Understanding the Risk of China's Local Government Debts and Its Linkage with Property Markets

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Abstract

The intertwining of local Chinese housing markets with government fiscal policies coincides is the direct result of central government reforms that have encouraged local governments to rely on land sales to fund infrastructure projects via a unique funding mechanism known as Local Government Financing Vehicles (LGFVs). We study the linkage between the solvency of LGFV debt and local housing market risk. Our results show that areas experiencing higher expected house price growth issue debt with lower risk premiums. However, LGFVs do not take advantage of this pattern by issuing more bonds during the booming period of housing markets.

Keywords: fixed income securities, housing markets, local government finance, China

JEL Classification: G1, H7, R3, R5

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1. Introduction

As an emerging economy, China experienced significant economic growth over the past 25 years. Since 1989, the annual GDP growth rate in China averaged over 9%. Coinciding with this remarkable period of economic growth, local housing markets also saw significant expansion with real prices in the major cities increasing by approximately 225% during the previous decade (See Wu, Gyourko and Deng, 2012). This remarkable period of economic growth created a number of social economic challenges (See Deng, Morck, Wu and Yeung, 2015, and Wu, Deng, Huang, Morck and Yeung, 2014 for more discussion). In particular, the link between government finances and the health of the housing market is of particular concern.

The intertwining of local Chinese housing markets with government fiscal policies is a result of the central government engaging in a number of reforms to China's fiscal system. These reform measures have created unique challenges for local governments and have raised global concerns about the impact of a possible correction of China's housing market on the Chinese and global economy.

The root of the concern lies in the efforts by China's central government to revise its tax revenue sharing policies in an effort to promote economic growth in less developed regions. Most notably, in 1994 China consolidated the provision for tax revenue collection and sharing in order to redistribute tax revenues to less developed areas while at the same time mandating increased local expenditures on infrastructure projects (and public housing projects recently). However, unlike local governments in western countries, local Chinese governments were prevented from directly issuing debt to fund mandated capital projects until very recently. As a result of the fiscal stresses and restrictions placed on local governments, China developed a unique funding source for local governments to obtain the capital necessary to fund large-scale infrastructure investments

- the funding mechanism known as Local Government Financing Vehicles (LGFV; or Local Government-Backed Investment Units, LGBIU). Using these investment units, local governments access capital markets by issuing bonds. However, unlike traditional municipal debt in western countries, the Chinese investment units are unable to use tax revenues to fund coupon or principal payments. Rather, as detailed in Lu and Sun (2013), the local government often capitalizes the investment unit through transfers of land usage rights. Thus, in effect, the local governments tap into the growing housing market by selling public land to fund the investment units' coupon and principal payments. As a result of this unique dependence of local governmental fiscal policies on local housing markets, a substantial drop in housing or land values may increase the risk level of local government debt, or even trigger a systematic default.

According to the latest available statistics published by the National Audit Office, by the end of June 2013, the total volume of outstanding local government debt reached 10.89 trillion yuan RMB, equivalent to 19.15% of China's GDP in 2013. In contrast, the total volume of central government debt was 9.81 trillion at the same time. The risk level of this local government debt highly relies on the housing/land market conditions. For example, according to the National Audit Office, 37.23% of the debts of local governments explicitly promised that they would use future land sales revenue to repay the debt. In addition, land parcels are also the most widely-used collateral for local government debt.

The purpose of this paper is to study the linkage between the solvency of local government debt and local housing market risk. Of all the financial instruments involved in local government debt, bonds issued by LFGVs are the only type that: 1) are publicly transacted; and 2) have public information available. We utilize a combination of several unique datasets to investigate how the market evaluates the risks associated with local government debt, especially focusing on the effect

of housing market conditions. Our results indicate that areas with higher expected house price growth are able to issue debt with lower risk premiums. Furthermore, we also find that the bond market reacts to changes in local housing conditions: bonds issued by LGFVs from areas that experience greater changes in housing prices see a corresponding decline in observed yield spreads. Thus, the results suggest that investors do price local housing risk into Chinese municipal bond risk premiums. However, we find no evidence that local governments or LGFVs take advantage of this pattern to issue more bonds during the booming period of housing markets.

2. Institutional backgrounds

2.1 China's fiscal system

With the transition away from a state controlled economic system, the Chinese economy has rapidly expanded. One of the outcomes of the increase in economic activity is a significant growth in government related expenditures. For example, as Fig. 1 shows, between 1995 and 2012 the Chinese government's budgetary expenditures increased at an average real annual growth rate of 16.1%. To fund these expenditures, the Chinese government enacted new tax provisions such that the government's budgetary income increased substantially since the mid-1990s. For example, between 1995 and 2012 the real average annual compound growth rate in income reached 16.2%, which was significantly higher than the GDP growth rate over the same interval. Consequently, the ratio between budgetary income receipts and GDP increased from 10.3% in 1995 to 22.6% in 2012.

However, this huge and increasing government income masks a fiscal dilemma facing local governments. During this period of rapid economic expansion, the fiscal relationship between the

central Chinese government and local government units also experienced significant changes that created substantial stresses on local government finances. For example, in 1994 China established the so-called "tax sharing system" (*fen shui zhi*) under which each type of tax is shared by the central and local governments according to a stated percentage.[1] Since local governments controlled most of these taxes before 1994, Fig. 2 illustrates that this reform immediately decreased local government income. Fig. 2 shows that in 1993 local governments accounted for 78.0% of all budgetary income. However, following enactment of the tax sharing system in 1994, local government share of income plunged to 44.3% and has remained below 50%. Unfortunately, local government budgetary expenditures were not shifted at the same percentages as income. Thus, local governments remain responsible for the majority of budgetary expenditures and their share of total government expenditures continues to increase creating significant fiscal pressure.

Although the central government retains a significant share of tax revenue, it does transfer a large portion of this income back to local governments in an effort to mitigate regional inequality in economic development. According to latest available statistics, in 2012 the total volume of such transfer payments reached 4.54 trillion, or 80.8% of the central government's total budgetary income. Although these transfer payments are almost enough to fill the gap between local government budgetary expenditures and income, the transfer payments are generally concentrated in less developed areas. Thus, the relatively more prosperous urban areas have not benefited from the transfer payments.

In addition to the redistributive nature of the transfer payments, the central government places significant restrictions on the uses of most of these funds. For example, in most cases the transfer

[1] For example, the central government receives 75% of the value added tax (VAT) and the local governments receive the left 25%. The corporate income tax from financial institutes and central state-owned enterprises goes to the central government, while local governments receive the corporate tax from other firms. All consumption tax goes to the central government, and all personal income tax goes to local governments.

payments from the central government cannot be spent on investment on urban infrastructure projects. However, local governments have strong incentives to invest in large-scale urban infrastructure projects since such investments are effective in boosting local economic GDP growth, and GDP growth rate plays an important role in determining future political career of local government officials (Wu et al, 2014). Compounding the local government fiscal imbalance, the central government often imposes additional requirements on the local governments' investment activities. For example, in China's 2008 stimulus package, the central government required that local governments fund 2.8 trillion (70%) of the 4-trillion package. In addition, since 2007 the central government has explicitly required local governments to develop more affordable housing units.

Unfortunately, unlike their counterparts in other countries like the U.S., local Chinese governments are unable to tap into the traditional municipal bond market to fund required infrastructure projects. In particular, the current Budget Law in China explicitly states that "*the local budgets at various levels shall be compiled according to the principles of keeping expenditures within the limits of revenues and maintaining a balance between revenues and expenditures, and shall not contain deficit. The local governments, including their subordinates, may not issue local government bonds, except as otherwise prescribed by laws.*" The revised version of the Budget Law, which became effective on January 1, 2015, allows the provincial-level government to issue bonds under a quota set by the State Council. But the prefectural or lower level governments still cannot borrow loans or issue bonds directly to support their investment projects.

2.2 Emergence of local government financing vehicles

The strong incentives for local Chinese governments to invest in large projects such as urban infrastructure or affordable housing combined with the lack of traditional financing methods (budgetary income, bank loans or municipal bonds) created an environment for local governments in China to seek innovative financing vehicles. As a result, local Chinese governments have turned to the concept of the "local government financing vehicles" (*di fang zheng fu rong zi ping tai* or LGFV for short) as an important financial vehicle to fund basic infrastructure projects. [2]

LGFVs first appeared at the beginning of this century and became popular as a result of the 2008 stimulus period. In order to facilitate local government efforts to support the 2008 stimulus package, the Peoples' Bank of China (China's central bank) and China Banking Regulation Commission jointly issued a document in March 2009 that encouraged local governments to use LGFVs to finance their stimulus-related investment projects. This pronouncement immediately triggered the rapid development of LGFVs. According to the latest available statistics published by the National Audit Office, as of June 2013 the total volume of outstanding debt (including bonds and bank loans) borrowed by LGFVs was 4.08 trillion, accounting for 37.5% of the total volume of local government debts (10.89 trillion).

A LGFV is essentially a state-owned enterprise (SOE) with a corresponding local (provincial, prefectural, or district/county) government as the only (in most cases) or dominant shareholder.[3] To create a LGFV, the corresponding local government transfers land parcels, utilities or infrastructure, shares of other non-LGFV SOEs, or in some cases capital funds to the LGFV exchange for equity ownership. The LGFV then, following rules regulating regular corporations, raises

[2] Local Government Financing Vehicles (LGFVs) are also referred as Local Government-Backed Investment Units (LGBIUs) or Local Government Financing Platforms (LGFPs). Currently the Chinese government has not provided an official English translation for this term. So LGFV, LGBIU, and LGFP are used interchangeably in the current literature.

[3] LGFVs are sometimes described as special purpose vehicles (SPVs). But currently in China SPV is not a strict legal concept, and thus legally LGFVs are founded and operated as regular corporations.

capital via bank loans, corporate bonds, medium term notes, or other securities to finance large-scale investment projects such as urban infrastructure or affordable housing. Before 2012 they also actively participated in the shadow banking system, such as issuing trusts or acquiring entrust loans. But LGFVs rarely raise capital by issuing new equity to other firms or persons.

In general, LGFVs differ from regular, local non-LGFV SOEs in two major aspects. First, LGFVs focus on investments on large projects such as urban infrastructure or affordable housing developments and are seldom involved in manufacturing industries. Secondly, and even more importantly, in most cases LGFVs are companies with unlimited liability such that the corresponding local government ultimately assumes or backs the LGFV debt in case of default. In particular, since a large majority of LGFV investment projects do not generate income or are not profitable, LGFVs rely on the funding support from corresponding local governments to repay their debts. In contrast, following several SOE reform initiatives beginning in the late 1980s, most non-LGFVs do not receive direct funding transfers from local governments.

To illustrate the LGFV concept, consider the following example of Fushun Development Investment Corporation (FSDIC) that is reported by H. Ma (as cited in Zhang and Barnett, 2014, p.8). The Fushun Development Investment Corporation was established in June 2002 by the Fushun city government. The city provided an initial capital infusion of RMB150 million and then in 2006 transferred a land usage right as additional paid-in capital. In 2009, FSDIC acquired three solely stated-owned companies as subsidiaries. With these acquisitions, FSDIC became the primary infrastructure development entity for the city. For example, FSDIC engages in development of the local sewage system, a flood protection project, road construction, and public housing. FSDIC generates revenue from the subsidiaries, such as the water company, and from

city government subsidies. However, the majority of revenue comes from the sale of land, which is used as collateral to support its bond issues.

