Journal of Banking and Finance 87 (2018) 216–232

Contents lists available at ScienceDirect

Journal of Banking and Finance

journal homepage: www.elsevier.com/locate/jbf

Are Chinese credit ratings relevant? A study of the Chinese bond market and credit rating industry☆

Miles Livingston[a], Winnie P.H. Poon[b], Lei Zhou[c,*]

[a] University of Florida, Warrington College of Business, Department of Finance, Insurance and Real Estate, Gainesville, FL 32611-7168, USA
[b] Lingnan University, Department of Finance and Insurance, Hong Kong
[c] Northern Illinois University, College of Business, Department of Finance, DeKalb, IL 60115-2897, USA

ARTICLE INFO

Article history:
Received 5 January 2017
Accepted 25 September 2017
Available online 12 October 2017

Keywords:
Bond yield
Credit rating
Emerging market

ABSTRACT

We investigate the nascent but fast-growing Chinese bond market and credit rating industry. We find Chinese bond ratings are informative and significantly correlated with bond offering yields. In addition, the Chinese bond investors distinguish ratings from different credit rating agencies (CRAs), demanding lower yields on bonds rated by global-partnered CRAs. However, the empirical results suggest that the rating scales used by Chinese CRAs are not comparable to those of international CRAs. Furthermore, Chinese CRAs have very broad rating scales and pool bonds with significantly different default risks into a single rating category, resulting in over 90% of bonds in only three rating categories.

© 2017 Elsevier B.V. All rights reserved.

Over the last four decades, the Chinese bond market has grown from virtually nonexistent to $5.4 trillion in total amount outstanding by the end of 2015. It is now the third largest bond market in the world (GSAM, 2015). In recent years, the Chinese government is increasingly opening its once-closed capital market to international investors. For example, in February 2016, the People's Bank of China (PBoC), the Chinese central bank, relaxed the requirements for foreign institutional investors to access the Chinese interbank bond market and scrapped the quotas previously allocated to foreign investors, allowing most foreign institutional investors unrestricted participation in the Chinese bond market (PBoC, 2016; Trivedi, 2016). In the same time, there is a heighten interest outside China in the Chinese domestic bonds. Citigroup recently included Chinese government bonds in some of its bond indices (Lockett, 2017). Yet, this nascent but fast-growing bond market, particularly the non-governmental bond market, has received little academic attention.

Along with the development of the bond market, the Chinese credit rating industry has experienced significant growth. Its industry structure and regulatory environment are very different from those in the US and Europe. Unlike their western counterparts who were established initially to meet the demand from bond investors for information, Chinese credit rating agencies (CRAs) are a direct product of Chinese regulators' mandate that all public bonds have to be rated. With a regulatory captive customer base, the Chinese rating industry, as a whole, has less incentive and pressure to provide a high quality product: informative credit ratings. Furthermore, there is a generally negative perception of the quality of Chinese bond ratings. The fact that the vast majority of Chinese bonds are rated AA or better has raised doubts about the accuracy of Chinese ratings and concerns of over-optimism of Chinese CRAs and/or rating shopping (Baglole, 2004; Lee, 2006). Consequently, some critics dismiss Chinese CRAs as 'bereft of influence' (Kennedy, 2008).

This study first directly tests the information content of Chinese bond ratings by examining the determinants of the bond ratings. With an ordered probit model, we test whether common accounting ratios and market-based variables, good predictors of default risk found in other studies, are indeed incorporated into Chinese bond ratings. Using newly issued domestic bonds by firms with publicly traded equity from 2009 to 2015, we find that about two thirds to three quarters of the variation in Chinese bond ratings can be explained by a dozen commonly used financial ratios and market-based variables, such as an issuer's market capitalization, interest coverage ratio, and total debt ratio. These findings provide direct evidence that Chinese bond ratings contain relevant

☆ We would like to thank Haoyu Gao, Dragon Tang, Diana Wei, Yao Zheng, Gao Zhi, seminar participants at the Anhui University of Finance and Economics, Shanghai University of Finance and Economics, the US Securities and Exchange Commission, 2017 China International Conference in Finance and 2017 China Financial Research Conference for helpful suggestions and comments. Poon acknowledges a research grant (LU13501214) from the General Research Fund (GRF), Research Grants Council, Hong Kong and a Business Faculty Research Grant (DB14B2) from Lingnan University, Hong Kong.

* Corresponding author.
E-mail addresses: miles.livingston@warrington.ufl.edu (M. Livingston), winpoon@ln.edu.hk (W.P.H. Poon), lzhou@niu.edu (L. Zhou).

https://doi.org/10.1016/j.jbankfin.2017.09.020
0378-4266/© 2017 Elsevier B.V. All rights reserved.

public information about default risk. Interestingly, bonds issued by non-state-owned-enterprises (non-SOEs) receive lower ratings, about one-third notch lower on average, than those by the state-owned-enterprises (SOEs) of the central government.

Next, we examine the factors that determine Chinese public bond offering yields, particularly the role played by credit ratings. If Chinese bond ratings are informative about default risk, the offering bond yields should be correlated with credit ratings.

Introduced in the mid-1980s, non-governmental bonds in China were initially required by regulators to obtain third-party guarantees, mostly by state-owned banks.[1] In addition, the coupon rates were set by the government (S&P, 2009). In 2006, the first non-governmental bond without a third-party guarantee was issued, initiating the development of the real corporate credit market in China. Without third-party guarantees, coupon rates are no longer dictated by the government but set by the market.

Using a large sample of newly issued public bonds with fixed coupon rates from 2009 to 2015, we first find that Chinese bond ratings are significantly correlated with bond yields. Holding bond features and issuer characteristics constant, lower rated bonds have significantly higher yield spreads. This suggests that Chinese bond ratings are informative.

Second, while Chinese bond ratings are revealing about bond yields, they seem to be incompatible with the rating scales of international CRAs, even though they use the same alpha-numerical symbols. For example, the average Treasury yield spread for AAA rated Chinese domestic bonds from 2009 to 2015 is 152 basis points.[2] During the same time period, the Merrill Lynch Global AAA Corporate Bond Index has a daily average yield spread of 85 basis points. The 152-basis-point spread for AAA rated Chinese bonds is similar to the average daily yield spreads for the Merrill Lynch Global A Corporate Bond Index. These findings are important to bond investors, particularly as the Chinese government increasingly opens its capital market to foreign investors.

Third, we find that the vast majority of Chinese bonds fall into only three rating categories: AAA, AA+, and AA. A notch difference in Chinese ratings results in an average difference of 58 basis points in yields. In contrast, prior studies on the US and Europe bond markets find a one-notch difference in investment grade ratings is associated with a 9- to 18-basis-point difference in yields. A one-notch difference in Chinese ratings is likely equivalent to a one-letter (or three-notch) difference in international ratings. Thus Chinese CRAs have very broad rating scales and tend to pool bonds with significantly different default risks into one broad rating category.

Fourth, yields on non-SOE bonds are found to be about 57 (41) basis points higher than bonds issued by SOEs of the central government (SOEs of local governments), holding the rating and other bond features constant. Compared to their non-SOEs brethren, SOEs have two advantages in the Chinese bond markets: higher bond ratings and lower yield spreads. Investors' perceived government backing of SOE bonds is the likely cause. This finding is consistent with the well documented fact that Chinese SOEs have easier access to bank loans and more favorable loan terms (Bailey et al., 2011).

Finally, our results indicate that bond investors differentiate the ratings issued by different CRAs. There are eight major CRAs in China. Some are pure domestic players (domestic CRAs), while others are allied with international CRAs (global-partnered CRAs).[3]

We find that bonds rated by global-partnered CRAs have significantly lower yield spreads, about 18 basis points on average, than bonds rated by domestic CRAs. This suggests that the reputations of the Big Three international CRAs lend credibility to the ratings issued by their Chinese partners and provide a stronger certification effect than domestic CRAs. The certification effect is more pronounced for bonds with higher credit risk. Furthermore, we find evidence that the rating standards vary significantly between different Chinese CRAs.

Overall, the findings suggest that Chinese bond ratings are informative and highly correlated with bond yields. However, not all bond ratings are created equal. The Chinese bond rating scales are very coarse and not comparable to those of international CRAs, even though they use similar alpha-numerical symbols. Ratings assigned by different Chinese CRAs are not perfect substitutes and Chinese bond investors differentiate among them.

