonds are packaged and issued by different entities and different types of projects, making investors unable to supervise the actual usage of bond funds, resulting in the misappropriation of bond funds and the lack of asset management corresponding to the project. Thirdly, imperfect information disclosure system makes it difficult for investors to evaluate the credit quality and default risk of bonds correctly. Fourthly, credit rating is a mere formality, which cannot be used as a reference for investors to identify bond risks. Fifthly, the lack of information intermediaries such as reputable underwriters, financial consultants and bond insurance leads to the interruption of information transmission chain, which cannot effectively alleviate the information asymmetry between investors and issuers.

3.1.2. Implementation of Pilot Policy of Revenue Bonds for Special Project in China

The Ministry of Finance issued a pilot policy in June 2017¹,

¹ The Ministry of Finance: "Notice on pilot issuing local government special bonds which satisfied balance between project income and financing" (Cai Yu [2017] No.

proposing to vigorously develop the revenue bonds for special project corresponding to the income of project asset. Compared with the ordinary special bonds, revenue bonds for special project is essentially an attempt from packaged issuance to unpacked issuance, which improves the information accuracy from three aspects: defining the responsibility subject, collective issuance of similar projects, and limiting repayment sources.

Defining the responsibility subject. Different from the fuzzy naming of ordinary special bonds, revenue bonds for special project directly indicate the city and county where the project is located from the name of bond, which not only clarifies the subject of the issuance, management and information disclosure of special bonds, but also clarifies the debt paying subject. In this way, the problem of soft budget constraints that may arise from the process of issuing and re-lending by provincial governments will be alleviated, thus forming financing constraints on local governments at the municipal and county levels, encouraging local governments to improve the efficiency of special bond funds, and greatly reducing the debt risk of local governments. At the same time, investors will make investment decisions directly based on the economic and financial situation of the municipal and county local governments without the credit guarantee of the provincial government.

Collective issuance of similar projects. Compared with the "big pot of rice" for ordinary special bonds, revenue bonds for special project have achieved the collective issuance of similar projects. Since the construction period and income flow estimation methods of similar projects are relatively close, the problems of maturity mismatch and inaccurate income forecasts will be greatly reduced.

Limiting repayment sources. Since ordinary special bonds do not have a one-to-one correspondence between bonds and projects, they largely rely on the repayment of transfer fees of state-owned land, which is not conducive to the sustainable development of finance. In contrast, the revenue bonds for special project clearly stipulates that the principal should be repaid by the government funds or special income corresponding to the project. It is not allowed to misappropriate income from other projects, pursuing a balance between financing and income. The revenue bonds for special project completely matches the fund with the project, which makes the connotation of the special bond solid.

3.2. Research Hypothesis

The revenue bonds for special project accurately defines the responsibility of debt repayment of the municipal and county governments, thus significantly improved the information accuracy. As the credit risk increases after the bond is released from the guarantee of provincial government, investors may ask for a higher risk premium. Therefore, this paper puts forward the hypothesis:

The pilot policy of the revenue bonds for special project

improves the information accuracy, so as to improve the issuing coupon rate of local government special bonds.

4. Research Design

4.1. Research Method

In order to verify the research hypothesis, the ideal method is to compare the difference of coupon rate between revenue bonds for special project and ordinary special bonds. However, the type of special bonds to be issued may be decided by the local government according to the different characteristics of the project, which has obvious self-selection problem. If the OLS method is used directly for estimation, sample selection bias will be produced. Instead, the propensity score matching method (PSM) can overcome this problem effectively.

In this paper, the basic ideas of PSM method are as follows: in the quasi natural experiment of local government issuing revenue bonds for special project in June 2017, whether the bonds improve the information accuracy is taken as the basis to distinguish the processing group and the control group. Namely, revenue bonds for special project belong to the treatment group, and the ordinary special bonds belong to the control group. The processing effect of individual i to improve information accuracy is $y_{1i} - y_{0i}$, average treatment effect

$ATE \equiv E(y_{1i} - y_{0i})$. Since individuals can only be in one state, only y_{i0} or y_{i1} can be observed. For each individual i in the treatment group, we need to find the individual j in the control group, so that the probability of the individual i and the individual j with the same characteristics entering the treatment group is equivalent. After matching, y_j can be used as the estimator of y_{0i} , i.e. $\hat{y}_{0i} = y_j$. Similarly, for each individual in the control group, a similar individual in the treatment group can be found for matching. In this way, the average treatment effect (ATE) of all samples can be obtained by averaging the treatment effects of each individual.

