

Understanding China's Evolving Credit Risk Maze

Ronald W. Anderson¹
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Abstract

This paper analyses factors that account for credit risk in the Chinese market for bonds issued by non-financial enterprises. By exploring a data set of covering monthly observations of individual corporate and enterprise bonds a number of important structural features of the market are seen to account for cross sectional and time series variations of yield spreads. The analysis sheds light on the issue of implicit government guarantees. The results suggest that steps taken by Chinese authorities to restructure local public finance are concentrating such guarantees to a few segments and are bringing greater financial discipline to other segments of the market.

1 Introduction

China has taken significant steps in opening up its domestic financial markets to international investors. Given the size of China's economy this is an opportunity that is difficult to ignore, but once investors start to explore Chinese markets they are confronted with important challenges. This is particularly the case regarding Chinese debt securities where there is a preponderance of non-financial debt issued by names that are generally unfamiliar to non-Chinese analysts. Standard tools for credit risk analysis such as ratings by international agencies are generally unavailable, and Chinese domestic ratings are so heavily concentrated in the top investment grade categories so as to be rather uninformative. While performance of issuers is clearly shaped by market competition, it is also widely recognized that many issuers are heavily dependent upon good relations with government institutions. For all these reasons international investors tend to view Chinese debt markets as being opaque. Furthermore, they fear that in dealing these markets they may be at a competitive disadvantage relative to domestic players both with respect to information and, possibly, with respect to treatment.

In their review of the development of the Chinese financial sector Allen *et al* (2013) emphasize the fact that China is a heavily bank oriented system where four large state-owned banks have played a dominant role. The development of securities markets after the introduction of market based reforms began in 1981 with introduction government Treasury bond trading. The main step toward building securities markets for enterprises came in 1990 with the opening of the Shanghai and Shenzhen Stock Exchanges. Corporate issuance of debt securities was restricted to state-owned enterprises (SOE's) who upon obtaining approval of the central planning authority were able to issue enterprise bonds using starting in 1984. As of 2006 corporate bond issues constituted only 553 billion RMB or 9% of a 6 trillion RMB bond market dominated by treasury bonds and policy bank issues (Allen *et al*, 2013).

Subsequently, major developments in corporate debt securities have taken place starting with the introduction of corporate bonds in 2007 and medium term notes (MTN) in 2008. As discussed in Anderson (2017) these new securities are introduced outside of the institutional framework that applies to treasury, policy bank and enterprise issues. Corporate bonds fall under the jurisdiction of the China Securities Regulatory Commission which also regulates the stock market. MTN and short-

¹ London School of Economics and Xinhua College of Sun Yat-Sen University, r.w.anderson@lse.ac.uk. This research has been supported by ESRC-Newton Fund grant ES/P004237/1 and the ESRC grant ES/K002309/1. Hengwei Zhang has provided excellent research assistance on this project. *This is a preliminary draft. Please do not circulate without my permission.*

term commercial paper issuance are governed by rules set by the National Association of Financial Market Institutional Investors (NAFMII). These innovations were followed by ten years of very strong growth in corporate issuance with the result that according to BIS statistics total corporate debt securities outstanding in 2016 stood at 2.6 trillion USD making it the second largest corporate bond market in the world behind United States with 5.8 trillion USD outstanding and far ahead of third placed Japan with 747 billion USD (see Anderson, 2017).

This growth of the corporate securities trading in China may be attributed in part to the institutional reforms that had been put in place. However, this is unlikely to be the only or even the main factor involved, for over the same ten year period there was an explosive growth of debt of all sorts including traditional RMB bank loans but also other forms of non-bank credit creation. These include trust loans, entrusted loans, and bankers' acceptances which taken as a whole have come to be known as China's "shadow banking" sector. The growth of all these forms of Chinese domestic debt is documented in Total Social Financing, a broad debt statistic introduced by the People's Bank of China in 2011. This series has shown extremely high and highly variable rates of growth in the period since 2007. The monthly publication of these statistics has frequently given rise to cries of alarm by commentators in the international business press and in some cases to dire predictions that China is facing an impending debt crisis. These have been given some credence in more thorough analyses of China's debt growth including most notably a number of reports of the IMF (see particularly, Maliszewski *et al*, 2016).

There have been a number of attempts by Chinese scholars to understand the forces that have caused the explosive growth of debt and to assess whether the debt burden is sustainable. One important analysis is contained in Bai *et al* (2016) who emphasize the importance of a programme of 4 trillion RMB fiscal stimulus that was adopted by the central authorities in late 2008 as a response to the unfolding global financial crisis. The objective was to induce a burst of domestic real investment which would mitigate the effect of the expected decline in exports and allow China to avoid a sharp slow-down in economic growth. Indeed, it had this effect with aggregate real investment rising from 42% of GDP in 2007 to 48% in 2010. Investment was heavily oriented toward non-residential structures including infrastructure projects which by their nature are important assets of a regional economy (e.g., bridges, subway systems, water purification...). While some large infrastructure projects were managed centrally, more often local governments were induced to plan and, in short order, to execute the projects they deemed most beneficial in the local context.

To this end, the authorities had to deal with an important institutional obstacle that had been in place since a fiscal reform of 1994 which simultaneously centralized a large share of tax collection while still expecting local government to shoulder a large share of public expenditure. Furthermore, these reforms prohibited local governments from most forms of bank borrowing and debt issuance. This left local governments dependent upon revenue transfers from the central government, but these typically came in the form of targeted programmes which were often ill-suited to the projects deemed most needed for local development. In response to this, some local governments, notably in Shanghai Pudong development district, developed a work-around which involved sponsoring a new form of SOE for the sole purpose of developing and then operating local infrastructure projects. Given their legal status as a local SOE these new enterprises were able to take on debt either through bank borrowing or through issuing enterprise bonds. This innovation was tolerated by central authorities, perhaps as a pragmatic means of smoothing over the transition of toward the new system of receipt centralisation and redistribution of funds back toward local governments. However, over time more local governments imitated the Shanghai Pudong model which became the *de facto* normal way of executing a wide variety of infrastructure projects. The specialised SOE's

have come to be known as the Local Government Funding Vehicles (LGFVs) and the bonds issued by such entities are recognized in the market as City Construction Bonds.²

The numbers of LGFV's grew relatively slowly in the decade that followed the fiscal reforms of 1994. This changed with the 2008 fiscal stimulus which made a rapid increase in infrastructure investment a national priority. The numbers of LGFV's grew rapidly as judged by the fact that the numbers of such entities which issued bonds rose from 600 in 2008 to 1600 by 2012 (Bai *et al*, 2016).

The consequences of this bulge of infrastructure investments being channelled through local SOE's has been a major driver of events in Chinese financial markets for the last ten years. Initially, the funding for the increased investments by these entities came in large part in the form of bank loans. However, the tenor of typical banks loans was generally much less than the horizon over which the infrastructure projects were expected to generate revenues either directly in the form of user fees or indirectly as the assets stimulate and support economic growth. As a result, the LGFV's were faced with a need to roll-over their debts. As discussed in detail by Chen *et al* (2017) these roll-over pressures began to be felt strongly in 2012. By that time, the central bank had taken steps to restrain the expansion of bank credit so that LGFV's had to look to alternative sources of funding in order to repay their maturing bank loans. Using provincial level information on bank loans in 2009 Chen *et al* report a significant positive association with growth in bond issuance by provincial level LGFV's in 2012-15. Similarly using provincial level aggregates, they report a positive association between bank loan growth in 2009 and growth in entrusted loans in 2013 and 2014. In contrast, they found no significant association between bank loan growth in 2009 and subsequent bank loan growth in 2013-15.