High quality credit ratings should contain both publicly available information, such as leverage ratios, and private information that bond issuers are unable or unwilling to reveal to investors credibly. Our major findings suggest that Chinese credit ratings do incorporate public information, allowing some bond investors to forego duplicative and costly information gathering and processing. Directly testing for private information content in credit ratings is difficult because private information, by definition, is not observable. However, our finding that bond investors differentiate ratings from different CRAs suggests that investors pay close attention to ratings because of potential nonpublic information. Future research on the impact of rating changes on bond/stock prices may offer stronger tests of the information contents of Chinese bond ratings and the reliance of investors on credit ratings.

This study contributes to the debate on the reputation hypothesis of credit ratings.

CRAs maintain that their concern for reputational capital effectively addresses potential conflicts of interest inherent in the issuer-pay model and that they would not sacrifice their long term reputation for short term profits and market shares (Tillman, 2007).[4] An important and implicit assumption underlying the reputation hypothesis is that bond investors *can* and *do* differentiate CRAs and make decisions based on their perceived reputation. The findings in this study validate the underlying assumption of the reputation hypothesis.

The rest of the paper is organized as follows. Section 1 gives an overview of the Chinese bond market and credit rating industry, their unique institutional features and regulatory environment, and the limited academic literature. Section 2 describes the data collection and reports summary statistics. Section 3 investigates the determinants of Chinese bond ratings and Section 4 presents the empirical findings on the determinants of bond offering yields. Section 5 concludes the paper.

1. Background and literature review

1.1. Description of the Chinese bond market

Fig. 1 depicts the amount of debt outstanding, year-over-year growth rates, and annual GDP growth rates from 2001 to 2015. The

[1] Prior to 1995, all banks in China were wholly owned by the central government and acted more like government agencies than commercial banks. The 1995 Commercial Bank Law commercialized the operations of the Big Four state-owned banks, which reorganized as joint-stock banks in the early 2000s. In 2006 and 2010, the Big Four banks went public, though the central government remains as the majority stockholder (see Bailey, Huang and Yang, 2011, Lin and Zhang, 2009 for an overview of the Chinese banking system).

[2] The Treasury yield spread is defined as the difference between yield on the bond and the yield on a Chinese Treasury bond with approximately the same maturity.

[3] International CRAs are not permitted to issue bond ratings on Chinese domestic bonds directly, but only through their domestic partners.

[4] The extant literature on the reputation hypothesis of credit rating has mixed findings (see Covitz and Harrison, 2003, Jiang, Stanford, and Xie, 2012, Kraft, 2015).

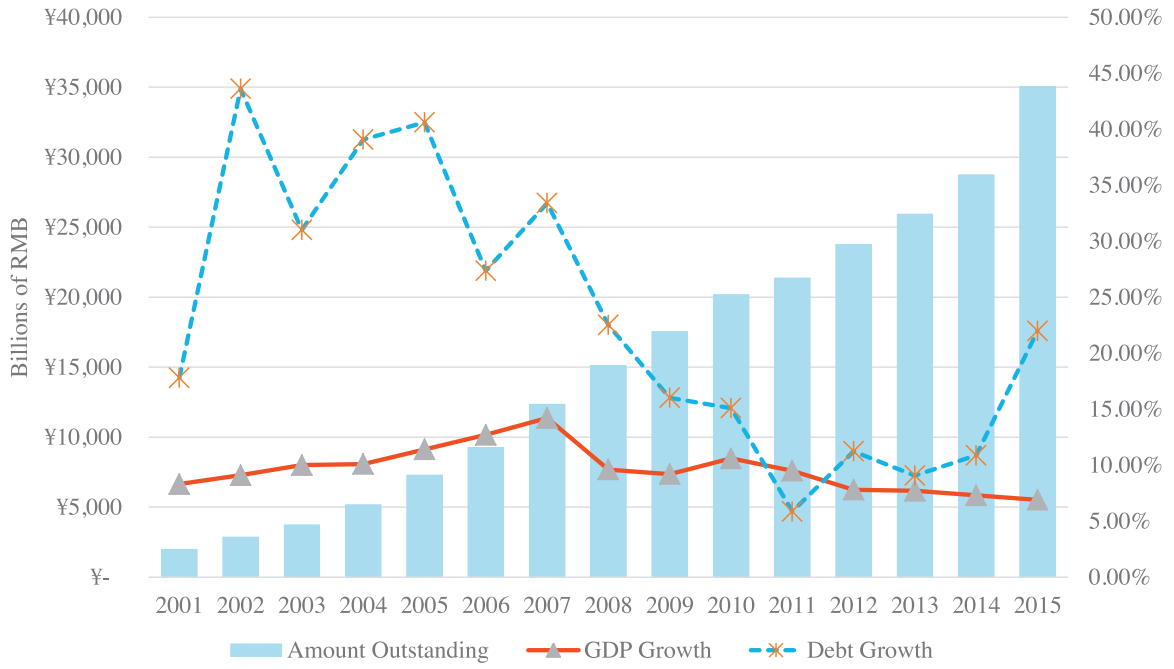


Fig. 1. Size and growth rates of Chinese debt market relative to GDP growth rates. Source: Chinabond.com.cn.

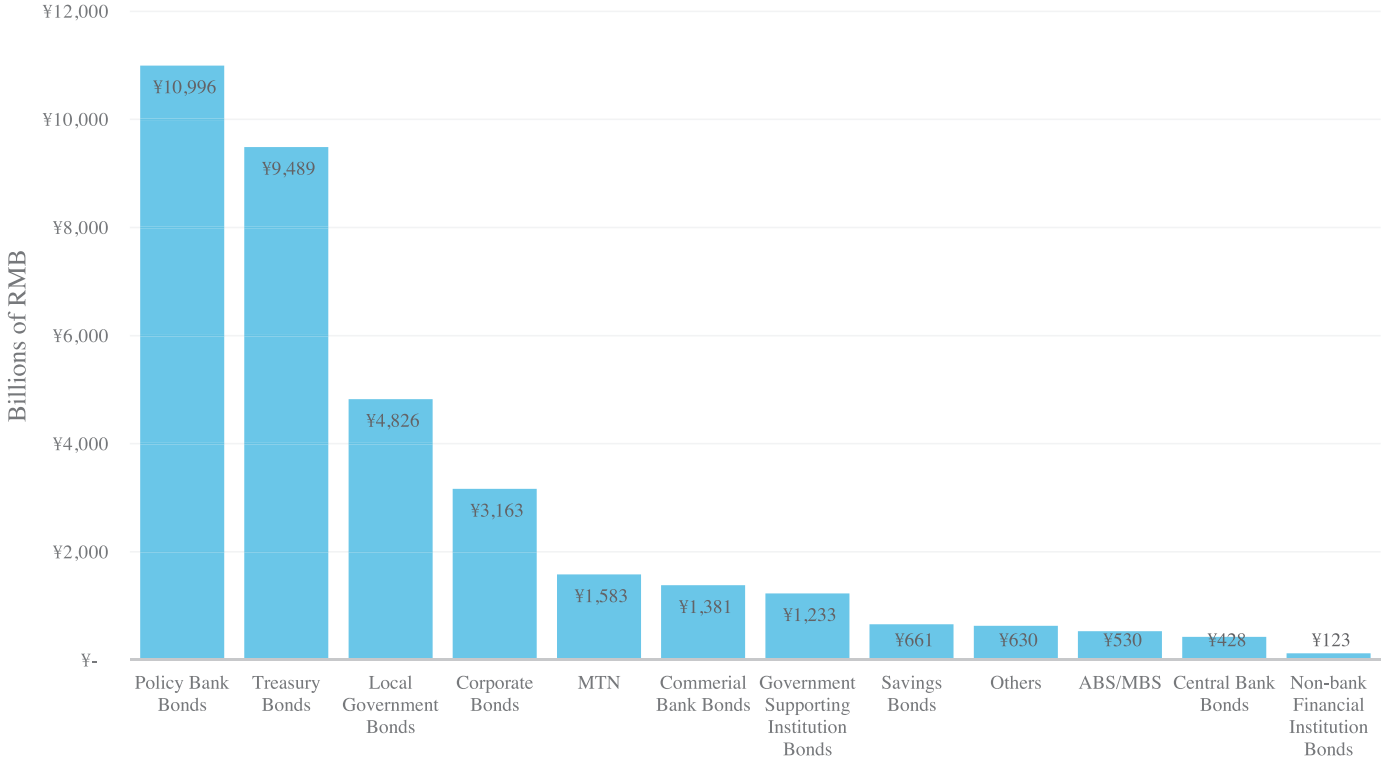


Fig. 2. Size of Chinese bond sectors by the end of 2015. Source: Chinabond.com.cn.

average annual growth rate of the debt market is 23%, far outpacing the average annual GDP growth rate of about 10%.

