



Does credit rating agency reputation matter in China's local government bond market?

Author list: Changqian Xie
Rubi Ahmad
Eric H. Y. Koh*

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Abstract

- Why China's local government bond market?
 - The world's **second-largest** and fast-growing
 - All issuers have **the same AAA ratings**
 - **Critics: limited information, unsustainable development**
- Aim: does **credit rating agency (CRA) reputation affect bond risk premium?**
- **Studied a sample** of 7941 local government bonds (2015-2021)
- Two key findings:
 - Those rated by more reputable CRAs enjoy lower risk premiums, and...
 - This is more marked for those perceived as less transparent in fiscal information disclosure



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- 2 Literature review
- 3 Data and methods
- 4 Results and discussion
- 5 Conclusion



Introduction





Local Government Bond Markets

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- 
- **Local governments** (developed & emerging countries) play important roles in supporting economic development and providing healthcare during the COVID-19 pandemic
 - **Bonds** provide key source of funds
 - **China's local government bond market** is the **world's second-largest** local government bond market (\$4.75 trillion at the end of 2021) → an attractive investment target for international investors
 - Evaluating **credit risk** in China's bond market is **challenging** (all the same AAA ratings)



Credit Rating Agencies

Credit rating agencies (CRAs), as **information intermediaries**, provide incremental information to the market and affect bond pricing (Kisgen et al., 2006). They play the following **two types of informational roles**:



Information revelation role

- the disclosure of information on issuers' default risks via their rating services

But for our context: All the same AAA → this role ❌



Information certification role

- rating agencies' reputation may help certify or add credibility to the reliability of ratings



Research Objective

- Credit rating agencies' information revelation role doesn't work well because they give undifferentiated ratings to all bonds in China's local government bond market.

- But we don't know whether credit rating agencies' reputation still matters.

→ Therefore, this paper aims to examine the effect of the credit rating agency reputation on risk premiums of China's local government bonds at issuance.

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Literature Review



Institutional Background (1): Credit Rating Agencies in China

Unlike the U.S. (three major CRAs: Moody, S&P, and Fitch)


→ China's credit rating industry a non-monopoly industry.