The rapid growth of aggregate non-financial debt since 2010 and the fact that some of this has been channelled through China's shadow banking sector has led a number of analysts to question whether the trajectory of debt was unsustainable and whether Chinese authorities had the means of bringing it under control. To a certain extent the growth of non-bank debt since 2010 can be viewed as transitory, reflecting the market's adjustment to the opportunities created by securities market reforms which allowed trading in new types of debt issues. Indeed Lu (2017) documents a number of regulatory changes which made it easier for the LGFV's to issue corporate bonds or MTN's for infrastructure purposes. However, others have pointed to the fact that many of the new debt issues, including City Construction Bonds issued by LGFV's, were being repackaged in so-called Wealth Management Products (WMP's) which were being sold to unsophisticated investors who were ill-placed to recognize the riskiness of the underlying instruments. It is argued that this has been knowingly tolerated by the Chinese authorities and that as a result there is a general expectation of government bail-outs in case of defaults (see, N. Zhu, 2016). Chen *et al* argue that it was the pressure of rolling-over the debts originated with the stimulus package of 2008 that forced Chinese authorities to send conflicting signals as to debt policy by which they have attempted to step back from blanket guarantees while at the same time tolerating continued debt issuance by LGFV's in some circumstances.

These issues were explored in Anderson and Lu (2018) focussing particularly on how China's debt policy is inextricably linked to structural problems of local government finance in China. They argue that the pressures to confront the build-up of LGFV's debt following the 4 trillion CNY stimulus program is forcing authorities to address the structural imbalances that originated from the 1994 fiscal reform. This has taken the form of the authorising direct municipal bond financing and facilitating muni-bond/ City Construction Bond swaps. They trace the effects that these policy

² In earlier literature these bonds are sometimes called municipal bonds; however, this is something of a misnomer as they are not issued by local governments. They are not to be confused with genuine municipal bonds were introduced only recently as I discuss in this paper.

actions have had since 2015 upon the trajectory of the main debt aggregates as well as the associated yield spreads.

In this paper, I use disaggregated information on Chinese debt securities to explore the changing pattern of credit spreads which have coincided with the major developments in the bond market summarized above. By looking at average credit spreads within fairly narrowly defined segments of the debt securities markets we can hope to learn how the expectations of Chinese investors have evolved over time in this context. I focus particularly on the period since the issuance of public statement No. 43 of 2014 “Opinions of the State Council on Strengthening the Administration of Local Government Debts”. As discussed in Chen *et al* and Anderson and Lu, this statement set out rather explicitly a strategy for containing the growth of debt. The strategy towards debt has been addressed in subsequent statements of the Chinese authorities and have sometimes been interpreted as signalling a wavering commitment to debt containment. By looking at the evolution of credit spreads, we can learn something of how Chinese investors have read these statements. In so doing, this will give the international observer some insight into the workings of Chinese debt markets.

The remainder of the paper is organized as follows. Section 2 presents a series of simple descriptive statistics which split the Chinese debt market using a variety of qualitative characteristics. These simple statistics highlight some very important institutional features of Chinese debt markets which any analyst needs to understand if they hope to make sense of these markets. Beyond this they suggest that perceptions of relative riskiness of different market segments have shifted dramatically since 2015. In section 3 I combine all these factors plus additional observable characteristics in a multivariate regression analysis to give a more comprehensive assessment of individual securities. Section 4 presents conclusions.

2 Understanding the major segments of the non-financial bond market in China

As discussed in the introduction, one of the striking feature of the Chinese domestic bond market is that despite the fact that securities issuance was opened up only recently to most non-financial enterprises, overall the non-financial corporate issues market has grown to be the second largest corporate bond market world after the US market. As discussed in Anderson (2017), the market divides roughly equally into three main segments.

Enterprise bonds have been issued since the 1980’s through an issuance facility organized by the China Central Depository and Clearing Co. (CCDC) which also serves for government and policy bank issuance. Importantly, issuance of enterprise bonds is done upon approval by the National Development Reform Commission (NDRC) which was formed out of the apparatus of the central plan. While central planning in China has become much less directive since the introduction of market reforms in the late 1970’s the five year plans still set out investment priorities and some general quantitative guidelines. The 13th Plan (2015-2020) sets a general GDP growth objective of about 6.5% annually and expresses priorities under broad objectives described as “five main tasks,” namely: De-capacity, De-stocking, Deleverage, Lowering costs, Improving weak links (Tang, 2016). In its evaluation of proposed enterprise issues the NDRC assesses the appropriateness of the real investment financed by the issue in light of plan priorities. In early 2017 there were approximately 4.5 trillion RMB of enterprise bonds outstanding.

Corporate bonds have been issued since 2007 under auspices of the Shanghai and Shenzhen stock exchanges and fall under the regulatory authority of China Securities Regulatory Commission (CSRC)

which also regulates equities markets issuance and trading. In 2017 there were about 4.2 trillion RMB of corporate bonds outstanding.

Finally, since 2008 short and medium term corporate paper has been issued in an over-the-counter market using the documentation standards and protocols established by the National Association of Financial Market Institutional Investors (NAMFII). This is a self-regulatory body of the financial industry which can be thought of as the Chinese equivalent of the International Swaps and Derivatives Association (ISDA). There is some official regulatory oversight involving, at least, some reporting by issuers of CP and MTN's. As of early 2017 there was about 6.6 trillion RMB of this shorter-term paper outstanding.

In this paper I focus on enterprise and corporate bonds, two channels that serve the same purpose of placing long-term debt issues into a market available to institutional investors. However, these channels have quite distinct regulatory frameworks, with that of enterprise bonds being more closely supervised by central authorities. The data set covers 5,681 bonds that were outstanding in May 2018 for which information about the issue, the issuer, and market pricing since early 2015 was obtained. See the Appendix A for a description of the data set.

Table 1 presents a break-down of these data by market segment and by type of issuer. In this sample, somewhat more than half of the number of bonds outstanding were issued as enterprise bonds. Of the corporate bonds outstanding 1651 were listed on the Shanghai Stock Exchange and 639 were listed in Shenzhen. Turning to the break-down by type of issuer we immediately see that the long-term, non-financial bond market is dominated by issuers that are state-owned, mainly locally-owned. 3586 issues, i.e., half of all issues are those of local SOE's. This is particularly true of enterprise bonds where local SOE issues comprise 82% of the total. In effect, the enterprise bond market is dominated by issuers which are directly linked to some governmental entity by share ownership. The majority of those bonds are linked to local governments at the provincial, municipal, or county level. Central SOE's and private companies account for about the same number of issues. A notable difference is that Central SOE's issue mainly enterprise bonds or corporate bonds listed in Shanghai; whereas, private firms issue mainly corporate bonds and use both the Shanghai and Shenzhen markets.

Table 1: Number of Non-financial Bonds Outstanding May 2018

	Enterprise	Corporate		Total
		SSE	SZSE	
Central SOE	385	374	49	808
Foreign-owned	9	93	29	131
Joint ventures	87	64	4	155
Local SOE	2,780	648	158	3,586
Other companies	17	11	7	35
Private Enterprise	96	431	362	889
Public company	13	30	30	73
Other SOE	4	0	0	4
Total	3,391	1,651	639	5,681

The review of literature in the Introduction pointed out that following the 4 trillion RMB stimulus package of 2008 there was a strong growth both in the number of state owned enterprises and in investments as a share of GDP. Furthermore, it was argued by Chen *et al* that a significant fraction of the debt issued to support these real investments was subsequently rolled-over into bonds that

have been issued by LGFV's. If this is the case then in light of the findings from Table 1, this suggests that a large fraction of the bonds issued by local SOE's were destined to finance infrastructure investment projects. Furthermore, since the enterprise market is dominated by local SOE's it is likely that a large fraction of enterprise bonds were used to finance infrastructure.

Table 2 presents evidence that supports these conjectures. It makes use of a classification of bond issues made by the People's Bank of China (PBOC) which identifies a bond as a City Construction Bond explicitly when the declared purpose of the bond was for infrastructure or other non-residential construction. In Panel A the data is broken down by type of issuer. Of the 5632 bonds for which both the City Construction indicator and issuer company type data are available 3571 were issued by local SOE's. Of these 2902 (or 81%) are City Construction bonds. In contrast, City Construction bonds constitute only a small fraction of issues either by central SOE's (14%) or private enterprises (7%). In Panel B of the table the data are broken down by market of issue. Here again the conjecture is supported by the data. A very large fraction of enterprise bonds were classified as City Construction Bonds. In contrast, only a relatively small fraction of corporate bonds were intended to finance infrastructure, specifically, 20% in Shanghai and 7% in Shenzhen. This supports the view that a large fraction of the infrastructure stimulus was channeled through LGFV's and often took the form of enterprise bonds.