The Chinese bond market is dominated by government and government-related issues. Fig. 2 reports the size of Chinese bond sectors at the end of 2015. The three policy banks have the largest market share, accounting for almost 1/3 of the total amount outstanding.[5] The total size of Treasuries, savings bonds, and central bank bonds is about 10.5 trillion RMB.[6] The local government bonds come in third, with 4.8 trillion RMB outstanding. In total,

[5] Chinese policy banks, agencies of the Chinese central government, were established in 1994 to take over non-commercial lending from the state-owned commercial banks. They provide financing for central government-invested projects. The three policy banks are China Development Bank, Export-Import Bank of China, and Agricultural Development Bank of China (see Lin and Zhang, 2009, and Bailey, Huang and Yang, 2011, for more detailed discussion on the Chinese policy banks).

[6] In 2003, the PBoC issued central bank bills to facilitate open market operations. They have become a very important monetary tool in recent years (S&P, 2009).

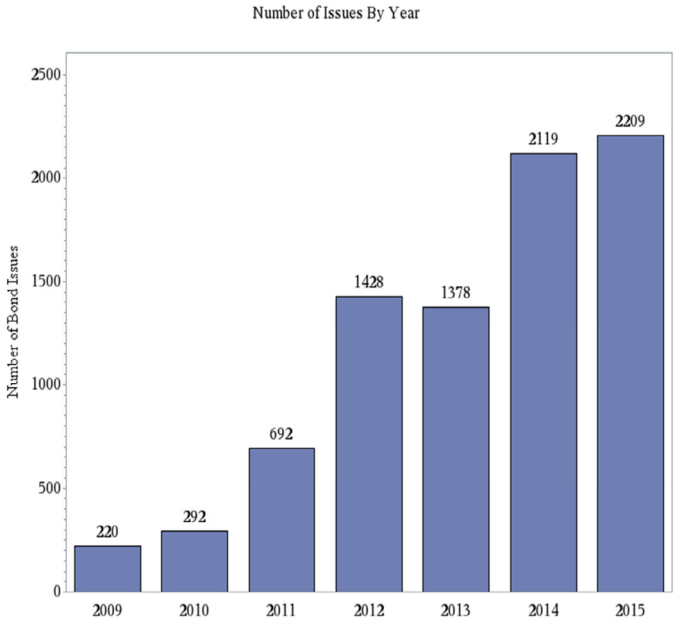


Fig. 3. Numbers of non-governmental public bond issues in China from 2009–2015. Source: WIND.

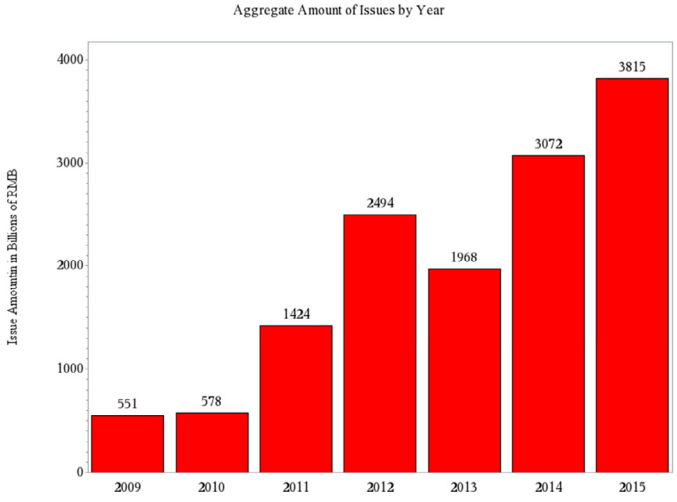


Fig. 4. Total amount of non-governmental public bond issues in China from 2009–2015 (in billions of RMB). Source: WIND.

these government and government-related bond issues account for about three quarters of the Chinese bond market.

While the market share of the non-governmental public bonds is small, it has increased significantly over the last two decades. Figs. 3 and 4 report the annual number of issues and aggregate amount of issuance of non-governmental public bonds from 2009 to 2015. The annual number of issues grew 10 times and the annual amount issued increased by almost 600% in the last 7 years.

Furthermore, the non-governmental public bond market is dominated by the SOEs. Figs. 5 and 6 break the annual number of non-governmental public bond issues and issue amounts from 2009 to 2015 by the types of issuers: SOEs of the central government (Central SOEs), SOEs of the local governments (Local SOEs) and Non-SOEs.[7] Local SOEs have the largest market share, in terms of both the number of issues and the issue amount.[8] Yet, the market share, in terms of the number of issues (issue amount), by the Non-SOEs has increased from 7.7% (12.6%) in 2009 to 21.1% (25.7%) in 2015, reflecting the Chinese government's efforts to establish a more robust bond market and reduce the reliance on bank lending, particularly for the private sectors.

There are four types of non-governmental public bonds: financial bonds, medium term notes (MTN), enterprise bonds and corporate bonds. They differ in terms of regulation, issuer industry, and trading venues. Table 1 summarizes the differences among the four types of non-governmental public bonds. Financial bonds are issued by banks, finance companies and other financial institutions. They are regulated by the PBoC and traded in the interbank market.[9] MTNs are also regulated by the PBoC and traded in the interbank market. Issues of MTNs need to be registered with the PBoC, but no regulatory permission is necessary. Enterprise bonds and corporate bonds differ mainly by their regulatory bodies and the types of issuers. Enterprise bonds are regulated by the National Development and Reform Commission (NDRC), while the China Securities Regulatory Commission (CSRC) regulates corporate bonds.[10] Issuers need to apply for permission to issue bonds from their respective regulators. In addition, enterprise bonds are mostly issued by SOEs, while a large percentage of corporate bonds are issued by non-SOEs.[11] Further, more than half of corporate bonds in our sample are issued by firms with publicly traded equity, but less than 1% of enterprise bonds are issued by public firms. Finally, corporate bonds are listed on the Shanghai or Shenzhen Stock Exchange, while enterprise bonds can be traded either in the interbank market or the exchange markets.[12]

Commercial banks are, by far, the largest investors in the Chinese bond market as shown in Fig. 7, which reports the amount of bonds held by different types of investors at the end of 2015. Funds institutions and insurance companies are the second and third largest investors. Individual investors only account for a very small piece of the market. Thus, the Chinese bond market is dominated by institutional investors.

1.2. An overview of the credit rating industry in China

A well-established credit rating industry is crucial for a healthy and vigorous bond market. To support the development of the bond market, the Chinese government fostered the establishment of a credit rating industry by introducing a few mandatory regulatory rating requirements in the 1990s. For example, the PBoC issued a requirement on December 16, 1997 that all enterprise bonds must obtain credit ratings from its approved CRAs (PBoC, 1997).

[7] Non-SOEs include private companies, foreign companies, foreign joint ventures, collectively-owned enterprises, and other none-state-owned firms. China went through a major privatization of its economy in the 1990s and early 2000s. See Guo, Gan, and Xu (2008) and Gan (2008) for detailed descriptions of the privatization process and different types of non-state-owned enterprises in China.

[8] Some local SOEs are owned by provincial governments, while others are owned by city and municipal governments. See Sheng and Zhao (2013) for detailed descriptions of the Chinese SOEs.

[9] The interbank market is regulated by the PBoC and the National Association of Financial Institutional Investors (NAFII). It serves as a wholesale market for institutional investors. The market is not limited to banks, but open to other regulator-recognized institutional investors, including the Qualified Foreign Institutional Investors (QFII). The interbank market dominates the bond market in terms of liquidity and the amount of funding. It accounts for more than 95% of the total trading volume (GSAM, 2015).

[10] China Securities Regulatory Commission (CSRC) is the regulator of the Chinese securities and futures markets. National Development and Reform Commission (NDRC) is China's primary economic planning and policy agency with broad control over the Chinese economy. One of its functions is 'to draft relevant laws and regulations concerning national economic and social development.'

[11] In our sample, more than 99% of enterprise bond issuers are SOEs. On the other hands, about a third of corporate bonds are issued by non-SOEs.

[12] The exchange market is mainly regulated by the China Securities Regulatory Commission. Investors in the exchange market include both institutional and retail investors.