The local government bond market in China has seven CRAs, as shown in

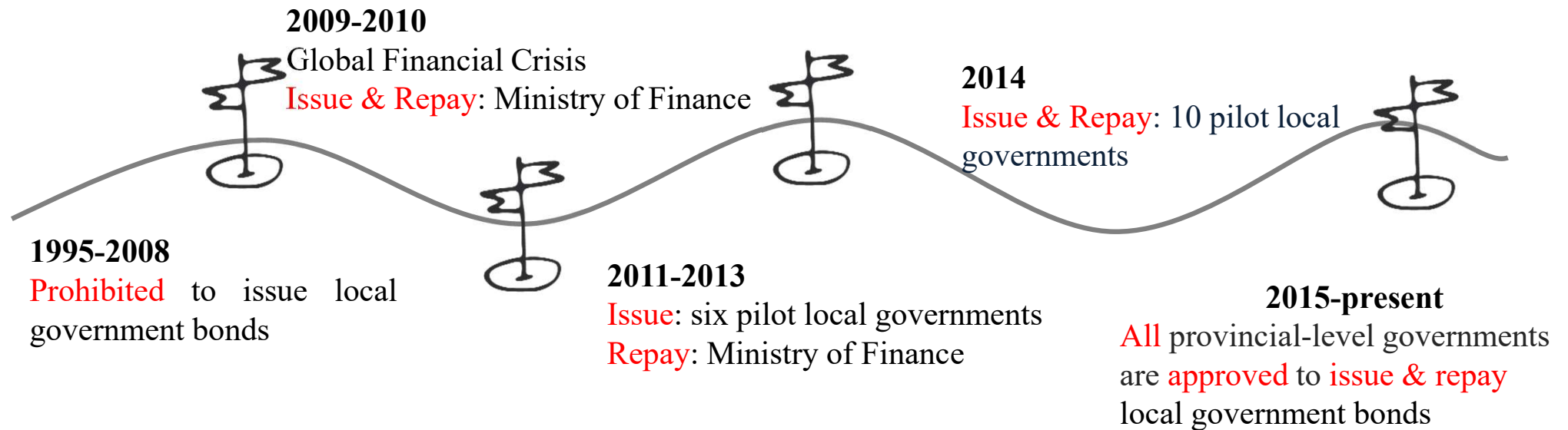
Table 1

Name of credit rating agency	Global partner	Website
CCXI Credit Rating Co. Ltd. (CCXI_Moody)	Moody's	http://www.ccxi.com.cn/
China Lianhe Credit Rating Co. Ltd. (Lianhe_Fitch)	Fitch	http://www.lhratings.com/
Shanghai Brilliance Credit Rating & Investors Service Co. Ltd. (Brilliance_S&P)	S&P	http://www.shxsj.com/
Dongfang Credit Rating Co. Ltd. (Dongfang)	No	https://www.dfratings.com/
CSCI Pengyuan Co. Ltd. (CSCI)	No	https://www.cspengyuan.com/
China Bond Rating Co. Ltd. (CBR)	No	https://www.chinaratings.com.cn/
Dagong Global Credit Rating Co. Ltd. (Dagong)	No	https://www.dagongcredit.com/

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Institutional Background (2): China's Local Government Bond Market Development





Hypothesis Development (1)

rational investor assumption + reputation certification theory



→ CRAs' reputational differences lead to yield differentials



Hypothesis 1 (H1): Employing credit rating agencies with high reputation helps local governments reduce their bonds' risk premiums.



Hypothesis Development (2)

With an increase in information disclosure of local government bond issuers (i.e., increase in fiscal transparency)  → investors pay less attention to the credit rating agencies' reputation 



Hypothesis 2 (H2): Credit rating agency's reputation effect is more important for local governments with lower fiscal transparency to reduce risk premiums.

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Data and Methods





Summary statistics

Variable	Obs	Mean	Median	Standard deviation	Min	Max
Risk Premium 5	7941	28.6754	25.5700	14.2383	-11.6180	85.7800
Risk Premium 0	7941	28.4539	25.1760	14.1781	-16.7400	89.8200
Reputation_CRA	7941	0.3755	0.0000	0.4843	0.0000	1.0000
Fiscal Transparency	7941	3.8151	3.9160	0.3616	2.7318	4.2486
RepFis	7941	1.4279	0.0000	1.8544	0.0000	4.2486
Maturity	7941	9.4104	7.0000	6.5775	1.0000	30.0000
Issue Size	7941	7.6607	7.8095	1.3638	0.6419	10.9495
Issue Frequency	7941	3.7775	3.7136	0.5636	1.6094	5.2781
Bond Type	7941	0.6368	1.0000	0.4809	0.0000	1.0000
Sale Methods	7941	0.1390	0.0000	0.3460	0.0000	1.0000
GDP Year	7941	10.0461	10.1271	0.8795	6.9499	11.6187
GDP per capita	7941	10.9507	10.9230	0.4314	7.6089	12.0130
GDP Growth Rate	7941	7.2908	7.8313	3.9709	-5.3369	21.2441
FAI Growth Rate	7941	6.2211	7.6000	9.1813	-56.6000	23.4000
Debt Ratio	7941	168.8497	153.5076	89.4300	28.0193	527.8049
Public Revenue per capita	7941	8.7242	8.5860	0.5084	7.8853	10.2709
Public Revenue Growth Rate	7941	4.2009	4.4400	7.8319	-33.3700	24.0000
Tbill	7941	2.5098	2.4091	0.5069	1.1177	3.7979

Sample Selection

- Consists of local government bonds from 31 mainland provincial-level governments
- Sample period: 2015 to 2021
- Final sample of 7941 bond issue observations