While LGFVs rely on local governments as the major source for servicing debt, local governments cannot use their budgetary income as the funding source, and thus usually rely on revenues from land sales as the primary funding source. Accordingly, a sharp decline in housing/land prices may have a significant effect on the local governments and their LGFVs ability to repay their debts. We test the existence of such effect in the following empirical analysis.

2.3 China's corporate bond market

Our focus is on corporate bonds issued by LGFVs, which is the only financing channels of LGFVs with publicly available data. As discussed in Huang and Zhu (2009) and Pessarossia and Weill (2013), the corporate bond market in China is less matured than developed economies such as the U.S. and only started to develop in the 2000s. Before 2007, firms needed approval from the National Development and Reform Commission (NDRC), which set an extremely opaque and strict quota system, to issue corporate bonds. Therefore, as depicted in Fig. 3, during that period the corporate bond sector only accounted for 2% or even less in the total annual issuance. Then in the reform in 2007, the rights of corporate bond approval were transferred to the China Securities Regulatory Commission (CSRC) and the quota system was abolished, which immediately triggered a rapid increase of the corporate bond sector. In 2014 the annual volume of corporate issuance in China reached 696.2 billion yuan RMB, accounting for 11.7% in the whole bond market.

While more institutional details about China's corporate bond market are available in Hale (2007), Huang and Zhu (2009), and Pessarossia and Weill (2013), three facts are especially

noteworthy. First, the Chinese bond market is only open to institutional investors. For example, according to ChinaBond, in 2014 commercial banks, funds, and security companies comprised 43.1%, 32.7% and 16.9%, respectively, the investors in the corporate bond market. These institutional investors may securitize part of these bonds as funds or financing products for sale to individuals or smaller institutional investors. However, until very recently, retail investors were not allowed to directly invest in the bond market.[4]

The second fact is about the procedures and pricing mechanism in the issuance of corporate bonds. The issuance of corporate bonds typically follows a quotation process. For a specific corporate bond, the underwriter will first help the issuer to set the issuance volume and offering rate range. Next, the underwriter arranges the road show and negotiates with the major potential institutional investors. Investors that are interested in the bond then provide bidding rates and amounts they would purchase, either via bidding procedures or book building procedures. Finally, the coupon rate of the bond is determined based on these biddings. Accordingly, in almost all cases, corporate bonds are issued at par, with a price discovery mechanism determining the coupon rate (or the initial yield spread).

After issuance, the corporate bond is transacted in either the inter-bank market or the exchanges (the Shanghai Exchange in most cases), and so far the former one has dominated. Huang and Zhu (2009) point out that the lack of liquidity was a major problem in the early corporate bond market, but such situation has substantially changed. Fig. 4 depicts the annual transaction volume of spot corporate bonds in both markets. There was effectively no liquidity before 2008, but the markets, especially the inter-bank market, started to increase dramatically since 2009. Currently,

[4] In February, 2016, the People's Bank of China adjusted the administration codes of the inter-bank market, and individual investors with financial assets no less than 3 million yuan RMB and at least two years of financial investment experience were allowed to directly invest in the inter-bank market.

a very active repurchase transaction sector also exists in both markets ensuring that the transaction prices of corporate bonds reasonably reflect market participants' understanding of the bonds' risk levels.

3. Data

To analyze the growing Chinese municipal bond market, we assembled a comprehensive panel encompassing the Chinese bond market, local and state government finances, and local housing markets. This section describes the data sources and documents the extent of the municipal bond market in China.

First, we collected detailed information on all 4,577 corporate bonds issued in mainland China between 2005 and 2014 using the WIND database, a Compustat-style database in China.[5] The majority of the bonds are issued and transacted in either the inter-bank market (2,009 bonds, or 43.9%) or on the exchanges in Shanghai (2,075 bonds, or 45.3%) or Shenzhen (409 bonds, or 8.94%). For each bond, we collect information on the issuer, coupon rate, issue amount, issue date, maturity, rate type (fixed, adjustable, or progressive), rating level of the issuer, rating level of the bond, credit enhancing arrangements (collateral, warrant by third party, or without any arrangement), declared use of the funds raised, and key information on the underwriter.

One of the challenges in collecting data on Chinese municipal bonds is that the "local government financing vehicle" is actually not a strict legal concept in China. However, LGFVs always contain some key features. For example, one widely accepted description promoted in a State Council document indicates that a local government-backed investment unit is "*a legally independent corporation or institution, with a specific local government as the only or dominant*

[5] See www.wind.com.cn for more details.

owner that invests in (and operates) urban infrastructure projects." [6] However, as discussed in the previous section, one essential feature of LGFV is the (implicit) guarantee or funding support from the corresponding local government, which cannot be covered by such descriptions and cannot be directly observed.

In this paper we choose to borrow the list of LGFVs issued by China Banking Regulation Commission (CBRC). Since August 2010, CBRC maintains a list of LGFVs that mainly serves as a guideline from CBRC to the commercial banks in regulating their borrowing to LGFVs. This provides the most reliable information on the coverage of LGFVs. For each of the 4,577 bonds, we check whether its issuer was included in the list when the bond was issued. Thus, we identify 1,679 LGFV bond issues, or 36.7% of all corporate bonds. As detailed in Table 1, the LGFV bonds are primarily traded in the inter-bank market (964 bonds, or 57.4%) and on the Shanghai Exchange (680 bonds, or 40.5%).

Table 2 reports the distribution of LGFV bonds by corresponding government levels. In general provincial-level governments issued more bonds, with larger volumes, and with shorter intervals, followed by prefectural-level governments and district/county-level governments. The 23 provincial government units account for 142 LGFV bonds (or 8%); the 215 prefectural-cities issued 828 bonds (or 49%); the 76 district governments within prefectural-cities issued 378 bonds (or 23%); and the 61 county or county-level cities issued 330 bonds (or 20%). The second panel of Table 2 provides preliminary information on regional variances in bond issuance. In particular, we note that local governments in the east region are generally more active, accounting for 9.97 bonds per issuer compared to the 5.28 bonds per issuer in the middle region and 5.27 bonds per issuer in the west region.

[6] State Council of China, "Circular on the Relevant issues on Strengthening the Management of Local Government-Backed Investment Units" (Document (2010) 19), June 13th, 2010.

Panel A of Fig. 5 shows the total volume of LGFV bonds issued each year, while Panel B displays the bonds' outstanding balances. Prior to 2008, the total volume of LGFV bonds was very small with less than 200 LGFV bonds issued. However, the volume of bond issuance boomed in 2009 as a result of the Chinese government's stimulus package, and then jumped again in 2012.[7] Thus, by the end of June 2013, the total volume of outstanding LGFV bonds reached 2.60 trillion RMB, accounting for about 23.9% of the total volume of local government debts (10.89 trillion), as reported by the National Audit Office. By the end of 2014, the total amount outstanding had increased to 1.97 trillion yuan RMB.

Fig. 6 shows how the issuance of LGFV bonds shifted to lower level (or more local) governments during recent years. For example, by the end of 2014, LGFVs associated with provincial-level governments accounted for about one-tenth (9.60%) of issues while prefectural-level city governments comprised 52.46%, with the remaining from district- and county-level governments. County- and district level government units' share significantly increased since the stimulus period.

Corresponding to the growth in debt issuance by smaller government units, Fig. 7 illustrates the rapid decline in issuers' ratings. During the sample period, in almost all cases ratings are provided by local rating agencies in mainland China. Since 2008 a significant number of higher risk issues have come to market. Thus, by the end of 2014, AAA-rated LGFVs accounted for only 3.31% of the total outstanding bond volume.

The maturity structure of LGFV debt also changed substantially between 2005 and 2013. As noted in Fig. 8, the average maturity of LGFV bonds issued before 2007 was more than 12 years,

[7] Before 2012, besides bank loans and corporate bonds the LGFVs also highly relied on trusts and entrust loans. But such financing vehicles became much less feasible in 2012 when the central government released stricter regulations on the shadow banking system, and so more LGFVs had to turn to the bond market.

but it decreased to 6.7 years in 2008 and fluctuated around 7 years after that. At the end of 2014, the average remaining maturity for the outstanding bonds was 7.35 years.

Not surprising, the shift to debt issues by smaller government units is associated with an upward trend in yield. Panel A of Fig. 9 depicts the yield-to-maturity (in our sample all the bonds were issued at par) and the corresponding offering yield spread at issuance. The offering yield spread is calculated by matching each bond to a China treasury bond with a similar maturity as a proxy for the risk-free rate. Specifically, we match each LGFV bond with a China treasury bond having a maturity date within three months of the LGFV bond maturity date. In general the yield spread increased from around 1% at the beginning of the sample period to over 3% after 2008.

We next merged the LGFV bond dataset with several other sources to obtain comprehensive statistics on local government finances, and since now we mainly focus on LGFV bonds issued by prefecture-, district-, or county-level local governments in 90 major cities, where we can get access to comparably reliable information. The distribution of these 708 bonds is listed in the last column of Table 1. First, as Chinese law requires corporations issuing bonds in mainland China to publicly release annual financial information, we collect key accounting information (such as annual total assets, liabilities, earnings, etc.) for LGFV issuers. Second, since China prevents local government units from directly issuing debt, we use the financial information-reporting requirement to obtain information on the wholly owned corporate entities issuing LGFVs on behalf of local governments. For each LGFV issuing unit, we collect local economic and demographic information (such as population, GDP, government fiscal income and expenditure, etc.) from the official statistics published by National Bureau of Statistics of China. Finally, we introduce the monthly constant quality housing price index discussed in Wu, Deng and Liu (2014), which provides a direct link between the LGFV bonds and local housing market conditions.

Table 3 reports the descriptive statistics at each bond's issue date. The average coupon rate for LGFV bonds is 6.9% and ranges between 3.4% and 9.1%. The majority of bonds (77%) are fixed-coupon and do not have any credit enhancements (66%). In terms of intended use of funds, about half of the bonds (55%) listed investment on urban infrastructure as the major designated usage, and other major usages include public housing development and operating funding of LGFVs.

Since the WIND database also reports quarterly transaction prices for each bond, we calculate the bonds' yield-to-maturity based on the closing price on the last trading day of each quarter, and match to a China treasury bond with a similar maturity in order to calculate the bond's quarterly yield spread over the risk-free rate. Table 4 provides the summary statistics for the unbalanced quarterly panel. Fig. 9, Panel B reports the average quarterly yield-to-maturity and yield spreads of all outstanding bonds. On average, the LGFV bond yield to maturity was 6.1%.

