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

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## Introduction

As an emerging economy, China has 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 has created a number of social economic challenges (See Deng, Morck, Wu and Yeung, 2014, 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 market 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 are prevented from directly issuing debt to fund mandated capital projects. 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 large-scale infrastructure investments.

Since China does not allow local governments to directly participate in the municipal bond market, these governments rely on a unique funding mechanism known as Local Government-Backed Investment Units (LGBIU). Using these investment units, local governments are able to access capital markets and issue bonds. However, unlike traditional municipal debt in western countries, the Chinese investment units are not able 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 local government-backed investment units are the only type that are: 1) 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, as expected. Bonds issued by LGBIUs 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.

## Background about Local Government Debt in China

### 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 Figure 1 shows, between 1995 and 2012 Chinese government 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 in 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 have 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 most of these taxes were purely controlled by local governments before 1994, Figure 2 illustrates that this reform immediately decreased local government income. Figure 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 does retain 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 central government's total budgetary income. Although these transfer payments are almost enough to fill the gap between local government

[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.

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 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 (Deng et al, 2014). Compounding the local government fiscal imbalance, the central government often imposes additional requirements on 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 local governments in western countries, local Chinese governments are unable to tap into the traditional municipal bond market to fund required infrastructure projects. For example, the current Budget Law in China 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 may not issue local government bonds, except as otherwise prescribed by laws or the State Council.*" Therefore, unlike their counterparts in other countries like U.S., local

governments in China cannot borrow loans or issue bonds directly to support their investment projects.

Emergence of Local Government-Backed Investment Units

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) has 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-backed investment units" (*di fang zheng fu rong zi ping tai* or LGBIU for short) as an important financial vehicle to fund basic infrastructure projects. [2]

LGBIUs 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 LGBIUs to finance their stimulus-related investment projects. This pronouncement immediately triggered the rapid development of LGBIUs. 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 LGBIUs was 4.08 trillion, accounting for 37.5% of the total volume of local government debts (10.89 trillion).

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

A LGBIU 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 share holder.[3] To create a LGBIU, the corresponding local government transfers land parcels, utilities or infrastructure, or in some cases capital funds to the LGBIU exchange for equity ownership.[4] The LGBIU then, following rules regulating regular corporations, raises 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. LGBIUs rarely raise capital by issuing new equity.

In general, LGBIUs differ from regular, local SOEs in several aspects. First, LGBIUs focus on investments on large projects such as urban infrastructure or affordable housing developments and are seldom involved in manufacturing industries. Second, in most cases LGBIUs are companies with unlimited liability such that the corresponding local government ultimately assumes or backs the LGBIU debt in case of default. Finally, since a large majority of LGBIU investment projects do not generate income or are not profitable, LGBIUs 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-LGBIUs do not receive direct funding transfers from local governments.

To illustrate the LGBIU 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

[3] LGBIUs are sometimes described as special purpose vehicles (SPVs). But currently in China SPV is not a strict legal concept, and thus legally LGBIUs are founded and operated as regular corporations.
[4] In a few cases, the LGBIU also owns shares of other non-LGBIU SOEs, which are also awarded by the local government

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 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 LGBIUs 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 LGBIUs ability to repay their debts.

**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 10,015 bonds issued by corporates in mainland China between 2003 and 2013 using the WIND database, a Compustat-style database in China.[5] This dataset comprises 3,421 corporate bonds with maturities over 10 years, 2,040 medium-term notes with the maturities between 1 and 10 years, 4,210 short-term commercial notes (or

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

commercial paper) with the maturities less than 1 year, and 344 other bonds (e.g., asset-backed securities, private placement notes, etc.). The majority of the bonds are issued and transacted in either the inter-bank market (8,055 bonds, or 80%) or on the exchanges in Shanghai (1,462 bonds, or 14.6%) or Shenzhen (427 bonds, or 4.3%). For each bond, we collect information on the issuer, coupon rate, issue amount, issue date, maturity, rate type (fixed, adjustable, or progressive), credit enhancing arrangements (collateral, warrant by third party, or without any arrangement), and declared use of the funds raised.

Unfortunately, one of the challenges in collecting data on Chinese municipal bonds is that the designation "local government-backed investment unit" is not a strict legal concept in China. As a result, the central government and other institutions do not maintain any official list of such units. However, LGBIUs are always described by some key features. For example, one widely-accepted description promoted in a State Council document[6] indicates that a local government-backed investment unit is (1) a legally independent corporation or institution, with (2) a specific local government as the only or dominant owner that (3) invests in (and operates) urban infrastructure projects.

Using the detailed information about the issuers in the WIND database, we screen each bond for features that match the State Council's local government-backed investment units definition. For example, we first check whether the bond issuer is owned by a provincial-, city- (prefectural), or county-level local government. Next, for all bonds linked to a governmental entity we determine whether the funds raised are designated for investment on urban infrastructure or other government projects. Based on these screens, we identify 2,452 LGBIU bond issues, or 24.5% of all corporate bonds. As detailed in Table 1, the LGBIU issues comprise 1,956 long-term bonds

[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.

(or 79.8%), 406 medium-term notes (or 16.6%), with the remainder being short-term commercial paper and other types. LGBIU bonds are primarily traded in the inter-bank market (1,632 bonds, or 66.6%) and on the Shanghai Exchange (784 bonds, or 32.0%).

Table 2 reports the distribution of LGBIU 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 30 provincial government units account for 533 LGBIU bonds (or 21.7%); 259 prefectural-cities issued 1,106 bonds (or 45.1%); district governments within 77 prefectural-cities issued 463 bonds (or 18.8%); and 123 county or county-level cities issued 354 bonds (or 14.4%). 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 22.6 bonds per issuer compared to the 10.1 bonds per issuer in the middle region and 14.7 bonds per issuer in the west region.

Panel A of Figure 3 shows the total volume of LGBIU bonds issued each year, while Panel B displays the bonds' outstanding balances. Prior to 2008, the total volume of LGBIU bonds was very small with less than 100 LGBIU 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. Thus, by the end of June 2013, the total volume of outstanding LGBIU bond balance reached 2.60 trillion yuan 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 2013, the total amount outstanding had increased to 3.02 trillion yuan RMB.

Figure 4 shows how the issuance of LGBIU bonds has shifted to lower level (or more local) governments during recent years. For example, by the end of 2013, LGBIUs associated with

provincial-level governments accounted for about one-fourth (25.93%) of issues while prefectural-level city governments comprised 44.82%, with the remaining from district- and county-level governments. In contrast, county level government units did not issue any LGBIU debt prior to 2007.

Corresponding to the growth in debt issuance by smaller government units, Figure 5 illustrates the rapid decline in issuers' ratings. Currently bond ratings are not compulsory in China, but bond issuers (i.e., LGBIUs in our case) are required to be rated. In most cases, ratings are provided by local rating agencies in mainland China. Before 2007, all issuers were ranked AAA. However, since 2008 a significant number of higher risk issues have come to market. Thus, by the end of 2013, AAA-rated LGBIUs accounted for only 14.28% of the total outstanding bond volume and 63.35% of LGBIUs were rated as AA or below.

The maturity structure of LGBIU debt has also changed substantially between 2003 and 2013. As noted in Figure 6, the average maturity of LGBIU bonds issued before 2007 was more than 10 years, but it decreased to 8.68 years in 2008 and 7.29 years in 2009, and has fluctuated between 7 and 8 years after that. At the end of 2013, the average remaining maturity for the outstanding bonds was 6.76 years.

Not surprising, the shift to debt issues by smaller government units is associated with an upward trend in yield. Panel A of Figure 7 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 LGBIU bond with a China treasury bond having a maturity date within three months of the LGBIU bond maturity date. In general the

yield spread increased from around 1% at the beginning of the sample period to about 3% after 2008.