	Number of bonds	Percentage (%)	Mean risk premium (bp)
Panel A: By bond type			
General obligation bonds	2884	36.32	28.72
Revenue bonds	5057	63.68	28.31
Panel B: By maturity			
1 year	13	0.16	25.53
2 years	28	0.35	26.79
3 years	938	11.81	26.39
5 years	1950	24.56	30.43
7 years	1510	19.02	29.48
10 years	1972	24.83	29.69
15 years	613	7.72	24.63
20 years	490	6.17	24.99
30 years	427	5.38	24.29
Panel C: By year			
2015	924	11.64	26.99
2016	1046	13.17	22.10
2017	1055	13.29	37.03
2018	849	10.69	43.97
2019	972	12.24	27.31
2020	1553	19.56	25.42
2021	1542	19.42	23.00
Panel D: By credit rating agency			
CXXI_Moody	422	5.31	21.20
Lianhe_Fitch	718	9.04	29.68
Brilliance_S&P	1842	23.20	29.30
Dongfang	818	10.30	28.17
CSCI	205	2.58	25.26
CBR	3347	42.15	28.10
Dagong	589	7.42	33.00
Panel E: By region			
East	2672	33.65	26.38
Central	1744	21.96	26.83
Northeast	614	7.73	32.24
West	2911	36.66	30.53
Total	7941	100.00	28.45



Research Method

Our baseline regression model is presented as Eq(1)

$$\begin{aligned} Risk\ Premium_{i,p,t} = & \beta_0 + \beta_1 Reputation_CRA_{i,p,t} + \beta_2 Fiscal\ Transparency_{i,p,t-1} + \\ & \beta_3 RepFis_{i,p,t} + Control\ Variables + Year\ Dummies + Region\ Dummies + \\ & Issuer\ Dummies + \varepsilon_{i,p,t} \end{aligned} \quad (1)$$

where the subscripts i , p , and t represent the bond, issuer, and year, respectively.

Variable definition

Variable Name	Definition
Risk Premium 5	Difference (in bp) between the local government bond's yield at issuance and the average yield of China's central government bond with the same maturity during the past five working days.
Risk Premium 0	Difference (in bp) between the local government bond's yield at issuance and the China's central government bond's yield with the same maturity.
Reputation_CRA	A dummy variable, which equals one if the bond is rated by CCXI_Moody, Lianhe_Fitch, or Brilliance_S&P, and zero otherwise.
Fiscal Transparency	The natural logarithm of the fiscal transparency index for each issuer in the previous year.
RepFis	The interaction term of fiscal transparency and credit rating agencies' reputation variable (Reputation_CRA * Fiscal Transparency).
Issue-specific Variables	
Maturity	Number of years to the maturity of a particular bond issue at the time of issuance.
Issue Size	The natural logarithm of one plus the face value of a particular bond (in million, RMB) at the time of issuance.
Issue Frequency	The natural logarithm of the number of total issuance times in the same year for each issuer.
Bond Type	A dummy variable, which equals one if a particular bond issue is a revenue bond, and zero otherwise.
Sale Methods	A dummy variable, which equals one if a particular bond issue is issued by private placement, and zero otherwise.
Issuer-specific Variables	
GDP Year	The natural logarithm of the issuer's total GDP (in 100 million, RMB) in the previous year.
GDP per capita	The natural logarithm of the GDP per capita (in yuan, RMB) of the issuer in the previous year.
GDP Growth Rate	The GDP growth rate (%) of the issuer in the previous year.
Fixed Asset Investment (FAI) Growth Rate	The fixed asset investment growth rate (%) of the issuer in the previous year.
Debt Ratio	The ratio of the outstanding amount of local government debt to the issuer's comprehensive fiscal revenue (%) in the issuance year ¹ .
Public Revenue per capita	The natural logarithm of the public revenue per capita (in yuan, RMB) of the issuer in the previous year.
Public Revenue Growth Rate	The issuer's public revenue growth rate (%) in the previous year.
Other Variables	
Tbill	The interest rate (%) of the one-year central government bond on the date of the local government bond's issuance.

