Pricing and Risks of China's Local Government Bond Market

by

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INTRODUCTION

Local government's indebtedness and their repayment capabilities sit very near the center of Chinese debt fears. A nationwide audit of government debt by National Audit Office (NAO) in People's Republic of China reveals outstanding local government debt in the amount of RMB10.9 trillion as of June 2013 and RMB 17.9 trillion if debt with explicit or implicit local government guarantees is included. About 50% of the total debt is bank credit, 10% local government bonds and 40% shadow banking financings. This paper will examine the current standings of China's local government bond market and pricings of these local government bonds. Section 1 will give an overview of the local government bond market through discussion of the two major types of local government bonds. Section 2 presents the backdrop of local government financing vehicles problem to provide a comprehensive story. Section 3 examines the pricing of Chengtou Bonds, especially the time variation in pricing Chengtou Bonds. Section 4 concludes.

1. Overview of the Chinese Local Government Bond Market

Two types of local government bonds exist in China: municipal bonds and Chengtou Bonds. Because of the ban of directly issuing bonds in local government level, municipal bonds are issued through the Ministry of Finance on behalf of municipalities since March 2009. Only since very recently in 2014, a pilot scheme allowed 10 economically stable and well-managed municipalities to directly issue bonds by themselves. However, local governments have been issuing urban construction bonds through local governments vehicles for two decades. Particularly, the RMB 4 trillion economic stimulus package

stimulates local governments at all levels to set up LGFVs and accordingly issue Chengtou Bonds.

1.1. Municipal Bonds

The Chinese Budget Law of 1994 prohibits local governments to directly issue bonds unless the State Council approves them, which gave rise to the need of special channels where local governments can circumvent this regulation. In 2009, the State Council allowed the issuance of municipal bonds as a response to stimulate economy following the financial crisis. Since then, municipal bonds with a total notional amount of about RMB 200 billion have been issued annually. However, local authorities still do not have the rights to directly issue bonds to the market; they have to issue through the Ministry of Finance using the issuance channel for Treasury securities. Should the municipalities fail to pay for principal or interests, the Ministry of Finance is responsible for the payments. Therefore, investors consider the municipal bonds as guaranteed by the central government with low default risks. Initially, municipal bonds were issued individually for each municipality. After 2010, the Ministry of Finance started to bundle these municipal bonds to raise funds as a package for multiple local governments. Because of this change, the number of municipal bonds issued decreased form 50 in 2009 to 10 in 2010 and to 7 in 2011. In 2011, the Ministry of Finance experimentally authorized four first-tier provinces and cities (Zhejiang, Guangdong, Shanghai, and Shenzhen) to issue bonds directly for the first time.

In May 2014, the Ministry of Finance extended the freedom to 10 economically stable and well-managed cities (Zhejiang, Jiangsu, Jiangxi, Ningxia, Shandong, and Guangdong provinces as well as the cities of Qingdao, Beijing, Shanghai and Shenzhen) in a pilot program. However the freedom is not unrestricted: the value of bonds that can be sold must be within an annual limit decided by China's cabinet. Any government that fails to sell as many bonds as it is allowed to in a year cannot carry its unused quota into the next year. For 2014, the local governments can sell RMB 400 billion ($64.1 billion) worth of bonds under the experiment program. Local government bonds must be rated rating agencies and use central government bonds prices as benchmark when pricing these municipal bonds. It is interesting that even though yields for those local bonds (Guangdong's is set at 3.84 % for five year bonds, Beijing's at 4.00%) were lower than that of central government bonds, they were brought up in large numbers. Also, all of the 10 municipal bonds have been given AAA credit rating by the domestic firm Shanghai Brilliance Credit Rating & Investors Service Co. despite the outstanding differences in their economic developments between provinces such as Ningxia /Jiangxi and Beijing/Shanghai. Inherent credit risks still do not seem to be priced in yet.

Underwriters can choose where to do the initial offering and consequently where the bonds are traded afterwards, either in the Chinese interbank bond market or the stock exchanges. Since commercial banks, one of the major investors of municipal bonds, are prohibited from trading bonds on the stock exchanges, majority of municipal bonds are issued in the interbank bond market. Both institutional investors and retail investors are

allowed to purchase the municipal bonds. Overseas investors can purchase these bonds through the Qualified Foreign Institutional Investor (QFII) scheme.