We next merged the LGBIU bond dataset with several other sources to obtain comprehensive statistics on local government finances. 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 LGBIU issuers. 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 LGBIUs on behalf of local governments. For each LGBIU 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, for 90 cities we also introduce the monthly constant quality housing price index discussed in Wu, Deng and Liu (2014), which provides a direct link between the LGBIU bonds and local housing market conditions.

Table 3 reports the descriptive statistics for the bonds at each bond's issue date. The average coupon rate for LGBIU bonds is 6.5% and ranges between 3.98% and 10.5%. The majority of bonds (77%) are fixed-coupon and do not have any credit enhancements (60.8%). In terms of intended use of funds, we see that over a quarter of the bonds (26.7%) were issued to fund local transportation infrastructure projects and 34% were used to fund public housing projects. However, it is also interesting to note that 39% of the capital raised went to the LGBIUs' "operating fund" without specific usages.

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. Figure 7, Panel B reports the average quarterly returns and yield spreads of all outstanding bonds. On average, the LGBIU bonds have earned a quarterly return of 6.2% with relatively high volatility (ranging between 18% and -26%).

Figure 8 reports the average offering yield spread for LGBIU bonds classified by government type. As expected, spreads on province and capital city bonds are lowest, reflecting the perception of less risk for these government units, while spreads for LGBIUs associated with county governments are highest. However, interestingly, the period between 2011 and 2013 saw a significant narrowing of the spreads and only recently have spreads begun to widen.

**Initial Yield Spread and Housing Risk**

Our investigation of the China municipal bond market begins by recalling that most LGBIU entities rely on land sales to facilitate coupon and principal payments. Figure 9 shows the quarterly series year-on-year growth rate of the national level constant-quality housing price index compared to the average LGBIU offering yield spread.[7] The graph suggests a negative relationship between LGBIU 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 LGBIU 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 the standard structural models of bond yield spreads derived in the literature. Thus, we test the hypothesis that bonds issued by LGBIU reflect the risk associated with trends in the local housing markets. As

[7] See Wu, Deng and Liu (2014)

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 LGBIU 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:

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

where $y_i$ is the yield on LGBIU bond $i$ less the yield on the China Treasury bond with maturity closest to the LGBIU bond $i$, $E(R_{i,H})$ is the expected return to the local housing market associated with bond $i$'s LGBIU, $B_i$ 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 (medium-term or short-term), coupon payment type (fixed, adjustable or progressive), initial bond issuer rating, 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 LGBIU. The specific factors associated with the LGBIU's include the log of total assets, estimated earnings (EBITDA/total assets), 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 to invest the funds raised on infrastructure projects, (2) capture differences in

[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.

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).

Table 5 presents the results for the regression of offering yield spread levels. Columns (1) and (2) present the baseline regression controlling for the bond specific factors (*B*) traditionally related to liquidity and credit risk. As expected, we find a positive and non-linear relation between offering yields and bond maturity. For example, the significant coefficients indicate that yield spreads increase with long-term bonds. Interestingly, we see a negative relation between adjustable and progressive payment structures and offering yields. We note that including bond issuer rating fixed effects (column 2) does not alter the results.

In column (2), we explore the role of credit enhancements in altering the offering yield spreads. First, we note that LGBIU bonds that have some type of third-party guarantee (*WARRANT*) have significantly lower offering yield spreads. This is consistent with the value of credit enhancements in protecting investors. However, we do not see any statistical difference in offering yields if the LGBIU provides collateral or not. This may reflect the uncertainty over property rights and legal foreclosure processes rendering the value of collateral moot.

In columns (3) and (4) of Table 5, we add a set of variables to capture differences across the LGBIUs. First, we note that larger LGBIUs, as reflected in total assets, have lower yield spreads. Second, we see that initial offering yields are lower for LGBIUs with higher earnings (as measured by the ratio of EBITDA to total assets.) Third, we also find a negative coefficient for LGBIU total liabilities (scaled by total assets) indicating that LGBIUs with higher debt have lower offering yields. While at first this finding is counter-intuitive, we note that LGBIU leverage accounts include bank borrowing as well as other debt offerings. Thus, to the extent that banks provide monitoring activities, greater use of debt by LGBIU may provide a signal of credit quality allowing

them to issue new debt at lower offering yields. Finally, we also include a dummy variable indicating whether the LGBIU has a history of issuing debt. The negative coefficient indicates that the first bond issued by LGBIUs has a lower yield spread than subsequent bonds issued by the LGBIU. This is consistent with the theory that governments that are accessing the capital markets through multiple LGBIU bond issues may be over leveraging their ability to adequately service the debt. Column (4) expands the set of LGBIU factors to include a dummy variable denoting whether the anticipated use of the issue proceeds is for infrastructure investments. The negative coefficient suggests that LGBIUs that are engaged in activities to develop or enhance local infrastructure and thereby enhance the value of the land are less risky than LGBIUs that raise capital for general operating funds.

Table 5, column (5) reports the results that introduces controls for differences across the local governments that created the LGBIUs. Interestingly, neither size (population) or GDP appear to have any impact on offering yields, however governments with higher budgetary expenses (relative to income) have higher offering yields. This is consistent with the market anticipating that local governments that have greater claims on existing income are higher risk. We also observe that relative to prefectural level governments, bonds issued by LGBIUs backed by county governments have higher offering yields while bonds issued by capital cities have lower yield spreads.

Finally, column (6) reports the results including 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. The estimated coefficient is 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. Since the majority of LGBIUs rely on land sales to cover coupon and principal payments, the results are consistent with investors pricing the housing market into the offering yields. The estimated coefficient indicates that a one standard deviation increase in the aggregated house price index over the previous 12 months would result in a 0.13 standard deviation lower offering yield spread.

In Table 6 we explore the linkage between changes in house prices and local government risk factors. We regress the offering yield spread against the cumulative housing price growth in the 12 months prior to the issue date interacted with various measures of local government risk. We also include the full set of control variables and fixed effects. When we introduce the interaction term with house price change, a negative coefficient implies the yield spread of the treatment group is more sensitive to house price changes. For example, according to column (1) in Table 6, the coefficient of house price change would be -0.4115 for bonds issued by prefectural-level governments, and -1.3569 (-0.4115-0.9454) for district- and county-level governments. Thus, a one standard deviation increase in house price change only results in an about a 6% standard deviation decrease in yield spread for the prefectural-level governments since they have financial resources beyond land sales. In contrast, for the district- and county-level governments, a one standard deviation increase in house price change results in a 20% decrease in yield spread. In other words, these lower-level governments have greater reliance on land sales revenue, and thus the linkage between land market conditions and LGBIU bond risk is stronger. For similar reasons, we can observe that the link is stronger if the corresponding local government is facing a higher level of budgetary deficit (column 2) or has lower per capita GDP (column 3), or if the LGBIU issuing the bond is rated as a lower level (column 4) or with a smaller size in total asset (column 5), although we do not find significant variation associated with fund usage.

**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 2013:

$$\Delta(y_{i,t}) = \gamma_0 + \gamma_1 \Delta R_{i,H,t} + \gamma_2 \sigma_{i,H} + \gamma_3 \Delta \left( {}^{Exp}/_{Inc} \right)_{i,t}$$

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

where $\Delta$ represents the first difference for each variable for each bond; $R_{i,H,t}$ is the housing price growth rate for LGBIU locality *i;* $\sigma_{i,H}$ is the standard deviation in the monthly housing price growth rate over the previous 24 months; $GDP_i$ represents the local LGBIU GDP, $Assets_i$ is the LGBIU *i*'s total assets, *Liab/Asset* is the ratio of total liabilities to total assets for LGBIU *i*; *EBITDA/Asset* is the ratio of LGBIU *i*'s earnings over total assets; and $B_i$ represents the set of individual bond fixed effects.