Correlation matrix

	Risk Premium 5	Risk Premium 0	Reputation_CRA	Fiscal Transparency	Maturity	Issue Size	Issue Frequency	Bond Type	Sale Methods
Risk Premium 5	1.0000								
Risk Premium 0	0.9651	1.0000							
Reputation_CRA	-0.0152	-0.0112	1.0000						
Fiscal Transparency	-0.0575	-0.0561	-0.0272	1.0000					
Maturity	-0.0991	-0.0999	0.0056	0.2637	1.0000				
Issue Size	-0.0711	-0.0679	0.0521	-0.1390	-0.0314	1.0000			
Issue Frequency	-0.1122	-0.1154	0.0686	0.3813	0.2422	-0.1980	1.0000		
Bond Type	-0.0075	-0.0137	0.0243	0.2091	0.2086	-0.3073	0.2315	1.0000	
Sale Methods	0.5267	0.5210	-0.0057	-0.2674	-0.1867	-0.0277	-0.1499	-0.1711	1.0000
GDP Year	-0.1253	-0.1166	0.1007	0.2745	0.1138	0.1891	0.4695	0.1552	-0.1253
GDP per capita	-0.1038	-0.0960	0.0306	0.2098	0.0927	0.0526	0.1985	0.1285	-0.1388
GDP Growth Rate	0.1873	0.2107	-0.1215	-0.1679	-0.1128	0.0381	-0.2543	-0.0330	0.0543
FAI Growth Rate	-0.0261	-0.0151	-0.0256	-0.2683	-0.0919	0.0676	-0.0536	-0.0651	0.0998
Debt Ratio	0.0985	0.0916	0.0138	-0.1657	0.0994	-0.1222	-0.0545	-0.0223	-0.0129
Public Revenue per capita	-0.1168	-0.1116	0.0965	0.0987	0.0072	0.0543	-0.0119	0.0666	-0.0347
Public Revenue Growth Rate	-0.0396	-0.0316	-0.1028	-0.2157	-0.1148	0.0860	-0.2429	-0.0945	0.1335
Tbill	0.3947	0.3830	-0.0015	-0.0712	-0.2763	-0.0061	-0.2206	-0.0494	0.0672
	GDP Year	GDP per capita	GDP Growth Rate	FAI Growth Rate	Debt Ratio	Public Revenue per capita	Public Revenue Growth Rate	Tbill	
GDP Year	1.0000								
GDP per capita	0.4178	1.0000							
GDP Growth Rate	-0.0544	-0.1543	1.0000						
FAI Growth Rate	0.0711	-0.1689	0.4063	1.0000					
Debt Ratio	-0.6019	-0.3498	-0.0976	-0.1348	1.0000				
Public Revenue per capita	0.1911	0.6650	-0.0658	-0.1174	-0.3977	1.0000			
Public Revenue Growth Rate	0.0262	-0.1719	0.5375	0.4583	-0.2622	0.0482	1.0000		
Tbill	-0.0612	-0.0719	0.2194	-0.0365	-0.0801	-0.0690	-0.0357	1.0000	

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Results and Discussion



Baseline regression analysis

Table 8. Baseline regression results. This table reports the estimates of the baseline regression Eq (1).

	Predicted sign	Dependent Variables					
		Risk Premium 5	Risk Premium 0	Risk Premium 5	Risk Premium 0	Risk Premium 5	Risk Premium 0
		(1)	(2)	(3)	(4)	(5)	(6)
Reputation_CRA	-	-0.6136*** (0.2370)	-0.5596** (0.2410)	-5.7837* (3.1190)	-10.9315*** (3.1751)	-6.8213** (3.2781)	-12.3012*** (3.3297)
Fiscal Transparency	-	-1.0418** (0.4479)	-0.8226* (0.4589)	-2.8153*** (0.6541)	-3.3828*** (0.6614)	-2.8147*** (0.6507)	-3.3497*** (0.6586)
RepFis	+			1.5471* (0.8046)	2.7923*** (0.8156)	1.8592** (0.8509)	3.1622*** (0.8609)
Maturity	+	0.0632*** (0.0124)	0.0576*** (0.0113)	0.0466*** (0.0127)	0.0417*** (0.0114)	0.0593*** (0.0129)	0.0547*** (0.0116)
Issue Size	+	0.2342** (0.0927)	0.2018** (0.0931)	0.2247** (0.0912)	0.2007** (0.0915)	0.2020** (0.0903)	0.1662* (0.0904)
				⋮			
Constant		5.2462 (6.1783)	4.2243 (6.3320)	24.5160*** (2.6851)	29.6191*** (2.7027)	-76.6889*** (28.3383)	-65.0953** (28.5797)
Year Dummies		Included	Included	Included	Included	Included	Included
Region Dummies		Included	Included	Included	Included	Included	Included
Issuer Dummies		Excluded	Excluded	Included	Included	Included	Included
Adjusted R-squared		0.5840	0.5730	0.5960	0.5880	0.6060	0.5990
No. of observations		7941	7941	7941	7941	7941	7941