1.2. Chengtou Bonds

As the name suggested, Chengtou Bonds are created to raise capital for public projects or real estate in the municipalities. Prior to 2005, most Chengtou Bonds were essentially corporate bonds issued by state-owned enterprises in provincial capitals or cities that are directly controlled by the central government. Shanghai Chengtou Corporatoin (上海城投), one of the largest LGFVs nowadays) issued the first RMB 500 million Pudong Development Bond on behalf of the municipal government in April 1992 to help the municipality to develop Pudong New Area. The central government approved quota of RMB 500 million worth of bond annually for ten consecutive years to support Pudong area.

Since the late 1990s, local governments have been creating financing vehicles backed by land revenues and public assets to borrow money from banks or institutional investors for funding projects. Local governemtn financing vehicles, or LGFVs, are entities set up by local governments, including provincial, city, county and township level governments, to raise funds primarily for infrastructure and real estate development projects. Put in another way, LGFVs are state-owned companies that raise funds for local governments. Because of the maturity mismatch nature of the borrowings, the poor cash flow, and the lack of transparency in financial information, these companies have long been considered as key sources of risk the system.

2. Local Government Financing Vehicles (LGFVs)

2.1. LGFVs Debt Problem

LGFVs have increasingly raised substantial amount of debt in the past five years, which had caused attention from both regulators and investors on the credit worthiness of these exotic financial vehicles and the loomed credit crisis. According to the estimate in *China: Revisiting the LGFV debt problem* published by Nomura Asia Research team, total LGFV debt reached RMB 24.0 trillion at the end of year 2013, which is about 41.9% of Chinese GDP. Compared to debt balance at the end of year 2010, it represents a 74.8% accumulative increase.

The LGFV interest-bearing debt are primarily structured through three major financing channels – bank credit, bond issuance and shadow-banking system (e.g. trust loans, borrowings from securities and insurance companies, private lending). The share of bank credit in LGFV interest-bearing debt is around 71.5% in mid-2013. However, the trend is that bank credit is shrinking while the other two financing channels' shares had gained traction accordingly. Bank loans to LGFVs rose by 7.6% to RMB 11.7 trillion as of mid-2013 from RMB 10.9 trillion in 2012; LGFV bonds outstanding rose by 26.0% to RMB 2.3 trillion from RMB 1.8 trillion; and shadow-banking financing to LGFVs increased by 14.6% to RMB 2.4 trillion from RMB 2.1 trillion.

The current financial situation of the LGFVs is not optimistic. Many of LGFV have seen their cash flow stagnant or decline while their debt continues to pile up. According

to Moody's, only 53% of 388 surveyed companies, had sufficient cash resources to cover estimated principal and interests payments in 2013 without refinancing. According to Nomura research, LGFVs with negative operating cash flow stand at around 32% in a sample of 448 LGFVs that disclosed their financial information for H1 2013. The return on equity falls to around 1.9% in 2011. The stress test conducted by Nomura team shows that if interest rates rose 100 basis point, the potential non-performing debt ratio for LGFV debt rises by around 10 percentage points. Without local government support to LGFVs, Nomura estimated, over half of LGFV debt would have been at risk of default in 2014. In the case of a liquidity crisis, that number could easily go up to 70 percent.

The impact of murky LGFVs also draws on the non-performing loans (NPL) in banks. The financial weaknesses of these vehicles raised the credit risks for commercial banks in China. Loans to LGFVs, estimated to be RMB 9.2 trillion, accounts for 14% of total bank loans at year-end 2012, according to Moody's Investors Service estimates. As a result of local governments' support, and not because of the LGFVs' intrinsic financial strength, banks' reported non-performing loans (NPLs) remain low, around or below 0.5% of their total LGFV loans. Local government support to the LGFVs has come in the form of subsidies, capital injections and involvement in debt renegotiations. While LGFV loans are typically collateralized, there are few precedents in which Chinese banks acquiring and selling collateral from their quasi-governmental borrowers. Coupled with the illiquid nature of those collaterals, there is a high degree of uncertainty regarding the actual protection offered by such collateral.

2.2. Correlation between Chengtou Bonds and Land Sales

The main revenue source for municipalities is land sales. While local governments do have the power to collect certain taxations from local companies and individuals, the taxes collected by local authorities are only a small portion of the total taxes paid to central governments. Thus, the major channel for local governments to finance their bond repayments is through selling lands. As urbanization continues to gain momentum in China, cities expand rapidly by taking over the peripheral lands around the city. Thus, one direct reflection of local government bond yield is the real estate market in the local area. We would imagine that real estate is a major driver in pricing local government bonds.

3. Pricing of Local Government Bonds

Little quantitative research is found on the Chinese local government bonds. Han (2011) descriptively identifies a positive relation between the issuance size of Chengtou Bonds and the GDP of the local government. Shan and Hu (2011) examined how issuance size, maturity, and credit ratings affect the bond's coupon rate.