4.2. Variable Selection

The explained variable is the coupon rate of local government special bonds, which directly describes the financing cost of local government. The processing variable is the type of special bonds, and the value of revenue bonds for special project is 1, indicating that the information accuracy has been improved, and the value of ordinary special bonds is 0. Following the researches of Wang Min et al. (2018), Heda (2018) and Liu Lezheng (2019), three types of variables, namely bond characteristics, issuer characteristics and market conditions, are selected as covariates [14, 15]. Among them, the bond characteristic variables include issuance scale, redemption right, maturity and year. The issuer characteristic variables include regional GDP per capita, fiscal self-sufficiency rate, debt rate, urbanization rate. The market liquidity variables include risk-free interest rate, Shanghai interbank offered rate (Shibor). Details of the variables are shown in Table 1.

Table 1. Definition of variables.

Type	Variable	Symbol	Explanation
Explained variable	Coupon rate	yield	Coupon rate at the time of bond issuance
Key explanatory variable	Type	type	It is a dummy variable that distinguishes whether the accuracy information is improved. Revenue bonds for special project is 1 and ordinary special bonds is 0.
	Scale	scale	Scale of bond issuance
Bond Characteristics	Maturity	maturity	Maturity of bond issuance
	Right	right	It is a dummy variable. If there is a redemption right, the value is 1, otherwise it is 0.
	Year	year	It is a dummy variable. If the bond is issued in 2019, the value is 1, otherwise it is 0.
	GDP per capita	pgdp	Regional per capita GDP, lagged by one year.
Issuer Characteristics	Fiscal self-sufficiency rate	fissself	It is equal to regional general public budget revenue divided by general public budget expenditure, lagged by one year.
	Debt rate	debrat	It is used to measure the scale of local government debt and default risk, which is equal to the balance of local government debt divided by the comprehensive financial resources, lagged by one year.
Market Liquidity	Urbanization rate	urbrat	It is equal to the population of permanent resident of urban area divided by the total population of resident, lagged by one year.
	Risk-free interest rate	Rate1	It is a compensation for opportunity cost and a benchmark for other investment.
	Shanghai interbank offered rate	shibor	It is a measure of the liquidity of the currency market.

4.3. Sample Selection and Data Sources

Since all the local government special bonds issued before the pilot policy in June 2017 were ordinary special bonds, the treatment group and the control group could not be distinguished according to the accuracy of information. Therefore, the sample range of special bonds selected in this paper is from June 1, 2017 to December 31, 2019, and the total number of special bond samples issued during this period is 1891. On this basis, after excluding the special bonds issued by directional underwriting and the bonds issued by five cities with separate planning and Xinjiang Construction Corps, 1650 samples finally entered the model.

The data of coupon rate, type, scale, maturity, issuance year of bonds are from WIND database. Indicators of regional per capita GDP, financial self-sufficiency rate and urbanization rate are calculated according to the data of China's economic network industry database, and the debt rate of each region from 2016 to 2017 is calculated according to the data published by China's local government debt information disclosure platform. The regional debt ratio in 2018 is calculated according to the data published in the final accounts report of each province. In addition, considering that the local government's borrowing behavior is mainly based on the financial and economic conditions of the previous year, and in order to reduce the multicollinearity problem, they are all lagged by one period. The risk-free interest rate is equal to the maturity yield of 1-year treasury bond on the corresponding date of the China's Treasury bond yield curve, and the data of Shibor is from RESSET database.

5. Empirical Results and Analysis

5.1. Descriptive Statistics

Table 2 reports the descriptive statistical results of the main variables. The average coupon rate of local government special bonds is 3.72%. The difference between the maximum value

and the minimum value of coupon rate is large, but the standard deviation is small, which indicates that the overall interest rate of local government special bonds is relatively stable. In terms of bond types, the number of revenue bonds for special project is more than that of ordinary special bonds, indicating that revenue bonds have become the main form of local government special bonds in recent years, but there are fewer bonds with right. The scale of bond issuance varies greatly, which reflects the big difference of fund demand of different projects in different places. The bond issuance maturity ranges from 2 to 30 years, with an average maturity of 7 years. The small standard deviation reflects that the maturity distribution is more uniform. Generally speaking, due to the mixed cross-section data used in this paper, the issuer characteristic variable data and market characteristic variable data of some bond samples are the same. While the difference of financial self-sufficiency rate, debt ratio and urbanization rate is small, the per capita GDP, risk-free interest rate and Shibor differ greatly, which will have an important impact on the coupon rate of local government special bonds.

Table 2. Descriptive statistical results of the main variables.