1. Coefficients

of *Reputation_CRA* are **negative**
and **statistically significant**

→ *H1* is supported

2. Coefficients of interaction term

(*RepFis*) are **positive** and
statistically significant

→ *H2* is supported

Endogeneity concern: Heckman two-stage model

Dependent variable: Risk Premium 5	First stage	Second stage
	Probit model of choosing CRA	Risk premiums of local government bonds
Reputation_CRA		-10.0667*** (2.5152)
Reputation_CRA_MarketShare	0.0064*** (0.0018)	
Inverse Mills ratio		0.4405 (1.1240)
Fiscal Transparency	-1.0017*** (0.0624)	-2.1745** (0.9137)
RepFis		2.5092*** (0.6538)
Maturity	-0.0014 (0.0027)	0.0603*** (0.0124)

Coefficients of *Reputation_CRA*, *RepFis* remain negative and positive separately, both are significant at the 1% level

➡ the results are robust with consideration of potential selection bias, *H1* and *H2* are supported



Endogeneity concern: Difference-in-differences regression (1)

Referring to He et al. (2021) and He et al. (2022) and take advantage of **the opening up of the credit rating industry to foreign agencies as exogenous shock** and conduct a DID-OLS regression (Eq(2))

$$\begin{aligned} \text{Risk Premium}_{i,p,t} = & \gamma_0 + \gamma_1 \text{Reputation_CRA}_{i,p,t} + \gamma_2 \text{Reputation_CRA}_{i,p,t} * \text{Post}_t + \\ & \gamma_3 * \text{Post}_t + \text{Control Variables} + \text{Year Dummies} + \text{Issuer Dummies} + \delta_{i,p,t} \end{aligned} \quad (2)$$

Endogeneity concern: Difference-in-differences regression (2)

Table 11. Difference-in-differences OLS regression results. This table reports the regression results based on Eq (2).

	Dependent Variable: Risk Premium 5	Dependent Variable: Risk Premium 0
Reputation_CRA	-15.2346*** (5.0955)	-14.7596*** (5.1544)
Reputation_CRA*Post	-2.1285*** (0.8047)	-1.5364* (0.8144)
Post	3.1792 (2.2212)	2.8312 (2.2096)
Fiscal Transparency	-4.1884*** (1.0694)	-4.2107*** (1.0842)
RepFis	4.5849*** (1.4009)	4.3256*** (1.4159)
Maturity	0.0581*** (0.0177)	0.0528*** (0.0160)

- Coefficients of *Reputation_CRA*Post* are negative and statistically significant → the opening-up policy has a significant impact on the rating industry in China, **thereby effectively alleviating the potential endogenous problems**
- Coefficient of *Reputation_CRA* is negative and statistically significant → supporting **H1**
- Coefficient of *RepFis* is positive and statistically significant → supporting **H2**

Endogeneity concern: Difference-in-differences regression (3)

Table 12. Test of parallel trends assumption. This table reports the results for the test of parallel trends assumption for difference-in-differences OLS regression.

	Dependent Variable: Risk Premium 5	Dependent Variable: Risk Premium 0
Reputation_CRA	-16.1694*** (5.1494)	-15.1900*** (5.2030)
Reputation_CRA*Year2016	1.2793 (1.2809)	1.6460 (1.3505)
Reputation_CRA*Year2017	-2.1976 (1.6101)	-2.2799 (1.7040)
Reputation_CRA*Year2018	0.9067 (1.7523)	1.6594 (1.7909)
Reputation_CRA*Post	-2.2094* (1.2985)	-1.2829 (1.3645)
Post	2.9922 (2.3088)	2.4846 (2.2952)
Fiscal Transparency	-4.0707*** (1.1020)	-3.9390*** (1.1256)
RepFis	4.8597*** (1.4507)	4.3948*** (1.4716)

All coefficients of the three interaction terms (*Reputation_CRA*Year2016*, *Reputation_CRA*Year2017*, and *Reputation_CRA*Year2018*) are **statistically insignificant**

→ there are no differences between the treatment and control groups before the opening event

→ the **parallel trends assumption holds** for the DID-OLS regression

Endogeneity concern: Machine learning method

Based on the framework of counterfactual inference provided by Rubin (1974), we use machine learning method to construct the counterfactual group.