Sheng Wang and Fan Yu, in their paper *What drives Chinese Local Government Bond Yields*, examined the determinants of the yield spread on two types of Chinese local government bonds that are publicly traded in the Chinese interbank bond market. Wang and Yu tracked Chinese local government bonds traded in the interbank bond market from 2009 to 2011 and used regression analysis to identity factors that influence the yield spread on these local government bonds. They find that the pricings of municipal bonds

issued through the Ministry of Finance is largely unrelated to the economic condition and fiscal performance of the issuing local authorities, suggesting that investors treat these securities as quasi-Treasuries. In addition, the strongly negative correlation between yield and issuance size suggests the *illiquidity* is the major concern for this type of municipal bonds among investors. In fact, only 6 out of 5 municipal bonds issued in 2009 were actively traded in the interbank market from 2009 to 2011. Their research shows that for Chengtou Bonds, pricings are statistically significantly correlated with key economic and financial indicators of the bond issuer and issuing local governments. However, counter-intuitively, they find that the yield spread on Chengtou Bonds is negatively related to the issuer's leverage ratio, which may suggest the investors believe that lower quality issuers are not allowed to fully participated in the market. Similarly to municipal bonds, the issuance size for Chengtou Bonds negatively influences its yield spread.

3.1. Data Collection

The biggest challenge in collecting data on Chinese municipal bonds is that "local government financing vehicles" is not a strict legal category of corporate entities in China. As a result, there is no official listing of LGFVs provided by central government or other institutions. However, there are widely accepted key features regarding LGFVs. LGFV is 1.) a legally independent corporation or institution, with 2.) a specific local government as the only or dominant owner 3.) that invests in urban infrastructure projects.

Using such criteria as guidance and the automatic compiled category of CTBs in the WIND database, I collect bond information on CTBs issued by provincial level local governments from 2008 to May 2015. Prior to 2008, the total volume of CTBs was negligible with less than 100 bonds issued on provincial, prefectural, and county level in total. 1732 CTB issues by provincial level local government in 2008-2015 are identified. CTBs are primarily traded in the inter-bank market and on the Shanghai Exchange. Panel In 2009, CTB issuances spiked to historical high as a result of the RMB 4 trillion stimulus package provided by the Chinese authority to stimulate the slacking economy. The central government only funded RMB 1.2 trillion for the stimulus package; the remainder of RMB 2.8 trillion is provided by local governments. Local governments relied heavily on CTB market to raise funds considering the strict restrictions on municipal bond issuance during this period. Currently the rating is not mandatory for bonds in China, but each bond issuer is required to be rated, by domestic rating agencies in mainland China.

The offering yield spread is calculated as the difference between a matching China treasury bond issued at approximately same time with similar maturity and the corresponding CTB.

Next, quarterly GDP growth rates at each province are collected to represent the prospect of future economic growth at each province. In addition, I rank provinces by GDP per capita and assign the rank number respectively to each province at the year to

calculate annual GDP per capita level. GDP per capita level is used to reflect the relative standing of each province's economic situation.

Finally, housing price increase is calculated as the growth rate of housing price in decimal number at the issuer city, using the price of the same period last year as baseline. The regression analysis provides preliminary evidence of a negative relationship between CTB's yield spread and previous housing price growth. As mentioned earlier, since local governments do have much authority in levying taxes, they rely extensively on land sales to generate cash flow to repay coupon and principal payments of the debt. Thus, we use the growth rate of housing price at issuer's city level as a proxy for market participants' price expectation s on local housing price risk.

3.2. Regression Analysis

I test the hypothesis that CTBs reflect the risk associated with the general economic trends in the issuer province, the local housing market, the ratings given by Chinese domestic rating agencies, and liquidity conditions as reflected by issue size.

My initial analysis focuses on differences in the offering yield spreads levels across CTB and estimate the yield spreads with the following regression:

$$r_{i,l} - r_{i,T} = \alpha + \beta_1 \times Issue\ Size + \beta_2 \times Bond\ Rating + \beta_3 \times Issuer\ Rating + \beta_4 \times Maturity + \beta_5 \times CGB\ rate + \beta_6 \times Housing\ price\ increase + \beta_7 \times overall\ GDP\ growth\ rate + \beta_8 \times GDP\ per\ capita\ level + \varepsilon_i$$

Where $r_{i,l}$ is the yield to CTB at issuance and $r_{i,T}$ is the yield to China government bond (treasury bond) with matching maturity to the CTB issued at the same time. Issue size represents the liquidity conditions of CTBs. Bond ratings and issuer ratings reflect the credit risks viewed by local rating agencies. Housing price increase reflects the local housing market risk. GDP growth rate and GDP per capita level represent the macro-economic trend at the province and the relative financial standing of each province compared to the rest of the country. Figure 6 summarizes all the variables. Figure 7 provides the results for the regression.