Table 2: Numbers of City Construction Bond Issues by Issuer and Market

	City Construction	Other	Total
Panel A: By company type			
Central SOE	112	689	801
Foreign-owned	2	127	129
Joint ventures	75	80	155
Local SOE	2,902	669	3,571
Other companies	14	21	35
Private Enterprise	57	811	868
Public company	1	68	69
Other SOE	2	2	4
Total	3,165	2,467	5,632
Panel B: By market			
Enterprise	4,668	1,000	5,668
SSE	322	1,327	1,649
SZSE	45	572	617
Total	5,035	2,899	7,934

A central issue in understanding Chinese non-financial debt securities is the extent to which risk of default by issuers is being borne by bond investors. In China, as in other markets, it is not unusual that bonds will be issued with an explicit guarantee provided by some third party guarantor. Table 3 summarizes the available information about such guarantees on outstanding enterprise and corporate bonds. It shows that explicit guarantees are more widespread among enterprise bonds than for corporate bonds. Furthermore, explicit guarantees are more prevalent among issues by central and local SOE's than for private issuers. Nevertheless, overall a majority of issues do not carry explicit guarantees, and that is true even for enterprise bonds or those issued by SOE's.

Table 3: Bond Issues with Guarantees by Issuer and Market

	Explicit Guarantee	No Explicit Guarantee	Total
Panel A: By company type			
Central SOE	371	430	801
Foreign-owned	31	98	129
Joint ventures	93	62	155
Local SOE	1,465	2,106	3,571
Other companies	20	15	35
Private Enterprise	222	646	868
Public company	23	46	69
Other SOE	4	0	4
Total	2,229	3,403	5,632
Panel B: By market			
Enterprise	2,534	3,134	5,668
SSE	237	1,412	1,649
SZSE	150	467	617
Total	2,921	5,013	7,934

While most bonds issued by non-financial enterprises may not carry explicit guarantees, it is often asserted that some and perhaps all corporate debt securities in China carry some form of implicit government guarantee. This may stem from a general reluctance of authorities to rely on legal bankruptcy proceedings to resolve insolvencies for fear that this could create economic and social instability. The view that China's policy makers have sheltered firms from financial discipline has been expressed repeatedly by the IMF. For example, Maliszewski *et al* (2016) argue that implicit guarantees have lowered borrowing costs for high risk/ low return borrowers by between 50 and 100 bps and in this way represent a significant allocative distortion that is feeding a general reduction in returns in the enterprise sector.

Clearly the question of implicit guarantees is a critical one for Chinese investors, and their expectation of future government bail-outs of defaulting issuers will be an important determinant of the pricing for various categories of bonds. We can learn something about these expectations and how they have evolved by examining the relative pricing of various segments of the Chinese bond market both in cross section and over time. The approach taken in this paper is to use monthly observations of prevailing yields to maturity of individual securities over the period running from April 2015 through May 2018. This period is chosen because starting in early 2015 the central authorities initiated a number of measures aimed at implementing the "deleveraging" policy highlighted in the 13th five year plan. Furthermore, this period coincided with the growing

awareness of the rapid growth of Chinese non-financial debt, and this has been given rise to a number of policy statements issued either by the State Council directly or by the PBOC, the Finance Ministry or the NDRC.

Of course differences in yields of various corporate bonds will differ as a function of many factors such as the issuers financial health and prospects, issue characteristics such as time to maturity, as well as fluctuations in the general level of interest rates represented for example by the movements in the term structure of central government treasury bonds. The next section will present evidence based on multivariate regressions which will control for a wide range of such factors using observable variables. It is useful however to first present some summary statistics of mean yields of segments of the non-financial bond market expressed as spreads over treasury issues with the same time until maturity. This will allow us to see some striking patterns which suggest how the perceptions of credit risk in different segments of the market have evolved over time. Our multivariate regressions can be used to check whether the patterns hold up as being statistically and economically significant when we control for more factors simultaneously.

Using the available information on bond issues and bond issuers, the Chinese market can be broken down into many different ways. The break-down that I have found most instructive considers whether the bond issue is enterprise or corporate and whether or not it is a construction bond. Considering this for seven categories of bond issuers results in 28 bond segments. With this break-down I have summarised yield spreads at the beginning of the sample period, April 2015, and the end, May 2018. The mean, standard deviation and number of observations are reported in Appendix B in Table B1.

In scanning through this large table there are a large pairwise comparisons that can be made, and many of these are quite revealing. Focussing just on the numbers of observations (NOBS) in the various segments, a first striking observation is that in fact the table is quite sparse. We knew from Table 2 that most bonds are issued by local SOEs, central SOEs or private firms. From Table B1 we can see that there is a clear evidence of segmentation. Most construction bonds are issued by local SOEs and most of these are issued as enterprise bonds. In contrast, private enterprises tend to issue corporate bonds rather than enterprise bonds and very few are construction bonds. Central SOEs issue both enterprise and corporate bonds but relatively few are construction bonds. All of this shows that the funding of infrastructure investments has been channelled largely through LGFVs which are organized as local SOE's and that much of the funding through securities issues has taken the form of enterprise bonds.

Turning to mean yield spreads, one notable pattern involves comparing yield spreads across company types for a given market segment at a given time. Focussing on central SOEs, local SOEs and private issues of non-construction bonds the relationship can be summarized as

$$S_{csoe} < S_{lsoe} < S_{private}$$

Interpreting average spreads as perceived credit risks, this can be rephrased as suggesting investors view bonds issued by central SOE's as less risky than local SOE issues which in turn are less risky than private issues. This held true for both enterprise issues and for corporate issues in April 2015. The same held true in May 2018.

To many readers this might be taken as evidence of implicit government guarantees which are stronger for firms backed by central government agencies compared to those backed by local governments which are in turn stronger than the government back-stop, if any, enjoyed by private firms. This is not implausible. However, the observed ordering of spreads could also be justified by

the underlying solvency and liquidity of the issuing firms in each category. However, we can gain some sense of the importance of government guarantees by looking at the evolution of the spreads over time when the relative financial strength (absent guarantees) of these categories of issuer may have a stable relationship.

In comparing yield spreads in Table B1 in April 2015 and May 2018 for a given market segment reveals that the average spreads rose systematically for all market segments over this three years. However the amount of increase in yield spreads varied widely across segments. This is summarised for the largest market segments in Table 4.

Table 4: Change of Mean Yield Spread, Apr-15 to May-18
(per cent)

	Central SOE		Local SOE		Private	
	construction		construction		Construction	
	no	yes	no	yes	no	Yes
enterprise	0.56	.	2.45	0.38	6.22	.
corporate	1.40	0.39	1.30	0.66	2.59	0.13

Focusing on non-construction enterprise bonds, average yields increased 56 bps for central SOEs, 245 bps for local SOEs and 622 bps for private firms. For non-construction, corporate bonds the increases were similar for central and local SOEs (140 and 130 bps, respectively) while the increase was 259 bps for private bond issues. In contrast, the spreads increased relatively little for construction bonds. This is particularly notable for the large number of enterprise construction bonds issued by local SOEs which rose only 38 bps for enterprise issues and 66 bps for corporate issues.

Apparently over this three year period risk perceptions of Chinese investors underwent a radical reassessment. Chinese investors seemed to think that credit risk had risen significantly across the board. However, the greatest risks were concentrated in issues of private enterprises. SOE issues apparently were viewed as less risky than private issues. And local SOE Construction issues were viewed as less risky than their other issues.

What could have accounted for this dramatic turnaround of risk assessments? One factor that certainly contributed to this pattern is that starting in 2014 there were a number of defaults on publicly traded bonds. These represented only a relatively small fraction of the market. However, following 12 defaults in 2014 and 46 in 2015, the total number of defaulted securities shot up to 158 in 2016. Most of the defaults occurred for privately owned companies, but there were a number also for local SOE's. This served to demonstrate that there was no blanket implicit guarantee to bond holders by government authorities and that even state ownership of the issuer was no insurance against loss by bond holders.