The **t-test** between risk premiums of the factual and counterfactual sets shows a significant difference between the two sets → **the causal relationship between Reputation_CRA (the cause) and risk premium (the effect) can be deemed tenable**

Model of machine learning	Optimizable tree	Optimizable ensemble of trees
Root mean square error	6.3399	5.5068
R-squared	0.80	0.85
Optimized hyperparameters		
Ensemble method	N/A	Bag
Minimum leaf size	1	8
Number of learners	N/A	30
Number of predictors to sample	N/A	1
Optimizer	Bayesian optimization	Bayesian optimization
Statistics		
Number of observations in the counterfactual set	1365	1281
Proportion of the observations of the counterfactual set to the total	45.77%	42.96%
Mean of risk premium in the factual set	28.2757 bp	28.1032 bp
Mean of risk premium in the counterfactual set	28.3760 bp	28.1593 bp
Difference of mean of risk premium between factual and counterfactual set	-0.103	-0.0561
P-value of t-test	0.0565	0.0139

<https://doi.org/10.1371/journal.pone.0274828.t013>

Robustness: Excluding observations with negative risk premium

➤ The main features of the results remain consistent with all the preceding results

→ *H1* and *H2* are supported

	Dependent Variable: Risk Premium 5	Dependent Variable: Risk Premium 0
Reputation_CRA	-5.8774* (3.2222)	-6.4877** (3.1507)
Fiscal Transparency	-2.1889*** (0.6452)	-1.9326*** (0.6244)
RepFis	1.5622* (0.8384)	1.6458** (0.8109)
	⋮	
Adjusted R-squared	0.6010	0.6090
No. of observations	7755	7735

Robustness: Subperiod analysis

- ◆ To alleviate the impact of COVID-19 on our research conclusions, we repeat the baseline regression by excluding data from 2020–2021
- ◆ The main features of the results of this subperiod analysis (2015-2019) remain consistent with the preceding full-period results → support *H1* and *H2*

	Dependent Variable: Risk Premium 5	Dependent Variable: Risk Premium 0
Reputation_CRA	-9.3151*** (3.5313)	-11.7342*** (4.5252)
Fiscal Transparency	-2.8774*** (0.6261)	-4.2322*** (0.8571)
RepFis	2.4667** (0.9646)	2.8455** (1.2326)
	⋮	
Adjusted R-squared	0.6020	0.6040
No. of observations	4846	4846

Conclusion





Conclusion (1)

Our study finds that:

- Engaging more reputable CRAs help reduce bond risk premiums, and
- This impact is more marked in issuers that are perceived to have lower fiscal transparency levels

A series of robustness checks reaffirm these results.



Our paper differs from previous literature in two aspects:

1. We draw attention to the CRA's reputation certification effect in China's local government bond market. This market **has high information asymmetry** and **complex political issues** due to the issuers' unique nature (Butler et al., 2009). Therefore, evidence from other bond markets cannot be directly applied to this market.
2. We **disentangle the CRA's two information roles owing to the specifics of the Chinese local government bond market**. Although some latest studies (Livingston et al., 2018; Hu et al., 2020) have provided evidence on the corporate bond markets, they cannot fully exclude the influence of information revelation role to test the effect of the CRA's reputation certification.



Conclusion (2): Implications



1 For investors

They can rely on the CRA's reputation to complement credit risk analysis. The reason is that these reputable CRAs have more stringent rating standards and provide more reliable information.

2 For issuers

Issuers (local governments) can lower borrowing costs by switching to more reputable CRAs. The impact is more marked for bond issuers that are perceived as being less transparent.

3 For regulators

Regulators should enhance the supervision of CRAs because of their substantial impact on bond pricing and the market's information asymmetry.



Thanks

