

# Implicit Government Guarantee and the Pricing of Chinese LGFV Debt

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# **Implicit Government Guarantee and the Pricing of Chinese LGFV Debt**

## **Abstract**

In light of a rising concern over the mounting Chinese local government debt, we examine the determinants of the yield spread on Chinese urban construction investment (chengtou) bonds during 2008-14. These are local government debt masquerading as corporate bonds, but are commonly understood as having some form of implicit government guarantee. We focus on the indebtedness of the local governments as well as the financial conditions of the local government financing vehicles (LGFVs) that issued these bonds. A major finding is the positive relation between the yield spread and the local government's ratio of debt to GDP or revenue, the magnitude and significance of which vary with the onset of defaults as well as policy directives on how LGFV defaults should be handled within the government hierarchy. In contrast, LGFV financial conditions are mostly insignificant after controlling for issuer-level fixed effects in a panel regression setting. Our results highlight the importance of implicit government guarantee in understanding the pricing of Chinese LGFV debt.

## *1. Introduction*

The rapid growth in Chinese local governments' indebtedness and their inability to shoulder this burden have become a persistent concern to regulators and investors in recent years.<sup>1</sup> A nation-wide audit of government debt by China's National Audit Office reveals outstanding local government debt in the amount of 10.9 trillion yuan as of June 2013, and this figure increases further to 17.9 trillion yuan when debt with explicit or implicit local government guarantees is also included (NAO, 2013). Of this total, about 50% are bank loans, 10% local government bonds, and the rest include BT (build-operate-transfer) and trust financing.

In this paper, we examine the determinants of the pricing of Chinese local government bonds, which are publicly traded in the interbank bond market as well as the stock exchanges. There are two types of local government bonds in China: municipal bonds and urban construction investment (chengtou) bonds. Municipal bonds have been issued directly by the Ministry of Finance on behalf of municipalities since March 2009. It was not until November 2011 that four municipalities (Shanghai, Zhejiang, Guangdong, and Shenzhen) were authorized to issue bonds by themselves. In contrast, chengtou bonds have been in existence for over two decades. Local governments typically set up companies with urban construction as their main business, and these companies then issue chengtou bonds to raise capital. Prompted by the four-trillion-yuan economic stimulus package, Chinese local governments at all levels have been busy setting up various financing vehicles (LGFVs) and issuing hundreds of chengtou bonds each year since 2009.

This unique background of the chengtou bonds raises interesting questions. Since they are nominally corporate bonds, their pricing should depend on the financial conditions of the

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<sup>1</sup> Zhang, Hua, and Chen (2013) use interest coverage ratios to examine Chinese local government financing vehicles, warning that nearly half of them are at risk of default without some form of government support.

issuing LGFVs. But more importantly, if they are implicitly guaranteed by the municipalities in which the LGFVs are located, then the pricing of these bonds could also be influenced by the financial conditions of the local governments. Whether investors respond more to changes in the financial conditions of the local government or the issuing LGFV presumably depends on the perceived commitment of the guarantor. In addition, there might be uncertainty regarding who the implicit guarantor is. For example, were the Nanjing Urban Construction Investment Group to default on its bonds, would it be bailed out using the resources of the city (Nanjing), the province (Jiangsu), the country (China), or not at all?

We attempt to shed light on these questions by analyzing the determinants of the yield spread of Chinese chengtou bonds traded during 2008-14. The potential determinants include three groups of variables: the fiscal conditions of the local governments, the financial conditions of the LGFVs, and the characteristics of the bonds themselves. We conduct regressions using yield spreads when the bonds were initially offered, as well as using yield spreads derived from secondary market trading, both with and without issuer-level fixed effects. While the relation between the yield spread and the LGFV-related variables is consistent with economic intuition, we find that its significance largely dissipates once issuer-level fixed effects are added. In contrast, we identify a robust positive relation between the yield spread and local government indebtedness as measured by the ratio of all LGFV debt to either the local GDP or the general budget revenue. These results confirm that chengtou bonds are largely regarded as local government rather than corporate liabilities.

We further exploit significant events during our sample period that might have changed investors' perception of the implicit guarantee. First, the default by the Yunnan Highway Development and Investment Co. Ltd. in April 2011 on the principal payments of its bank loans

triggered a wave of panic among investors, and the liquidity of the credit market, especially for chengtou bonds, was severely impaired afterwards.<sup>2</sup> These first incidences of LGFV default could have served to focus investors' attention, for the first time, on the fiscal conditions of the local governments that are supposed to offer assistance to the failing LGFVs. Second, the National Development and Reform Commission (NDRC) subsequently relaxed the approval process for bond issuance, and the issuance of chengtou bonds more than doubled in 2012 compared to 2011 (see Xu and Wang, 2012). Investors could have interpreted the central government's "warming up" to the chengtou bonds as a signal of its willingness to fully guarantee local government debt. Lastly, after 2013, the Ministry of Finance and the NDRC began encouraging the refinancing of high-yield short-term LGFV debt with low-yield long-term municipal bonds issued by the provinces.<sup>3</sup> Effectively, this allowed some of the LGFV debt to be shifted onto the balance sheet of the provincial governments.

Consistent with the timing of these episodes, we find that the positive relation between the yield spreads of chengtou bonds and local government debt ratios is insignificant prior to 2010, large and significant in 2011, insignificant again in 2012, and smaller but still significant during 2013-14. When we include the fiscal conditions of both the local government and the provincial government in the same regressions, the provincial debt ratios are not significant except during the 2013-14 period, when they are positively associated with the yield spreads. These results suggest that LGFV debt has been increasingly viewed as local government obligations with a likely provincial backstop. Incidentally, the November 2016 policy directive from the State Council categorizes local government default into four tiers, with progressively

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<sup>2</sup> <http://finance.sina.com.cn/china/dfj/20110627/114910052674.shtml>.

<sup>3</sup> <http://wallstreetcn.com/node/107087>.

higher-level backstops pending the severity of the events.<sup>4</sup> Thus, our 2013-14 results could very well be the norm going forward.

There is a small but growing academic literature on Chinese local government debt. Among others, She, Luo, and Yang (2015) find that the issuance of chengtou bonds can be explained by the economic development, financial maturity, and the investment propensity of the associated municipality. Luo and She (2015) show that political uncertainty, as measured by the replacement of major city administrators (mayors and party secretaries), reduces the issuance and increases the yield spread of chengtou bonds.<sup>5</sup> Gao, Ru, and Tang (2016) analyze LGFV bank loans and find that distressed local governments often default on loans from commercial banks, but keep paying on loans from the policy banks due to their political influence.

The most comprehensive study of Chinese chengtou bonds to date is Ang, Bai, and Zhou (2015). Arguing that all such bonds are implicitly guaranteed by the central government, the authors focus on their exposures to common macroeconomic factors such as the Chinese sovereign CDS spread, the real exchange rate, and the one-year deposit rate. The estimated factor betas, along with measures of political corruption, bond illiquidity, and the importance of real estate to the local economy, are used to explain the panel of chengtou yield spreads.