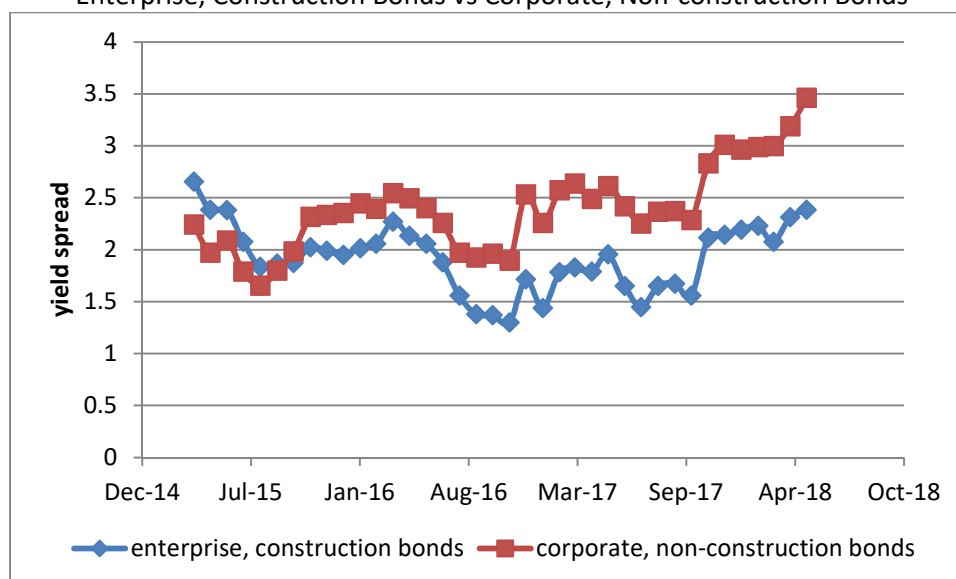
In addition to these market events, starting in 2015 central authorities increasingly have engaged in a number of policies which have been aimed at reforming local government finance and as such have directly contributed to a realignment of risks in the bond market. As discussed in detail in Anderson and Lu (2018) a key step was to allow the direct issuance of municipal bonds by selected local governments which in effect rolled back some of the restrictions imposed by the fiscal reforms of 1994. As in the case of many Chinese structural reforms, the changes were introduced on an exceptional basis initially and then subsequently were rolled out more widely. Currently, a limited number of provinces or provincial level municipalities are authorised to issue municipal bonds

directly; however, a larger number of provinces and cities have been able to participate in muni bond issues that have been organized by the Ministry of Finance on their behalf. Beyond this the authorities have introduced a muni-bond/City Construction Bond swap programme designed to shift the refunding obligations away from LGFV's onto their sponsoring governments directly. The result was a dramatic reversal of the trajectories of amounts outstanding in various segments of the bond market since 2015 (see Anderson and Lu, Figure 8). The total amount of muni bonds outstanding rose from about 1 trillion RMB in 2014 to stand at more than 14 trillion RMB in 2017. At the same time, issuance of enterprise bonds which previously had been one of the fastest growing market segments levelled off as many LGFV's found alternative means of refunding their maturing debt or in financing their on-going infrastructure investment plans.

A second programme aimed at relieving the refunding pressures of LGFVs are Public-Private Partnerships (PPP) where LGFV's join with new partners (which in fact may be privately or state owned) to fund, complete and subsequently operate regional infrastructures. As part of the PPP agreement the financial obligations of the sponsoring local governments and their partners are spelled out explicitly. Furthermore, through repeated statements central authorities have indicated that government backing cannot go beyond what is specified in the PPP agreement and that general assurances or commitments to future land sales are strictly prohibited.

In light of these developments the patterns seen in Table 4 are more readily understood. Credit spreads have risen at least in part because the central government has strongly backed-away from any notion that there are blanket guarantees which serve to protect bond holders from losses when insolvent issuers are unable to repay their debts. Instead, the obligations of various governmental entities have been made more explicit with better defined limits on the amount of backing and have been concentrated in certain types of issues. Existing City Construction Bonds have become relatively more attractive by recognition of these obligations. However, they have also been made more attractive because LGFV funding pressures have been relieved in part by the muni-bond/ City Construction Bond swaps and by the strong backing of PPP.

Figure 1: Monthly Average Credit Spreads (per cent), Enterprise, Construction Bonds vs Corporate, Non-construction Bonds



In order to see how the effect of these influences evolved over the three years since reforms directed at local government finance were introduced, Figure 1 depicts the mean yield spreads

monthly for the two segments most affected by these developments. These are enterprise, construction bonds and corporate, non-constructions bonds. The trajectories of these two segments began to diverge starting in July 2015 which as discussed by Anderson and Lu coincided with a series of explicit statements from the central authorities (notably the NDRC) stating that in principle enterprise bonds should not default. Over time it was clearer that the underlying principle here was that the enterprise bond approval process required that the local governments give assurances of the solid backing of the LGFV's they had sponsored. In this way, guarantees that previously had been implicit became more explicit. Furthermore, the strength of the backing became limited by the financial health of the sponsoring local government.

To summarize, there has been a dramatic repricing of credit risks in the Chinese domestic bond market in the last three years characterised by substantial increases in yield spreads for most categories of non-financial paper. The categories of bonds that have seen relatively modest increases in credits spreads are issues of state owned enterprises, particularly central SOEs and issues of LGFVs specifically used to finance infrastructure investments. This is consistent with repeated policy guidance issued by the State Council and other central authorities. It has been backed up by strong policy actions notably in the form of the muni-bond/City Construction Bond swap programme and the PPP programme. Other categories of corporate issues have generally experienced significant increases in yield spreads. This has been particularly the case for corporate bonds issued by private enterprises.

The authorities' explanations of its policies on debt are often couched in terms of implementing the "deleveraging" objective of the 13th five-year plan. For example, in his speech at the World Economic Forum in January 2018 Liu He stated, "... strengthened risk awareness and changing market expectations on implicit guarantee or moral hazard have created important psychological conditions for us to prevent and control financial risks." Despite such explicit statements, the commitment of central authorities to increased financial discipline has often been viewed as half-hearted by the international financial press. However, it seems that the Chinese investors believe the commitment of the authorities is credible.

One possible reason for this divergence of views may reflect that foreign market analysis may be sceptical of alleged guarantees that are not explicitly spelled out in the term and conditions of the debt contract; Chinese domestic investors may have more confidence that they know the meaning of statements of policy guidance from central authorities. To try to shed light on the relative importance contractual guarantees versus general government guarantees afforded to some categories of debt securities it is useful look at a break-down of yields spreads similar to the one reported in Table 4 but looking at the distinction of whether or not a bond carries an explicit contractual guarantee.

Table 5: Change of Mean Yield Spread, Apr-15 to May-18
(per cent)

	Central SOE		Local SOE		Private	
	explicit guarantee		explicit guarantee		explicit guarantee	
	no	yes	no	yes	no	yes
enterprise	1.31	0.32	0.60	0.41	9.61	4.72
corporate	0.45	2.04	0.77	1.86	2.72	1.69

The result of this break-down is reported in Table 5. Again, between April 2015 and May 2018 yield spreads increased on average in all the market segments: enterprise and corporate, with and without explicit guarantees, for central SOEs, local SOEs and private firms alike. However some

segments had much smaller spread increases than others. In particular, for enterprise bonds with explicit contractual guarantees the increase was only 32 bps for central SOE issues and 41 bps for local SOE issues. In contrast, for private firm issues the rise for enterprise bonds with contractual guarantees the increase in spreads was an order of magnitude large—472 bps. This suggests strongly that Chinese investors viewed the commitment of the Chinese governments to backing up enterprise bonds was concentrated mainly in issues of SOEs.