4. Initial yield spread and housing risk

4.1 Empirical strategy

Our investigation of the China municipal bond market begins by recalling that most LGFV entities rely on land sales to facilitate coupon and principal payments. Fig. 10 shows the quarterly series year-on-year growth rate of the national level constant-quality housing price index by Wu, Deng and Liu (2014) compared to the average LGFV offering yield spread. The graph suggests a negative relationship between LGFV bonds' offering yield spread and historical housing price growth. Building on this insight, our analysis begins by assuming that market participants price expectations of local housing price risk in LGFV bonds. To analyze this risk, we follow the modeling set-up of Ambrose and Warga (1992) to include a variable reflecting local housing

market risk as a supplement to the standard structural models of bond yield spreads derived in the literature. Thus, we test the hypothesis that bonds issued by LGFVs reflect the risk associated with trends in the local housing markets. As noted by Ambrose and King (2002), prior research shows that bond yields reflect market liquidity conditions and the liquidity of fixed-income securities is a function of many factors including issue size, age, coupon, and general economic trends.[8]

Following Chen, Lesmond and Wei (2007), our initial analysis focuses on differences in the LGFV bond offering yield spreads. To control for bond liquidity, credit risk, and macro-economic factors, as well as differences in local real estate market conditions, we estimate the following regression:

$$y_i = \alpha + \beta_1 E(R_{i,H}) + \beta_2 B_i + \beta_3 L_i + \varepsilon_i$$

where y_i is the yield on LGFV bond i less the yield on the China Treasury bond with maturity closest to the LGFV bond i, $E(R_{i,H})$ is the expected return to the local housing market associated with bond i's LGFV, B_i represents a vector of bond characteristics, and L_i represents a vector of local market factors. The set of bond characteristics (B) reflect the typical factors that capture differences in bond liquidity such as maturity, bond type (long-term, medium-term, or short-term), coupon payment type (fixed, adjustable or progressive), bond rating at issuance, the presence of credit enhancements (collateral or warrants), and the market where the bond is expected to trade (inter-bank or exchanges). The set of local market factors (L) reflect systematic differences in locality or LGFV. The specific factors associated with the LGFV's include the log of total assets, estimated earnings (ROA), and total debt (Liability/total assets). We control for differences in local governments by including a set of variables that (1) denote whether the local government expects

[8] For example, Amihud and Mendelson (1991), Warga (1992), and Sarig and Warga (1989) document that bond liquidity is related to security age and maturity; Kamara (1994) finds that interest rates impact liquidity; Crabbe and Turner (1995) and Flemming (2001) relate bond size to liquidity; Bernanke (1983, 1991), Stock and Watson (1989), and Hand, Holthausen and Leftwich (1992) relate yield spreads to macro-economic factors and credit quality.

to invest the funds raised on infrastructure projects, (2) capture differences in population size (the log of the population), (3) control for differences in economic output (log of the per capita GDP), and (4) reflect the government level (city, county, districts, or prefectural).

4.2 Basic specifications

Table 5 presents the results for the regression of offering yield spread levels, using the sample of all LGFVs in 90 major cities. As our focus in this paper, we include the variable denoting the cumulative housing price growth during the 12 months prior to the bond issuance. As noted by Deng, Gyourko and Wu (2012) and Wu, Deng and Liu (2014), housing markets in China display high degrees of persistence. Thus, we use the previous 12-month return as a forecast for expected returns. In the five model specifications, the variable representing housing price growth is always negative and statistically significant. This is consistent with the hypothesis that areas with higher anticipated house price growth are able to borrower at lower costs. As reported in column (5) of Table 5, a one standard deviation increase in resent housing price growth (measured by the accumulated growth during the previous 12 months), which is about0.125 (or 12.5 percentage points), would lead to a reduction in offering yield spread of about 6 basis points. Since the majority of LGFVs rely on land sales to cover coupon and principal payments, the results are consistent with investors pricing the housing market into the offering yields.

Some results regarding the control variables are also noteworthy. First, besides the quarterly fixed effects and bond attributes, in column (3) we add a set of variables to capture differences across the LGFVs. We note that larger LGFVs, as reflected in total assets, have lower yield spreads. Interestingly, the other indicators on LGFVs' performance, including their profitability (ROA), total liabilities (scaled by total assets), and previous record in issuing bonds (i.e., whether this is

the first bond issued by the LGFV) are all insignificant in the model. In other words, it seems that the LGFVs' own performance is not perceived to be very important in measuring the risk level of LGVF bonds.

Second, in column (4) we further introduce controls for differences across the local governments that created the LGFVs. The level of the corresponding local government plays an important role: relative to prefectural level governments, the offering spread for bonds issued by LGFVs backed by county governments is about 20 basis points higher, controlling for other factors, while bonds issued by capital cities have more than 25 basis points lower yield spreads. Bonds issued by LGFVs affiliated with local governments in more developed areas, measured by higher per capita GDP, have lower offering yield spreads. Our estimates (in column (4)) suggest that a one standard deviation increase in per capita GDP would result in about 18 basis points reduction in offering yield spreads.

Finally, in column (5) we further control for the underwriter's previous experiences in issuing LGFV bonds, and it is significantly negative in the model. Thus, more experienced underwriters effectively help issuers reduce their financing costs.

In Table 6 we compare the pattern revealed before with corporate bonds issued by non-LGFV SOEs (column 1) and private firms (column 2). There are several noteworthy differences compared with column (4) in Table 5. Most importantly, the linkage between housing market condition and offering yield spread does not exist in either non-LGFV SOEs or private firms, which is consistent with the fact that neither of these two types of firms can rely on local governments' land sales revenues as a major source of repayment. The results also imply that the effect of the housing market condition revealed in Table 5 should not be interpreted just as a result of endogeneity. For example, if such linkage only results from omitted variables such as demand shocks, then it would

also apply to non-LGFV SOEs and private firms as well. In addition, the corresponding local government level is insignificant for non-LGFV SOEs. By contrast, in general the issuers' own performance is more important in affecting offering yield spread for non-LGFV SOEs and private firms: besides total asset, firms with higher profitability or lower liability can also enjoy lower offering yield spread, while firms have to pay higher rate for their first bond.

The last two columns in Table 6 refer to bonds from a special group of firms. In 2010 (Document 2010-19) the State Council explicitly required that a SOE should no longer be treated as a LGFV if its daily operating can be supported by its own operating income. Accordingly the CBRC regularly updated its LGFV list, and would delist a LGFV if it was believed to be sufficiently profitable. Thus, in 2010, 121 LGFVs were delisted and the number of delistings jumped to 1,456 in 2011. In the following three years, 284, 241, and 113 LGFVs were delisted, respectively. In column (3) we focus on the offering yield spread of corporate bonds issued by these delisted LGFVs after they were explicitly excluded from the LGFV list. Among others, we find that the linkage between housing market condition and offering yield spread no longer exists. Finally, in the last column we introduce a difference-in-difference model specification to investigate the change when a previous LGFV is delisted. Controlling for other factors, the offering spread significantly decreases after the previous LGFV is delisted. Meanwhile, the effect of housing market conditions disappears.

In Table 7 we turn to the effect of housing market conditions on the issuers' (column 1) or bonds' (column 2) ratings based on an ordered logit model. As we have found that the bond market participants perceive that housing market conditions play a significant role in affecting bond risks, the question is whether the rating agencies would take such factors into considerations. The answer is no. Controlling for other available information for LGFVs and corresponding local governments,

as well as bond characteristics (for bond rating), the proxy for the housing market condition is negative in these two models, but both statistically insignificant. These results are consistent with the fact that the role of land sales revenue as a major potential source of LGFV bond repayment, although recognized by market participants, is actually not explicitly stated in any official documents and thus cannot be formally considered by rating agencies.

4.3 Heterogeneity in the interrelationship between housing price change and yield spread

The results before suggest that housing price changes can significantly affect the initial yield spread of LGFV bonds. In this subsection we further explore the potential heterogeneity in such effect, and especially focus on two factors.

The first is about the degree of LGFVs' (or the corresponding local governments') reliance on revenues from land sales. It is reasonable to expect that, for local governments with heavier reliance on land sale revenues, the offering yield spread of their LGFV bonds should be relatively more sensitive to the housing market conditions. We start with the rank of the corresponding local governments. As listed in Panel A of Table 8, the variable of previous housing price change is significantly negative in the model for lower-level governments (i.e., district or county level governments), but insignificant in the model for prefectural or higher level governments. Our estimates suggest that a one standard deviation increase in recent housing price growth would lead to a 10 basis points reduction in the offering yield spread for lower-level governments. This is consistent with the fact that lower-level governments have fewer other financial resources, and thus have greater reliance on land sales revenue. Similarly, the results in Panel B suggest that the effect of previous housing price change is much more important in more developed areas (i.e., local governments with higher per capita GDP). A one standard deviation increase in recent

housing price growth would lead to a 15 basis points reduction in yield spread for cities whose per capita GDP are higher than the median level, controlling for other factors. As introduced before, in the current fiscal system in China, less developed areas are the major target of transferred incomes from central government and thus rely less on land sales revenues.

Next, we turn to the efficiency of price discovery mechanism. According to Panel C, the effect of housing market conditions on offering yield spread is much more significant in the inter-bank market. As introduced in the second section, the inter-bank market in China is relatively more mature and much more active than the exchanges in the bond sector. Therefore, we expect that investors in the inter-bank market better understand the underlying factors affecting LGFV bonds' risks. Finally, in the last panel we find that underwriters with more experience in issuing LGFV bonds are able to take advantage of a booming housing market and help the issuer reduce offering yield spreads.

5. Changes in yield spreads and housing risk

In this section we explore the role of changing housing market expectations on bond yield spread changes. Following Ambrose and King (2002), Chen, Lesmond and Wei (2007), and Collin-Dufresne, Goldstein and Martin (2001), we estimate the following regression for the period from 2005 to 2014:

$$y_{i,t} = \gamma_0 + \gamma_1 R_{i,H,t} + \gamma_2 \left({}^{Exp}/_{Inc}\right)_{i,t}$$

$$+ \gamma_3 GDP_{i,t} + \gamma_4 Assets_{i,t} + \gamma_5 ({}^{Liab}/_{Asset})_{i,t} + \gamma_6 (ROA)_{i,t} + \gamma_7 B_i + \varepsilon_{i,t}$$

where $R_{i,H,t}$ is the housing price growth rate for LGFV locality i; GDP_i represents the local LGFV GDP, $Assets_i$ is the LGFV i's total assets, *Liab/Asset* is the ratio of total liabilities to total assets for

LGFV *i*; *ROA* is the ratio of LGFV *i*'s earnings over total assets; and B_i represents the set of individual bond fixed effects.

Table 9 reports the estimated coefficients for the change in yield spread regression. Column (1) reports the base quarterly model focusing on the risk associated with changing housing market returns. The negative and statistically significant coefficient for $R_{i,H,t}$ indicates that, as expected, changes in bond yields are related to changes in local real estate values (as reflected by increases in housing market returns). The negative coefficient indicates that bonds issued by LGFVs in areas with higher housing returns have lower yields, reflecting a decline in the risk premium. The negative relation is expected since LGFVs rely predominately on land sales to fund coupon and principal repayments. In columns (2), we further introduce indicators on LGFVs and corresponding local governments, although such information is only updated annually. The proxy of housing market conditions remains consistent in this specification.

6. Local governments' decisions on bond issuances

The analysis above suggests that, the LGFV bonds are perceived by market participants to have lower risks when the housing prices are expected to keep growing; in other words, local governments or their LGFVs can reduce their financing costs during a housing market booming. Then our last question is, do local governments or LGFVs take advantage of such pattern and choose to issue more bonds during the boom period?