As expected, we find a positive relation between offering yields and maturity, the significant coefficient suggesting that investors require higher returns on longer-term bonds in general. The positive coefficient between CGB rate and yield spreads speaks for the fact that when the risk free rate is higher, investors require higher yields on CTBs as well. We observe negative correlation between issue size, bond rating and issuer rating, all of which are consistent with our expectation. As a proxy for liquidity, larger issue size representing better liquidity situation, better bond ratings and issuer ratings representing lower credit risks perceived by the rating agencies, will be rewarded with lower yield spreads requirement from investors. The significantly negative coefficient for housing price growth verifies our hypothesis on the linkage between the real estate market and the CTB market. Higher housing price growth signifies high potential in the local real estate market, lowering the risks in repaying the debt for local governments. Thus, market participants reward higher housing price growth with low spreads. Similarly, the negative coefficient of GDP per capita level suggest that CTBs issued by wealthier provinces have

lower yield spreads as investors foresee lower risks in these area. Interestingly, the overall GDP growth rate is positively correlated to the CTB yield spreads, suggesting that, counter-intuitively, higher GDP growth rate might implicitly correlate with some factors that investors consider as higher risks.

To further test the time variation effects on CTB pricings, dummy variables with different year as the threshold year have been added to the regression. After experimenting with different cut-off years, I found that 2011, as the cut-off year, has the most significant coefficient, which suggests that pricing of CTB experienced significant change from the 2008-2010 period to the 2011-2015 period. Since issue size and CGB rate are no longer statistically significant, regression without these two predictors is shown to summarize the relation between yield spreads and other predictors. Figure 8 summarizes the regression results with time variation.

$$
\begin{aligned}
r_{i,l} - r_{i,T} \; = {} & 2.722474 - .0964128 \times Bond\ Rating - .2321195 \times Issuer\ Rating \\
& + .1352052 \times Maturity - 2.057823 \times Housing\ Price\ Increase \\
& - .0120067 \times GDP\ per\ capita\ level + 4.917648 \\
& \times GDP\ per\ capita\ level + .6836404 \times f(issue\ date) \\
& = \begin{cases} 0, & issue\ date < 1/1/2011 \\ 1, & issue\ date \geq 1/1/2011 \end{cases} + \varepsilon_i
\end{aligned}
$$

Finally, interactions between the dummy variable and other independent factors are added to the regression equation. Figure 9 summarizes the results. The negative coefficient of the dummy variable suggests that if everything remains the same, investor

demand higher return on CTBs after 2011. The booming shadow banking system in 2010-2011 extracted capitals to flow out of other investment alternatives might be one reason for such increase. As we can see from the summary table, coefficient for bond ratings changes the sign after 2011. One level better bond rating has less impact on the yield of CTB compared to the period prior to 2011. One potential explanation is that the accumulation of local government bonds up to 2011 brought the too-big-to-fail psychology in rating agencies, rendering higher bond ratings for CTB issued after 2011 and smaller influence of bond credit ratings on the yield spreads. The change of sign in maturity suggests that investors prefer shorter-term maturities as the risks of CTBs increase with time. The coefficient of housing price growth also changes its sign after 2011. Since 2011, the market became more aware of the potential crash of the real estate market, thus rewarding the higher growth of housing prices in a certain province with lower required yield spreads on its CTBs.

4. Conclusion

Given the fiscal stresses and legal restrictions on financing alternatives placed on local governments, municipalities in China have developed sophisticated Chengtou bond market to meet the needs in funding infrastructure projects to further fuel economic growth. As show in the analysis, CTB market is closely intertwined with other pieces in the Chinese financial system, including the real estate market and the shadow banking system. This distinct feature distinguishes the local government bonds in China from their counterparts of municipal bonds in the western financial system because unlike

municipal bonds in the west, China's local government bonds seem to have the power in causing systematic risks and even structural upheavals due to their unique relations with the real estate and the murky shadow banking sector. Thus, research on issuing yield spreads of the local government bond market, especially CTBs, could provide us insights on the larger picture of the risks in China's financial system.