It is worth pursuing an even more detailed break-down of the data for the local SOE issues which represents that largest part of the market. This has been done in Table B2 in the appendix where yield spreads are summarised for local SOE issues of both enterprise and corporate bonds taking into account whether or not the issue is a construction bond and also whether or not it carried an explicit contractual guarantee. For enterprise construction bonds the yield spreads were very similar whether or not the bonds carried an explicit contractual guarantee. This is true both in April 2015 and in May 2018. Furthermore, for those issues spreads increased only slightly over this period. In contrast for non-construction enterprise bonds the spreads increased very significantly—200 bps or more over this three year period. This suggests that Chinese investors took the view that central authorities had made a clear commitment to backing up the enterprise issues of LGFV's and this implicit guarantee made the presence or not of contractual guarantees relatively unimportant.

This account of the evolution of credit risk in the Chinese non-financial bond market since 2015 has been based on statistics on the change of yield spreads over this period combined with an analysis of some of the main policy actions initiated by central authorities aimed at addressing the perceived excessive growth of leverage that may have been encouraged in the past by the expectation of bail-outs for investors. Overall the picture that emerges is one of increased market discipline combined with greater coherence and transparency in the financing of local government backed infrastructure projects. It is interesting to compare this view with what one might learn from conventional credit analysis based on the evolution of ratings over the period in question. Table 6 presents information about ratings changes for enterprise and corporate bonds outstanding in May 2018. It is based on data on original Chinese domestic ratings at the time of issue with those prevailing in spring 2018. This covers 5028 bonds which represent most of the bond issues used in the analysis of yield spreads given in Tables 4 and 5.

Table 6: Initial Ratings and Rating Changes, Apr-15/May-18

Panel A: Enterprise bonds				
Original rating	AAA	AA+	AA	AA-
Count	630	750	1421	11
	Transition frequency			
Upgrade	0	0.305	0.165	0.455
no change	0.998	0.677	0.818	0.545
downgrade	0.002	0.017	0.018	0
Panel B: Corporate bonds				
Original rating	AAA	AA+	AA	AA-
Count	898	572	737	9
	Transition frequency			
Upgrade	0	0.192	0.205	0.333
no change	0.991	0.787	0.756	0.556
downgrade	0.009	0.021	0.039	0.111

Table 6 shows that at issue ratings of both enterprise and corporate bonds are constrained to the top four categories of investment grade, AAA, AA+, AA, and AA-. Gives some insight as to why it is often claimed that Chinese domestic ratings are not very informative. Even more striking is the fact that over the period since 2015 during which the number of defaults rose sharply, credit spreads rose sharply for all major categories of corporate paper, and authorities were publicising their efforts to bring greater discipline to credit markets, there were very few rating downgrades of enterprise or corporate bonds. In effect, it appears that Chinese institutional investors were looking beyond ratings in formulating their views about relative value in the Chinese non-financial bond market.

3 Regression analyses

The statistical tables used in the previous section have yielded some rather clear and sharp ideas about important patterns in credit risk expectations of Chinese investors and how they evolved since 2015 in light of policy actions by Chinese central authorities. The sample mean credit spreads reported in Tables 5 and 6 as well as in Tables B1 and B2 controlled for only a few categorical characteristics and did not explicitly take into account other factors that may affect expectations. This section will explore the determinants of expected credit risk premia using multivariate analysis which will control for more factors simultaneously and will help to avoid possible biases in the inferences drawn from these data.

The dependent variables in the regression analysis are the yield spreads as used in Table 5 and 6, namely the yield to maturity for a specific bond issue prevailing in the market at month end less the yield taken from the central government bond yield curve estimate for the same date and the same time to maturity. The explanatory variables include those that capture the qualitative factors highlighted in the previous section. Specifically Construction is a qualitative variable taking the value 1 if the issue is classified by the PBOC as a City Construction Bond and zero otherwise. GuaranteeYN takes the value 1 if the bond's terms and conditions lists details concerning explicit guarantee by a designated guarantor and zero otherwise. ConstGuar is the interaction term Construction*GuaranteeYN which allows us to distinguish between City Construction Bonds with and without explicit guarantee and thus help identify the difference between implicit and explicit guarantees.

The effect of ownership of the issuing entity is captured with a series of dummy variables corresponding to company type: Central SOE, Public firms (which in China is a category used for a limited number of very large firms with a possibly mixed/public private ownership but with a large number of employees), Local SOE (a firm sponsored by a government at the provincial, municipal, or county level), Other SOE (a designation for a small number of government sponsored issuers that are not specifically designated as central or local), Foreign (the issuer is an entity registered outside of mainland China), and Private (the issuer is a mainland registered non-governmental Chinese firm). The omitted ownership category is JV that is, a joint venture involving a foreign firm and a mainland Chinese firm. It is worth noting that LGFV's are included in the local SOE category but that the category also includes other firms undertaking commercial or industrial activities at the initiative of local governments.

Chinese domestic rating information is captured by four dummy variables (AAA, AA+, AA, AA-) which take on the value 1 if the bond carried the corresponding rating at the time of issue and zero otherwise. These can be viewed a summary statistic capturing a general credit assessment at the time of issue. AAA is the omitted category in the reported regressions. There are no bonds in our data set carry a rating at issue below AA-.

As seen in Section 2 it seems that bonds credit risk assessments underwent important changes in the three years from spring 2015 and these reassessments appeared to differ for corporate bonds and for enterprise bonds. A general time effect is captured either with the variable Month which is a counter varying from 1 to 38 over April 2015 to May 2018 or with month-specific dummy variables which allow for a possibly nonlinear time trend. To allow for different time trends depending upon bond category, separate regressions are run for enterprise bonds and corporate bonds (with the latter pooling both SSE and SZSE issue).

Table 7: Yield Spread Regression Analysis, benchmark regressions

	Enterprise		Corporate	
	b/t	b/t	b/t	b/t
Construction	-1.678***	-1.676***	-0.757***	-0.744***
	(-7.25)	(-7.23)	(-10.45)	(-10.33)
GuaranteeYN	-0.533	-0.535	0.519**	0.475**
	(-1.44)	(-1.44)	(3.65)	(3.35)
ConstGuar	1.076**	1.075**	0.313*	0.324**
	(3.53)	(3.53)	(2.42)	(2.47)
Month	0.017***		0.064***	
	(8.53)		(19.3)	
Central SOE	-4.587**	-4.583**	-0.561***	-0.594***
	(-3.20)	(-3.19)	(-11.68)	(-8.55)
Public	-2.26	-2.261	-0.312	-0.347
	(-1.70)	(-1.70)	(-0.80)	(-0.87)
Other SOE	-3.766**	-3.767**	0.445	0.412
	(-2.61)	(-2.61)	(1.11)	(1.04)
Local SOE	-2.696	-2.69	-0.215	-0.255
	(-1.94)	(-1.93)	(-0.89)	(-0.97)
Foreign	-2.2	-2.195	0.159	0.144
	(-1.91)	(-1.91)	(1.36)	(1.11)
Private	1.631	1.637	0.577*	0.549*
	(1.13)	(1.14)	(2.27)	(1.99)
AA+ at issue	1.006***	1.006***	0.882***	0.891***
	(13.25)	(13.19)	(11.57)	(11.02)
AA at issue	1.651***	1.651***	2.057***	2.057***
	(15.67)	(15.50)	(15.45)	(15.44)
AA- at issue	2.054***	2.045***	3.903***	3.923***
	(15.55)	(15.55)	(98.6)	(118.78)
_cons	4.360**	4.879**	-0.115	0.775*
	(2.94)	(3.31)	(-0.44)	(2.24)
Month dummies	No	Yes	No	Yes
R-sq	0.274	0.292	0.229	0.24
Nobs	81320	81320	42631	42631

Table 7 summarises the results of the regressions of monthly observations of yield spreads on these explanatory variables. These regressions may be taken as benchmarks to which alternative specifications can be compared. Column 1 gives the results for enterprise bonds allowing for a linear time trend; whereas, column 2 gives the enterprise bond spread regression using monthly time dummies. Column 3 gives corporate bond results using a linear time trend and column 4 uses month dummies. The table reports point estimates obtained by OLS and t-statistics using robust standard errors based on clustering according to province of issue.