In contrast to Ang, Bai, and Zhou (2015), we do not assume that the implicit guarantor of all chengtou bonds is the central government. While this may very well have been the expectation in the earlier years, it is not realistic given the explosive growth of the chengtou bond market in the more recent years. Since investors' perception of who the implicit guarantor is might shift over time, we are motivated to include the fiscal conditions of the related cities and

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<sup>4</sup> [http://www.gov.cn/zhengce/content/2016-11/14/content\\_5132244.htm](http://www.gov.cn/zhengce/content/2016-11/14/content_5132244.htm).

<sup>5</sup> This study parallels Gao and Qi (2013)'s analysis of U.S. municipal bond yields and increased political uncertainty around the election of state governors.

provinces as explanatory variables for chengtou yield spreads. Our results are consistent with investor perception of the implicit guarantor being the central government in the earlier years, shifting to the immediate municipalities of the LGFVs (mostly cities) after the 2011 chengtou debt crisis, reverting to the central government after its policy to open up debt issuance in 2012, and finally shifting to the provincial government after the recent effort to backstop the exploding LGFV debt with a closely monitored municipal bond swap program.

Interestingly, a recent paper by Gao, Lee, and Murphy (2016) find that U.S. states that proactively offer assistance to distressed municipalities have higher borrowing costs than states that permit unrestricted Chapter 9 bankruptcy filings. On the other hand, bonds issued by municipalities located in Proactive states have lower yields than those located in Chapter 9 states. While Gao, Lee, and Murphy (2016) exploit the cross-sectional variation of government assistance to municipal borrowers among U.S. states to estimate its impact on municipal bond pricing, we take advantage of the time-series variation of implicit government guarantee for Chinese chengtou bonds. Specifically, estimating how the implicit guarantor's fiscal condition affects the pricing of chengtou bonds is a unique feature of our paper.

The remainder of this paper proceeds as follows: Section 2 briefly documents the historical development and current status of the Chinese local government bond market. Section 3 explains the construction of our dataset and summarizes the variables used in our analysis. Section 4 presents the results of our regression analysis of chengtou bond yield spreads. Section 5 concludes.

## *2. Overview of the Chinese Local Government Bond Market*

According to the Chinese Budget Law of 1994, municipalities are not allowed to issue bonds unless with the approval of the State Council. Therefore, urban construction investment (chengtou) bonds were created to help Chinese local governments raise capital for urban development. Before 2005, most chengtou bonds were corporate bonds issued by state-owned enterprises located in either large provincial capitals or municipalities directly controlled by the central government (e.g., Shanghai). The first chengtou bond can be traced back to the early 1990s when the Shanghai municipal government was planning to develop the Pudong New Area. The central government approved an annual bond issuance quota of 500 million yuan for ten consecutive years to support the development, and the Shanghai Chengtou Corporation issued the first 500-million-yuan Pudong Development Bond on behalf of the municipal government in April 1992.

The pace of development quickened when more and more local enterprises were permitted to issue corporate bonds after 2005. By 2008, nearly 100 billion yuan of chengtou bonds were issued annually. Furthermore, to cope with the negative impact of the global financial crisis, the central government launched a four-trillion-yuan economic stimulus package in 2009. Local governments at various levels all over China were encouraged to increase their investment, especially in infrastructure construction. Consequently, various local government financing vehicles sprang up, which drove the growth of the chengtou bond market. The total issuance of chengtou bonds nearly tripled in 2009 compared to the year before.

This rapid expansion of local government debt brought about potential default risks and drew the attention of the central government. In June 2010, the State Council issued new guidelines calling for local governments to exit their financing vehicles and prohibiting them



from providing guarantee on any new ones. The issuance of chengtou bonds was suspended in the following month and subsequent new issues were without guarantee. However, in response to several LGFV defaults during 2011 and in order to calm the turbulent market, the NDRC loosened its strict approval process for corporate bond issuance in 2012. This allowed the annual issuance of chengtou bonds to grow unabated. In fact, Figure 1 shows that the amount of such bonds issued during 2012-14 is close to one trillion yuan each year, more than twice the annual amount during 2009-11.

In more recent years, the central government has allowed the provinces to issue municipal bonds under annual quotas. Part of the quota is to be used for refinancing high-yield short-term LGFV loans into low-yield long-term municipal bonds, effectively transferring off-balance-sheet local government liabilities onto the provincial balance sheet. This also raises the expectation that the provinces will act as a “lender of last resort” to distressed LGFVs and their municipalities. Indeed, this sentiment seems to be confirmed by a November 2016 policy directive from the State Council, which articulated four categories of LGFV defaults according to their severity. While Category IV events are to be resolved by the local governments, Category III and II events will involve financial assistance from the provinces, and Category I, the most severe type of events, will be directly handled by the Ministry of Finance using Treasury funds.

In summary, the market’s perception of implicit guarantee for chengtou bonds seems to have undergone several changes since 2008. Initially, the implicit guarantor was thought to be the central government, but that belief was severely shaken when several LGFVs defaulted during 2011 (even though the promised payments were eventually made with state assistance). The central government probably restored this belief when it opened up the spigot of bond

issuance in 2012, but in more recent years the de facto guarantor for most local government debt might have been the provincial government, which are permitted to issue municipal bonds to rescue the struggling cities and counties. These shifting perceptions about the implicit guarantor will be exploited in our subsequent empirical analysis.

### *3. Data*

#### *3.1 Sample Construction*

Information on the chengtou bond characteristics, offering and transaction prices and yields, financial conditions of the issuing LGFVs, as well as fiscal conditions of the local governments (cities and provinces) is obtained from the WIND database for the period of May 2008 to April 2015. Since the financial and fiscal variables are available annually and often not publicly disclosed until at least a quarter after each year-end, we compute annual averages of the chengtou bond yield spread and match them with lagged financial and fiscal variables. For example, we would average the yield spreads from the period between May 2014 and April 2015, and associate them with the trading year 2014 and financial and fiscal information from the year 2013.

To compute the yield spread, we closely follow the procedure outlined in Ang, Bai, and Zhou (2015). Specifically, we use zero curves estimated weekly from actively traded Chinese central government bonds to compute the yield on a hypothetical central government bond with the same maturity date and coupon rate as the chengtou bond under examination. The difference between the chengtou bond yield and the yield on this hypothetical central government bond is defined as our yield spread measure.<sup>6</sup> We do this each week using weekly closing prices, and

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<sup>6</sup> The coupons on central government bonds are tax-exempt, while those on chengtou bonds are not. Therefore, a part of the yield spread constructed here can be attributed to tax differentials across these two types of bonds. This is

then aggregate the yield spreads into an annual average. Most chengtou bonds trade in both the interbank bond market, which features financial institutions with most of the trading volume, as well as the exchange bond market, with participation by small retail investors. For these bonds, we use their pricing on the interbank market to compute their yield spreads. There is also a small subset of chengtou bonds that only trade on the exchange market. These bonds' yield spreads are computed with the exchange market pricing.