In Table 10 we test this from two aspects. In column 1, we adopt a city-level panel data framework; that is, for the 90 major cities between 2010 and 2014, we focus on whether any prefecture-, district-, or county-level LGFV affiliated with a city issued bonds within a specific

year. Controlling for both city and year fixed effects, as well as the economic development and budgetary expenditure conditions; we find that, somewhat surprisingly, the housing market condition proxy is negative and marginally significant. This suggests that LGFVs in cities that experienced large house price increases in the prior year are less likely to issue debt. In column (2) we conduct the analysis on the LGFV level. Unfortunately, we cannot obtain access to LGFV financial information for years prior to when it issues bonds. Thus, we adopt an unbalanced panel for LGFVs that have issued at least one bond. Again the estimated coefficient for the housing price growth variable is negative, although statistically insignificant.

The results in Table 10 provide no evidence that local governments or their LGFVs intentionally issue bonds during a booming housing market; by contrast, it is more likely that they actually issue fewer bonds. One possible explanation is that local governments only choose to issue bonds when they need to raise funds from the capital market. This can well explain the negative effect of housing market condition proxy in Table 10 – during a booming housing market, local governments are able to obtain more funding from land sales to finance their infrastructure investments, and thus rely less on borrowing.

7. Conclusion

The linkage between the health of China's local government finances and the sustainability of the housing market is not very well understood in the academic literature or by policy makers. The intertwining of local Chinese housing markets with government fiscal policies is a result of the central government engaging in a number of reforms to China's fiscal system. As a result of the fiscal stresses and restrictions placed on local governments, China has developed a unique

funding source for local governments to obtain capital necessary to fund required large-scale infrastructure investments.

The purpose of this paper is to study the linkage between local government debt and local housing market risk. We utilize a combination of several unique datasets to investigate how the market evaluates the risks associated with local government debt, especially focusing on the effect of housing market conditions. Our results indicate that areas with higher expected house price growth issue debt with lower yield spreads. Furthermore, we also find that the bond market reacts to changes in local housing conditions, as expected. Bonds issued by local investment units from areas that experience greater changes in housing prices also see a corresponding decline in observed yield spreads. Thus, the results suggest that investors do price local housing risk into Chinese municipal bond risk premiums.

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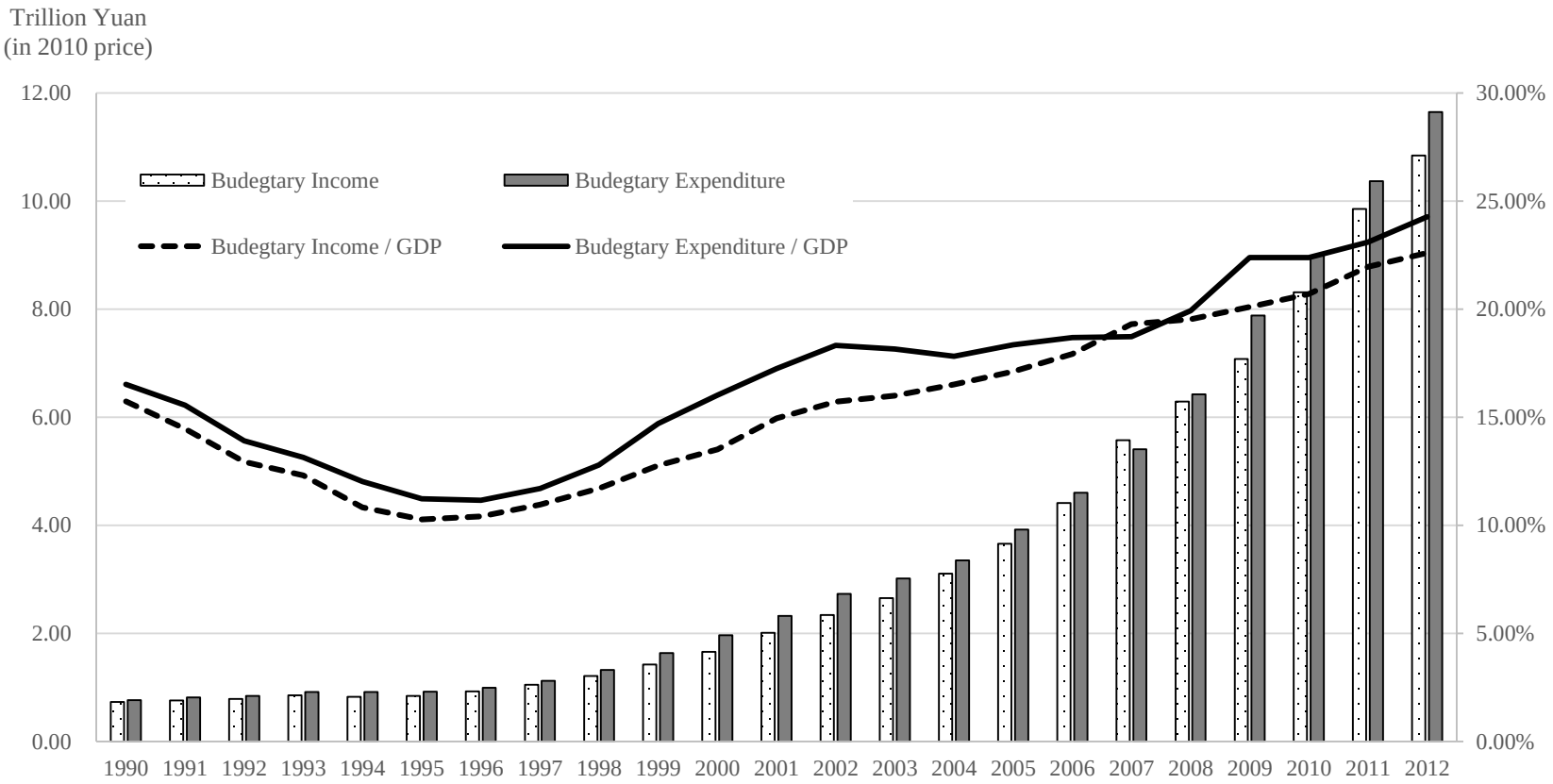


Fig. 1: Budgetary Income and Expenditure of Chinese Government

The figure reports the annual budgetary income and expenditure of Chinese governments between 1990 and 2012, as well as their share in GDP, according to authors' calculations based on data reported by National Bureau of Statistics of China.

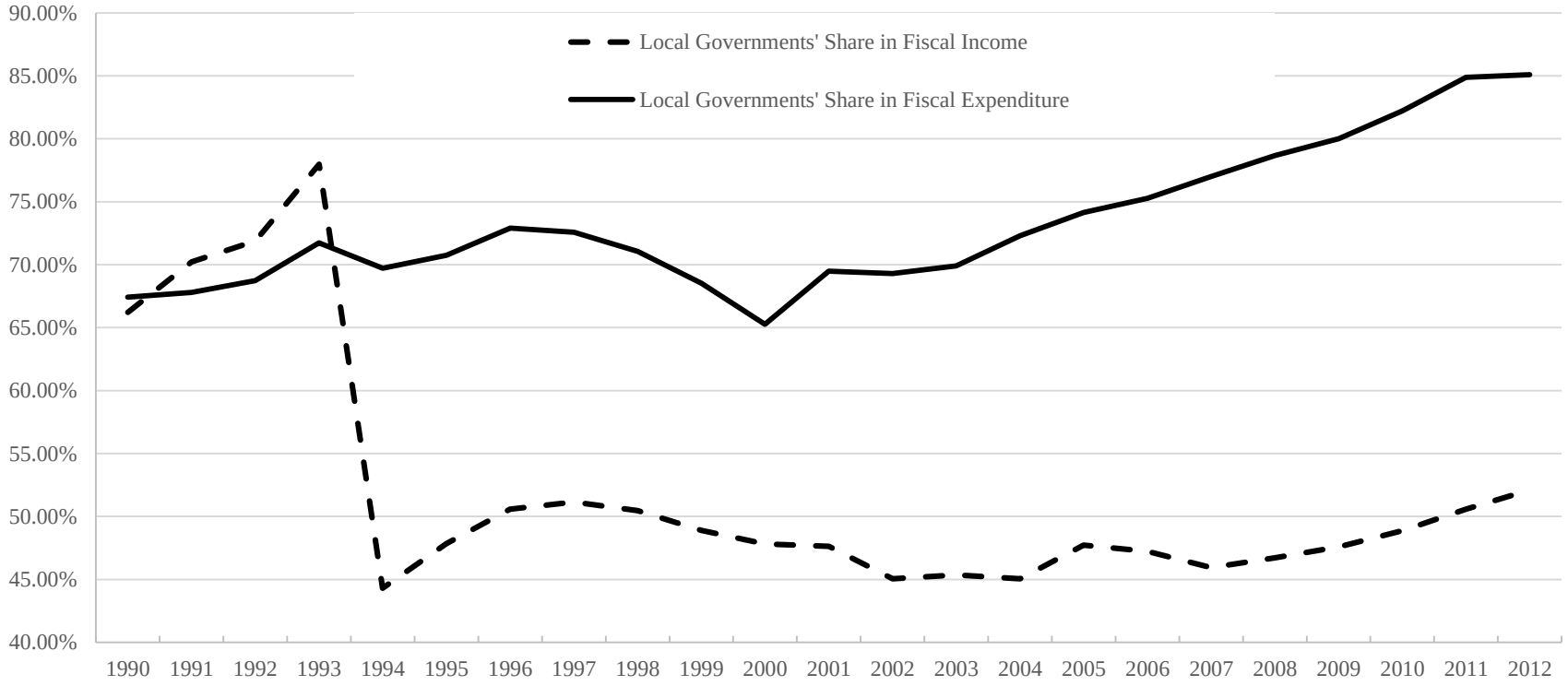


Fig. 2: Local Governments' Share in Total Budgetary Income and Expenditure

The figure reports the local governments' share in budgetary income and expenditures in China between 1990 and 2012, according to authors' calculations based on data reported by National Bureau of Statistics of China.