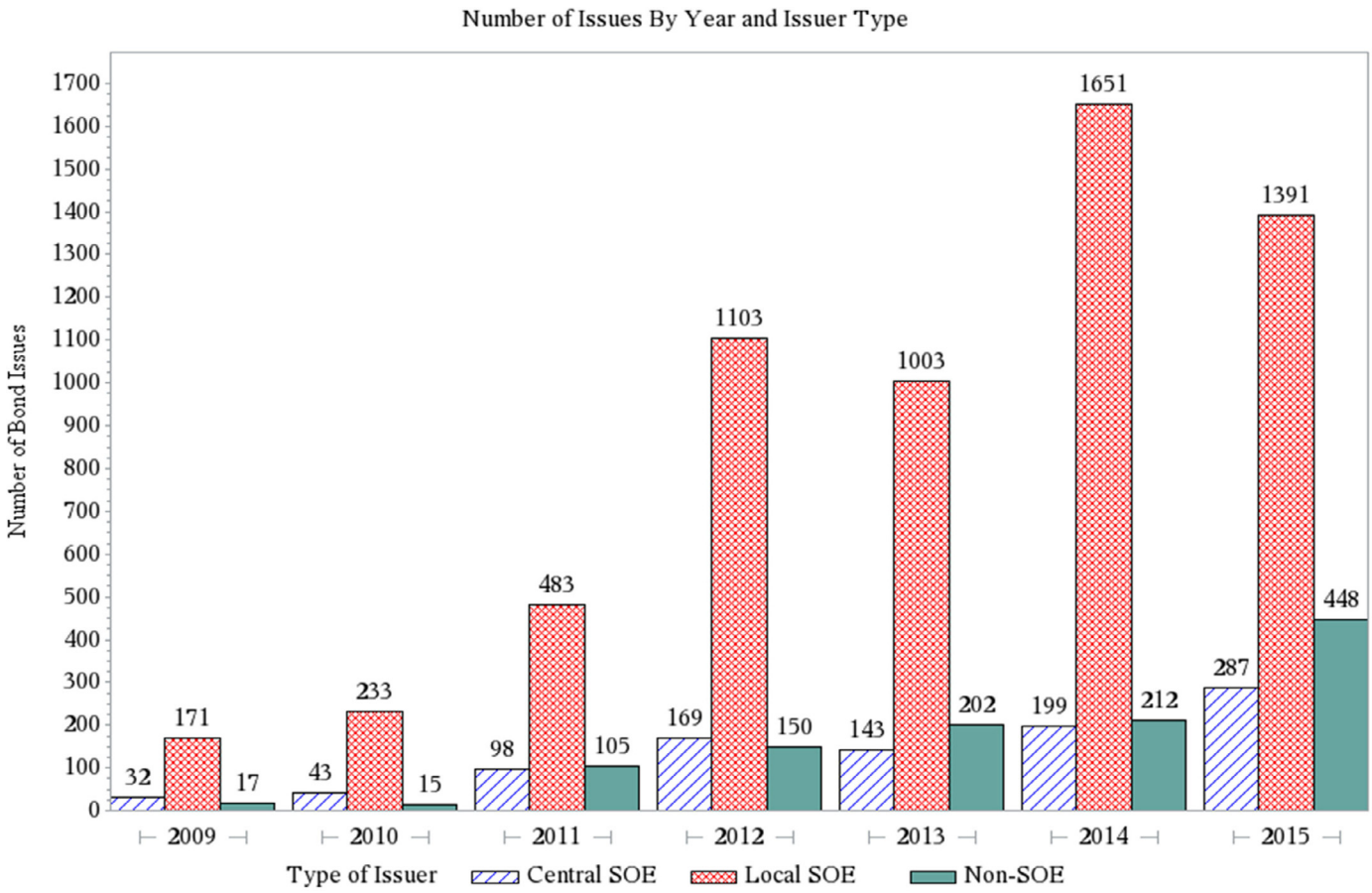


Fig. 5. Number of non-governmental public bond issues in China by types of issuers from 2009–2015. Central SOEs are state-owned enterprises of the central government of China. Local SOEs are state-owned enterprises of the Chinese local governments. Non-SOEs are issuers not owned by the government. Majority of the non-SOEs are private companies, foreign companies, and joint ventures. Source: WIND.

Kennedy (2008) and Poon and Chan (2008) provide detailed descriptions of the early development of the Chinese credit rating industry. In addition, to protect its nascent credit rating industry, the Chinese government effectively forbids foreign CRAs to issue ratings directly on domestic Chinese bonds.[13] Furthermore, the Chinese government has a policy to limit foreign ownership to minority stakes in industries deemed strategically important. The credit rating industry seems to be constrained by this policy. Recently, however, the Chinese government announced plans to allow international CRAs direct access to the domestic bond market (Wildau, 2017). The details and the timetable of the regulatory change are not publicized.

The industry structure and regulatory environment of the Chinese credit rating industry are quite different from those in the US. Unlike the oligopolistic competition among the Big Three CRAs (Moody's, S&P and Fitch) in the US, the Chinese credit rating industry today is still developing with close to a dozen CRAs; eight major ones are listed in Table 2. In addition, the Securities and Exchange Commission (SEC) is the sole regulator of the CRAs in the US, but multiple Chinese government regulators have their own approved CRAs. For example, because the China Securities Regulatory Commission (CSRC) is the regulator of corporate bonds, CRAs need to have approval from the CSRC to rate corporate bonds. On the other hand, CRAs need to obtain approval from the National Development and Reform Commission (NDRC) to rate enterprise bonds. The last five columns of Table 2 list the approvals from the five government regulatory bodies for each CRA.[14] Two CRAs (Brilliance and Dagong) have approvals from all five regulators. On the other hand, Chengxin and Pengyuan have approvals from only two regulators.

The ownership structure of the Chinese CRAs is also complicated. Four of the major CRAs listed in Table 2 are standalone companies: Brilliance, Dagong, Jincheng, and Pengyuan. On the other hand, Chengxin_Moody and Chengxin are subsidiaries of Chengxin Credit Management Co. Ltd.[15] Chengxin_Moody is a joint venture between the parent company and Moody's while Chengxin is a wholly owned subsidiary.[16] Lianhe_Fitch and Lianhe are subsidiaries of Lianhe Credit Information Service Co. Ltd.[17] Lianhe_Fitch has been a joint venture with Fitch since 2007 while

[13] To be eligible to issue rating, a CRA is required to be a Chinese Legal Entity (中国法人) by the China Securities Regulatory Commission (CSRC, 2007b). According to the 2013 Amended Chinese Corporate Law, subsidiaries of foreign firms in China cannot be classified as Chinese Legal Entity.

[14] We obtain the regulatory approval information from the websites of the CRAs and cross-check with the approved CRAs lists from the regulatory agencies whenever available.

[15] The company website of Chengxin Credit Management Co. is www.ccx.com.cn.

[16] Chengxin_Moody was formed in 2006 with Moody's holding a 49% stake. The official name of Chengxin_Moody is China Chengxin International (CCXI) and its domestic brethren is officially named as China Chengxin Securities Rater (CCXR). The Chinese name of Chengxin_Moody does not contain any reference to Moody's. We use the name 'Chengxin_Moody' to distinguish it from the domestic subsidiary (CCXR) of the parent company.

[17] The parent company's website is www.lhcis.com. In addition to the two CRA subsidiaries, the parent company has subsidiaries engaged in consulting and other financial services.