In our later analysis of chengtou yield spreads, we examine not only secondary market pricing, but also the pricing of these bonds at issuance. Table 4 summarizes the bonds in the issuance sample in terms of the number of bonds issued, the total issue size, and the average offering yield each year. It further breaks down these statistics by several maturity buckets. We find that the bulk of chengtou bond issuance, whether by the number of bonds issued or by the total issue size, is concentrated in the three- to seven-year maturities. There are only a handful of chengtou bonds issued in 2008, which is why we choose to begin our sample period from that year. Furthermore, we see that issuance activity jumped dramatically between 2008 and 2009, 2011 and 2012, and 2013 and 2014, which is consistent with Figure 1. In Table 3, we summarize the bonds in the secondary market trading sample. Not all bonds issued had active secondary market trading each year. Therefore, the sample described in Table 3 is somewhat smaller than that in Table 4. However, the summary statistics are quite similar.

When compared to the chengtou bond issuance sample from Ang, Bai, and Zhou (2015), ours appears smaller by around 45 percent, even though both studies use bond data from WIND and the bulk of the sample periods overlap (2008-14). Apparently, as a result of the central

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similar to the tax premium in the corporate bond yield spread in the United States, where Treasury bond coupons are exempt from state and local taxes, while corporate bond coupons are not (both are subject to federal taxes). See Elton, Gruber, Agrawal, and Mann (2001) for details.

government's recent effort to survey the scope of outstanding local government debt, limit the growth of LGFVs, and clarify what constitutes "true" local government debt that the local governments are responsible for repaying,<sup>7</sup> WIND modified its own definition of chengtou bonds after December 29, 2014 to be consistent with a more stringent definition that ChinaBond uses to construct its chengtou yield curves (ChinaBond, 2014). Evidently, this change of definition was applied retroactively, causing the number of bonds in our sample to be smaller than Ang, Bai, and Zhou's sample. Another reason for our smaller sample size compared to Ang, Bai, and Zhou (2015) is that we include only fixed-coupon bonds in our analysis and remove bonds with variable coupons. In any case, since we are focusing on the effect of implicit government guarantee on chengtou bond pricing, it makes sense to examine a more restrictive subset of chengtou bonds whose connection to the local government is unambiguous.

### *3.2 Variables and Summary Statistics*

In the appendix, we define the variables used in our empirical analysis. Besides the chengtou yield spread as the dependent variable, the explanatory variables can be classified into three groups. The first group of variables include measures of local government fiscal conditions. We compute a city's debt ratio by summing the debt of all of its LGFVs and dividing this sum by its annual general budget revenue, GDP, or social fixed capital investment. A greater city-level debt ratio should be associated with a higher chengtou yield spread, if chengtou bonds are effectively local government debt. We also compute the fiscal balance, or the ratio of a city's general budget revenue to its general budget expenditure, which should be negatively related to the yield spread. We measure the importance of a city in the government hierarchy by dividing

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<sup>7</sup> See NAO (2013) and [http://www.gov.cn/zhengce/content/2014-10/02/content\\_9111.htm](http://www.gov.cn/zhengce/content/2014-10/02/content_9111.htm).

its GDP by the sum of GDP over all cities that had previously issued chengtou bonds (either including or excluding municipalities directly under the central government). Cities higher up in the hierarchy are expected to have a lower chengtou yield spread. Lastly, we calculate the ratio of a city's land revenue to its general budget revenue. To the extent that over-reliance on selling land to generate revenue is not sustainable in the long-run, we expect this ratio to be positively associated with the yield spread. In some of our empirical analysis, we include the fiscal conditions of the province in which an LGFV is located. Therefore, we also construct provincial versions of these same variables.

The second group of variables pertain to the financial conditions of the chengtou bond issuers. We measure the importance of an LGFV among all LGFVs within a city by the rank of its assets, normalized between zero and one, with one being the highest rank. The other, more standard, measures of issuer-level credit risk include profitability, cash flow, financial leverage, and total assets. We expect the chengtou yield spread to be positively related to LGFV leverage and negatively related to its profitability, cash flow, total assets, and normalized asset rank among all LGFVs.

The third group of explanatory variables are bond-specific characteristics. They include the issue size of the bond, its average remaining maturity (or maturity at issuance if we are examining offering yield spreads), and whether the bond carries any third-party guarantee or collateralization. We expect the yield spread to be higher for smaller issue size (due to the lack of liquidity), longer bond maturity, and bonds with no external guarantee.

Tables 1 and 2 present the summary statistics of all variables for the secondary market trading sample and the issuance sample, respectively. As they are quite similar, we focus on the secondary market trading sample in Table 1. First, we find that the average yield spread over the

full sample is 2.73 percent, which is significantly higher than the 1.98 percent documented by Ang, Bai, and Zhou (2015). Again, apart from marginal differences in the sample period, we think that this can be attributed to the retroactively applied and more stringent definition of chengtou bonds, which requires that they be used to fund only public projects that cannot be fully supported by their own cash flows and must rely on local government subsidies. The average city in our sample has total LGFV debt equal to 2.3 times its general budget revenue, 25 percent of GDP, or 46 percent of social fixed capital investment. Its general revenue is only 68 percent of its general expenditure, and 73 percent of the revenue is land-related. When we examine these variables at the provincial level, they look quite similar. These statistics paint a rather bleak picture compared to the typical U.S. municipalities. For instance, Gorina and Maher (2016) analyze the determinants of fiscal distress among 300 municipalities in California, Michigan, and Pennsylvania between 2007 and 2012. The unconditional likelihood of fiscal distress in their sample is a rather alarming 32 percent, yet several of their fiscal measures, including debt ratios and fiscal coverage, appear much better than those of the Chinese municipalities in our sample – the average municipality in their sample has a revenue to expenditure ratio of 96 percent and a debt to revenue ratio of 0.96.<sup>8</sup>

#### *4. Results*

##### *4.1 Results for the Full Sample*

We begin our empirical analysis by regressing the chengtou bond yield spread on the three groups (city-level, issuer-level, and bond-level) of explanatory variables using secondary market transactions over the entire sample period of 2008-14. The results are presented in Table

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<sup>8</sup> The local government revenue from the U.S. data includes transfers from the federal and state governments, while ours does not. This difference probably explains why our fiscal measures look so bleak.

5. The first three columns include year fixed effects, while the next three columns also include LGFV (issuer) fixed effects.

In Columns (1)-(3), we find that all of the city-level explanatory variables have coefficients consistent with our expectation. For instance, the three city debt ratios all have positive coefficients significant at the one-percent level. If we increase these debt ratios by one standard deviation according to their summary statistics in Table 1, the chengtou bond yield spread would increase by five to seven basis points, which are economically significant effects. Another highly significant city-level measure for chengtou bond pricing is the proportion of its GDP among all cities that have issued these bonds. A one-standard deviation increase in this proportion would lower the yield spread by 16-19 basis points. We also find a negative and significant coefficient for fiscal balance – a one-standard deviation increase would lower the yield spread by around five basis points. For the share of land revenue, only one of the columns has a significant estimate, although all three estimates are positive, consistent with the yield spread being higher for cities that rely more heavily on land revenue to balance the budget.

Turning to the issuer-level financial conditions, we find that the yield spread is reduced for more important LGFVs (judging by the size of total assets as well as the asset rank relative to other LGFVs in the same city) and LGFVs with greater profitability and cash flows. We also find that bonds with shorter maturity and larger issue size command lower yield spreads. While these results are well anticipated, somewhat surprising are the negative and significant coefficient for the LGFV's leverage ratio and the positive and significant coefficient for bonds with guarantee.