A few directions can be taken on for further research. First, the analysis could be expanded to all three levels – provincial, prefectural, and county levels – Chengtou bonds provided information on GDP and housing prices can be gathered on prefectural and county levels. Lower local government entities have speeded up issuing CTBs in recent years to stimulate the economy. An analysis on the pricing differences among these three levels of issuances could shed some light on the potentially diverse risks underlying these various local governments. Second, if financial statements data of LGFVs are available to the public, fiscal information could also be used as indicators to examine the heterogeneity of credit risks across the wide variety of LGFVs.

Figures:

Figure 1 - Annual Issue Size of Chengtou Bonds (2000-2013). This graph is based on all Chengtou Bonds contained in the WIND database. The unit for the issue size is 100 million yuan.

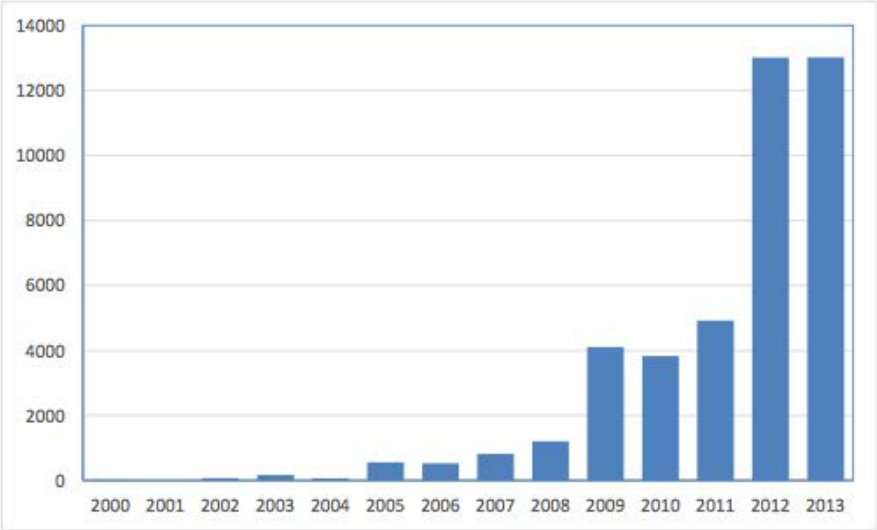


Figure 2 – Government and Corporate Bond yield. Source: WIND and Nomura Global Economics

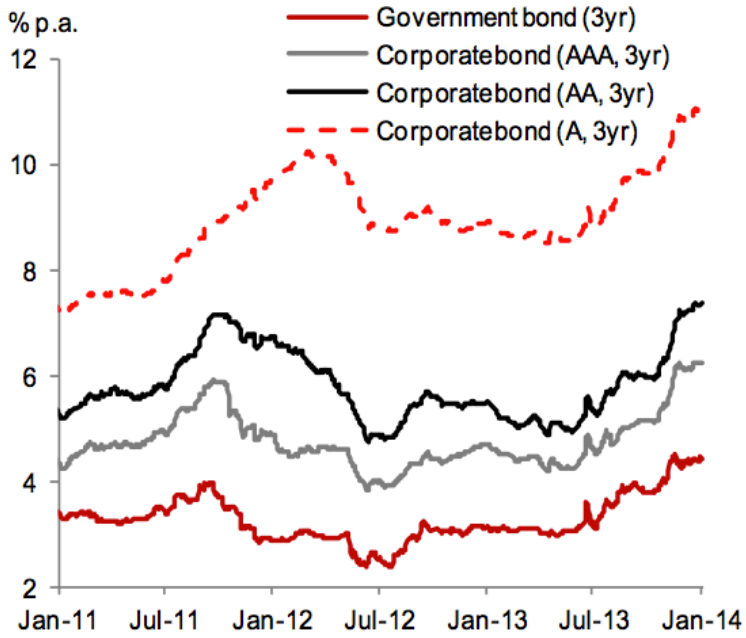
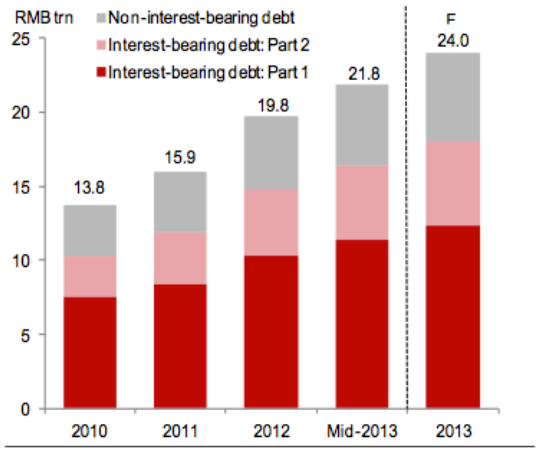