Table 7 reports the estimated coefficients for the change in yield spread regression. Columns (1) and (2) report the base model focusing on the risk associated with changing housing market returns. Column (2) incorporates bond fixed effects to control for differences across bonds and issuers. 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 LGBIUs in areas with higher housing returns have lower yields, reflecting a decline in the risk premium. The negative relation is expected since LGBIUs rely predominately on land sales to fund coupon and principal repayments.

In columns (3) and (4) of Table 7, we incorporate specific risk factors associated with LGBIUs. In these specifications, the standard deviation of the local housing market (a measure of housing risk) is now statistically significant. The positive coefficient indicates that higher housing volatility is related to higher LGBIU bond yields. Again, this is consistent with investors pricing the risk associated with local housing markets in the LGBIU bonds. In addition, we find a negative and statistically significant coefficient on the change in LGBIU liability ratio. This suggests that LGBIUs that increase their leverage have a negative impact on the changes in bond yield. While at first counter-intuitive, this result is consistent with the notion that an increase in a LGBIU's leverage ratio (which most likely occurs due to additional bank borrowing) implies greater monitoring and financial strength. Finally, and somewhat surprising we find a positive (and statistically significant) coefficient for the change city GDP. This suggests that LGBIU yield spreads increase when the local city experiences an increase in economic activity. While somewhat counter-intuitive, the increase in yield spread corresponding to an increase in GDP is consistent with the theory that areas with positive economic growth are less likely to receive transfer payments from the central government and thus will have to rely on other revenue sources (including additional land sales) to fund required infrastructure investments. Thus, to the extent that such additional land sales compete with existing commitments by the LGBIU to sell property to fund debt coupon and principal payments, investors will view these activities as increasing the risks associated with existing LGBIU debt.

## 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 academic literature and 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 are able to issue debt with lower risk premiums. 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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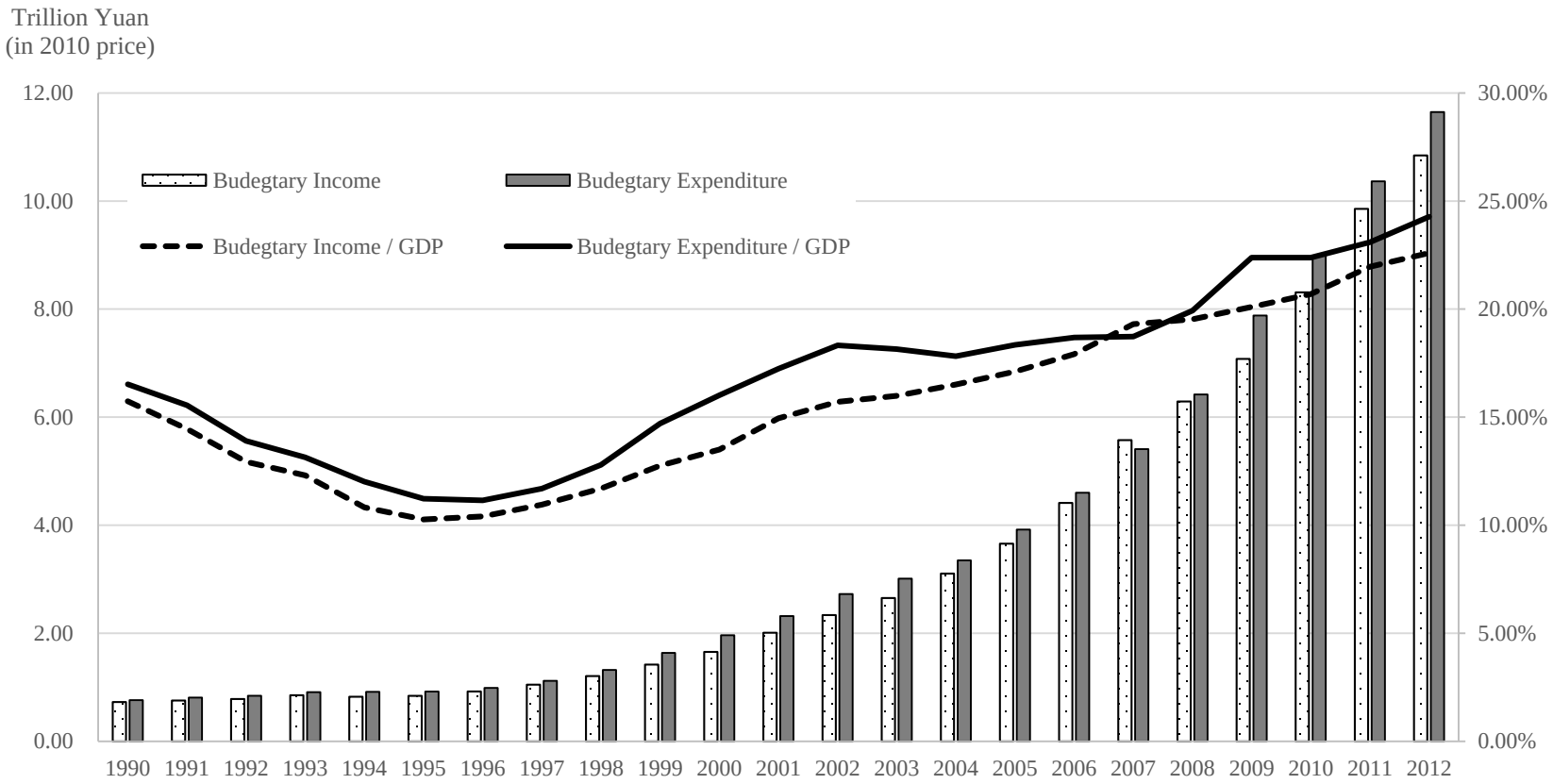



**Figure 1: Budgetary Income and Expenditure of Chinese Government**

Source: authors' calculations based on data reported by National Bureau of Statistics of China.