We next present a set of regressions that include issuer fixed effects. Essentially, we are relying on the within-issuer variation of the explanatory variables to identify their effects on the

chengtong bond yield spread. As a result, we would expect less precise estimates with larger standard errors. Nevertheless, we are interested in how this change in the method of inference affects our conclusion regarding the three groups of variables in explaining the pricing of chengtong bonds.

In Columns (4)-(6), we first notice that many issuer-level and bond-level variables that used to be significant in explaining the yield spread are no longer significant. Financial leverage, which had a negative and significant coefficient, is no longer significant. Bond guarantee, which had a positive and significant coefficient, now has a negative but insignificant coefficient. Therefore, controlling for time-invariant issuer-level heterogeneities seems important to resolving some of the puzzling results in Columns (1)-(3). For example, if only LGFVs with higher credit quality are allowed to raise more debt, and only LGFVs with lower credit quality feel the necessity to seek third-party guarantee, we could end up with lower yield spread for higher leverage issuers and bonds with no guarantee. These results, however, largely disappear when we make inferences using the within-issuer variation of leverage and bond guarantee.

Another important observation from Columns (4)-(6) is that many of the city-level fiscal measures retain their sign and significance from Columns (1)-(3). This is true for two of the three city debt ratios, the city's GDP proportion, as well as the city's share of land revenue. Moreover, the magnitude of these coefficients has become even larger, implying a greater economic significance of the estimated effects. The only city-level fiscal measure that lost its significance is the fiscal balance.

We further perform the same set of regression analyses using the issuance sample summarized in Tables 2 and 4. Since only offering yield spreads are used, the number of observations is less than half of the secondary market transactions sample. As in Table 5, the first



three columns of Table 6 include year fixed effects, while the next three columns include both year and issuer fixed effects. It is possible to include issuer fixed effects because LGFVs typically issue multiple bonds. Overall, the estimates of Table 6 are similar in magnitude to those of Table 5, except that they have larger standard errors due to the smaller sample size. In Columns (1)-(3), many variables have statistically significant coefficients and their signs are as expected. However, none of the issuer-level financial variables remain significant in Columns (4)-(6), while a couple of the city-level fiscal measures are still significant.

In summary, our preceding results indicate that city-level fiscal measures play an important role in the pricing of chengtou bonds. Some of our regression specifications demonstrate that city-level fiscal conditions are even more important than issuer-level financial conditions in explaining the within-issuer variation of the chengtou yield spread over time. These results are consistent with our interpretation of chengtou bonds as de facto local government obligations.

#### *4.2 Results for the Sub-Samples*

In this subsection, we split the sample into four subsamples: 2008-2010, 2011, 2012, 2013-2014. We take out year 2011 because of the first default event of LGFV occurred in 2011 as described in the previous section. The results are reported in Table 7.

Pre 2011, all three debt ratio variables are insignificant, consistent with the argument that investors believe in central government guarantee, thus do not care too much about the local government financial conditions. The default event in 2011 changed investors' perceptions as the significant coefficients in year 2011. It seems like that the event triggered investors' concerns

about central government guarantee on Chengtou bond, although it was bank loan default and it was resolved eventually.

The coefficients on government bonds in later period is also significant, but with smaller magnitude. It is consistent with that investors built up certain confidence due to central government's rescue activities. However, the issue of local government debt becomes a concern so that investors cared about the local government debt ratio when determining the yield spread of the Chengtou bond.

#### *4.3 Results with Provincial-Level Fiscal Measures*

So far, the local government level variables are measured at the prefectural level, which is the administration authority of the LGFV in our sample. In this subsection, we add provincial level variable in the regressions.

If investors believe that province, as a upper administration, will work as an implicit guarantor, we expect to observe provincial level variable to be significant. Otherwise, only prefectural level variables should be significant. The results are reported in Table 8. We only report subsample results to save space.

For 2008-2012 periods, the provincial level variables are largely insignificant, suggesting that there is no implicit guarantee by province. On the other hand, the provincial level debt ratio turns significant in 2013-2014 period. This is the period when the debt swap program enters into the pictures. Since province has the right to issue new debt to swap the existing Chengtou bond, the market interpreted this as the province will have means to support the prefectural, if needed.

#### *5. Concluding Remarks*

In this study, we investigate how local government debt affect the yield spread of Chengtou bonds. We find that high local government debt is associated with higher yield spread, based on several different measures of local government debt. This result is robust with issuer fixed effects. We further show that the results are strongest in 2011, suggesting that the default event of LGFV raised investors' concern on the issue of local government guarantee.

In summary, our results highlight the importance of implicit government guarantee in understanding the pricing of Chinese LGFV debt.

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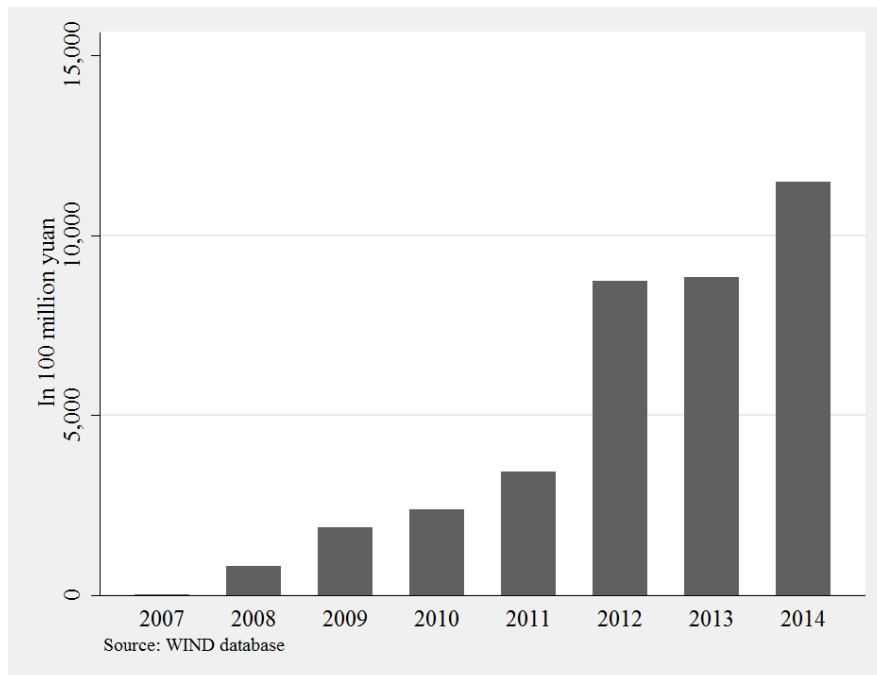
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**Figure 1**

**Annual Issue Size of Chengtou Bonds (2007-2014).** This graph is based on all Chengtou Bonds contained in the WIND database. To be consistent, year  $t$  is defined as the time interval from May in year  $t$  to April in year  $t+1$ .

**Table 1**

**Summary Statistics of Key Variables for Full Transaction Sample.** This table presents the mean, standard deviation, 5 percentile, median and 95 percentile of key variables for fixed-rate Chengtuo Bonds by year. For provincial-level fiscal variable summary, samples in Beijing, Shanghai, Tianjin and Chongqing are excluded. Variables are defined as in Appendix.