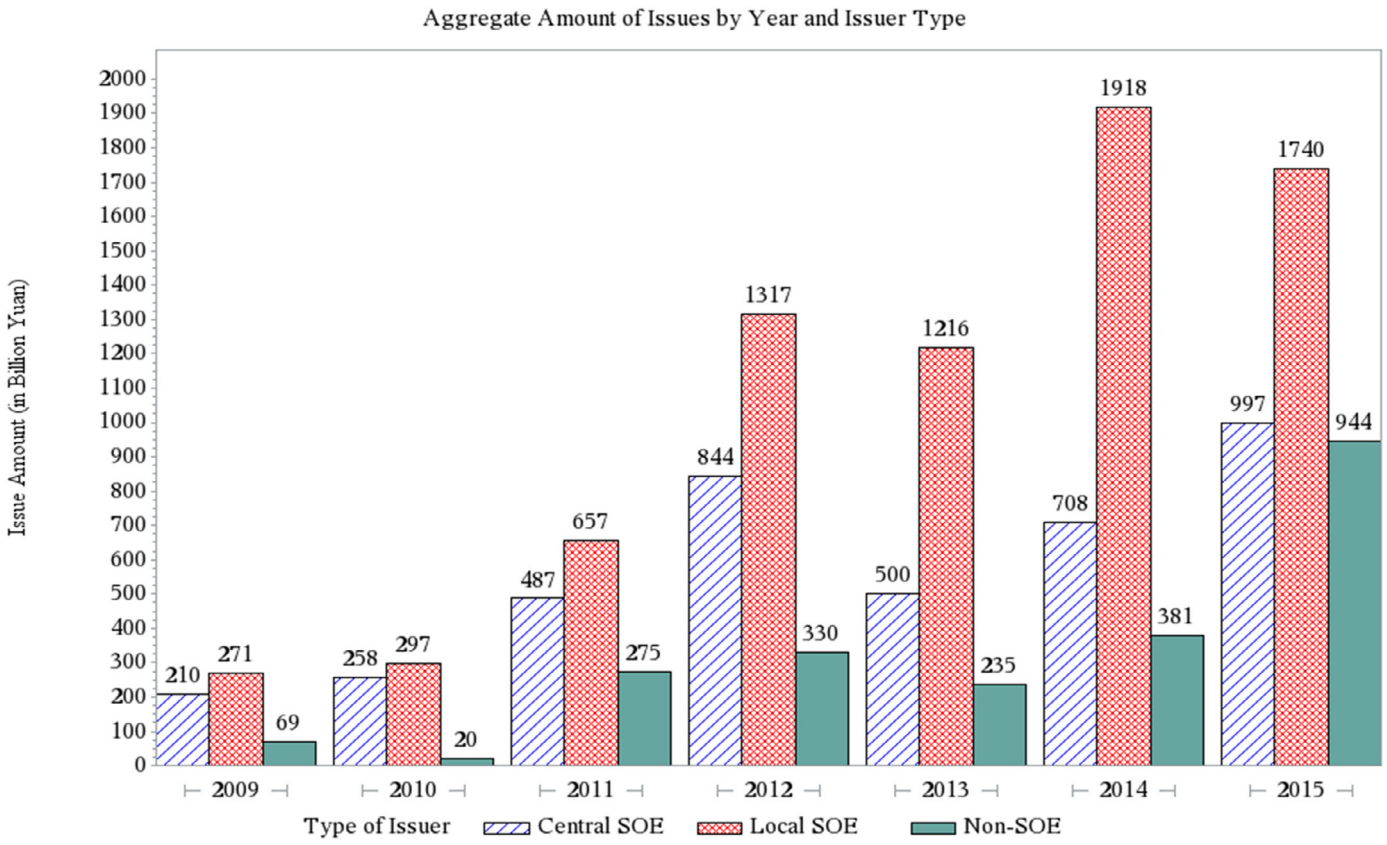


Fig. 6. Total issue amount of non-governmental public bond issues in China by types of issuers from 2009–2015. Central SOEs are state-owned enterprises of the central government of China. Local SOEs are state-owned enterprises of the Chinese local governments. Non-SOEs are issuers not owned by government. Majority of the non-SOEs are private companies, foreign companies, and joint ventures. Source: WIND.

Table 1
Types of non-governmental Chinese bond issues.

	Regulators	Issuing approval	Trading venues	Issuers	Governing law/regulation
Enterprise bonds	NDRC	Permission from NDRC	Exchange and interbank markets	Non-financial institutions. Mostly SOEs and non-listed firms	*Regulations on administration of enterprise bonds* (State Council, 1993) *Regulations on Administration of Enterprise Bonds* (State Council, 2011)
Corporate Bonds	CSRC	Permission from CSRC	Exchange market	Non-financial institutions. Mostly listed firms.	*Pilot rules on the issuance of corporate bonds* (CSRC, 2007a) *Measures for the Administration of Corporate Bonds Issuance and Trading* (CSRC, 2015)
Medium term notes	PBoC	Registration with PBoC	Interbank market	Non-financial institutions	*Administrative measures for debt financing instruments of non-financial enterprises in the inter-bank bond market* (PBoC, 2008)
Financial bonds	PBoC	Permission from PBoC	Interbank market	Banks, finance companies, and other financial institutions	*Administrative measures for the issuance of financial bonds in the national inter-bank bond market* (PBoC, 2005)

This Table lists the four types of non-governmental Chinese public bond issues and summarizes their major differences.
CSRC: China Securities Regulatory Commission.
PBoC: People's Bank of China (Chinese Central Bank).
NDRC: National Development and Reform Commission.

Lianhe is a wholly owned subsidiary.[18] Neither of the parent companies issues bond ratings by themselves. While S&P does not have a joint venture with any Chinese CRA, it formed a technical partnership with Brilliance in 2008.[19]

[18] Fitch has a 49% stake in the joint venture. The official name of Lianhe_Fitch is China Lianhe Credit Rating Co. Ltd. and its Chinese name does not have any reference to Fitch. We use the name "Lianhe_Fitch' to distinguish it from its domestic brethren. Fitch had formed a joint venture with Chengxin in 1999, which was terminated in 2003 (Kennedy, 2008).

[19] In a press release, S&P states that the partnership "will provide Standard & Poor's and Shanghai Brilliance with a mutually beneficial platform to share respective knowledge and experience. Broad areas of cooperation include participating in training sessions, collaborating on joint research projects and sharing credit rating expertise."

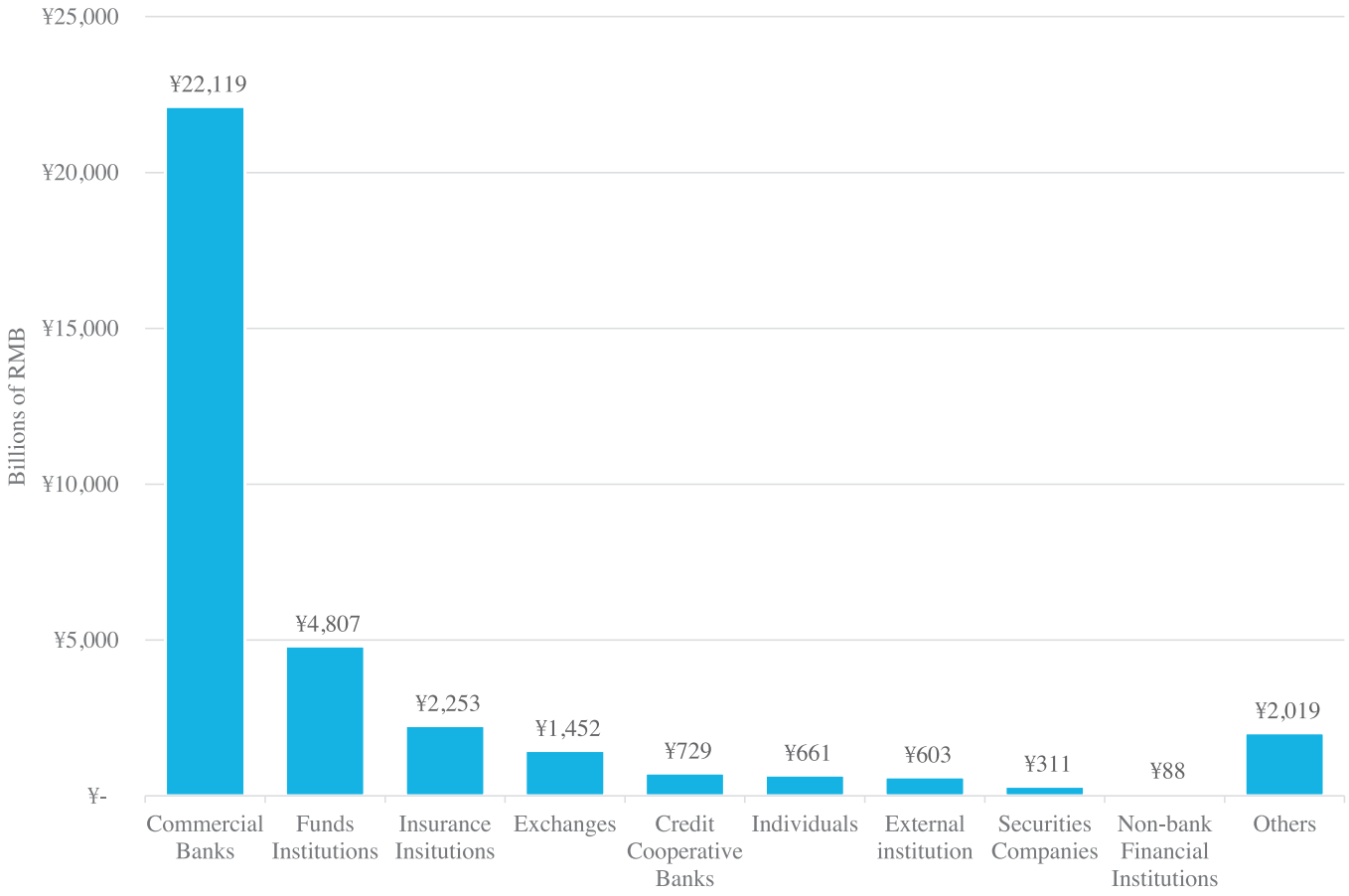


Fig. 7. Chinese bond investments by types of investors (outstanding amount by end of 2015). Source: Chinabond.com.cn.