For both the enterprise bond and the corporate bond regressions the estimates are very similar for the regressions with linear time trend or monthly dummies. For both enterprise and corporate bonds Construction enters with a negative sign that is highly significant both statistically and economically. All else equal, the expected yield spread on an enterprise, city construction bond is about 167 basis points less than a comparable non-construction, enterprise issue. The construction bond yield discount is about 75 basis points for corporate bond issues. The effect of carrying an explicit guarantee differs in the enterprise and corporate estimates with coefficient of GuaranteeYN being negative but insignificant for enterprise bonds while being positive and insignificant for corporate issues. The coefficient for the interaction term ConstGuar is positive and significant for both enterprise and corporate bonds. Summing all three coefficients in order to estimate the combined effect of a contract guarantee and being a construction bond the net difference is -113 bps for enterprise issues and +8 bps for corporate issues. One way of seeing this is that among enterprise bonds those funding infrastructure projects and carrying explicit guarantees are viewed as significantly less risky than other enterprise issues used to fund activities other than infrastructure and not carrying explicit guaranties. This result based on the full 38 month sample is in line with the qualitative pattern seen for local SOE issues in Table B2 for May 2018.

Turning to the general time trend in spreads controlling for other factors, we find as expected a significant uptrend for corporate bonds of about 6.4 bps per month (based on the specification with linear time trend). For enterprise bonds, inspection of the individual coefficients of the month dummies shows an effect fluctuating from between positive and negative; however, over the three years it amounts to a slight uptrend of about 1.7 bps per month based on the linear specification. These time effects are in line with expectations based on the preliminary results in Figure 1.

Somewhat surprisingly given the initial sample statistics reported in Table 4, most of the estimates of the effect of company type turn out to be insignificant in the regression estimates. The exceptions are the sensitivities of central SOE's which are negative and significant in enterprise and corporate bond regressions. Other SOE is significantly negative in the enterprise regression but insignificant in the corporate bond regressions. Private bond issues have a significant positive dummy in the corporate bond regressions. All other company type effects are insignificant.

The coefficients of the original rating of the issue are all positive and statistically significant for both enterprise and corporate bond regressions. Furthermore, they are monotone increasing as you descend a credit rating notch from the AAA reference, i.e., in enterprise bonds, 100 bps for AA+, 165 bps for AA, and 200 bps for AA-. This somewhat belies the view that Chinese domestic ratings are uninformative. Taking into account other factors such as whether the issue is enterprise or corporate, city construction bond or not, carrying an explicit guarantee or not, and issued by a central SOE or not, rating is viewed a communicating significant information about credit quality, albeit of a sort that is fairly coarse given that ratings are tightly constrained to top four notches of the investment grade range. This suggests that ratings may be quite useful for comparisons among issues with a segment of the bond market but not for making comparisons across segments.

Finally, from the reported R-squared coefficients we see that there is more unexplained variation amongst corporate bonds than for enterprise bonds. Furthermore, the nonlinear specification of pure time effects yields a fit that is only slightly better than the linear time trend specification for both enterprise and the corporate bonds.

In the benchmark regressions in Table 7, many of the company type dummies turned out to be statistically insignificant. In order to see whether or not pure company ownership effects matter for the predicted sensitivities to other factors, the same regressions were run with company type dummies omitted. The results are given in Table 8. The point estimates of the sensitivities to the included variables are very close to those in Table 7. However, R-squared coefficients are significantly reduced by dropping the company type dummies. Accordingly in the following extensions company type effects are included.

Table 8: Yield Spread Regressions, Omitting Company Type

	enterprise		corporate	
	b/t	b/t	b/t	b/t
Construction	-1.612***	-1.611***	-0.932***	-0.929***
	(-5.63)	(-5.61)	(-10.28)	(-10.03)
GuaranteeYN	-0.106	-0.107	0.538**	0.495**
	(-0.12)	(-0.12)	(3.64)	(3.35)
ConstGuar	0.799	0.798	0.426**	0.438**
	(0.97)	(0.97)	(3.2)	(3.2)
Month	0.018***		0.066***	
	(9.69)		(18.55)	
AA+ at issue	2.012***	2.012***	1.221***	1.230***
	(8.22)	(8.26)	(13.86)	(15.04)
AA at issue	2.701***	2.701***	2.555***	2.558***
	(12.58)	(12.6)	(19.54)	(19.90)
AA- at issue	3.020***	3.011***	4.393***	4.418***
	(20.52)	(20.37)	(53.43)	(72.08)
_cons	0.624	1.156**	-0.389	0.416
	(1.93)	(3.51)	(-1.61)	(-.29)
Month dummies	No	Yes	No	Yes
R-sq	0.157	0.175	0.211	0.222
Nobs	85085	85085	42666	42666

The next alternative specification considered is designed to ask whether credit spreads are sensitive to the general *level* of interest rates as well as the qualitative factors included in Table 7. This is explored in Table 9 where the 5 year government yield is included as an explanatory variable. The government treasury yield does enter as a significant variable in these regressions. However, the estimates of the sensitivities to other explanatory variables are much the same as in Table 7. In particular, Construction enters negatively and is highly significant both for enterprise bonds and for corporate bonds either with a linear time trend or with the monthly dummy variables. GuaranteeYN is positive and significant in the corporate bond regressions but insignificant in the enterprise bond regressions. The interaction term ConstGuar is significant and positive in the enterprise regression but insignificant for corporate bonds. Perhaps most strikingly the point estimates of the general time trends of spreads are very similar to those obtained in the benchmark models in Table 7, namely, 1.2 bps per month for enterprise bonds and 6 bps per month for corporate bonds.

Regarding the company type effects and the initial ratings dummy variables, the estimated pattern of signs of the coefficients and significance are much found in the benchmark regressions. The conclusion then is that, yes, considering the general level of interest rates may have an influence on credit spreads; however, whether or not this is taken into account the effects of the qualitative factors introduced in the benchmark regressions remain largely unchanged.

Table 9: Robustness, Are spreads explained by treasury yields?

	Enterprise		Corporate	
	b/t	b/t	b/t	b/t
gov5y	0.207***	3.707***	0.103*	10.168***
	(7.64)	(23.61)	(2.01)	(11.85)
Construction	-1.678***	-1.676***	-0.755***	-0.744***
	(-7.25)	(-7.23)	(-10.40)	(-10.33)
GuaranteeYN	-0.534	-0.535	0.515**	0.475**
	(-1.43)	(-1.44)	(3.59)	(3.35)
ConstGuar	1.075**	1.075**	0.315*	0.324**
	(3.52)	(3.53)	(2.42)	(2.47)
Month	0.012***		0.060***	
	(6.23)		(13.5)	
Central SOE	-4.581**	-4.583**	-0.566***	-0.594***
	(-3.20)	(-3.19)	(-11.60)	(-8.55)
Public	-2.256	-2.261	-0.314	-0.347
	(-1.70)	(-1.70)	(-0.80)	(-0.87)
Other SOE	-3.762**	-3.767**	0.442	0.412
	(-2.61)	(-2.61)	(1.1)	(1.04)
Local SOE	-2.689	-2.69	-0.22	-0.255
	(-1.94)	(-1.93)	(-0.91)	(-0.97)
Foreign	-2.193	-2.195	0.159	0.144
	(-1.92)	(-1.91)	(1.35)	(1.11)
Private	1.638	1.637	0.575*	0.549*
	(1.14)	(1.14)	(2.26)	(1.99)
AA+ at issue	1.007***	1.006***	0.882***	0.891***
	(13.23)	(13.19)	(11.61)	(11.02)
AA at issue	1.652***	1.651***	2.056***	2.057***
	(15.57)	(15.5)	(15.44)	(15.44)
AA- at issue	2.053***	2.045***	3.900***	3.923***
	(15.46)	(15.55)	(96.46)	(118.78)
Month dummies	No	Yes	No	Yes
_cons	3.817**	-7.179***	-0.345	-32.304***
	(2.58)	(-4.70)	(-1.48)	(-10.38)
R-sq	0.275	0.292	0.229	0.24
Nobs	81320	81320	42631	42631

Until now all the explanatory variables used are capturing relatively high-level determinants of risk of the issue. Some of these capture structural factors in the bond market, for example, whether or not the bond issue was processed in the enterprise bond channel and thus was explicitly vetted according to the criteria prioritized by China's central planning process. Other determinants can be viewed as capturing policy actions of central authorities. In the analysis here, this takes the form of a policy to control debt growth which involved limiting government guarantees to certain categories of bonds (notably enterprise bonds and particularly those that are issues of LGFV's) while at the same time making it clear that investors would face losses on other categories of bonds should their issuers become distressed. In the regressions in Tables 7-9 these latter effects are captured mainly in the differing time trends for enterprise and corporate bonds.