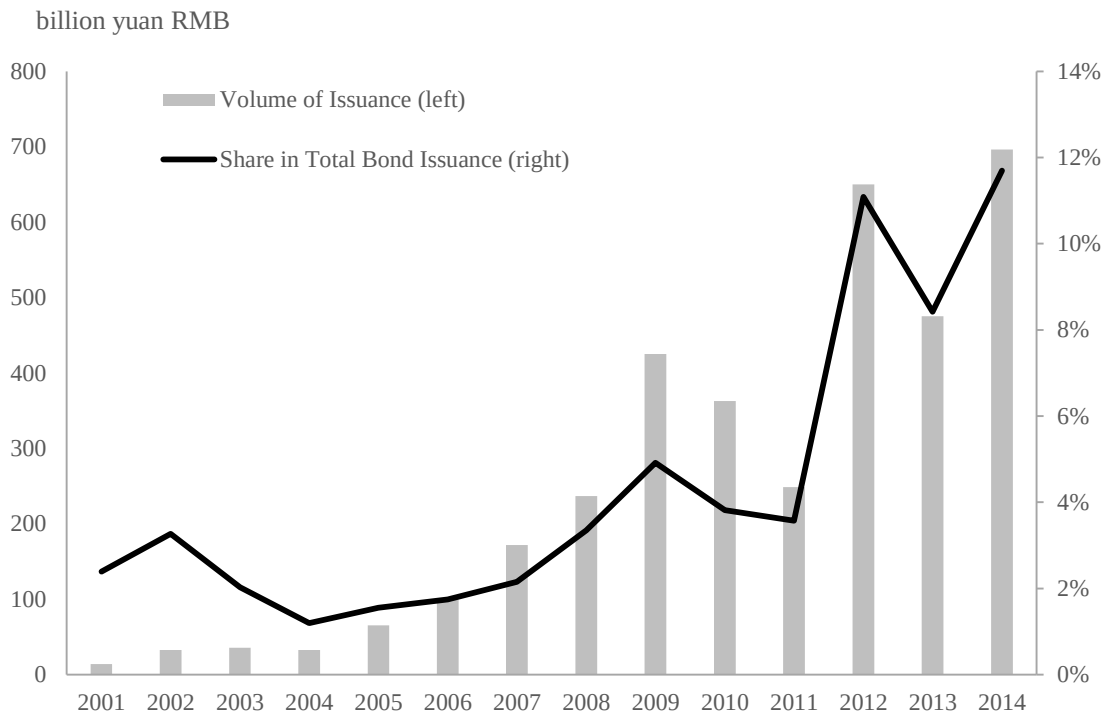


Fig. 3: Annual Issuance of Corporate Bond in China

The figure reports the annual volume of corporate bond issuance in China between 2001 and 2014, as well as its share in total bond issuance, according to authors' calculations based on data released by China Securities Depository & Clearing Corporation Limited.

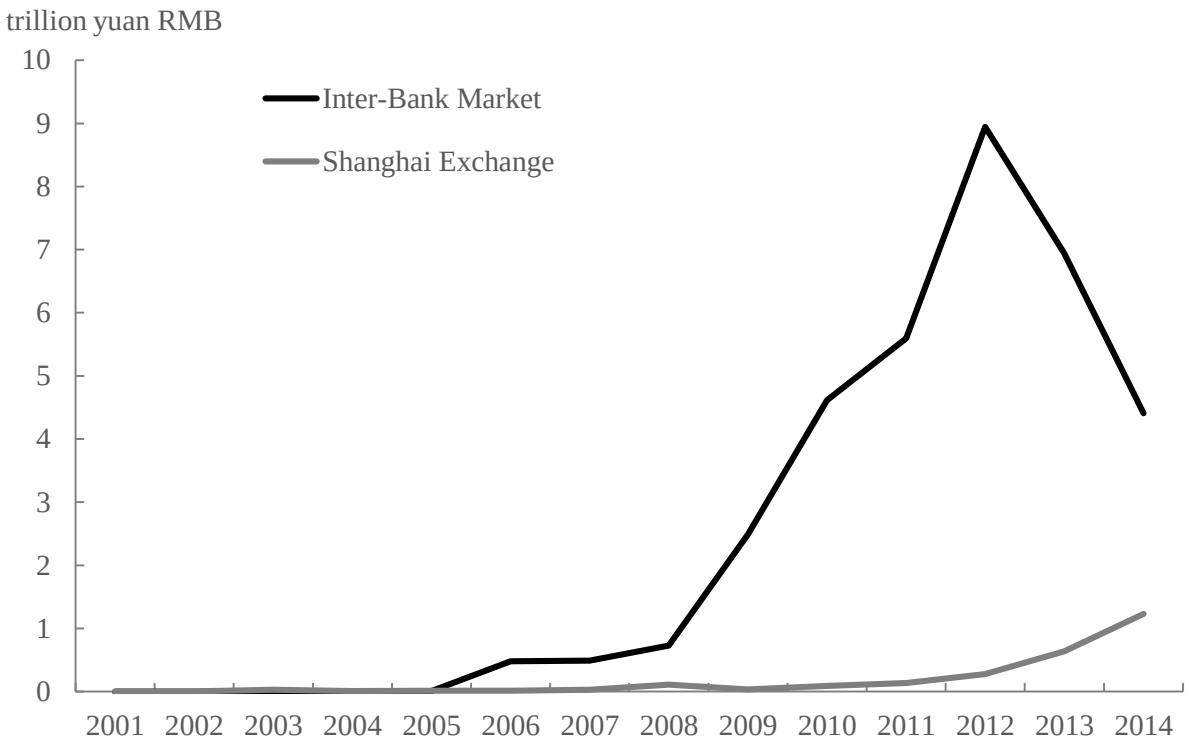
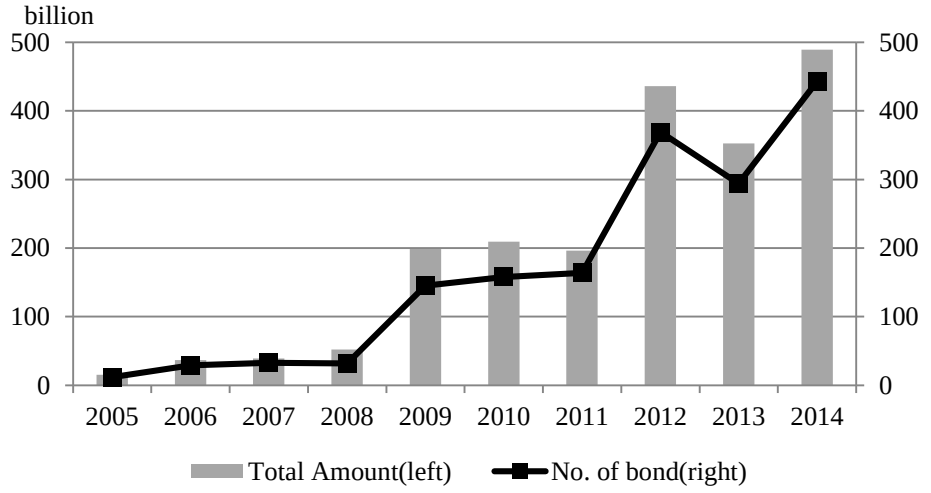
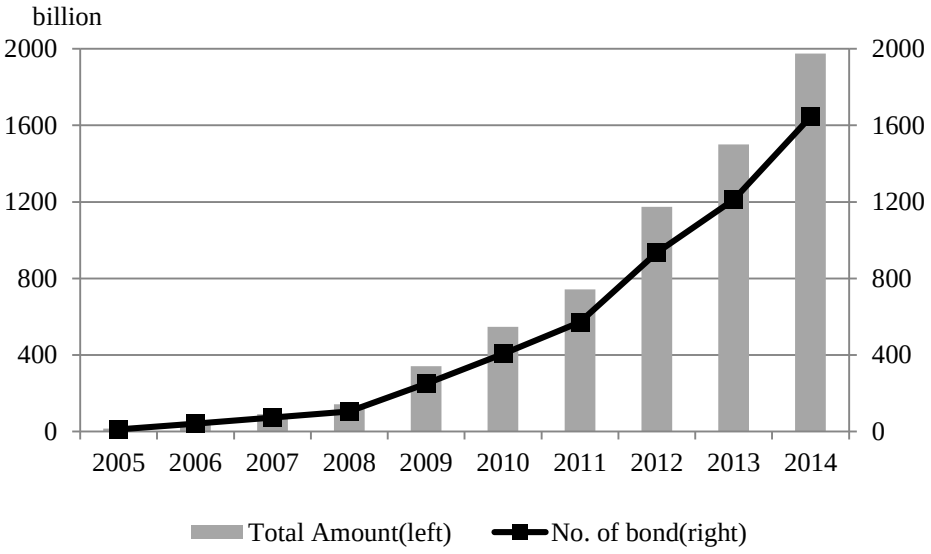


Fig. 4: Annual Trasaction Volume of Spot Corporate Bonds

The figure reports the annual transaction volume of spot corporate bonds in both the inter-bank market and Shanghai exchange in China between 2001 and 2014, according to authors' calculations based on data released by China Securities Depository & Clearing Corporation Limited and Shanghai Exchange.



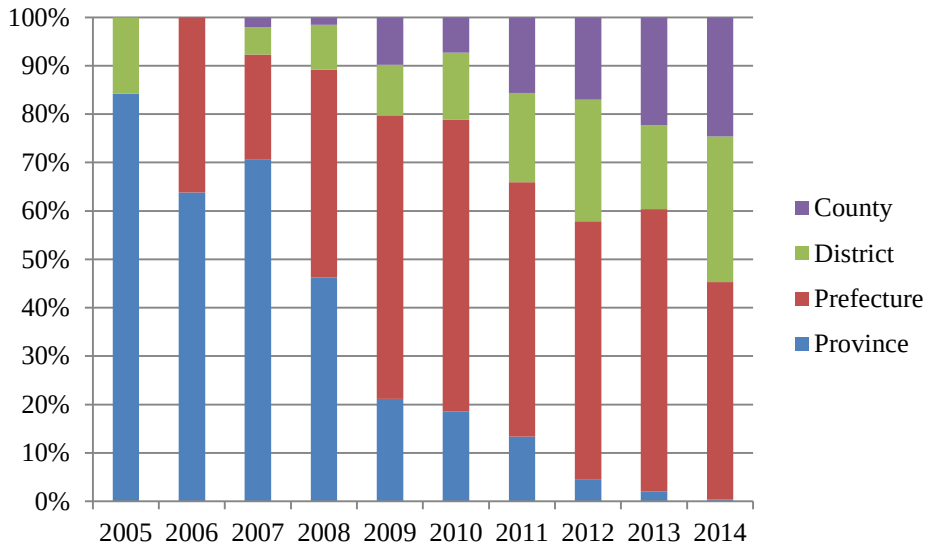
(A) Bonds Issued during the Year



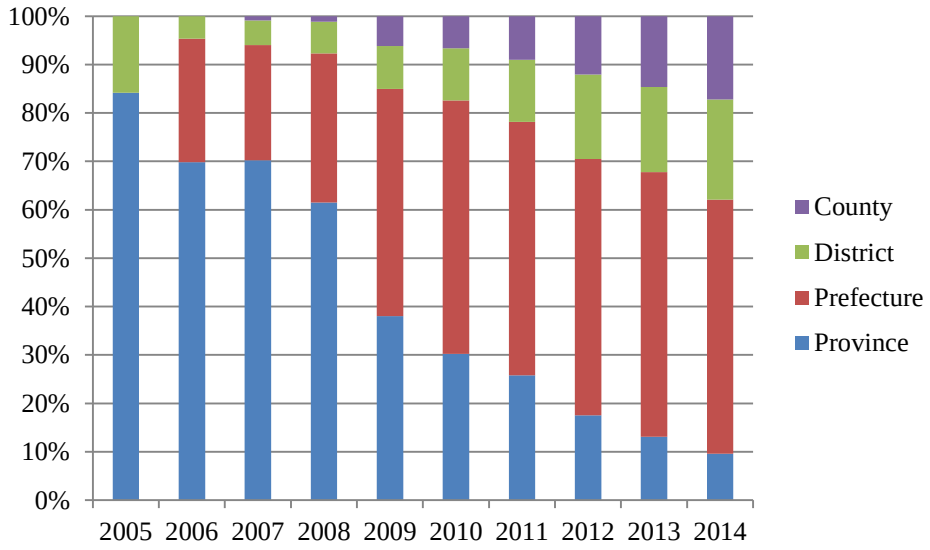
(B) Outstanding Bonds at the End of the Year

Fig. 5: Total Volume of LGFV Bonds

Panel A reports the annual number and volume of corporate bonds issued by LGFVs between 2005 and 2014; panel B reports the number and total volume of outstanding bonds issued by LGFVs at the end of each year between 2005 and 2014.