Table 2
List of major Chinese credit rating agencies.

Name	Chinese Full name	Global partner	Website	Head-quarter	Regulatory approval				
					PBoC	CIRC	CSRC	NDRC	NAFMII
Brilliance	上海新世纪资信评估投资服务有限公司	S&P*	shxsj.com	Shanghai	Yes	Yes	Yes	Yes	Yes
Chengxin_Moody	中诚信国际信用评级有限责任公司	Moody's*	ccxi.com.cn	Beijing	Yes	Yes	No	Yes	Yes
Lianhe_Fitch	联合资信评估有限公司	Fitch*	lhratings.com	Beijing	No	Yes	No	Yes	Yes
Dagong	大公国际资信评估有限公司	None	dagongcredit.com	Beijing	Yes	Yes	Yes	Yes	Yes
Chengxin	中诚信证券评估有限公司	None	ccxr.com.cn	Shanghai	No	Yes	Yes	No	No
Jincheng	东方金诚国际信用评估有限公司	None	dfratings.com	Beijing	No	Yes	Yes	Yes	Yes
Lianhe	联合信用评级有限公司	None	lianhecreditrating.com.cn	Beijing	Yes	Yes	Yes	Yes	No
Pengyuan	鹏元资信评估有限公司	None	pyrating.cn	Shenzhen	Yes	No	Yes	Yes	No

The Table lists the eight major Chinese CRAs in this study. The English names in the first column are assigned by authors and the second column reports the full Chinese names. The last five column reports the regulatory recognition of each CRA by various regulatory bodies in China.
NAFMII: National Association of Financial Markets Institutional Investors (regulator of the interbank market).
*Brilliance has a technical partnership with the S&P since 2008. Moody's has a 49% ownership of Chengxin_Moody since 2006. Fitch has a 49% ownership in Lianhe_Fitch since 2007.
CIRC: China Insurance Regulatory Commission (Chinese insurance industry regulator).

Finally, another unique feature of the Chinese credit rating industry is that almost all public bonds have only one rating, and no Chinese CRA has an unsolicited rating policy. While regulators (PBoC, CSRC and NDRC) require public bonds rated by approved CRAs, they do not specify the number of ratings, effectively setting the minimum required number of ratings to one. In our unfiltered sample, less than 1% of the bonds have ratings from multiple CRAs.

1.3. Chinese bond defaults

Defaults on bank loans are not uncommon in China. A recent study provides a comprehensive examination of Chinese bank loan defaults (Ai et al., 2017). However, prior to 2014, there were no actual domestic bond defaults in China.[20] There were instances where bond defaults, particularly by state-owned enterprises, were avoided by last-minute government bailouts (see, for example, the case of Shandong Helon in 2012 as discussed in Zhen (2013), page 67). The first domestic bond default happened in March 2014, when Shanghai Chaori, a non-state-owned solar-equipment maker, failed to meet interest payments. In April 2015, Baoding Tianwei became the first state-owned enterprise to default on its domestic bond issue. More companies, both non-SOEs and SOEs, defaulted

[20] In March 2013, Suntech Power Holdings Co. became the first Chinese firm that defaulted on a US dollar denominated bond issued in the US (Sweet and Stynes, 2013).

on their domestic bonds in late 2015 and 2016. There were 5 domestic bond defaults in 2014, 21 in 2015, and more than 30 by June 2016 (Hong and Lamar, 2016).

While bond defaults are on the rise, the Chinese government is not giving up its bailouts completely, particularly for SOE bonds. For example, Heilongjiang Longmay, a state-owned coal miner, was bailed out by the local government and avoided bond default in December 2015 (Bloomberg News, 2016). Furthermore, not all bond defaults lead to bankruptcy or liquidation, and in some cases, bondholders were eventually made whole. For example, six months after the default by Shanghai Chaori, its bondholders were rescued by a state-owned asset management firm and the company resumed operations (Economist, 2014). It seems that Chinese governments at various levels are dealing with potential bond defaults and bankruptcy in an ad hoc approach. This leads critics to argue that 'China's corporate bonds [are] too murky for many investors' (Hong and Lamar, 2016).

1.4. Literature on Chinese bond market and credit ratings

Despite the large size and the fast growth of the Chinese bond market, there are, to our knowledge, very few academic studies (in English) that investigate the Chinese bond market and credit rating industry. Chen et al. (2011) describe the early development of the Chinese bond market. The few studies in the area focus on the relatively more developed and transparent Chinese Treasuries. For example, Fan et al. (2012) examine the excess return on Chinese Treasury bonds. A notable exception is Dhawan and Yu (2015) which examines the relation between Chinese corporate bond yields and credit ratings. It finds lower rated bonds have significantly higher yields after controlling for bond features and issuer characteristics. The very small sample size of the study, however, makes it hard to generalize its conclusion.

Kennedy (2008) provides a description of the early development of the Chinese credit rating industry and the challenges and issues that it faces. Poon and Chan (2008) provides preliminary empirical evidence on the informational content of credit ratings in China. They also describe the early background and initial regulations for the industry in China. Details of later regulatory developments are presented in Xu and Weng (2011). While international CRAs are not permitted to issue ratings on Chinese domestic bonds, a few Chinese firms with globally issued bonds are rated by international CRAs. A recent study by Jiang and Packer (2017) examines issuer ratings on Chinese firms assigned by both domestic and international CRAs and finds ratings by domestic CRAs are about 6–7 notches higher than those by international CRAs.

2. Data and sample description

Data on Chinese bond yields and ratings are provided by the WIND Information Co. Ltd. (WIND), a leading Chinese financial data provider. Another database, China Stock Market & Accounting Research (CSMAR) is used to access accounting data for bond issuers in China. Appendix A defines the variables used in this study. We use a sample period from 2009 to 2015. We start with 2009 for two reasons. First, the non-governmental Chinese bond market was very small prior to 2009, but experienced significant growth since then. Second, almost all non-government bonds had third-party guarantees and coupon rates were set by the government prior to 2008.

There are a total of 8338 non-governmental public and taxable bond issues from 2009 to 2015.[21] We apply several data filters (in sequence) and exclude the following bond issues. 1) Bond issues where the type of issuer (SOEs or non-SOEs) cannot be identified (183 issues). 2) Bond issues with third-party guarantees (1312 issues). 3) Bond issues with missing ratings (131 issues), whose CRAs are not identified (23 issues), rated by multiple CRAs (70 issues), or rated by a CRA not included in our study (1 issue). 4) Convertible bonds (5 issues). 5) Issues with maturity less than one year (3 issues). 6) Bonds rated below AA- rating (45 issues). 7) Bonds by issuers whose ages are not identified (37 issues).

The final sample includes 6528 bond issues. Among them, 1560 bonds have floating, step-up, or adjustable coupon rates and 4968 bond issues have fixed coupon rates. Table 3 reports the sample descriptive statistics. The average coupon rate for fixed coupon bonds is 6.203% and the average Treasury Yield Spreads is 2.609%. The average bond rating (= 1 for AAA, = 2 for AA+, = 3 for AA and = 4 for AA−) is 2.381, or between AA+ and AA. The mean and median maturities are 6.038 and 6 years. The longest maturity is 23 years. The average issue amount is 1.73 billion RMB, or about 250 million US dollars. The mean and median issuer age are 13.374 and 12 years.

Table 4 presents a breakdown of the sample by 1) rating, 2) issuer type, 3) bond type, 4) issuing year, 5) trading venue and 6) issuer listing status. The first (second) column reports the breakdown of the whole sample (sample of fixed coupon bonds). The third column reports the mean Treasury Yield Spreads for each subsample of fixed coupon bonds.

More than half of the bonds are rated AA and less than 4% are rated AA−. The mean Treasury Yield Spread increases monotonically as rating decreases: 1.517%, 2.410%, 3.052%, and 3.326% for AAA, AA+, AA, and AA− rated bonds respectively. This negative correlation between Treasury Yield Spread and bond ratings suggests that the Chinese bond ratings do contain relevant information about default risk. However, the yield spreads seem to be very large relative to similarly rated bonds outside China. As a comparison, the average daily yield spreads of the Merrill Lynch Global AAA Corporate Bond Index is 0.85% from 2009 to 2015.[22] The average yield spreads for the Merrill Lynch Global AA, A, BBB, BB Corporate Bond Indices are 1.09%, 1.61%, 2.45% and 4.60% for the same period. Thus, AAA (AA+) rated Chinese bonds have similar average yield spreads as A (BBB) rated bonds outside China. This suggests that AAA (AA+) ratings by Chinese CRAs have much higher potential default risk than bonds rated AAA (AA or A) by international CRAs.[23] In addition, the average difference in yields for a notch difference in ratings is 60 basis points for Chinese bonds. In contrast, the yield spread difference for a letter difference for the Merrill Lynch Global Indices of investment grade bonds is about 53 basis points. Based on the yield spreads, a notch difference in Chinese ratings results in a yield spread difference similar to a letter grade difference in ratings by international CRAs. This strongly suggests that the Chinese rating scales are very coarse.