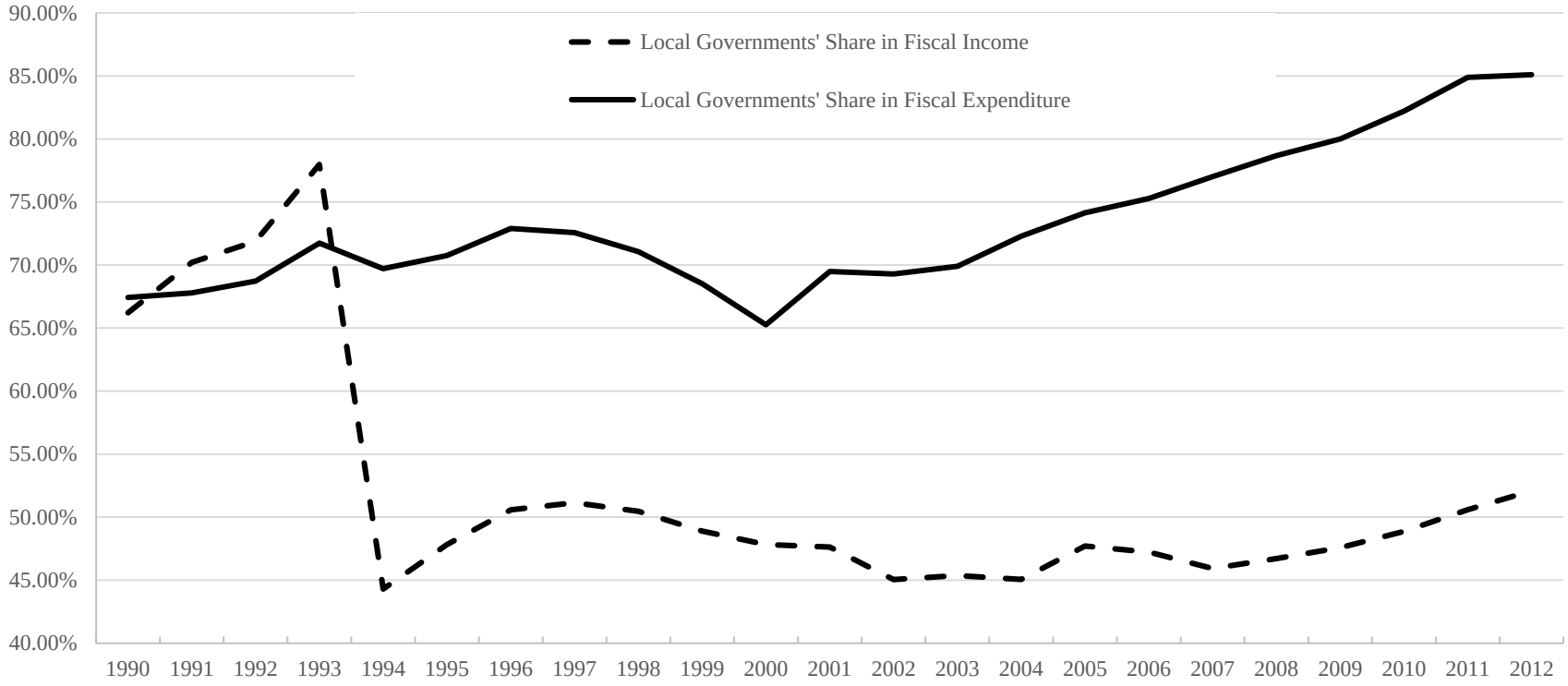
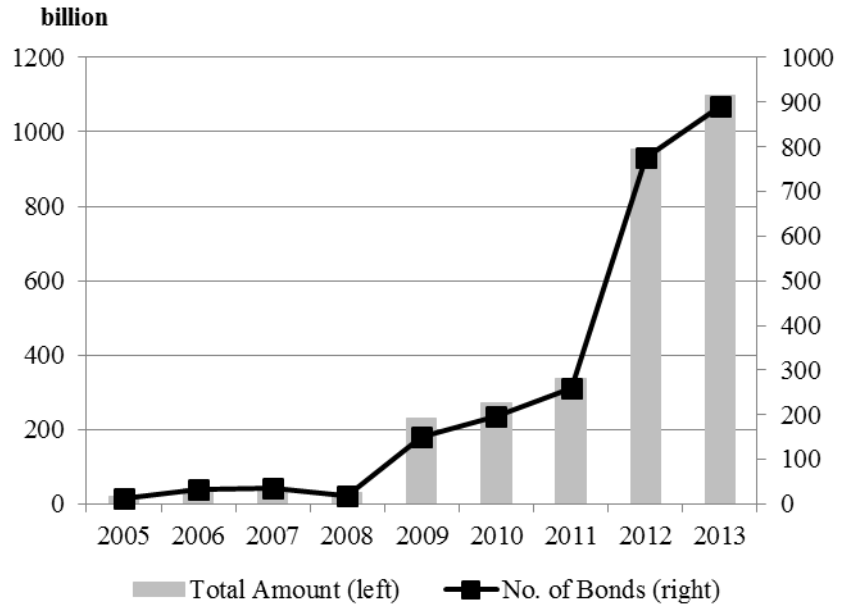
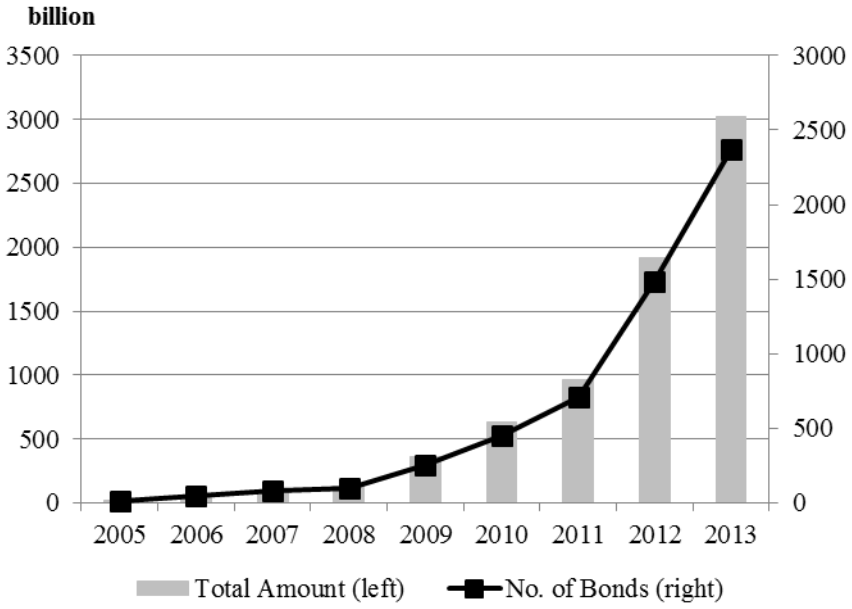



**Figure 2: Local Governments' Share in Total Budgetary Income and Expenditure**

Source: authors' calculations based on data reported by National Bureau of Statistics of China.