Figure 3 – LGFV outstanding debt and a breakdown of total government debt

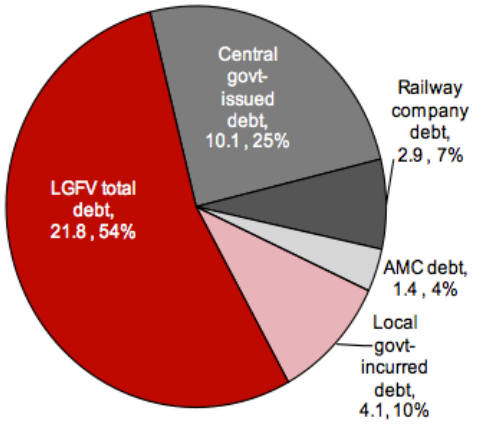
Fig. 3: LGFV outstanding debt



Note: Part 1 of interest-bearing debt mainly refers to provincial- and city-level LGFVs captured in our sample; Part 2 mainly refers to county- and township-level LGFVs not captured in our sample. Source: WIND, NAO 2013 Audit Report and Nomura Global Economics.

Fig. 4: A breakdown of total government debt

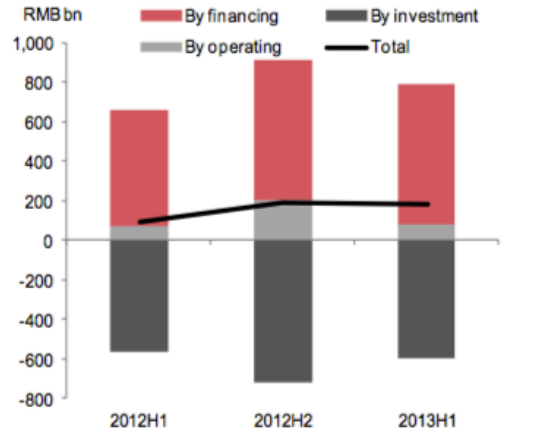
(RMB trn, % of total government debt, as of mid-2013)



Note: There may be double-counting between local government debt and LGFV debt. Source: WIND, NAO 2013 Audit Report and Nomura Global Economics.

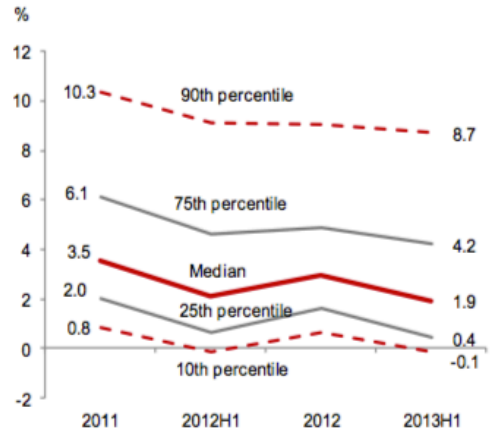
Figure 4 – Overall cash flow in the sample of LGFVs and ROE of LGFVs

Fig. 5: Overall cash flow in the sample of LGFVs



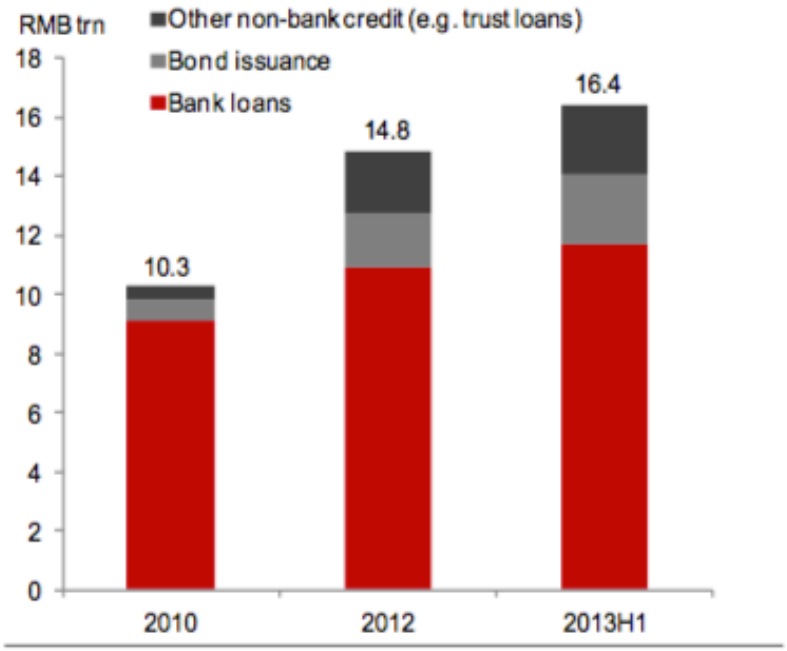
Note: Estimates done on a balanced sample of 448 LGFVs.
Source: WIND and Nomura Global Economics.