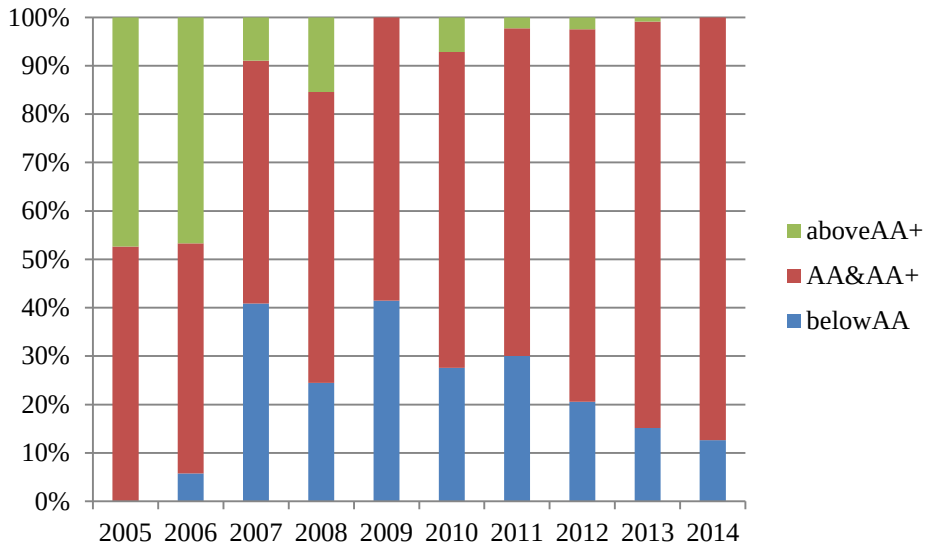
(A) Bonds Issued during the Year



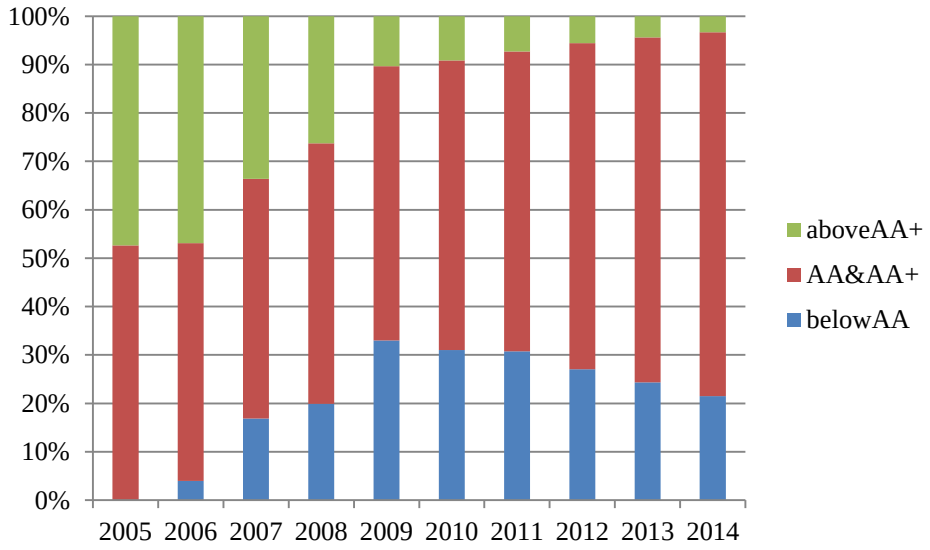
(B) Outstanding Bonds at the End of the Year

Fig. 6: Structure of Corresponding Government Levels

Panel A reports the breakdown (based on volume) of corporate bonds issued by LGFVs between 2005 and 2014, according to the level of corresponding government levels (county, district, prefecture, and province); panel B reports the corresponding breakdown based on the total volume of outstanding bonds issued by LGFVs at the end of each year.



(A) Bonds Issued during the Year



(B) Outstanding Bonds at the End of the Year

Fig. 7: Structure of Bond Issuer Ratings

Panel A reports the breakdown (based on volume) of corporate bonds issued by LGFVs between 2005 and 2014, according to issuers' rating levels; panel B reports the corresponding breakdown based on the total volume of outstanding bonds issued by LGFVs at the end of each year.

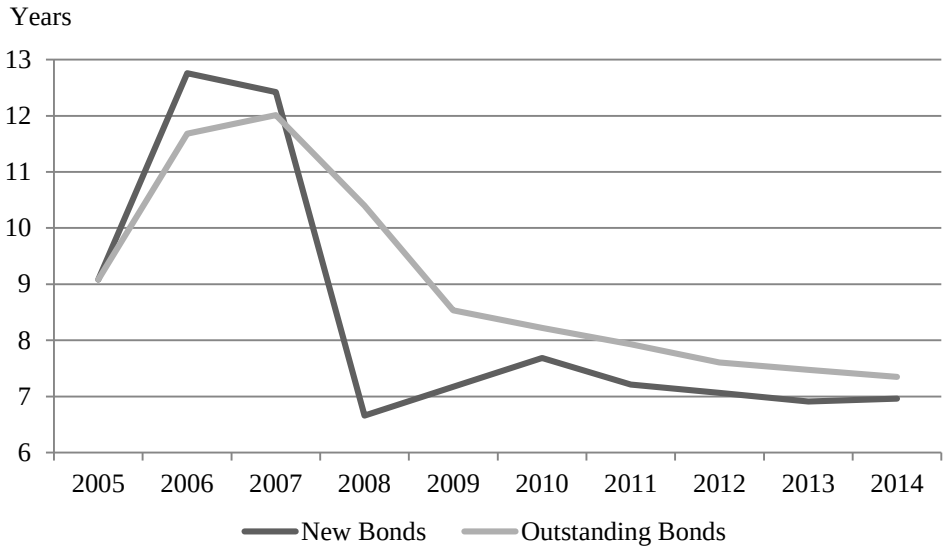
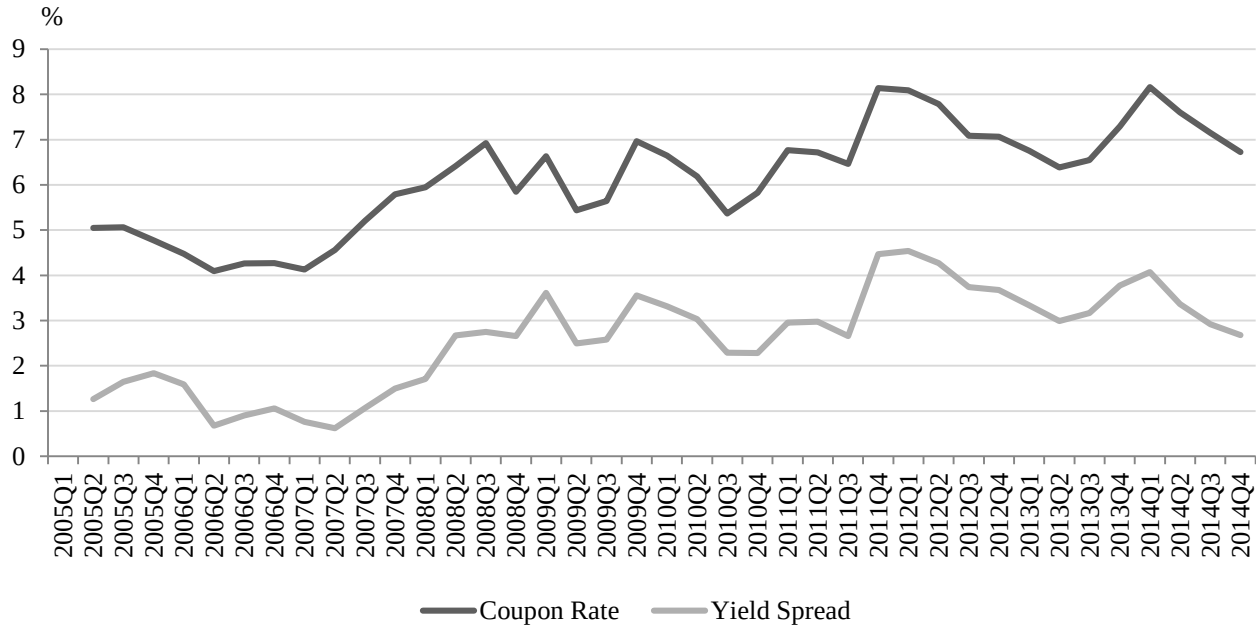
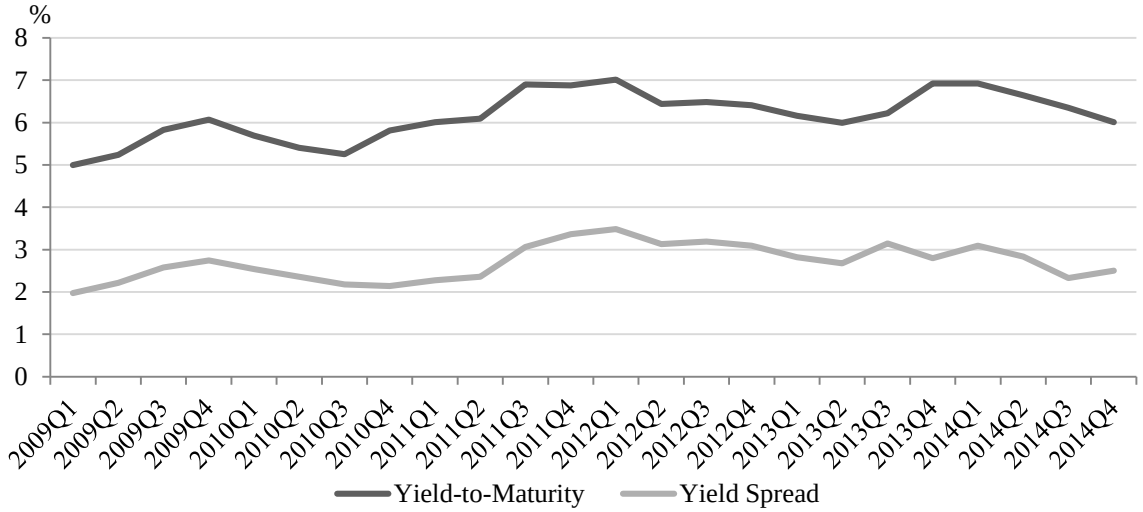


Fig. 8: Average Maturity of LGFV Bonds

The dark line reports the average maturity of corporate bonds issued by LGFVs between 2005 and 2014, while the grey line reports the average maturity of outstanding corporate bonds issued by LGFVs at the end of each year.