Variable	N	Mean	Std. Dev.	P5	Median	P95
Trade Spread (%)	5199	2.731	0.772	1.574	2.701	4.039
Govt Lev 1	4480	2.251	1.524	0.427	2	5.13
Govt Lev 2	4480	0.248	0.219	0.029	0.175	0.723
Govt Lev 3	4480	0.458	0.472	0.04	0.282	1.521
GDP Portion 2	4480	0.0109	0.0104	0.00109	0.00696	0.0337
Land Revenue	5199	0.734	0.383	0.241	0.686	1.448
Fiscal Balance	5199	0.683	0.244	0.264	0.706	1.038
Importance (0-1)	5199	0.649	0.307	0	0.685	1
Adj ROA	5199	0.00929	0.0218	-0.0134	0.0056	0.0416
Adj Cash ROA	5199	-0.004	0.0523	-0.0946	0.00184	0.0643
Lev	5199	0.321	0.149	0.0929	0.309	0.594
Log Asset	5199	23.88	1.033	22.4	23.74	25.75
Log Scale	5199	20.75	0.61	19.81	20.72	21.77
Warranty (0, 1)	5199	0.274	0.446	0	0	1
Trade Mtr (year)	5199	4.777	2.194	0.621	4.995	6.966
Prv Govt Lev 1	3648	1.978	0.801	0.755	2.172	3.468
Prv Govt Lev 2	3648	0.199	0.0884	0.0598	0.211	0.366
Prv Govt Lev 3	3648	0.312	0.142	0.0989	0.328	0.491
GDP Portion 1	3648	0.00797	0.00697	0.0011	0.00568	0.024
Prv GDP Portion	3648	0.0633	0.0336	0.015	0.0484	0.111
Prv Land Revenue	3648	0.681	0.235	0.283	0.664	1.086
Prv Fiscal Balance	3648	0.627	0.186	0.368	0.681	0.842

**Table 2**

**Summary Statistics of Key Variables for Full Issue Sample.** This table presents the mean, standard deviation, 5 percentile, median and 95 percentile of key variables for fixed-rate Chengtuo Bonds at issuance. Bond issue spread and the corresponding fiscal and financial variables are included in the summary. Variables are defined as in Appendix.

Variable	N	Mean	Std. Dev.	P5	Median	P95
Issue Spread (%)	2661	2.836	0.936	1.326	2.849	4.391
Govt Lev 1	2230	2.185	1.502	0.388	2	5.13
Govt Lev 2	2230	0.244	0.219	0.0247	0.171	0.723
Govt Lev 3	2230	0.465	0.484	0.0366	0.28	1.521
GDP Portion 2	2230	0.0118	0.0119	0.00109	0.00733	0.0345
Land Revenue	2661	0.725	0.38	0.21	0.667	1.365
Fiscal Balance	2661	0.681	0.245	0.263	0.701	1.038
Importance (0-1)	2661	0.615	0.321	0	0.667	1
Adj ROA	2661	0.0113	0.0244	-0.0115	0.00729	0.0475
Adj Cash ROA	2661	-0.0023	0.0558	-0.0972	0.00417	0.0721
Lev	2661	0.312	0.158	0.0679	0.3	0.593
Log Asset	2661	23.76	1.089	22.27	23.59	25.74
Log Scale	2661	20.68	0.639	19.52	20.72	21.64
Warranty (0, 1)	2661	0.21	0.407	0	0	1
Issue Mtr (year)	2661	5.21	2.545	1	6	7
Prv Govt Lev 1	1795	1.956	0.797	0.77	2.129	3.468
Prv Govt Lev 2	1795	0.195	0.0873	0.0598	0.208	0.366
Prv Govt Lev 3	1795	0.31	0.139	0.0989	0.329	0.491
GDP Portion 1	1795	0.00856	0.00808	0.00107	0.00596	0.0251
Prv GDP Portion	1795	7.871	6.178	1	7	21
Prv Land Revenue	1795	0.68	0.242	0.248	0.664	1.086
Prv Fiscal Balance	1795	0.625	0.188	0.358	0.681	0.842



**Table 3**

**Chengtou Bonds Summary from Full Transaction Sample (May 2008-April 2015).** This table presents issuance characteristics of bonds which are covered in the full transaction sample. Number of bonds issued, issue amount and yield at issue are broken down by maturity buckets and calendar years.

Year	Number of bonds issued					Issue Amount (0.1 billion)					Yield at Issue (%)				
	(0,1]	(1,3]	(3,7]	(7,30]	Total	(0,1]	(1,3]	(3,7]	(7,30]	Total	(0,1]	(1,3]	(3,7]	(7,30]	Average
2008	0	0	5	1	6	0	0	84	8	92			7.16	7.50	7.33
2009	0	0	35	9	44	0	0	591	314	905			5.95	5.45	5.70
2010	0	0	40	8	48	0	0	619	120	739			5.71	6.01	5.86
2011	0	10	104	7	121	0	112.4	1410	141	1663		6.45	6.68	6.56	6.56
2012	0	32	448	28	508	0	214.7	5436	397.5	6048		5.62	6.83	7.10	6.52
2013	36	28	394	17	475	446.5	238	4664	406	5755	6.07	5.60	6.51	6.06	6.06
2014	324	50	649	30	1053	3334	377.9	7358	526	11596	5.29	6.11	7.06	6.99	6.36
2015	78	13	107	1	199	704.8	171.5	1118	30	2024	5.17	5.58	6.21	5.97	5.73
Total	438	133	1782	101	2454	4485	1115	21280	1943	28822	5.51	5.87	6.51	6.46	6.27

**Table 4**

**Chengtou Bonds Summary from Full Issue Sample (May 2008-April 2015).** This table presents issuance characteristics of bonds which are covered in the issue sample. Number of bonds issued, issue amount and yield at issue are broken down by maturity buckets and calendar years.

Year	Number of bonds issued					Issue Amount (0.1 billion)					Yield at Issue (%)				
	(0,1]	(1,3]	(3,7]	(7,30]	Total	(0,1]	(1,3]	(3,7]	(7,30]	Total	(0,1]	(1,3]	(3,7]	(7,30]	Average
2008	0	0	5	1	6	0	0	84	8	92			7.16	7.50	7.33
2009	0	0	35	9	44	0	0	591	314	905			5.95	5.45	5.70
2010	0	0	40	8	48	0	0	619	120	739			5.71	6.01	5.86
2011	0	12	104	7	123	0	132.4	1410	141	1683		6.43	6.68	6.56	6.55
2012	0	77	448	28	553	0	831.5	5436	397.5	6665		5.86	6.83	7.10	6.60
2013	40	40	396	18	494	495.5	397	4677	410	5980	6.13	5.92	6.51	6.14	6.17
2014	381	51	659	35	1126	3742	380.9	7460	625.2	12208	5.481	6.077	7.049	6.931	6.38
2015	92	16	154	5	267	764.3	181.5	1591	84	2621	5.127	5.613	6.161	6.03	5.73
Total	513	196	1841	111	2661	5002	1923	21868	2100	30893	5.58	5.98	6.51	6.46	6.29

**Table 5**

**Regression Results for Transaction Sample without Provincial-level Variables.** This table reports the pooled and firm-fixed regressions estimates with samples of fixed-rate bonds issued by city-level LGFVs in which LGFVs in Beijing, Shanghai, Tianjin and Chongqing are as well included. The dependent variables in all columns are Trade Spread, i.e. bond annually averaged spread. Column 1-3 and Column 4-6 present results from pooled and firm-fixed regressions respectively. We use robust standard error to calculate t value. The sample period extends from May 2008 to April 2015. Two-tailed t-tests are conducted where \*\*\* denotes  $p < 0.01$ , \*\*  $p < 0.05$ , and \*  $p < 0.1$ .