This emphasis on structural or macroprudential factors contrasts with the traditional approach of security analysis in established corporate bond markets. These latter analyses typically focus on issuer-specific factors such as the solvency and liquidity of the issuer, measures of leverage, as well as asset volatility. It would be very interesting to learn how successful such factors would be in accounting for variations in credits spreads both in cross section and over time. In particular, would such measures work as standalone explanations applicable across all the various segments of the bond market as identified by our qualitative variables used in Tables 7-9? Or is it necessary to control for structural and macroprudential factors before turning finer details of individual security analysis?

In order to gain some insight into these issues it is useful to incorporate some issuer specific accounting variables that are available for the bonds in our data set. Of course, there are a wide variety of specific measures that are sometimes used by analysts. Table 10 explores four of the most popular analysts' ratios that are reported for many of the securities in our data set. TangibleAssets ratio gives the ratio of tangible assets to total assets. CurrentRatio gives the ratio of current assets to current liabilities. QuickRatio gives the ratio of current assets net of inventories to current liabilities. CashRatio is the ratio of cash and cash equivalents to current liabilities. These indicators are used separately either alone in a simple regression or in a multiple regression in combination with the other explanatory variables as in the benchmark specification of Table 7 with nonlinear time trends captured with month-specific dummies. The regressions are run for enterprise bonds and corporate bonds separately.

Table 10 reports the point estimates and t statistics of the sensitivities of each of the four ratios. Estimates of the simple regressions are in columns 1-4, and the estimates from the multiple regressions which included as controls all the explanatory variables used in Table 7 are given in columns 5-8. The estimates of the control variables were all very close to those obtained in Table 7 and are omitted here. Panel A gives the results for enterprise bonds. It is striking that none of the analysts' ratios considered is significant when used stand-alone in simple regressions. However, when included alongside the variables which were found significant in the benchmark regressions they are all statistically significant and have the expected negative sign. The implication seems to be that the accounting measures of credit risk on their own do not appear to capture first-order important drivers of credit risk expectations. However, when applied in specific segments of the enterprise bond market as determined taking into account structural and macro policy related factors, they do seem to help in accounting for cross-sectional variations in credit risk across bonds in the same market segment.

Table 10: Security Analysis Comparison

	b/t	b/t	b/t	b/t	b/t	b/t	b/t	b/t
Panel A: Enterprise Bonds								
TanAssetratio	-0.002				-0.007**			
	(-0.34)				(-3.40)			
CurrentRatio		0.006				-0.013**		
		(0.2)				(-3.07)		
QuickRatio			0.007				-0.026***	
			(0.11)				(-5.50)	
CashRatio				-0.035				-0.071**
				(-0.36)				(-6.07)
cons	1.893**	1.775***	1.787***	1.818**	5.327**	5.187**	5.199**	5.206**
	-3.29	-4.23	-4.3	-4.95	-3.53	-3.36	-3.4	-3.42
Other controls	No	No	No	No	Yes	Yes	Yes	Yes
R-sq	0	0	0	0	0.35	0.348	0.348	0.348
Nobs	71531	71531	71531	70201	68529	68529	68529	67313
Panel B: Corporate Bonds								
TanAssetratio	-0.005				-0.012***			
	(-1.61)				(-7.17)			
CurrentRatio		-0.005				-0.027		
		(-0.43)				(-1.36)		
QuickRatio			-0.029				-0.029	
			(-1.94)				(-1.35)	
CashRatio				-0.105				-0.102
				(-1.28)				(-1.39)
cons	2.722***	2.611***	2.634***	2.650***	0.918***	0.642**	0.632**	0.652**
	-8.54	-10.52	-10.01	-9.16	-4.09	-2.77	-2.74	-2.65
Other controls	No	No	No	No	Yes	Yes	Yes	Yes
R-sq	0.001	0	0	0.001	0.277	0.271	0.271	0.272
Nobs	42655	42655	42655	42721	41965	41965	41965	42031

Panel B in Table 10 reports the comparable results for corporate bonds. Again, the analyst ratios considered here considered on their own do not appear to account for variations in yield spreads. The coefficients are either insignificant or have the implausible positive sign. Once these variables are incorporated in multiple regressions using the benchmark explanatory variables as well, the estimated sensitivities are negative as expected; however, only tangible asset ratio is statistically significant.

This is far from an exhaustive exploration of the usefulness of standard accounting information in assessing risks in Chinese non-financial corporate securities. However, it gives some indication that to be helpful these measures need to be applied in specific segments of the market. Furthermore, application of them needs to take into account both structural factors and how those factors that evolve over time under the influence of broad policies applied by central authorities as part of their macro prudential policies and long-term enterprise reforms.

A number of other robustness checks have been carried out and all have yielded a similar conclusion— inclusion of additional variables sometimes turns out to be significant, but the estimates of the influence of the variables considered in the benchmark regressions in Table 7 hardly change at all. One such extension involved including indicator variables for the province where the bond issuer was located. Indeed some of the province sensitivities proved to be significant; however, the estimates of the benchmark explanatory variables differed very slightly from those in Table 7. Another extension was to include indicator variables for sixteen different industrial categories. In this case, most of the industry sensitivities turned out to be insignificant, and, again the benchmark sensitivities were very close to those reported in Table 7.

4 Conclusion

This paper has analysed the factors that account for credit risk in the Chinese market for bonds issued by non-financial enterprises. Using a data set of covering monthly observations of all corporate and enterprise bonds trading in China between 2015 and 2018 I have explored a number of alternative factors that can account for cross sectional and time series variations of credit risk premia as reflected in yield spreads over Chinese government bonds. One of the main aims of this analysis has been to clarify the role of implicit government guarantees in the market and how those guarantees have evolved over time as the Chinese authorities have sought to bring under control the explosive growth of non-financial debt between 2008 and 2014.

A first important finding that emerges from this is the analysis that there is clear evidence of segmentation within the market for non-financial debt securities market. The contours of the borders between various segments reflect institutional factors, particularly legal and administrative differences that apply to different types of securities depending upon the legal status of the issuer and the channel by which the securities enter the market. One of the challenges facing participants in this market is that the legal and administrative framework in China is not static but rather has been evolving under the influence of long-term enterprise and fiscal reform and also macro prudential policies employed to maintain China on a path of stable and high growth path. All this means that the borders between segments are evolving over time.

Second, between 2015 and 2018 there have been very striking changes in the pattern of credit spreads in the market that can be associated very closely with policy actions taken by central authorities to bring under control the explosive growth of debt issues that emerged following the attempts dating from 2008 to counteract the effects of the trans-Atlantic financial crisis. This involved a strong stimulus of domestic non-residential construction, particularly infrastructure investment implemented by local governments and their associated LGFV's. This gave rise to a burst of debt issues including those by recently created SOE's sponsored by local governments and whose business models and sources of future revenues were very unclear. As this unfolded it became widely believed that if these issuers came under stress the government authorities would have no choice but to support them through access to credit or otherwise.

By 2014 the central authorities recognized that a wide-spread belief in open-ended guarantees would feed the investment spree of LGFV's and give rise to an unsustainable growth of debt. In line with the general objective of deleveraging as articulated in the 13th five-year plan, a series of policy directives were released that sought to bring discipline to the market by limiting the scope of government guarantees on the one hand and on the other to place funding of infrastructure onto a sustainable basis through a combination of direct municipal bond finance and public-private partnerships. The implication for the bond market has been that government backing for non-financial issues has been more explicitly limited to enterprise bonds, particularly city construction bonds, while at the same time the growth of that segment has been slowed through restrictions in the planning process. Furthermore, the yield spreads in corporate bonds rose steadily relative to enterprise bonds as policy guidance became more explicit and also as note and bond defaults spiked up.