Bonds issued by SOEs of local governments account for more than three quarters of the sample and non-SOEs have a market share of less than 15%. The average Treasury Yield Spreads for Central SOE bonds is 1.570%, much lower than the average Treasury

[21] During the sample period, there are 1,545 privately placed bond issues which are not included in our sample because the majority of them are either not rated and/or have a third party guarantee.

[22] We downloaded the bond indices from Bloomberg and used the daily option-adjusted spreads (OAS) over government bonds.

[23] An alternative interpretation of the finding is that Chinese bond investors are more risk-averse and demand for much higher risk premium. While we do not have evidence against this alternative interpretation, anecdotal evidence supports the non-comparable-rating-scale explanation. For example, property developer Evergrande Group received AAA ratings from three Chinese CRAs on its domestic bond issue in June 2015, while S&P, Moody's, and Fitch maintained non-investment ratings on the firm's foreign bonds (Yam, 2015).

Table 3
Descriptive statistics.

	Mean	Median	Standard deviation	Minimum	Maximum	N
Coupon rate (in percentage)	6.203	6.200	1.152	3.280	9.500	4968
Treasury spreads (in percentage)	2.609	2.615	0.931	0.377	6.362	4968
Bond rating	2.381	3.00	0.834	1	4	6528
Bond maturity	6.038	6.000	2.119	1	23	6528
Issue amount (in billion RMB)	1.730	1.000	2.881	0.03	50	6528
Issuer age (in years)	13.374	12.000	7.243	0	66	6528

The Table reports the descriptive statistics of the sample. Variables are as defined in Appendix A.

Table 4
Sample breakdown.

	Number of bond issues (% of Total)	Number of fixed coupon bond issues (% of Total)	Mean treasury yield spreads (Standard dseviation)
By rating			
AAA	1304 (19.98%)	991 (19.95%)	1.517% (0.435%)
AA+	1632 (25.00%)	1127 (22.69%)	2.410% (0.761%)
AA	3394 (51.99%)	2682 (53.99%)	3.052% (0.730%)
AA−	198 (3.03%)	168 (3.38%)	3.326% (1.077%)
By issuer ownership			
Central SOE	792 (12.13%)	630 (12.68%)	1.570% (0.550%)
Local SOE	4803 (73.58%)	3801 (76.51%)	2.772% (0.850%)
Non-SOE	933 (14.29%)	537 (10.81%)	2.678% (1.044%)
By bond type			
Corporate	473 (7.25%)	110 (2.21%)	1.912% (0.975%)
Enterprise	3044 (46.63%)	2299 (46.28%)	3.091% (0.799%)
Financial	390 (5.97%)	311 (6.26%)	1.792% (0.624%)
MTN	2621 (40.15%)	2248 (45.25%)	2.264% (0.830%)
By trading venue			
Interbank	4501 (68.95%)	3696 (74.40%)	2.499% (0.923%)
Exchange	2027 (31.05%)	1272 (25.60%)	2.931% (0.876%)
By issuer type			
Listed	1018 (15.59%)	625 (12.58%)	2.097% (0.884%)
Non-listed	5510 (84.41%)	4343 (87.42%)	2.683% (0.914%)
By year			
2009	125 (1.91%)	38 (0.76%)	2.596% (1.202%)
2010	186 (2.85%)	57 (1.15%)	2.464% (1.095%)
2011	519 (7.95%)	301 (6.06%)	2.492% (0.882%)
2012	1127 (17.26%)	885 (17.81%)	3.108% (1.011%)
2013	1121 (17.17%)	980 (19.73%)	2.488% (0.699%)
2014	1719 (26.33%)	1502 (30.23%)	2.760% (0.851%)
2015	1731 (26.52%)	1205 (24.26%)	2.193% (0.910%)
Total	6528 (100%)	4968 (100%)	4968

This Table reports the number of bond issues by 1) rating, 2) issuer ownership, 3) bond type, 4) trading venue, 5) issuer type and 6) issuing year. The first (second) column reports the breakdown of the whole sample (sample of fixed coupon bonds). The last column reports the mean Treasury Yield Spreads for each subsample of bonds with fixed coupon rates.

Yield Spreads on bonds by Local SOEs and Non-SOEs bonds (2.772% and 2.678% respectively).[24]

In terms of bond types, enterprise bonds and MTN each account for about 40% to 46% of the sample. There are only 473 corporate bonds, about 7% of the sample.[25] Further, most of the corporate bonds do not have fixed coupon rates. In terms of average Treasury Yield Spreads, enterprise bonds have the highest spreads (3.091%) and the financial bonds have the lowest (1.792%).[26] MTN and corporate bonds have similar average Treasury Yield Spreads at about 2%.

The average Treasury Yield Spreads peaked in 2012 at 3.108%, coincident with the spike in credit spreads in the international bond market during the European sovereign debt crisis in 2011–2012. Treasury Yield Spreads declined to a low level of 2.193% in 2015.

As to trading venues, three fourths of the sample is traded in the interbank market and the remainder in the Shanghai and Shenzhen Stock Exchanges. Finally, about 16% of the bonds are issued by firms with publicly traded equity.

Table 5 reports the rating distribution by the eight CRAs in our sample. The average ratings vary significantly among different CRAs. Overall, bonds rated by global-partnered CRAs have slightly higher average (unconditional) ratings (2.277) than those rated by domestic CRAs (2.502). Fig. 8 depicts the average ratings by the two types of CRAs over the sample period. There is a general downward trend in average ratings, suggesting that, along with the rapid growth of the Chinese bond market during the sample period, more firms with higher credit risk are accessing the public bond market.

While Table 5 also reports the market shares of each CRA in terms of the number of bonds rated, Fig. 9 shows the CRA market shares by the issue amount of bonds rated. From Table 5 and Fig. 9, it is clear that Chengxin_Moody, Lianhe_Fitch, and Dagong are the Big Three Chinese CRAs with the largest market shares.

[24] The large difference in Treasury Yield Spreads can be partially explained by the differences in credit ratings between Central SOE bonds (1.406) and those of Local SOEs and Non-SOEs (2.542 and 2.637 respectively).

[25] Corporate bond market has grown significantly over our sample period, but more than half of corporate bonds are private-placements and/or non-rated, making them ineligible for our sample. In addition, a large percentage of corporate bonds has third party guarantees, further limiting the number of corporate bonds in the sample.

[26] While the average rating for financial bonds is better than that of enterprise bonds, the difference is less than half a notch: 2.277 vs. 2.651.

Table 5
Rating distribution by CRAs.

	AAA	AA+	AA	AA−	Total	Average ratings
Panel A: domestic CRAs						
Chengxin	60	67	51	1	179	1.961
Dagong	321	297	595	48	1261	2.293
Jincheng	2	34	148	1	185	2.800
Lianhe	29	36	114	1	186	2.532
Pengyuan	8	296	877	15	1196	2.752
Total	420	730	1785	72	3007	2.502
Panel B: global-partnered CRAs						
Brilliance	89	213	504	33	839	2.573
Chengxin_Moody	496	385	586	41	1508	2.114
Lianhe_Fitch	299	304	519	52	1174	2.276
Total	884	902	1609	126	3521	2.277

This Table reports the number of bonds rated by CRA and rating category. Panel A lists the pure domestic CRAs and Panel B contains the global-partnered CRAs. The last column reports the average rating (= 1 for AAA, 2 for AA+, 3 for AA and 4 for AA−) of bonds rated by each CRA.