	(1)	(2)	(3)	(4)	(5)	(6)
Govt Lev 1	0.035*** (5.787)			-0.018 (-0.701)		
Govt Lev 2		0.331*** (6.896)			0.886*** (3.283)	
Govt Lev 3			0.110*** (3.732)			0.288** (2.072)
GDP Portion 2	-16.286*** (-16.736)	-18.702*** (-17.354)	-18.459*** (-13.669)	-30.059*** (-4.652)	-26.236*** (-4.397)	-23.855*** (-3.446)
Land Revenue	0.020 (1.039)	0.029 (1.469)	0.043** (2.171)	0.056* (1.791)	0.064** (2.039)	0.060* (1.922)
Fiscal Balance	-0.231*** (-6.428)	-0.211*** (-5.924)	-0.231*** (-6.422)	0.161 (0.763)	0.217 (1.037)	0.192 (0.920)
Importance	-0.034 (-0.992)	-0.031 (-0.892)	-0.058* (-1.717)	-0.089 (-1.231)	-0.053 (-0.740)	-0.069 (-0.965)
Adj ROA	-0.932** (-2.175)	-0.923** (-2.123)	-1.025** (-2.428)	0.282 (0.361)	0.135 (0.173)	0.202 (0.256)
Adj Cash ROA	-0.803*** (-5.450)	-0.807*** (-5.476)	-0.832*** (-5.621)	-0.014 (-0.071)	-0.015 (-0.075)	-0.007 (-0.038)
Lev	-0.227*** (-3.335)	-0.212*** (-3.171)	-0.152** (-2.306)	0.080 (0.555)	-0.078 (-0.539)	-0.003 (-0.019)
Log Asset	-0.220*** (-14.779)	-0.223*** (-15.253)	-0.209*** (-14.395)	-0.150*** (-3.006)	-0.174*** (-3.536)	-0.162*** (-3.300)
Log Scale	-0.029* (-1.827)	-0.029* (-1.828)	-0.032** (-2.011)	-0.022 (-1.034)	-0.020 (-0.942)	-0.021 (-0.961)
Warranty	0.116*** (6.899)	0.117*** (6.942)	0.118*** (6.967)	-0.015 (-0.525)	-0.012 (-0.419)	-0.012 (-0.449)
Trade Mtr	0.106*** (23.641)	0.106*** (23.726)	0.107*** (23.630)	0.049*** (9.067)	0.049*** (9.095)	0.048*** (9.054)
Year Fixed	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed	No	No	No	Yes	Yes	Yes
Observations	4,480	4,480	4,480	4,480	4,480	4,480
R-squared	0.626	0.627	0.624	0.851	0.852	0.852

**Table 6**

**Regression Results for Issue Sample without Provincial-level Variables.** This table reports the pooled and firm-fixed regression estimates with samples of fixed-rate bonds issued by city-level LGFVs in which LGFVs in Beijing, Shanghai, Tianjin and Chongqing are as well included. The dependent variables in all columns are Issue Spread, i.e. bond issuance spread. Column 1-3 and Column 4-6 present results from pooled and firm-fixed regressions respectively. We use robust standard error to calculate t value. The sample period extends from May 2008 to April 2015. Two-tailed t-tests are conducted where \*\*\* denotes  $p < 0.01$ , \*\*  $p < 0.05$ , and \*  $p < 0.1$ .

	(1)	(2)	(3)	(4)	(5)	(6)
Govt Lev 1	0.02* (1.869)			-0.02 (-0.266)		
Govt Lev 2		0.15* (1.725)			0.73 (0.853)	
Govt Lev 3			-0.00 (-0.017)			0.84** (2.417)
GDP Portion 2	-15.74*** (-8.575)	-16.49*** (-7.829)	-15.19*** (-6.413)	-16.28** (-2.143)	-12.92 (-1.510)	-4.07 (-0.450)
Land Revenue	0.03 (0.743)	0.03 (0.953)	0.03 (0.960)	0.18 (1.518)	0.19 (1.522)	0.19 (1.579)
Fiscal Balance	-0.25*** (-4.072)	-0.24*** (-3.917)	-0.24*** (-4.044)	-0.24 (-0.601)	-0.18 (-0.484)	-0.18 (-0.510)
Importance	-0.09 (-1.323)	-0.10 (-1.398)	-0.12* (-1.813)	-0.26 (-1.280)	-0.22 (-1.089)	-0.20 (-0.973)
Adj ROA	-0.50 (-0.765)	-0.51 (-0.780)	-0.55 (-0.855)	2.31 (0.859)	2.20 (0.828)	2.03 (0.758)
Adj Cash ROA	-0.73*** (-3.126)	-0.74*** (-3.160)	-0.76*** (-3.277)	0.31 (0.416)	0.34 (0.459)	0.35 (0.473)
Lev	0.08 (0.677)	0.10 (0.838)	0.13 (1.124)	-0.04 (-0.083)	-0.18 (-0.391)	-0.24 (-0.526)
Log Asset	-0.24*** (-8.388)	-0.24*** (-8.464)	-0.23*** (-8.006)	-0.14 (-0.971)	-0.17 (-1.167)	-0.15 (-1.117)
Log Scale	-0.02 (-0.687)	-0.02 (-0.708)	-0.02 (-0.802)	0.01 (0.228)	0.01 (0.244)	0.01 (0.304)
Warranty	0.13*** (3.522)	0.12*** (3.510)	0.13*** (3.517)	-0.01 (-0.070)	-0.01 (-0.076)	-0.00 (-0.060)
Issue Mtr	0.10*** (13.415)	0.10*** (13.434)	0.10*** (13.340)	0.04*** (3.408)	0.04*** (3.422)	0.04*** (3.451)
Year Fixed	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed	No	No	No	Yes	Yes	Yes
Observations	2,230	2,230	2,230	2,230	2,230	2,230
R-squared	0.595	0.595	0.594	0.850	0.851	0.851

**Table 7**

**Regression Results for Subsamples without Provincial-level Variables.** This table reports pooled regression estimates with subsamples divided by year. Column 1-3, 4-6, 7-9 and 10-12 respectively present results for samples in trading year 2008-2010, 2011, 2012 and 2013-2014. The dependent variables in all columns are Trade Spread, i.e. annually averaged bond spread. We use robust standard error to calculate t value. The sample period extends from May 2008 to April 2015. Two-tailed t-tests are conducted where \*\*\* denotes  $p < 0.01$ , \*\*  $p < 0.05$ , and \*  $p < 0.1$ .