A third important finding is that standard measures of credit worthiness such as solvency and liquidity ratios traditionally used by financial analysts are not capable of accounting for the major variations in credit risk premia in the non-financial debt market as a whole. They may prove useful in specific, narrow segments. However, to understand the relative pricing across the segments and over time it seems important to refer to the structural and macro-prudential factors emphasized here.

Beyond these findings the results presented here shed some additional light on the issue of whether the Chinese debt capital markets are becoming more thoroughly integrated and are facilitating the flow of capital to the highest uses on a risk-adjusted basis. Here I think the evidence is mixed. On the one hand the rise in yield spreads on non-city construction, corporate bonds has meant the enterprise and corporate spreads have converged to rather similar levels. On the other hand, it seems likely that this may reflect the impact of government backing for the infrastructure projects that in large measure the enterprise bonds segment serves to support. Furthermore, the fact that the growth path of enterprise bonds has slowed may reflect the influence of rationing by government authorities through the planning approval process, which may or may not be applied efficiently. Overall, my view is that full market integration remains a goal for the long-term.

Finally, what do the results presented here say for the issue of whether Chinese authorities have a viable strategy for containing debt and avoiding a sudden collapse that could provoke a financial crisis that could spill over into a major growth slowdown? Here I think the patterns in risk premia reported in this paper are consistent with the view that greater financial discipline is being felt by Chinese issuers and investors. Beyond this, it seems that changing market conditions are largely the result of removing dysfunctional modes of local public finance which resulted in ill-governed LGFV's which lacked clearly defined enterprise strategies. All this looks hopeful for the strategy that been adopted. However, the significant challenges still remain. In particular, it remains to be seen whether the future access to the enterprise bond channel is being shut down to LGFV's. There are a great many of these that have been created. No doubt many of them will seek to survive even if the main job of funding infrastructure is shouldered by the new muni bonds. The main lever available to central authorities is to shut off access to enterprise bond funding. However, it may still be possible that some local governments will attempt to find alternative ways to indirectly support their associated LGFVs.

References

- Allen, F., J. Qian, C. Zhang, and M. Zhao (2013), "China's Financial System: Opportunities and Challenges," in J. P. H. Fan and R. Morck (eds.) *Capitalizing China*. National Bureau of Economic Research, Ch.2, pp 63-143.
- Anderson, R. W., "Chinese Debt Capital Markets: An Emerging Global Market ...With Chinese Characteristics," London School of Economics, July 2017
https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3005392
- Anderson, R.W. and H. Lu, 2018, "Sustainable Local Public Finance in China: Are Muni Bonds the Structural Solution?"
https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3158688
- Bai, Chong-en, Chang-tai Hsieh, and Zheng Michael Song "The Long Shadow of China's Fiscal Expansion," *Brookings Papers of Economic Activity*. (Fall, 2016) plus on-line appendix.
- Chen, Zhuo, Zhiguo He and Chun Liu, "The Financing of Local Government in China: Stimulus Loan Wanes and Shadow Banking Waxes," NBER Working Paper Series, July, 2017
- Liu, He, 2018, "3 critical battles China is preparing to fight," speech, World Economic Forum.
- Lu, Hua, "Local Government Bond Market Financing: Structure and Change," Fudan University, May 2017. (in Chinese)
- Maliszewski, W., S.Arslanalp, J.Caparusso, J. Garrido, S. Guo, J.S. Kang, W. R. Lam, T. D. Law, W. Liao, N. Rendak, P. Wingender, J. Yu, and L. Zhang, 2016, "Resolving China's Corporate Debt Problem" " IMF WP/16/203.
- Tang, D.D., 2016, "Understanding The 13th Five-Year Plan of China," Institute of Economics, Chinese Academy of Social Sciences.
- Zhu, N., (2016) *China's Guaranteed Bubble: How Implicit Government Support Has Propelled China's Economy While Creating Systemic Risk*. McGraw-Hill.

Appendix A: Data

The data used in this paper consists of detailed data on Chinese enterprise and corporate bonds trading on the domestic Chinese market in May 2018 as reported in Wind data services. This includes all the enterprise bonds identified by Wind as trading in the interbank market and all the corporate bonds listed in the Shanghai and Shenzhen stock markets.

The data set includes a wide variety of information concerning the debt issue including coupon and other pricing terms, face value at issue, issue date, maturity date and many other details from the contract terms and conditions. In addition, there is information on the intended purpose of the funding including the PBOC designation as a City Construction Bond if applicable.

Issuer information includes precise legal name and address of the issuing enterprise, type of legal status, industrial classification of the firm, among other details. In addition for most firms there are accounting data from past financial reports as well as a variety of standard analysts' ratios based on these reports. Beyond this there is information about third party guarantees including type of guarantee and the type of body providing the guarantee.

Pricing information for each bond consists of the CSI yield to maturity registered at month end for the 38 months from April 2015 to May 2018. These are calculated daily based on the CSI estimates of applicable yield curves fitted using all available market transactions. Yield spreads for individual securities were calculated as the difference of the security's yield and the yield of a Chinese central government bond with the same maturity. This latter yield was obtained by linear interpolation of points on the constant maturity central government yield curve as reported by Wind.

Appendix B: Supplementary Tables

Table B1: Yield spreads by bond type and company type, Apr-15 and May-18
Mean, Std Dev (per cent), NOBS

Panel A: Central SOE					Panel B: Foreign				
	Apr-15		May-18			Apr-15		May-18	
	construction		construction			construction		construction	
	no	yes	no	yes		no	yes	no	yes
Enterprise	-0.20	.	0.36	.	enterprise	3.18	.	4.52	.
	1.57	.	2.23	.		0.84	.	0.79	.
	165	0	241	0		7	0	9	0
Corporate	0.76	1.50	2.16	1.89	corporate	2.77	.	5.17	4.85
	1.04	0.00	1.58	0.67		1.61	.	6.02	2.36
	43	1	398	6		5	0	117	2
Panel C: Joint Ventures					Panel D: Local SOE				
	Apr-15		May-18			Apr-15		May-18	
	construction		construction			construction		construction	
	no	yes	no	yes		no	yes	no	yes
enterprise	3.44	.	6.49	.	enterprise	1.88	2.27	4.33	2.64
	0.60	.	7.16	.		1.67	0.81	6.90	1.08
	5	0	8	0		118	1182	166	2223
corporate	.	.	3.46	.	corporate	2.13	1.49	3.42	2.15
	.	.	1.83	.		1.26	1.01	3.93	1.01
	0	0	65	0		68	10	449	330
Panel E: Other SOE					Panel F: Private				
	Apr-15		May-18			Apr-15		May-18	
	construction		construction			construction		construction	
	no	yes	no	yes		no	yes	no	yes
enterprise	2.30	.	3.37	.	enterprise	4.63	.	10.85	3.71
	0.32	.	0.32	.		2.29	.	13.94	0.99
	3	0	3	0		43	0	55	3
corporate	3.21	.	4.75	.	corporate	2.91	2.68	5.50	2.81
	0.04	.	1.98	.		1.17	1.72	5.91	1.14
	2	0	17	0		56	2	724	25
Panel G: Public									
	Apr-15		May-18						
	construction		construction						
	no	yes	no	yes					
enterprise	2.80	.	4.89	.					
	0.31	.	1.07	.					
	2	0	2	0					
corporate	1.43	.	3.87	2.29					
	0.69	.	3.80	0.00					
	3	0	52	1					

Table B2: Yield spread for Local SOEs by bond type, Apr-15 and May-18
 Mean and StdDev (per cent), NOBS

		Enterprise				Corporate			
		Apr-15		May-18		Apr-15		May-18	
		Construction		Construction		Construction		Construction	
		no	yes	no	yes	no	yes	no	yes
Explicit Guarantee	no	2.11	2.20	4.82	2.64	2.07	1.00	3.11	2.12
		1.06	0.81	8.11	1.13	1.15	0.79	2.39	0.94
		59	756	97	1305	29	6	349	301
	yes	1.64	2.39	3.63	2.64	2.18	2.22	4.51	2.44
		2.09	0.78	4.67	1.01	1.35	0.91	6.93	1.56
		59	426	69	918	39	4	100	29