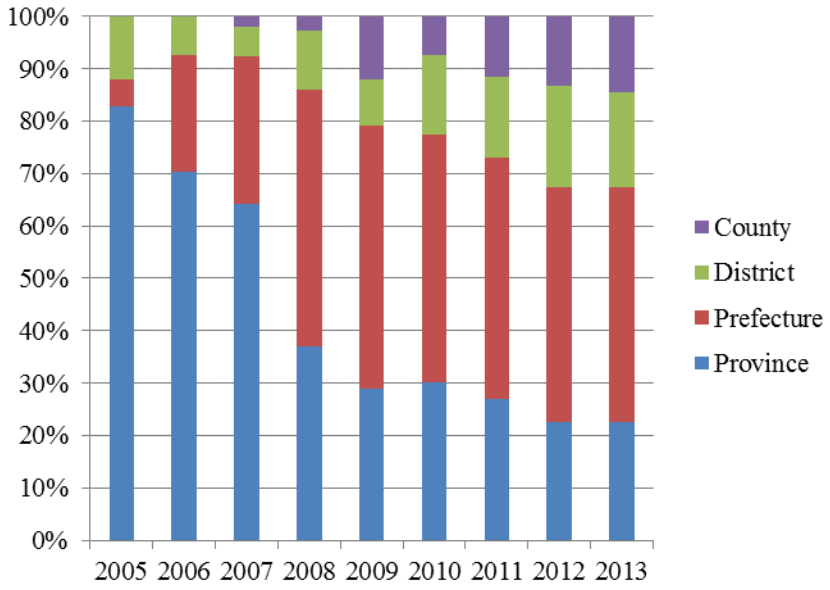



**(A) Bonds Issued during the Year**

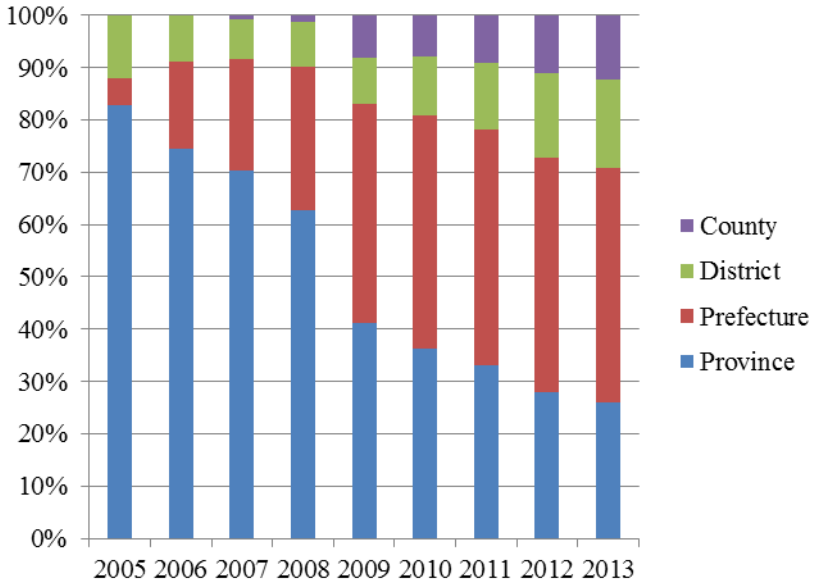



**(B) Outstanding Bonds at the End of the Year**

**Figure 3: Total Volume of LGBIU Bonds**

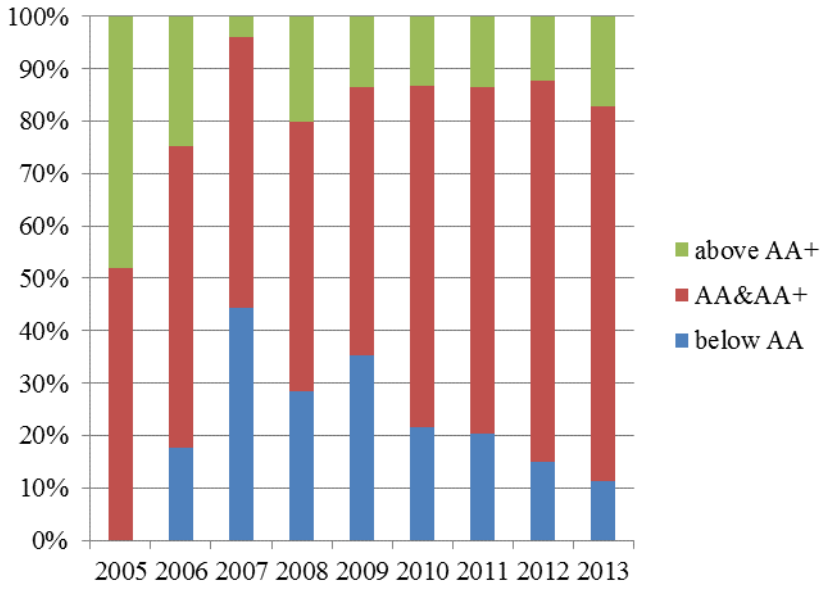



**(A) Bonds Issued during the Year**

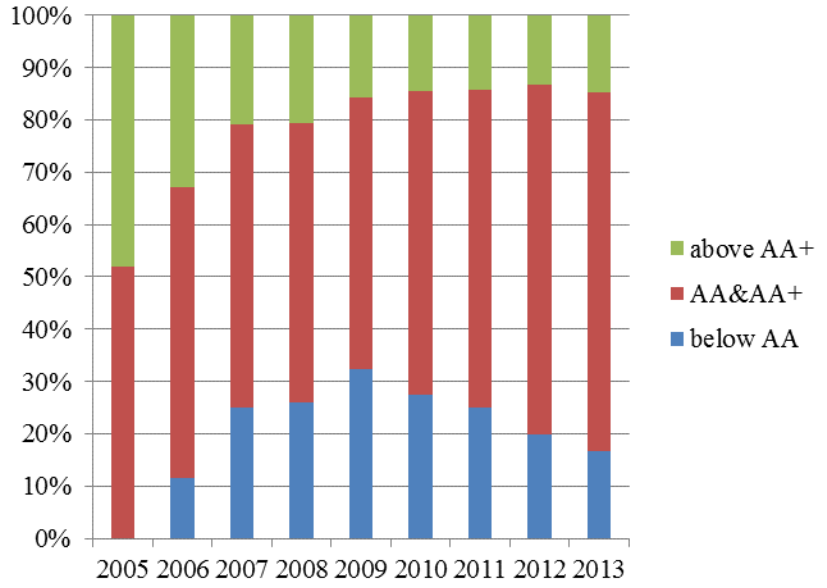



**(B) Outstanding Bonds at the End of the Year**

**Figure 4: Structure of Corresponding Government Levels**




**(A) Bonds Issued during the Year**




**(B) Outstanding Bonds at the End of the Year**

**Figure 5: Structure of Bond Issure Ratings**

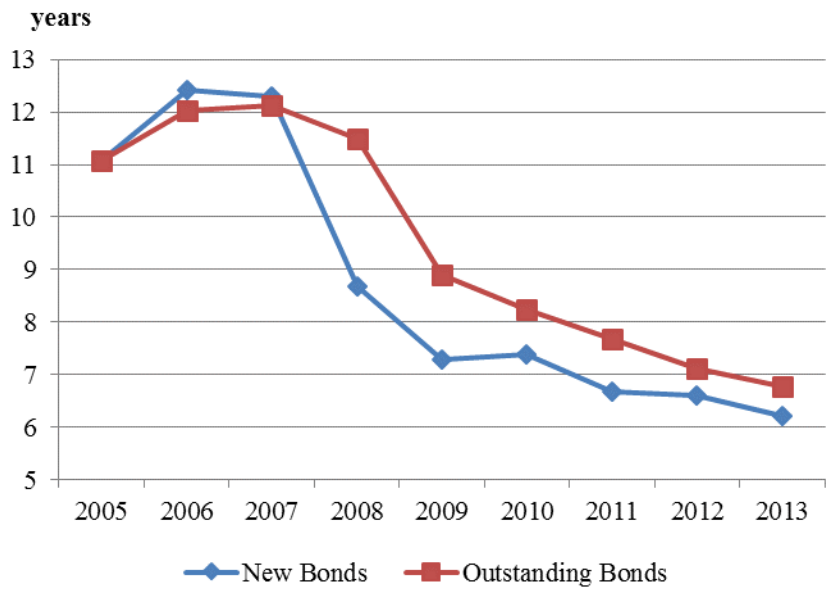
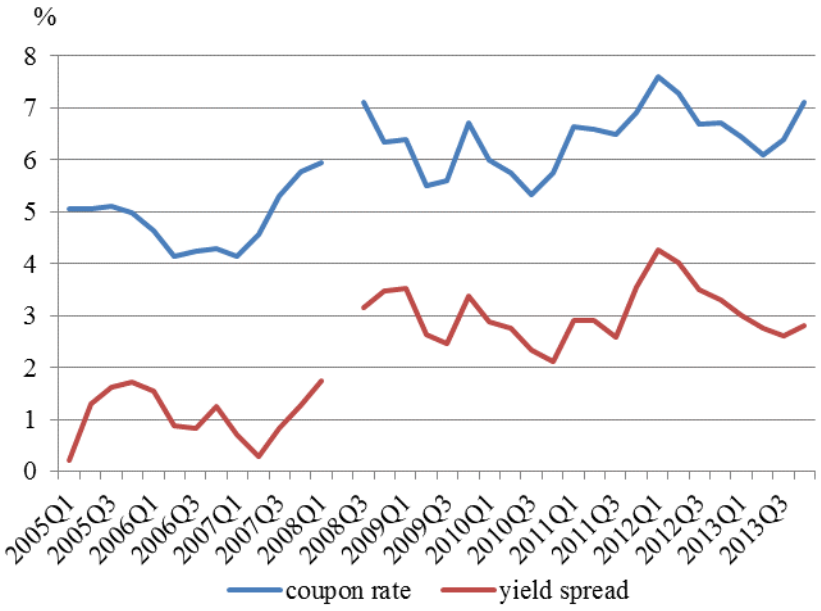
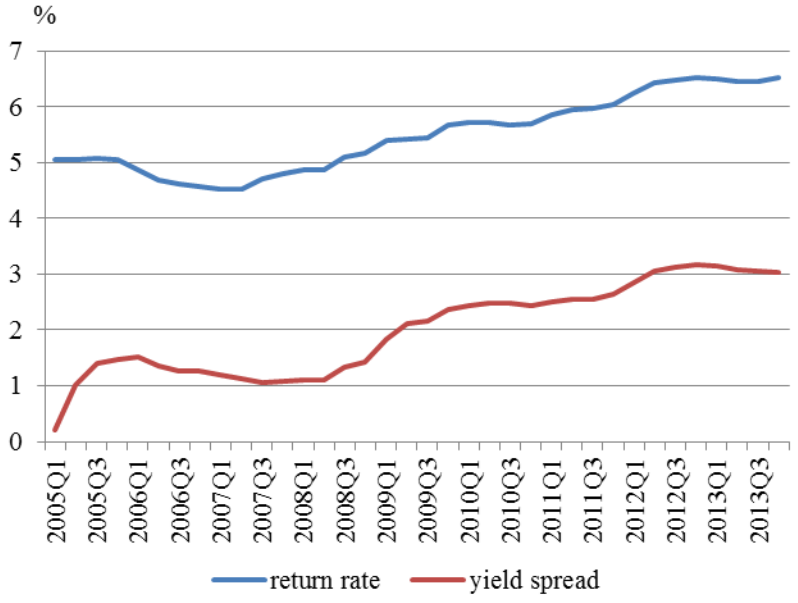