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Govt Lev 1	-0.01 (-0.376)			0.03 (1.287)			0.04** (2.376)			0.04*** (5.834)		
Govt Lev 2		-0.06 (-0.267)			0.40* (1.676)			0.31** (2.301)			0.30*** (5.818)	
Govt Lev 3			-0.03 (-0.142)			0.43** (2.207)			0.05 (0.516)			0.04 (1.187)
GDP Portion 2	-8.26** (-2.263)	-8.10** (-2.185)	-8.07** (-2.041)	-21.51*** (-4.519)	-24.31*** (-4.735)	-30.90*** (-4.895)	-16.32*** (-6.631)	-18.37*** (-6.869)	-16.34*** (-4.548)	-14.72*** (-13.656)	-16.97*** (-14.130)	-14.53*** (-9.287)
Land Revenue	0.15 (1.011)	0.14 (1.006)	0.14 (0.999)	0.06 (0.584)	0.06 (0.550)	0.06 (0.591)	0.11** (2.099)	0.11** (2.166)	0.12** (2.320)	0.01 (0.519)	0.02 (1.034)	0.03 (1.557)
Fiscal Balance	-0.65*** (-3.739)	-0.65*** (-3.743)	-0.65*** (-3.744)	-0.01 (-0.060)	0.02 (0.104)	-0.02 (-0.120)	-0.22** (-2.315)	-0.19** (-2.068)	-0.21** (-2.251)	-0.26*** (-6.647)	-0.24*** (-6.124)	-0.26*** (-6.533)
Importance	-0.07 (-0.374)	-0.07 (-0.360)	-0.07 (-0.345)	0.20 (1.227)	0.21 (1.291)	0.24 (1.487)	0.08 (1.005)	0.08 (0.949)	0.05 (0.608)	-0.10** (-2.490)	-0.10*** (-2.640)	-0.14*** (-3.759)
Adj ROA	-1.69 (-0.522)	-1.72 (-0.530)	-1.71 (-0.515)	-1.26 (-0.596)	-1.27 (-0.597)	-1.39 (-0.660)	-2.03** (-2.256)	-2.03** (-2.267)	-2.07** (-2.317)	-0.47 (-1.012)	-0.49 (-1.047)	-0.59 (-1.312)
Adj Cash ROA	-0.45 (-0.455)	-0.44 (-0.449)	-0.43 (-0.438)	-2.87*** (-3.583)	-2.87*** (-3.547)	-2.84*** (-3.367)	-1.10*** (-3.145)	-1.11*** (-3.179)	-1.15*** (-3.255)	-0.55*** (-3.617)	-0.56*** (-3.698)	-0.60*** (-3.953)
Lev	-0.58** (-2.132)	-0.59** (-2.203)	-0.60** (-2.263)	-0.20 (-0.635)	-0.17 (-0.549)	-0.14 (-0.453)	-0.18 (-1.210)	-0.15 (-1.007)	-0.11 (-0.770)	-0.23*** (-3.044)	-0.21*** (-2.719)	-0.14* (-1.862)
Log Asset	-0.34*** (-5.916)	-0.34*** (-6.083)	-0.34*** (-5.949)	-0.59*** (-8.613)	-0.60*** (-8.872)	-0.62*** (-9.239)	-0.31*** (-9.234)	-0.31*** (-9.152)	-0.29*** (-8.618)	-0.16*** (-9.840)	-0.16*** (-9.961)	-0.14*** (-8.641)
Log Scale	-0.07 (-0.797)	-0.07 (-0.782)	-0.07 (-0.777)	0.16* (1.904)	0.16* (1.929)	0.16* (1.910)	0.11*** (2.981)	0.11*** (2.934)	0.11*** (2.858)	-0.07*** (-4.124)	-0.07*** (-4.172)	-0.08*** (-4.383)
Warranty	0.24** (2.427)	0.24** (2.423)	0.24** (2.421)	0.12 (1.382)	0.12 (1.384)	0.12 (1.439)	0.17*** (4.265)	0.17*** (4.361)	0.17*** (4.404)	0.08*** (4.494)	0.08*** (4.560)	0.09*** (4.638)
Trade Mtr	0.02 (0.616)	0.02 (0.607)	0.02 (0.620)	0.22*** (6.222)	0.22*** (6.274)	0.22*** (6.410)	0.10*** (7.693)	0.10*** (7.743)	0.10*** (7.709)	0.11*** (22.993)	0.11*** (22.962)	0.11*** (22.776)
Year Fixed	Yes	Yes	Yes							Yes	Yes	Yes
Observations	194	194	194	265	265	265	773	773	773	3,248	3,248	3,248
R-squared	0.705	0.705	0.705	0.683	0.684	0.687	0.530	0.529	0.527	0.590	0.590	0.586

**Table 8**

**Regression Results for Subsamples with Provincial-level Variables.** This table reports pooled regression estimates with subsamples divided by year. Column 1-3, 4-6, 7-9 and 10-12 respectively present results for samples in trading year 2008-2010, 2011, 2012 and 2013-2014. The dependent variables in all columns are Trade Spread, i.e. annually averaged bond spread. We use robust standard error to calculate t value. The sample period extends from May 2008 to April 2015. Two-tailed t-tests are conducted where \*\*\* denotes  $p < 0.01$ , \*\*  $p < 0.05$ , and \*  $p < 0.1$ .