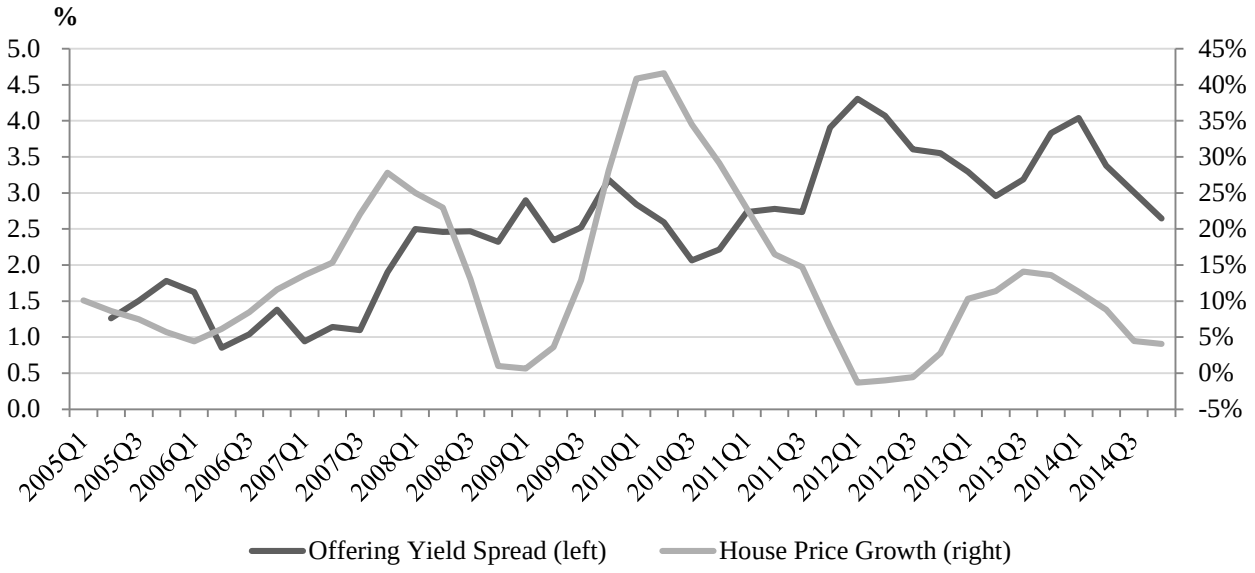
(A) Bonds Issued during the Quarter



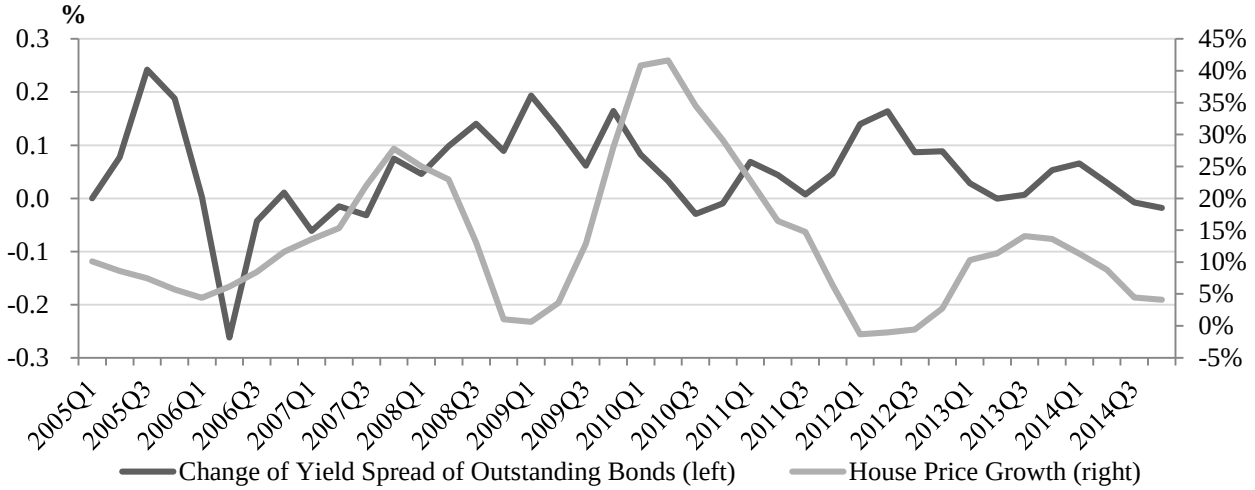
(B) Outstanding Bonds at the End of the Quarter

Fig. 9: Average Rates and Yield Spreads of LGFV Bonds

Panel A reports the quarterly average of yield-to-maturity (or coupon rate since in our sample all the bonds were issued at par) and the corresponding offering yield spread (with a China treasury bond having a maturity date within three months of the LGFV bond maturity date as the risk-free rate) at issuance for all bonds issued by LGFVs; panel B reports the average yield-to-maturity and corresponding yield spread on the last trading day of each quarter for all outstanding bonds issued by LGFVs.



(A) Comparison with New Bonds



(B) Comparison with Change of Outstanding Bonds

Fig. 10: Relationship between LGFV Bond Rates and Housing Price Change

These figures compare the quarterly series of average offering yield spread of new corporate bonds issued by LGFVs (panel A) or average yield spread of all outstanding bonds issued by LGFVs (panel B) with the average of accumulative housing price changes during the previous 12 months in the corresponding cities. The time series of average offering yield spread or average yield spread are consistent with Fig. 9. The house price growths are calculated based on the constant-quality price index by Wu, Deng and Liu (2014).

Table 1: Number of Bonds in the Sample

This table reports the coverage of corporate bonds in our sample. Column (1) reports the total number of all corporate bonds issued during the sample period, as well as the breakdown by market type. Column (2) focuses on corporate bonds issued by all SOEs identified as LGFVs. Column (3) further narrows the scope to bonds issued by LGFVs in 90 major cities since 2010, which are the sample included in the empirical analysis.

		All Bonds Issued by Corporates	LGFV Bonds	LGFV Bonds in 90 Major Cities Since 2010
	Total	4,577	1,679	708
Market	Inter-Bank Market	2,009	964	402
	Shanghai Exchange	2,075	680	304
	Shenzhen Exchange	409	21	2
	Others	84	14	0

Table 2: Comparison between Different Local Governments

This table compares different types of local governments' behaviors in issuing LGFV bonds, from the perspective of government level (panel A) and region (panel B). Column (1) focuses on the average number of LGFV bonds issued by each local government during the sample period; column (2) lists the average of total amount issued by each government; and column (3) lists the average interval between two LGFV bond issuance by each local government.

	Average No. of Bonds Issued per Gov.	Average of Total Amounts Issued by each Gov. (in million yuan)	Average Internval between Two Issuing by each Gov. (in days)
A. **Various Government Levels**			
Provincial Level Governments	6.17	9,724.78	318.24
Prefectural-Level City Governments	3.85	4,871.63	256.34
District Governments in Cities	4.97	5,439.05	156.21
County/County-Level City Governments	5.41	5,575.57	133.43
B. **Various Government Levels**			
East Region	9.97	11,961.22	142.51
Middle Region	5.28	6,413.65	222.21
West Region	5.27	6,365.18	148.68

Table 3: Major Summary Statistics at Bond Issuing

This table reports the major summary statistics of the dataset on bond issuance for bonds issued by LGFVs, including variables on bond characteristics, key attributes of the bond issuer at issuance, and key attributes of the corresponding local governments at bond issuance.

	Average	Std. Dev.	Max.	Min.
A. Bond Information				
Amount (in million yuan RMB)	1,235.042	520.438	5,000	50
Coupon Rate (in %)	6.916	0.936	9.1	3.4
Yield Spread (in %; see text for more details)	3.248	0.885	5.482	0.491
Maturity (in months)	85.983	13.627	180	36
Rate Type				
- Fixed Rate (dummy)	0.766	0.424	1	0
- Adjustable (dummy)	0.020	0.139	1	0
- Progressive (dummy)	0.215	0.411	1	0
Credit Enhancement Arrangement				
- With Collateral (dummy)	0.107	0.310	1	0
- With Warrant (dummy)	0.229	0.420	1	0
- Without Any Enhancement (dummy)	0.664	0.473	1	0
Usage				
- Investment on Infrastructure	0.548	0.498	1	0
Rateing				
- AAA	0.052	0.223	1	0
- AA+	0.308	0.462	1	0
- AA	0.633	0.482	1	0
- AA- & Below	0.006	0.075	1	0
B. Issuer Information				
Total Asset (in million yuan RMB)	20,933.750	23,037.510	265,099	748
ROA (in %)	2.852	2.051	17.227	-0.031
Liablity / Asset (in %)	46.636	16.293	87.093	0.314
Rateing				
- AAA	0.024	0.153	1	0
- AA+	0.140	0.347	1	0
- AA	0.678	0.467	1	0
- AA- & Below	0.157	0.364	1	0
First Bond Issued	0.369	0.483	1	0
C. City Attribute				
GDP per capital (in thousand yuan RMB)	70.388	40.014	183.422	12.342
Ratio between local fiscal expenditure and local fiscal revenue	1.519	0.650	7.908	0.649
Accumulative housing price growth during the previous 12 months	0.075	0.125	0.584	-0.235

Table 4: Major Summary Statistics of the Quarterly Panel Data

This table reports the major summary statistics of the bond-quarter panel data for outstanding bonds issued by LGFVs, including variables on bond characteristics on the last trading day of the quarter, key attributes of the bond issuer at the end of the quarter, and key attributes of the corresponding local governments at the end of the quarter.

	Average	Std. Dev.	Max.	Min.
A. Bond Information				
Return Rate (in %)	6.089	3.740	32.418	-176.087
Yield Spread (in %; see text for more details)	2.542	2.704	30.123	-179.294
Maturity (in months)	64.758	27.114	205.676	0.197
B. Issuer Information				
Total Asset (in million yuan RMB)	48,089.830	69,854.550	542449	748
ROA (in %)	2.551	2.024	17.510	-1.456
Liablity / Asset (in %)	53.053	15.590	89.961	0.314
C. City Attribute				
GDP per capital (in thousand yuan RMB)	75.566	43.299	199.078	10.487
Ratio between local fiscal expenditure and local fiscal revenue	1.479	0.626	7.908	0.649
Accumulative housing price growth during the previous 12 months	0.075	0.122	0.803	-0.506

Table 5: Effect of Housing Price Change on Initial Yield Spread: LGFVs

This table lists the results of OLS model on offering yield spread for corporate bonds issued by LGFVs in 90 major cities. The dependent variable is the offering yield spread (i.e., the difference between the coupon rate and the rate of treasury bond with a maturity date within three months of the LGFV bond maturity date). Our major focus is the accumulative housing price growth in the corresponding city during the previous 12 months of bond issuances. We also control for quarterly fixed effects (all columns), bond rating level dummies and other bond characteristics (column 2 to 5), performance of the issuer (column 3 to 5), attributes of corresponding local government (column 4 and 5), and previous experience in issuing LGFV bonds (column 5). T statistics are reported in parentheses; * p < 0.1, ** p < 0.05, *** p < 0.01.