Fig. 6: Return on equity of LGFVs



Note: Estimates done on a balanced sample of 448 LGFVs.
Source: WIND and Nomura Global Economics.

Figure 5 – Financial Channels for LGFV interest-bearing debt



Note: Estimates for 2010 and 2012 made based on our sample and for H1 2013 based on the NAO 2013 report. Source: WIND, NAO 2013 Audit Report and Nomura Global Economics.

Figure 6 (1) – Data Description Summary

Data Label	Description
Issue Size	Issue Size per bond in **Billion Yuan**
Bond Rating	Bond Rating at Issuance – **AAA, AA+, AA, AA-, A+, A, A-** coded with 7~1 and 0 if missing
Issuer Rating	Issuer Rating at Issuance – same coding as above
Dummy	Dummy variable to test the borderline year. **0 if issued before (and include) 2011, 1 if after 2011**
Issue Date	Issue Date
Maturity Date	Maturity Date
Maturity	Maturity in years – **from 1 month to 15 years**
Bond Yield (%)	= coupon rate since all samples were issued at par
Issuer	Issuer

Province	The province of issuer
City	The city of issuer
CGB Rate (%)	China's government bond with the **matching maturity** at the same issuance time
GDP Growth Rate (.)	GDP Growth Rate of the province at the issuance time
GDP Per Capita level (31)	The **rank** of the province in a particular year according to its GDP per capita, 1 lowest
Housing Price Index	Housing price index at the city by setting the price of the same period last year as 100
Housing Price increase (.)	Housing price growth rate at the city using the price of the same period last year as baseline
Yield Spread (%)	**Bond Yield - CGB yield**

Figure 6 (2) – Descriptive Statistics

stats	YieldSpd	CpnRate	CGBrate	ISize	BRating	IRating
mean	2.559947	6.138077	3.57888	1.281443	3.649538	5.640878
sd	.8353445	.9893341	.4224371	.996724	2.816994	1.232767
skewness	.4151753	.3476522	.2076837	2.657308	-.3107845	-2.211476
p5	1.2834	4.7	3.016117	.3	0	4
p25	1.939557	5.385	3.216071	.6	0	5
p50	2.474049	6.06	3.490518	1	5	6
p75	3.11561	6.8	3.93429	1.75	6	6
p95	4.0212	7.95	4.339433	3	7	7

stats	Maturity	HousChg	GDPgr	GDPpcl~l
mean	4.827273	.0402182	.10319	18.50462
sd	2.662708	.0475147	.0262906	9.421112
skewness	.568409	.7553387	.5114301	-.3296278
p5	1	-.014	.07	3
p25	3	.005	.084	9
p50	5	.034	.1	20
p75	7	.068	.121	27
p95	10	.12	.15	31

Figure 7 – Baseline Regression Table.
This table presents the baseline regression results based on the 1732 observations of CTBs issued on the provincial level from 2008 to 2015.

Source	SS	df	MS	Number of obs =	1730
				F(8, 1721) =	101.78
Model	387.484107	8	48.4355133	Prob > F =	0.0000
Residual	819.012916	1721	.475893618	R-squared =	0.3212
				Adj R-squared =	0.3180
Total	1206.49702	1729	.697800476	Root MSE =	.68985

YieldSpd	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ISize	-.0372409	.0183572	-2.03	0.043	-.0732457	-.001236
BRating	-.0964364	.0082544	-11.68	0.000	-.1126262	-.0802466
IRating	-.219069	.0145433	-15.06	0.000	-.2475934	-.1905445
Maturity	.1163401	.0092733	12.55	0.000	.098152	.1345283
CGBrate	.1546697	.0496965	3.11	0.002	.0571977	.2521417
HousChg	-1.464127	.4115607	-3.56	0.000	-2.271339	-.6569149
GDPgr	4.521053	.690968	6.54	0.000	3.165827	5.876278
GDPpclevel	-.0118166	.0018236	-6.48	0.000	-.0153933	-.0082399
_cons	2.891117	.2213625	13.06	0.000	2.456949	3.325284

Figure 8 (1) – Adjusted Regression Table 1.
This table presents the baseline regression results based on the 1732 observations of CTBs issued on the provincial level from 2008 to 2015, with dummy variable representing the year 2011 as the cut-off year.