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Govt Lev 1	0.05 (0.983)			0.05 (1.024)			0.04 (1.466)			0.03*** (3.140)		
Prv Govt Lev 1	-0.19** (-2.209)			0.02 (0.395)			0.01 (0.316)			0.02 (1.519)		
Govt Lev 2		0.44 (0.562)			0.55 (0.772)			0.13 (0.439)			0.29** (2.511)	
Prv Govt Lev 2		-1.69* (-1.855)			0.32 (0.490)			0.34 (1.184)			0.29** (2.531)	
Govt Lev 3			0.02 (0.054)			0.05 (0.135)			0.08 (0.571)			0.15** (2.119)
Prv Govt Lev 3			-0.71 (-0.982)			0.45 (1.060)			0.19 (1.067)			0.15* (1.854)
GDP Portion 1	-16.18** (-2.327)	-16.45** (-2.368)	-15.99** (-2.253)	-27.40*** (-3.293)	-27.72*** (-3.339)	-29.47*** (-3.421)	-17.32*** (-4.056)	-17.92*** (-4.189)	-18.45*** (-4.248)	-11.87*** (-5.783)	-11.99*** (-5.797)	-13.79*** (-6.916)
Land Revenue	0.06 (0.379)	0.06 (0.359)	0.05 (0.321)	-0.09 (-0.682)	-0.10 (-0.737)	-0.10 (-0.710)	0.00 (0.011)	-0.00 (-0.007)	0.00 (0.072)	0.02 (0.952)	0.02 (0.885)	0.03 (1.127)
Fiscal Balance	-0.84*** (-2.641)	-0.90*** (-2.655)	-0.91*** (-2.717)	0.07 (0.310)	0.04 (0.141)	0.14 (0.574)	-0.05 (-0.353)	-0.03 (-0.197)	-0.03 (-0.197)	-0.12* (-1.814)	-0.14** (-2.014)	-0.11* (-1.705)
Prv GDP Portion	1.85 (0.479)	1.30 (0.328)	0.69 (0.176)	1.67 (0.582)	1.97 (0.673)	2.15 (0.707)	2.20* (1.921)	2.30** (2.002)	2.41** (2.085)	-0.86* (-1.696)	-0.72 (-1.433)	-0.76 (-1.492)
Prv Land Revenue	0.37 (1.349)	0.34 (1.205)	0.31 (1.132)	0.52* (1.835)	0.53* (1.872)	0.56** (1.974)	0.52*** (5.112)	0.53*** (5.132)	0.56*** (5.326)	-0.01 (-0.151)	-0.02 (-0.324)	0.03 (0.505)
Prv Fiscal Balance	0.20 (0.268)	0.46 (0.635)	0.71 (0.989)	-0.65 (-1.069)	-0.72 (-1.159)	-0.90 (-1.333)	-0.92*** (-4.007)	-0.94*** (-4.089)	-1.04*** (-4.297)	-0.14 (-1.316)	-0.14 (-1.355)	-0.24** (-2.296)
Importance	0.02 (0.099)	-0.03 (-0.147)	-0.08 (-0.334)	0.26 (1.419)	0.27 (1.420)	0.21 (1.165)	0.08 (0.934)	0.06 (0.722)	0.07 (0.772)	-0.07* (-1.778)	-0.07* (-1.739)	-0.08* (-1.825)
Adj ROA	0.73 (0.184)	0.44 (0.115)	0.41 (0.105)	0.04 (0.014)	-0.03 (-0.012)	-0.03 (-0.087)	-2.47** (-2.394)	-2.49** (-2.394)	-2.52** (-2.424)	-1.25** (-2.267)	-1.27** (-2.304)	-1.31** (-2.378)
Adj Cash ROA	-0.14 (-0.112)	-0.06 (-0.051)	-0.14 (-0.106)	-3.34*** (-3.458)	-3.28*** (-3.399)	-3.32*** (-3.450)	-0.54 (-1.412)	-0.57 (-1.510)	-0.57 (-1.526)	-0.35** (-2.104)	-0.35** (-2.123)	-0.37** (-2.220)
Lev	-0.50 (-1.435)	-0.53 (-1.527)	-0.48 (-1.408)	-0.30 (-0.767)	-0.28 (-0.723)	-0.23 (-0.610)	-0.17 (-0.982)	-0.13 (-0.775)	-0.13 (-0.776)	-0.41*** (-4.592)	-0.40*** (-4.399)	-0.37*** (-4.247)
Log Asset	-0.38*** (-3.909)	-0.34*** (-3.738)	-0.32*** (-3.664)	-0.69*** (-8.107)	-0.68*** (-7.813)	-0.66*** (-7.845)	-0.30*** (-7.413)	-0.30*** (-7.028)	-0.31*** (-6.884)	-0.15*** (-7.721)	-0.15*** (-7.728)	-0.15*** (-7.564)
Log Scale	-0.09 (-0.797)	-0.08 (-0.673)	-0.08 (-0.648)	0.30*** (2.769)	0.29*** (2.784)	0.29*** (2.664)	0.19*** (4.171)	0.19*** (4.144)	0.19*** (4.138)	-0.07*** (-3.742)	-0.07*** (-3.717)	-0.08*** (-3.924)
Warranty	0.18 (1.377)	0.20 (1.477)	0.19 (1.436)	-0.07 (-0.784)	-0.07 (-0.748)	-0.07 (-0.760)	0.12*** (3.044)	0.13*** (3.126)	0.13*** (3.206)	0.08*** (4.175)	0.08*** (4.199)	0.08*** (4.309)
Trade Mtr	0.02 (0.478)	0.03 (0.641)	0.03 (0.714)	0.17*** (4.178)	0.18*** (4.247)	0.18*** (4.288)	0.08*** (4.702)	0.08*** (4.724)	0.08*** (4.739)	0.11*** (20.253)	0.11*** (20.263)	0.11*** (20.253)
Year Fixed	Yes	Yes	Yes							Yes	Yes	Yes
Observations	147	147	147	210	210	210	641	641	641	2,650	2,650	2,650
R-squared	0.625	0.621	0.615	0.602	0.602	0.602	0.420	0.420	0.420	0.538	0.539	0.537

## Appendix

**Definition of Variables in Bond, Firm and Fiscal Levels.** This table reports the definitions of all variables used in the study of Chengtou Bonds

Variables	Definition
<u>Dependent Variables</u>	
Trade Spread	Annually averaged spread of fixed-rate Chengtou Bonds transacted in interbank markets (for bonds only traded in exchange market, we use trade data in exchange market). Weekly closing price is used to calculate bond yield to maturity, and risk-free rate is matched after cash-flow structure adjustment following the method in Ang et.al (2015).
Issue Spread	Fixed-rate Chengtou Bonds issuance spread, risk-free rate is matched after cash-flow structure adjustment following Ang et.al (2015).
<u>Fiscal-level Variables</u>	
Govt Lev 1	Debt sum of LGFVs under a city government in a certain year divided by general budget revenue of the government.
Govt Lev 2	Debt sum of LGFVs under a city government in a certain year divided by local annual GDP.
Govt Lev 3	Debt sum of LGFVs under a city government in a certain year divided by local annual social fixed capital investment.
GDP Portion 1	Portion of city GDP to sum of GDP in cities (excluding municipalities directly under the Central Government) which have first-issued dates before the end of the trading year.
GDP Portion 2	Portion of city GDP to sum of GDP in cities which have first-issued dates before the end of the trading year.
Land Revenue	Ratio of city land revenue to city general budget revenue.
Fiscal Balance	Ratio of city general budget revenue to general budget expenditure.
Prv Govt Lev 1	Debt sum of LGFVs within a province in a certain year divided by general budget revenue of the province.
Prv Govt Lev 2	Debt sum of LGFVs within a province in a certain year divided by local provincial GDP.
Prv Govt Lev 3	Debt sum of LGFVs within a province in a certain year divided by local annual social fixed capital investment.
Prv GDP Portion	Portion of province GDP to sum of GDP in provinces which have first-issued dates before the trading year.
Prv Land Revenue	Ratio of province land revenue to province general budget revenue.
Prv Fiscal Balance	Ratio of province general budget revenue to general budget expenditure.
<u>Firm-level Variables</u>	
Importance	Importance of LGFV within one city in one year, equals to the ratio of asset size inverted rank subtracted by 1 to total number of LGFVs with the city or province subtracted by 1, Importance=0.5, if only one LGFV exists in one city-year.
Adj ROA	Ratio of operating profit to total asset.
Adj Cash ROA	Difference between operating cash flow and net cash flow in related operating activities divided by total asset.
Lev	Sum of short-term and long-term borrowings, bonds payable and current portion of long-term liabilities divided by total asset.
Log Asset	Log of total asset.
<u>Bond-level Variables</u>	

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Log Scale	Log of bond scale.
Warranty	Equals to one, if guaranteed or collateralized, zero otherwise
Trade Mtr	Annually averaged maturity of bonds transacted in accordance with Trade Spread.
Issue Mtr	Bond maturity at issuance.

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