**Figure 6: Average Maturity of LGBIU Bonds**




**(A) Bonds Issued during the Quarter**




**(B) Outstanding Bonds at the End of the Quarter**

**Figure 7: Structure of Corresponding Government Levels**

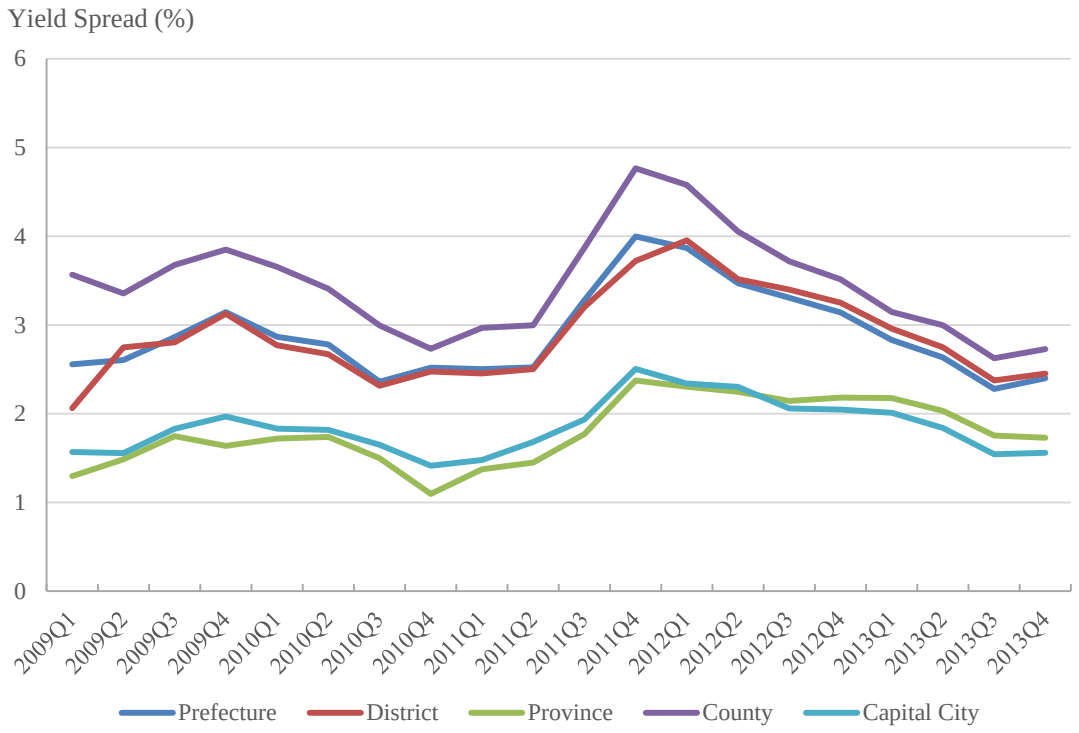
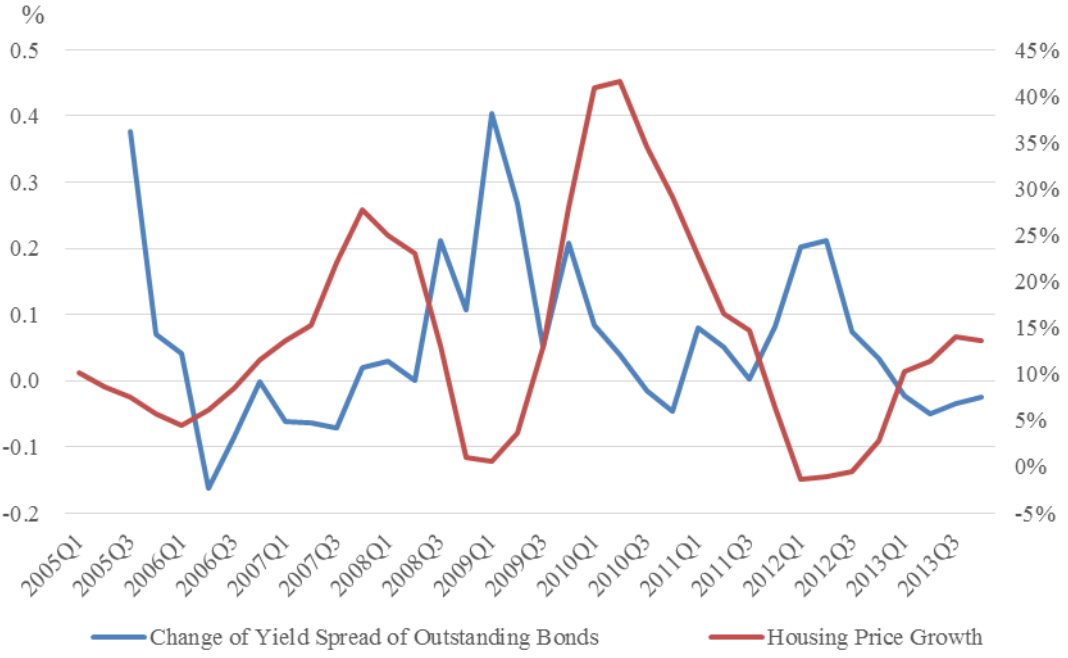



**Figure 8: Yield Spread of Outsanding Bonds**




**(A) Comparison with New Bonds**




**(B) Comparison with Change of Outstanding Bonds**

**Figure 9: Structure of Corresbonding Governmnt Levels**

**Table 1: Number of Bonds in the Sample**

| | | All Bonds Issued by Corporates | LGBIU Bonds |
|---|---|---|---|
| | Total | 10,015 | 2,452 |
| Market | Inter-Bank Market | 8,055 | 1,632 |
| | Shanghai Exchange | 1,462 | 784 |
| | Shenzhen Exchange | 427 | 33 |
| | Others | 71 | 3 |
| Bond Type | Corporate Bonds | 3,421 | 1,956 |
| | Medium-Term Notes | 2,040 | 406 |
| | Short-Term Commercial Paper | 4,210 | 56 |
| | Others | 344 | 34 |