Source	SS	df	MS	Number of obs =	1730
				F(9, 1720) =	102.74
Model	421.836435	9	46.870715	Prob > F =	0.0000
Residual	784.660588	1720	.456198016	R-squared =	0.3496
				Adj R-squared =	0.3462
Total	1206.49702	1729	.697800476	Root MSE =	.67542

YieldSpd	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ISize	-.0280597	.0180045	-1.56	0.119	-.0633726	.0072533
BRating	-.0963334	.0080818	-11.92	0.000	-.1121846	-.0804821
IRating	-.2258018	.0142603	-15.83	0.000	-.2537712	-.1978324
Maturity	.1360885	.0093603	14.54	0.000	.1177298	.1544473
CGBrate	.032036	.050668	0.63	0.527	-.0673415	.1314134
HousChg	-1.887264	.4058938	-4.65	0.000	-2.683361	-1.091166
GDPgr	4.994255	.6787127	7.36	0.000	3.663065	6.325444
GDPpclevel	-.0116852	.0017855	-6.54	0.000	-.0151873	-.0081832
1.Dummy2	.6613798	.0762166	8.68	0.000	.5118928	.8108668
_cons	2.603847	.219247	11.88	0.000	2.173828	3.033866

Figure 8 (2) – Adjusted Regression Table 2.
This table presents the baseline regression results based on the 1732 observations of CTBs issued on the provincial level from 2008 to 2015, with dummy variable representing the year 2011 as the cut-off year.

Source	SS	df	MS		
Model	420.498104	7	60.0711577	Number of obs	= 1730
Residual	785.998918	1722	.456445365	F(7, 1722)	= 131.61
				Prob > F	= 0.0000
Total	1206.49702	1729	.697800476	R-squared	= 0.3485
				Adj R-squared	= 0.3459
				Root MSE	= .67561

YieldSpd	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
BRating	-.0964128	.0080283	-12.01	0.000	-.1121591	-.0806665
IRating	-.2321195	.013545	-17.14	0.000	-.2586859	-.2055531
Maturity	.1352052	.0085743	15.77	0.000	.1183882	.1520223
HousChg	-2.057823	.3588206	-5.73	0.000	-2.761593	-1.354053
GDPgr	4.917648	.6597271	7.45	0.000	3.623697	6.211599
GDPpclevel	-.0120067	.0017747	-6.77	0.000	-.0154874	-.0085259
1.Dummy2	.6836404	.0730017	9.36	0.000	.540459	.8268218
_cons	2.722474	.1402452	19.41	0.000	2.447405	2.997542

Figure 9 – Interaction Effect Regression Table.
This table presents the baseline regression results based on the 1732 observations of CTBs issued on the provincial level from 2008 to 2015, with dummy variable representing the year 2011 as the cut-off year and interaction effects between the dummy variable and other predictors.

Source	SS	df	MS
Model	452.490219	12	37.7075182
Residual	754.006804	1717	.439141994
Total	1206.49702	1729	.697800476

Number of obs	1730
F(12, 1717)	85.87
Prob > F	0.0000
R-squared	0.3750
Adj R-squared	0.3707
Root MSE	.66268

YieldSpd	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
BRating	-.4903589	.1036378	-4.73	0.000	-.6936286	-.2870891
IRating	-.207692	.0799776	-2.60	0.009	-.3645558	-.0508282
Maturity	-.0256981	.0382679	-0.67	0.502	-.1007547	.0493585
HousChg	4.478814	1.137488	3.94	0.000	2.247805	6.709822
GDPgr	5.723785	1.818615	3.15	0.002	2.156852	9.290719
GDPpclevel	-.0112745	.0017458	-6.46	0.000	-.0146985	-.0078504
1.Dummy2	-2.515116	.6265388	-4.01	0.000	-3.743975	-1.286256
Dummy2#c.BRating						
1	.3920419	.1039055	3.77	0.000	.1882473	.5958365
Dummy2#c.IRating						
1	-.015277	.0811032	-0.19	0.851	-.1743484	.1437944
Dummy2#c.Maturity						
1	.1654918	.039235	4.22	0.000	.0885383	.2424452
Dummy2#c.HousChg						
1	-7.23588	1.198569	-6.04	0.000	-9.586689	-4.88507
Dummy2#c.GDPgr						
1	-.1213317	1.949801	-0.06	0.950	-3.945567	3.702903
_cons	5.799221	.6155083	9.42	0.000	4.591996	7.006446

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