Variable	Obs	Mean	Std. Dev.	Min	Max
yield	1650	3.72	0.35	2.92	4.75
type	1650	0.714	0.452	0	1
right	1650	0.016	0.127	0	1
scale	1650	33.157	50.705	0.043	457.03
maturity	1650	7.388	4.674	2	30
fissself	1650	0.509	0.215	0.098	1.804
debrat	1650	0.788	0.238	0.037	1.795
urbrat	1650	0.599	0.107	0.296	0.881
lnpgdp	1650	10.969	0.379	10.227	11.851
Rate1	1650	2.927	0.407	2.305	3.798
shibor	1650	2.431	0.412	0.877	2.924

5.2. Empirical Results

5.2.1. Results of OLS

Columns (1), (2) and (3) in Table 3 are OLS regression results of the impact of bond characteristics, issuer

characteristics and market characteristics on the coupon rate of local government special bonds, respectively. The results of these models show that if the type is revenue bonds, the coupon rate is significantly increased. Among them, model (3) has the highest credibility, which shows that the pilot policy has increased the coupon rate of local government special bonds by 5.5 basis points and significant at the level of 1%. Considering the limitations of OLS regression such as selective bias, it is only for reference.

5.2.2. Results of PSM

Firstly, according to the selected covariates, the logit model (column 4 of Table 3) is used to estimate the probability of all samples issuing as revenue bonds for special project to obtain the propensity score value.

Secondly, the propensity score are matched and tested. This paper focuses on the analysis of nearest neighbor matching. Since samples of the control group are relatively small, one-to-four with replacement matching is carried out. As shown in Figure 1, the standardization deviations (% bias) of most variables after matching are less than 10%. Compared with the results before matching (unmatched), except for the slight increase of deviation of debt rate, the standardized deviations of other variables are greatly reduced, indicating that the model meets the balance assumption. In addition, among 1650 observations, 22 of the treated samples are not in the common range, while the control group samples are all in the common value range. A total of 1628 observations are in the common value range, which satisfies the overlapping assumption (Figure 2).

Finally, the average treatment effect is calculated. In the nearest neighbor matching (1-to-4), the estimated ATT is 0.048, and the corresponding t value is 2.06, which is significant at the 5% level, indicating that the issuance of revenue bonds increases the coupon rate by 4.8 basis points, which supports the conclusion of research hypothesis.

Table 3. Regression results of OLS and logit.

Variable	OLS			logit
	(1) yield	(2) yield	(3) yield	(4) type
type	0.025** (2.40)	0.035*** (3.39)	0.055*** (6.22)	
right	-0.095*** (-6.19)	-0.066* (-1.89)	-0.083*** (-2.79)	-
scale	0.000*** (-4.00)	0.000* (-1.69)	0.000 (-0.01)	-0.010*** (-8.05)
year	-0.629*** (-63.36)	-0.622*** (-62.13)	-0.383*** (-29.92)	1.030*** (5.05)
maturity	0.033*** (36.99)	0.032*** (30.90)	0.033*** (37.89)	-0.98*** (-7.20)
lnpgdp		0.031 (0.98)	0.092*** (3.35)	1.121* (2.57)
fissself		-0.032 (-1.18)	-0.085*** (-3.71)	0.439 (1.10)
debtrat		0.145*** (7.42)	0.132*** (7.95)	-0.775*** (-3.02)
urbrat		-0.345*** (-3.10)	-0.478*** (-5.07)	-4.061** (-2.71)
rate1			0.407*** (25.22)	-0.756** (-3.07)

Variable	OLS			logit
	(1) yield	(2) yield	(3) yield	(4) type
shibor			-0.054*** (-5.35)	-0.243 (-1.27)
Constant	3.759*** (320.08)	3.515*** (12.00)	1.761*** (6.72)	-4.998 (-1.22)
obs	1650	1650	1650	1650
R-squared	0.723	0.743	0.816	0.133

Note: t-values are in parentheses, ***, **, and * indicate significant at the level of 1%, 5%, and 10% respectively. The following are the same.

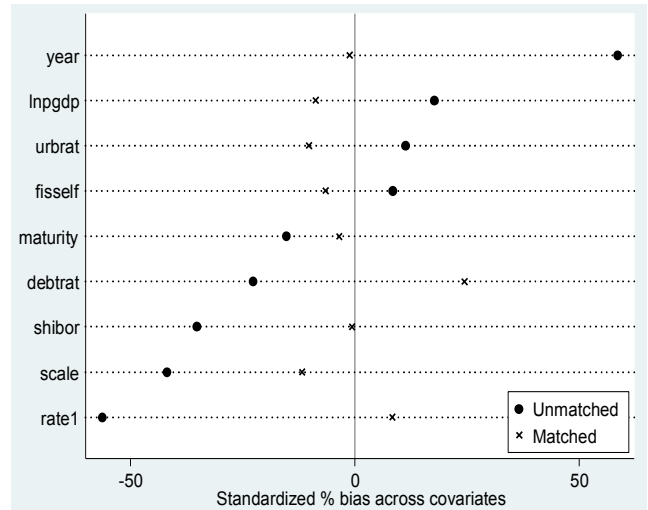


Figure 1. Standardization deviation of variables.