**Table 2: Comparison between Different Local Governments**

| | 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) |
|---|---|---|---|
| Provincial Level Governments | 17.767 | 26415.333 | 219.385 |
| Prefectural-Level City Governments | 4.254 | 5205.500 | 263.384 |
| District Governments in Cities | 6.013 | 6625.195 | 157.535 |
| County/County-Level City Governments | 2.878 | 3028.618 | 242.456 |
| East Region | 22.625 | 6788.251 | 235.207 |
| Middle Region | 10.177 | 4961.667 | 250.714 |
| West Region | 14.679 | 6173.723 | 192.148 |

**Table 3: Major Summary Statistics at Bond Issuing**

| | Average | Std. Dev. | Max. | Min. |
|---|---|---|---|---|
| **A. Bond Information** | | | | |
| Amount (in million yuan RMB) | 1273.323 | 778.849 | 10000 | 50 |
| Coupon Rate (in %) | 6.513 | 1.024 | 10.500 | 2.980 |
| Yield Spread (in %; see text for more details) | 3.026 | 1.005 | 6.713 | -3.825 |
| Maturity (in months) | 81.166 | 25.665 | 240 | 12 |
| *Rate Type* | | | | |
| - Fixed Rate (dummy) | 0.771 | 0.420 | 1 | 0 |
| - Adjustable (dummy) | 0.017 | 0.130 | 1 | 0 |
| - Progressive (dummy) | 0.212 | 0.408 | 1 | 0 |
| *Credit Enhancement Arrangement* | | | | |
| - With Collateral (dummy) | 0.161 | 0.368 | 1 | 0 |
| - With Warrant (dummy) | 0.231 | 0.421 | 1 | 0 |
| - Without Any Enhancement (dummy) | 0.608 | 0.488 | 1 | 0 |
| *Usage* | | | | |
| - Others | 0.024 | 0.152 | 1 | 0 |
| - Transportation Infrastructure (within city) | 0.267 | 0.442 | 1 | 0 |
| - Transportation Infrastructure (between cities) | 0.177 | 0.382 | 1 | 0 |
| - Electricity Supply | 0.037 | 0.188 | 1 | 0 |
| - Gas Supply | 0.020 | 0.140 | 1 | 0 |
| - Heating Supply | 0.008 | 0.091 | 1 | 0 |
| - Telecom Infrastructure | 0.002 | 0.041 | 1 | 0 |
| - Water Supply | 0.088 | 0.283 | 1 | 0 |
| - Sewage | 0.098 | 0.297 | 1 | 0 |
| - Disaster Protection | 0.033 | 0.178 | 1 | 0 |
| - Waste Treatment | 0.075 | 0.264 | 1 | 0 |
| - Flood Control | 0.063 | 0.242 | 1 | 0 |
| - Public Housing | 0.343 | 0.475 | 1 | 0 |
| - Culture, Education, Health | 0.023 | 0.150 | 1 | 0 |
| - Industrial Parks | 0.094 | 0.292 | 1 | 0 |
| - Operating Fund | 0.390 | 0.488 | 1 | 0 |
| - Industrial | 0.060 | 0.238 | 1 | 0 |
| - Urban Redevelopment | 0.061 | 0.240 | 1 | 0 |
| **B. Issuer Information** | | | | |
| Total Asset (in million yuan RMB) | 33531.8 | 66072.1 | 1112306 | 608.7 |
| Liablity / Asset (in %) | 0.036 | 0.025 | 0.275 | 0.000 |
| EBITDA / Asset (in %) | 48.247 | 17.594 | 90.803 | 0.314 |
| *Rateing* | | | | |
| - AAA | 0.085 | 0.279 | 1 | 0 |
| - AAA- | 0.002 | 0.045 | 1 | 0 |
| - AA+ | 0.166 | 0.372 | 1 | 0 |
| - AA | 0.528 | 0.499 | 1 | 0 |

| | | | | |
|---|---|---|---|---|
| - AA- | 0.200 | 0.400 | 1 | 0 |
| - A+ | 0.016 | 0.126 | 1 | 0 |
| - A | 0.001 | 0.035 | 1 | 0 |
| - A- | 0.000 | 0.020 | 1 | 0 |
| - BBB | 0.000 | 0.020 | 1 | 0 |
| - BBB- | 0.001 | 0.029 | 1 | 0 |
| **C. City Attribute** | | | | |
| Population (in million) | 7.983 | 7.089 | 29.712 | 0.069 |
| GDP per capital (in thousand yuan RMB) | 60.977 | 29.837 | 191.911 | 8.477 |
| Ratio between local fiscal expenditure and local fiscal revenue | 1.697 | 1.009 | 14.577 | 0.650 |
| Accumulative housing price growth during the previous 12 months (in %) | 7.692 | 13.440 | 80.342 | -51.966 |
| Standard deviation of monthly housing price growth during the previous 24 months | 0.030 | 0.030 | 0.350 | 0.005 |

**Table 4: Major Summary Statistics of the Quarterly Panel Data**

| | Average | Std. Dev. | Max. | Min. |
|---|---|---|---|---|
| **A. Bond Information** | | | | |
| Return Rate (in %) | 6.219 | 1.198 | 18.004 | -26.691 |
| Yield Spread (in %; see text for more details) | 2.688 | 1.229 | 14.230 | -31.029 |
| Maturity (in months) | 69.339 | 25.620 | 220.700 | 7.867 |
| **B. Bond Information** | | | | |
| Total Asset (in million yuan RMB) | 46080.19 | 89406.76 | 1247680 | 608.69 |
| Liablity / Asset (in %) | 5.788 | 12.028 | 170.585 | -0.743 |
| EBITDA / Asset (in %) | 52.168 | 15.966 | 92.148 | 0.314 |
| **C. City Attribute** | | | | |
| Population (in million) | 8.310 | 7.632 | 29.450 | 0.068 |
| GDP per capital (in thousand yuan RMB) | 57.595 | 28.709 | 182.680 | 6.475 |
| Ratio between local fiscal expenditure and local fiscal revenue | 1.715 | 1.046 | 14.577 | 0.188 |
| Accumulative housing price growth during the previous 12 months (in %) | 9.040 | 12.688 | 81.165 | -59.740 |
| Standard deviation of monthly housing price growth during the previous 24 months | 0.029 | 0.026 | 0.405 | 0.005 |