	(1) Yield Spread	(2) Yield Spread	(3) Yield Spread	(4) Yield Spread	(5) Yield Spread
Accumulative housing price growth during the previous 12 months	-0.614**	-0.384*	-0.426*	-0.508**	-0.488**
	(-2.35)	(-1.70)	(-1.90)	(-2.30)	(-2.23)
log(total asset)	-	-	-0.171***	-0.127***	-0.111***
	-	-	(-4.06)	(-3.02)	(-2.64)
Return on Asset	-	-	-0.007	-0.007	-0.006
	-	-	(-0.67)	(-0.63)	(-0.61)
Liability/Total Asset	-	-	-0.002	0.002	0.001
	-	-	(-1.00)	(1.10)	(0.91)
First Bond Issued of the Firm	-	-	-0.088	-0.036	-0.031
	-	-	(-1.48)	(-0.62)	(-0.55)
Government Level					
- Prefectural	-	-	-	*Default*	*Default*
- Districts	-	-	-	0.196***	0.201***
	-	-	-	(3.56)	(3.69)
- Counties	-	-	-	0.225***	0.226***
	-	-	-	(3.39)	(3.43)
- Capital Cities	-	-	-	-0.254*	-0.255*
	-	-	-	(-1.65)	(-1.68)
log(per capita GDP)	-	-	-	-0.297***	-0.278***
	-	-	-	(-5.81)	(-5.46)
Budgetary Expense /Budgetary Income	-	-	-	-0.010	0.000
	-	-	-	(-0.25)	(0.01)
Number of LGFV Bonds the Underwriter Had Issued	-	-	-	-	-0.003***
	-	-	-	-	(-4.02)
Bond Ratings	No	Yes	Yes	Yes	Yes
Bond Attributes	No	Yes	Yes	Yes	Yes
Quarterly Fixed Effect	Yes	Yes	Yes	Yes	Yes
N	664	662	659	659	659
R^2	0.548	0.668	0.683	0.708	0.715

Table 6: Effect of Housing Price Change on Initial Yield Spread: Other Issuers

This table lists the results of OLS model on offering yield spread for other groups of corporate bonds. The dependent variable and explanatory variables are consistent with column (5) of Table 5. Column (1) uses corporate bonds issued by non-LGFV SOEs, and column (2) uses corporate bonds issued by private firms. Column (3) focus on corporate bonds issued by SOEs which used to be included in the list of LGFVs, but had been delisted from the LGFV list before the bond issuance. In column (4) we still focus on LGFVs which were delisted, but introduce bonds issued both before and after delisting, and used a dummy variable "delisted" to label such difference. T statistics are reported in parentheses; * p < 0.1, ** p < 0.05, *** p < 0.01.

	(1) Non-LGFV SOEs	(2) Private Firms	(3) Delisted LGFVs	(4) DID on Delisted LGFVs
Accumulative housing price growth during the previous 12 months	0.052	-0.144	0.109	-2.969***
	(0.16)	(-0.56)	(0.38)	(-5.63)
Delisted	-	-	-	-0.343***
	-	-	-	(-2.95)
Accumulative housing price growth during the previous 12 months * Delisted	-	-	-	4.209***
	-	-	-	(5.77)
log(total asset)	-0.253***	-0.097**	-0.068	-0.449**
	(-4.38)	(-2.17)	(-1.51)	(-2.53)
Return on Asset	-0.043***	-0.043***	-0.006	-0.077**
	(-4.35)	(-5.46)	(-0.50)	(-2.45)
Liability/Total Asset	0.006**	0.004*	0.000	-0.000
	(2.28)	(1.70)	(0.16)	(-0.03)
First Bond Issued of the Firm	0.166**	0.121*	0.154**	0.101*
	(1.97)	(1.67)	(2.44)	(1.89)
Government Level				
- Prefectural	*Default*	*Default*	*Default*	*Default*
- Districts	-0.084	-	0.041	-
	(-0.96)	-	(0.71)	-
- Counties	0.108	-	0.207***	-
	(1.12)	-	(2.90)	-
- Capital Cities	0.010	-	-0.192*	-
	(0.12)	-	(-1.90)	-
log(per capita GDP)	-0.128*	-0.141**	-0.115*	-2.070***
	(-1.72)	(-2.25)	(-1.83)	(-4.65)
Budgetary Expense /Budgetary Income	0.017	-0.002	0.135*	-0.120
	(0.18)	(-0.03)	(1.72)	(-0.23)
Bond Ratings	Yes	Yes	Yes	Yes
Bond Attributes	Yes	Yes	Yes	Yes
Issuer Fixed Effect	No	No	No	Yes
Quarterly Fixed Effect	Yes	Yes	Yes	Yes
N	407	597	540	719
R^2	0.66	0.61	0.69	0.89

Table 7: Effect of Housing Price Change on LGFV and Bond Ratings

This table lists the results of ordered logic models on issuer and bond ratings. The dependent variable is the rating level of LGFV at bond issuance in column (1), and the rating level of the bond in column (2). Our major focus is the accumulative housing price growth in the corresponding city during the previous 12 months of bond issuances. We also control for quarterly fixed effects, issuer rating level dummies (column 2 only), bond characteristics, performance of the issuer, and attributes of corresponding local government. Z statistics are reported in parentheses; * p < 0.1, ** p < 0.05, *** p < 0.01.

	(1) LGFV Ratings	(2) Bond Ratings
Accumulative housing price growth during the previous 12 months	-0.126	-0.309
	(-0.27)	(-0.68)
log(total asset)	0.827***	0.102
	(8.62)	(1.10)
Return on Asset	-0.004	-0.008
	(-1.23)	(-0.33)
Liability/Total Asset	-0.030	-0.002
	(-1.23)	(-0.46)
First Bond Issued of the Firm	-0.178*	0.255*
	(-1.67)	(1.90)
Government Level		
- Prefectural	*Default*	*Default*
- Districts	-0.845***	0.187
	(-6.25)	(1.42)
- Counties	-1.693***	0.160
	(-9.63)	(0.98)
- Capital Cities	1.520***	-0.936***
	(5.65)	(-3.47)
log(per capita GDP)	1.136***	-0.287**
	(8.67)	(-2.28)
Budgetary Expense /Budgetary Income	0.104	-0.005
	(0.91)	(-0.05)
Bond Attributes	Yes	Yes
Issuer Ratings	No	Yes
Quarterly Fixed Effect	Yes	Yes
N	761	761
Pseudo R^2	0.38	0.32

Table 8: Effect of Housing Price Change on Initial Yield Spread: Hetrogeneity

This table compares the effect of previous housing price growth on offering yield spread between different types of LGFV bonds. The dependent and explanatory variables are all consistent with column (5) of Table 5. Panel A compares LGFV bonds issued by district or county level governments (column 1) and prefectural or higher level governments (column 2). Panel B compares LGFV bonds issued by cities with per capital GDP level lower (column 1) and higher (column 2) than the median level. Panel C compares LGFV bonds issued on the interbank market (column 1) and exchanges (column 2). Panel D compares LGFV bonds underwritten by underwriters with more (column 1) and less (column 2) previous experiences in issuing LGFV bonds. T statistics are reported in parentheses; * p < 0.1, ** p < 0.05, *** p < 0.01.

A. Local Government Ranks

	(1) Affiliated to District or County Level Government	(2) Affiliated to Prefectural or Higher Level Government
Accumulative housing price growth during the previous 12 months	-0.830**	0.029
	(-2.56)	(0.09)
Control Variables	Yes	Yes
N	415	244
R^2	0.692	0.780

B. Economic Development Degree

	(1) With Lower Per Capita GDP (lower than median)	(2) With Higher Per Capita GDP (higher than median)
Accumulative housing price growth during the previous 12 months	-0.122	-1.166***
	(-0.40)	(-3.05)
Control Variables	Yes	Yes
N	332	327
R^2	0.769	0.715

C. Market Type

	(1) Inter-Bank Market	(2) Exchanges
Accumulative housing price growth during the previous 12 months	-0.588**	-0.425
	(-2.20)	(-1.11)
Control Variables	Yes	Yes
N	370	289
R^2	0.775	0.675

D. Underwriter's Previous Experiences

	(1) With More Experiences (higher than median)	(2) With Less Experiences (lower than median)
Accumulative housing price growth during the previous 12 months	-0.578*	-0.343
	(-1.70)	(-1.24)
Control Variables	Yes	Yes
N	332	327
R^2	0.674	0.811

Table 9: Factors affecting yield spread

This table lists the results of the panel data model on yield spread for outstanding corporate bonds issued by LGFVs in 90 major cities. The dependent variable is the yield spread (i.e., the difference between the yield-to-maturity and the rate of treasury bond with a maturity date within three months of the LGFV bond's remaining maturity date) on the last trading day of the quarter. Our major focus is the accumulative housing price growth in the corresponding city during the previous 12 months. We also control for bond fixed effects (both columns), performance of the issuer (column 2), and attributes of corresponding local government (column 2) T statistics are reported in parentheses; * p < 0.1, ** p < 0.05, *** p < 0.01.

	(1) Yield Spread	(2) Yield Spread
Accumulative housing price growth during the previous 12 months	-0.950***	-1.195***
	(-3.62)	(-4.30)
log(maturity)	0.571***	0.338***
	(7.38)	(3.11)
log(total asset)		-0.375**
		(-2.19)
Return on Asset		-0.011
		(-0.40)
Liability/Total Asset		0.014**
		(2.40)
log(per capita GDP)		-0.511
		(-1.46)
Budgetary Expense /Budgetary Income		-0.784***
		(-6.60)
Bond Fixed Effect	Yes	Yes
N	9298	9246
R^2	0.298	0.303

t statistics in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 10: Effects on the decisions on bond issuance

This table lists the results of the logic models on local governments' bond issuance behaviors. In column (1) each observation is a city-year, and the dependent variable equals 1 if at least one corporate bond was issued by any LGFV affiliated to the city during the year. The explanatory variables include the accumulative housing price growth during the previous 12 months, city and year fixed effects, and local government attributes. In column (2) we adopt an unbalanced panel data of LGFV-years since LGFVs' first bond issuances. The explanatory variables include the accumulative housing price growth during the previous 12 months, LGFV and year fixed effects, LGFV performances, and local government attributes. Z statistics are reported in parentheses; * p < 0.1, ** p < 0.05, *** p < 0.01.

	(1) Whether Any Bond is Issued by LGFVs in this City-Year	(2) Whether Any Bond is Issued in this LGFV-Year
Accumulative housing price growth during the previous 12 months	-0.014*	-0.002
	(-1.65)	(-0.57)
log(per capita GDP)	1.534	0.230
	(0.53)	(0.17)
Budgetary Expense /Budgetary Income	0.245	-0.149
	(0.66)	(-0.49)
log(total asset)		0.615**
		(2.25)
Return on Asset		-0.093**
		(-2.25)
Liability/Total Asset		-0.014
		(-1.64)
Year Fixed Effect	Yes	Yes
City Fixed Effect	Yes	No
LGFV Fixed Effect	No	Yes
N	438	1585
Pseudo R^2	0.41	0.15