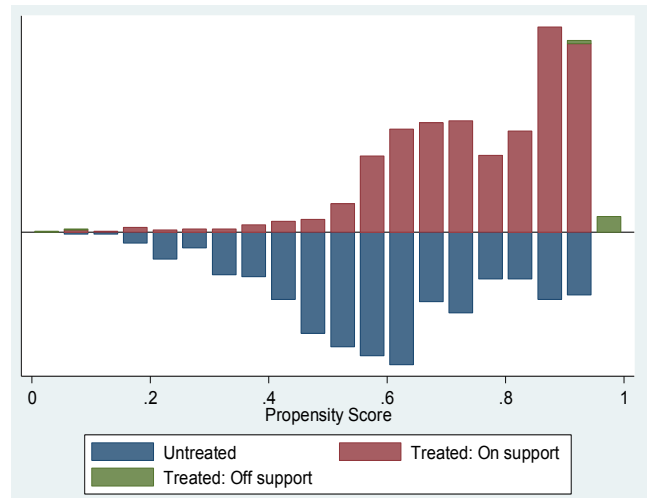


Figure 2. Common value range of propensity score.

5.3. Robustness Test

5.3.1. Results of Using Bootstrap Method to Get Standard Errors

Considering that the standard error reported in the PSM method using logit model ignores the fact that the propensity score is estimated, here we use bootstrap method to get standard errors following Adadie and Imbens (2006) to test [16]. As shown in Table 4, the ATT is 0.048, which is significant at the 5% level, and there is no difference from the benchmark result.

Table 4. Results of bootstrap (nearest neighbor matching).

Indicate	Difference	Standard Error	z	p
ATT	0.048**	0.018	2.74	0.06
ATE	0.039**	0.015	2.60	0.09
ATU	0.016	0.022	0.73	0.464

5.3.2. Results of Using Different Matching Methods

As proposed by Chen Qiang (2014), if the results obtained by different matching methods are consistent, the results are

Table 5. Results of using different matching methods.

Matching Methods	Treatment Group	Control Group	ATT	Standard Error	t
Unmatched	3.672	3.841	-0.169	0.019	-9.09
Nearest Neighbor Matching (n=4)	3.680	3.632	0.048**	0.023	2.06
Caliper Matching (n=4)	3.680	3.632	0.048**	0.024	2.01
Radius Matching	3.680	3.629	0.051**	0.023	2.21
Kernel Matching	3.680	3.641	0.039*	0.022	1.80

6. Conclusions and Suggestions

6.1. Conclusions

Based on the data of local government special bonds issued from June 1, 2017 to December 31, 2019, this paper uses the propensity score matching method to deeply explore the impact of the increased information accuracy due to the pilot policy of issuing revenue bonds on the coupon rate of local government special bonds. In general, after the pilot policy of issuing revenue bonds for special project has improved the accuracy of information, investors abandon the credit guarantees of the provincial government and directly evaluate the risks of bonds with the credit of the municipal and county-level local governments, thus significantly improving coupon rate of the local government special bonds.

6.2. Suggestions

From the aspect of financing efficiency, although improving the information accuracy can guide investors to correctly identify the credit risk of local government special bonds, but blindly increasing the accuracy of information may lead to "Matthew Effect". That is, regions with strong financial and economic strength are more and more easy to obtain infrastructure funds through issuing bonds, while less developed areas are difficult to obtain necessary funds. As a result, the regional differences will be further expanded. From the perspective of financing cost, the improvement of information accuracy makes the main body of bond funds stripped off the guarantee of financial resources and credit of provincial government. In this way, local governments face higher risk premium and financing costs.

From the above two perspectives, we can not only emphasize the improvement of information accuracy, but also explore the optimal management policy of information accuracy to achieve a balance between the interests of the market subject and the government. In addition, in order to reduce the negative impact of improved information accuracy on local governments, local governments are required to strengthen information disclosure and reduce the risk

robust [17]. Therefore, in addition to nearest neighbor matching (1 to 4), this paper also performs caliper (1-to-4) matching, radius matching and kernel matching. According to the ATT results reported in Table 5, except for the result of kernel matching, the results obtained by the other three matching methods are basically the same. The ATT value is about 0.05, and it is significant at the 5% level, which further verifies the robustness of hypothesis.

compensation demanded by investors due to uncertainty, so as to reduce the financing cost of local governments.

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