**Table 5: Offering Yield Spread Determinates**

| | (1) Offering Yield Spread | (2) Offering Yield Spread | (3) Offering Yield Spread | (4) Offering Yield Spread | (5) Offering Yield Spread | (6) Offering Yield Spread |
|---|---|---|---|---|---|---|
| log(Maturity) | 2.3395 | 3.2495 | 2.8597 | 4.0231 | 4.2112 | 1.5490 |
| | (0.3747)*** | (0.3446)*** | (0.3593)*** | (0.4070)*** | (0.5412)*** | (0.6228)** |
| log(Maturity)^2 | -0.8498 | -0.8584 | -0.7397 | -1.0084 | -1.0499 | -0.1868 |
| | (0.0979)*** | (0.0888)*** | (0.0930)*** | (0.1033)*** | (0.1405)*** | (0.1710) |
| *Bond Type* | | | | | | |
| - Corporate Bond | *default* | *default* | *default* | *default* | *default* | *default* |
| - Medium-term Note | -1.1932 | -0.5165 | -0.4348 | -0.4504 | -0.4510 | -0.3454 |
| | (0.0573)*** | (0.0513)*** | (0.0538)*** | (0.0564)*** | (0.0672)*** | (0.0735)*** |
| - Short-Term | 0.6094 | 2.7111 | 2.4997 | 3.6654 | 3.8240 | 2.0159 |
| Commercial Paper | (0.3867) | (0.3552)*** | (0.3662)*** | (0.4166)*** | (0.5413)*** | (0.5913)*** |
| *Rate Type* | | | | | | |
| - Fixed | *default* | *default* | *default* | *default* | *default* | *default* |
| - Adjustable | -0.3119 | -0.2648 | -0.1441 | -0.1518 | -0.0931 | 0.0720 |
| | (0.1265)** | (0.0996)*** | (0.1011) | (0.1002) | (0.1054) | (0.1293) |
| - Progressive | -0.0711 | -0.1624 | -0.1062 | -0.1413 | -0.1213 | -0.1869 |
| | (0.0417)* | (0.0335)*** | (0.0351)*** | (0.0357)*** | (0.0391)*** | (0.0543)*** |
| *Market* | | | | | | |
| - Inter-Bank | *default* | *default* | *default* | *default* | *default* | *default* |
| - Exchanges | -0.1009 | -0.0743 | 0.0036 | -0.0066 | -0.0279 | 0.0008 |
| | (0.0377)*** | (0.0299)** | (0.0393) | (0.0390) | (0.0414) | (0.0512) |
| *Credit Enhancement* | | | | | | |
| - No | | *default* | *default* | *default* | *default* | *default* |
| - Collateral | | 0.0210 | 0.0190 | 0.0136 | -0.0088 | -0.0151 |
| | | (0.0455) | (0.0469) | (0.0464) | (0.0477) | (0.0742) |
| - Warrant | | -0.4760 | -0.4430 | -0.4447 | -0.3715 | -0.2417 |
| | | (0.0370)*** | (0.0377)*** | (0.0375)*** | (0.0396)*** | (0.0503)*** |
| log(total asset) | | | -0.2104 | -0.2228 | -0.2139 | -0.2581 |
| | | | (0.0545)*** | (0.0542)*** | (0.0618)*** | (0.0731)*** |
| EBITDA/Total Asset | | | -3.2138 | -3.2056 | -2.5524 | -3.5847 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | (0.5656)*** | (0.5632)*** | (0.6633)*** | (0.8881)*** |
| Liability/Total Asset | | | -0.0000 | -0.0000 | -0.0000 | -0.0000 |
| | | | (0.0000)*** | (0.0000)*** | (0.0000)*** | (0.0000) |
| First Bond Issued of the | | | -0.1060 | -0.0987 | -0.0732 | -0.0877 |
| Firm | | | (0.0377)*** | (0.0375)*** | (0.0409)* | (0.0496)* |
| Infrastructure Investment | | | | -0.1173 | -0.1357 | -0.1104 |
| | | | | (0.0309)*** | (0.0326)*** | (0.0419)*** |
| *Government Level* | | | | | | |
| - Prefectural | | | | | *default* | *default* |
| - Districts | | | | | 0.0802 | 0.0936 |
| | | | | | (0.0433)* | (0.0504)* |
| - Counties | | | | | 0.1808 | 0.1165 |
| | | | | | (0.0484)*** | (0.0626)* |
| - Capital Cities | | | | | -0.1668 | -0.0923 |
| | | | | | (0.0707)** | (0.0774) |
| log(population) | | | | | -0.0961 | -0.0980 |
| | | | | | (0.0529)* | (0.0710) |
| log(per capita GDP) | | | | | -0.0284 | -0.2244 |
| | | | | | (0.0965) | (0.1503) |
| Budgetary Expense /Budgetary Income | | | | | 0.0675 | 0.0599 |
| | | | | | (0.0179)*** | (0.0461) |
| Accumulative housing price growth during | | | | | | -0.8694 |
| the previous 12 months | | | | | | (0.1369)*** |
| *Firm Rating Fixed Effects* | No | Yes | Yes | Yes | Yes | Yes |
| *Monthly Fixed Effects* | Yes | Yes | Yes | Yes | Yes | Yes |
| *N* | 2452 | 2416 | 2258 | 2236 | 1878 | 1005 |
| $R^2$ | 0.292 | 0.540 | 0.554 | 0.564 | 0.553 | 0.646 |

**Table 6: Variance on the Linkage between House Price Change and Bond Yield**

| | (1) Offering Yield Spread | (2) Offering Yield Spread | (3) Offering Yield Spread | (4) Offering Yield Spread | (5) Offering Yield Spread | (6) Offering Yield Spread |
|---|---|---|---|---|---|---|
| Accumulative housing price growth during the previous 12 months | -0.4115 (0.1838)** | -0.1213 (0.3829) | -7.0527 (3.2238)** | -0.5486 (0.1920)*** | -2.8978 (0.7194)*** | -0.9123 (0.1551)*** |
| * Lower Level Government | -0.9454 (0.2552)*** | | | | | |
| * Deficit Degree | | -0.5652 (0.2702)** | | | | |
| * log (Per Capita GDP) | | | 1.2859 (0.6698)* | | | |
| * Lower Firm Rating Level | | | | -0.6108 (0.2568)** | | |
| * log (Firm Asset) | | | | | 0.8607 (0.2998)*** | |
| * Infrastructure Investment | | | | | | 0.1271 (0.2158) |
| *Control Variables* | Yes | Yes | Yes | Yes | Yes | Yes |
| *Firm Rating Fixed Effects* | Yes | Yes | Yes | Yes | Yes | Yes |
| *Monthly Fixed Effects* | Yes | Yes | Yes | Yes | Yes | Yes |
| *N* | 1005 | 1005 | 1005 | 1005 | 1005 | 1005 |
| $R^2$ | 0.651 | 0.648 | 0.648 | 0.649 | 0.649 | 0.647 |

**Table 7: Changes in Yield Spread and Local Housing Risk**

| | (1) Quarterly | (2) Quarterly | (3) Annual | (4) Annual |
|---|---|---|---|---|
| dlog(Maturity; in days) | 0.0383 | 3.4260*** | -0.7886*** | 0.2042 |
| | (0.3078) | (0.6014) | (0.2919) | (0.6564) |
| d(Y-o-Y Housing Price Growth Rate) | -0.9685*** | -0.7783*** | -2.3136*** | -2.1298*** |
| | (0.1150) | (0.1237) | (0.1866) | (0.2537) |
| Standard Deviation of Monthly Housing Price Growth | 0.5260 | -0.1404 | 5.6652** | 13.7742** |
| Rate in the Past 24 Months | (0.4041) | (0.7188) | (2.2137) | (5.9739) |
| d(Local Government Expenditure / Local Government | | | 0.0559 | 0.2073 |
| Income) | | | (0.1074) | (0.1654) |
| dlog(City GDP) | | | 7.2169*** | 10.3106*** |
| | | | (1.4018) | (2.3872) |
| dlog(Firm's Total Asset) | | | -0.9568*** | -0.8106 |
| | | | (0.3536) | (0.5676) |
| d(Liability / Asset) | | | -0.0088** | -0.0203*** |
| | | | (0.0045) | (0.0067) |
| d(EBITDA / Asset) | | | 0.0065 | 0.0038 |
| | | | (0.0078) | (0.0162) |
| constant | -0.1437*** | 0.0606 | -1.1580*** | -1.3010*** |
| | (0.0228) | (0.0427) | (0.1266) | (0.2839) |
| Bond Fixed Effect | No | Yes | No | Yes |
| *N* | 7555 | 7555 | 1455 | 1455 |
| $R^2$ | 0.01 | 0.11 | 0.13 | 0.48 |

Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$