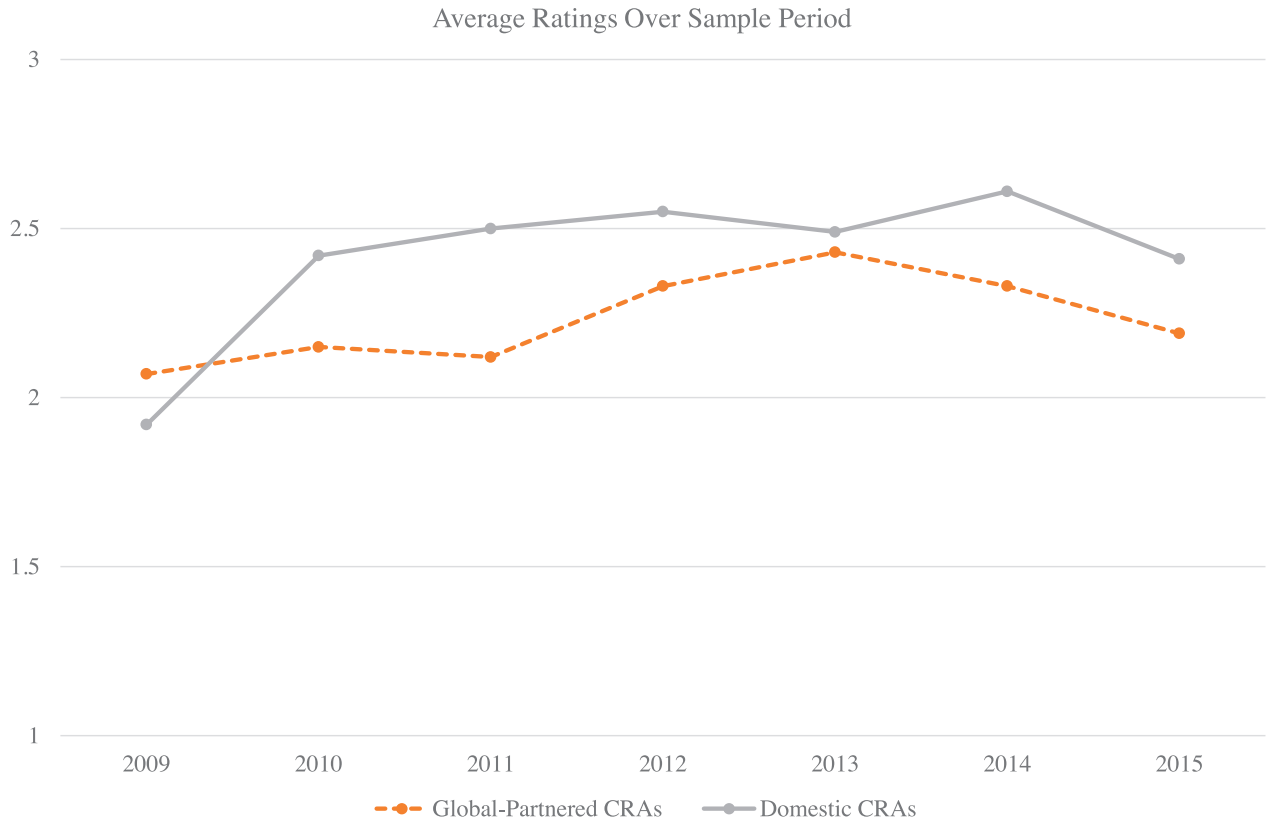


Fig. 8. Average ratings by global-partnered CRAs and domestic CRAs over the sample period.

3. Determinants of Chinese bond ratings

This section tests the public information content of Chinese bond ratings directly by examining the factors determining ratings. As prior literature shows that accounting ratios and market-based variables are important determinants of credit ratings, the sample used in this section is limited to bonds issued by firms with publicly traded equity. In addition, since accounting ratios for financial firms are generally not comparable with those of non-financial firms, we exclude financials in the sample. These two filters significantly reduce the sample size.[27]

Following Blume et al. (1998), we build an ordered probit model of bond ratings as in Eq. (1).

$$\text{Rating}_i = \alpha + \sum \lambda_k{}^{*}\text{Issuer Characters}_{k,i} + \beta_1 {}^{*}\text{GP} - \text{CRA} + \text{other control variables} + \varepsilon_i \quad (1)$$

The dependent variable is the ordinal variable of Rating, from 1 for an AAA rating to 4 for an AA− rating. The explanatory variables include Log of Coverage Ratio, Log of Market Cap, Market to Book Ratio, Operating Profit Margin, Return on Equity, Total Debt Ratio, Long Term Debt Ratio, Equity Beta, and Market Model Errors. Appendix A defines these variables and the estimation methodol-

[27] To maximize sample size, we include bonds with non-fixed coupon rates in the analysis of bond ratings. While coupon structure affects bond yields, it is not expected to affect default risk and, consequently, the bond ratings. In a robustness check, we control for coupon structure in the ordered probit model of rating. Neither is the coefficient on the coupon structure variable significant, nor do the empirical results differ. For the sake of brevity, we do not tabulate and report these results.

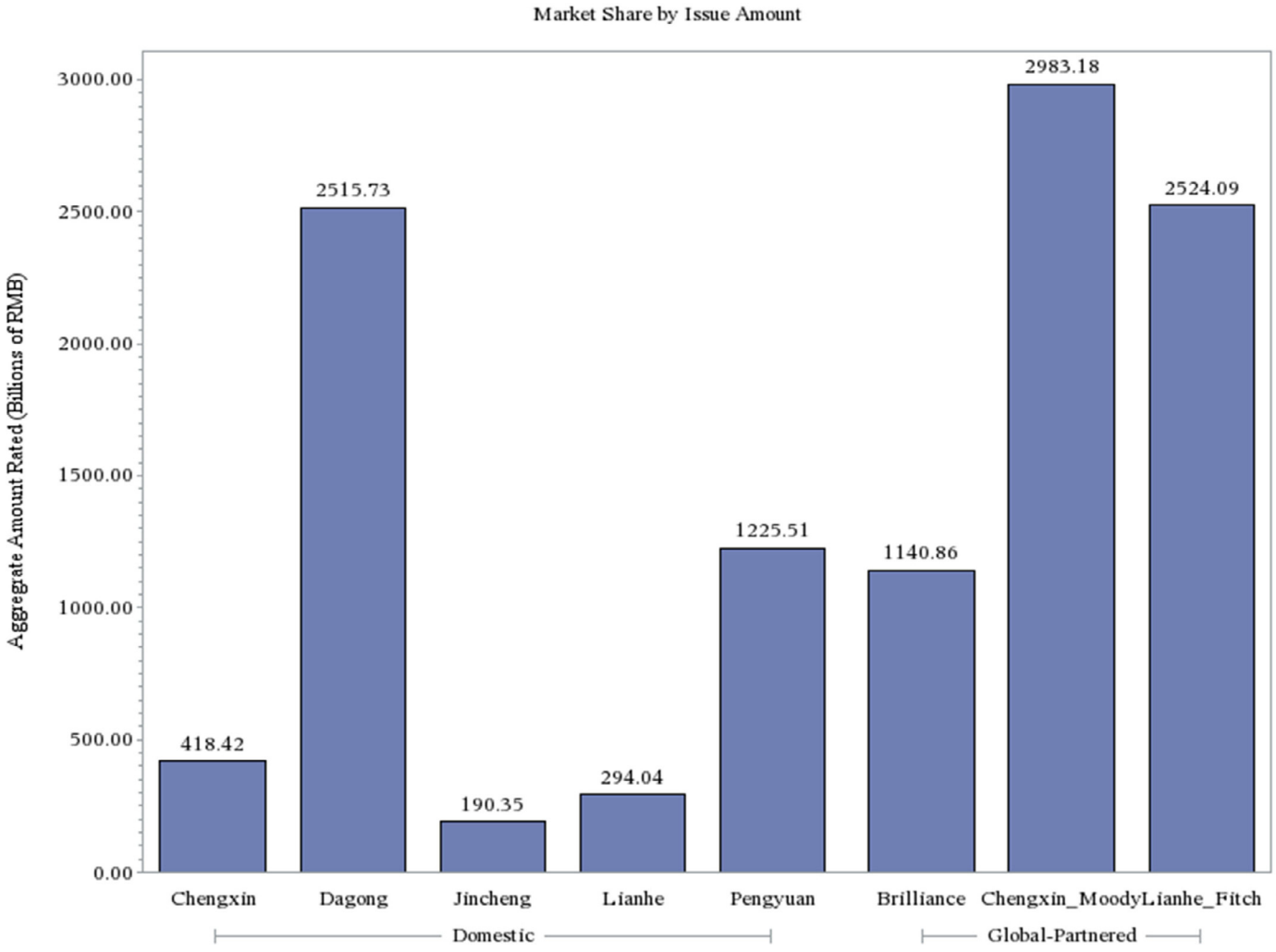


Fig. 9. Market shares of CRAs by the total issue amount (in billions of RMB) of bonds rated.

ogy. Prior research shows that these accounting ratios and market-based variables can explain up to 80% of the variations in bond ratings (Kaplan and Urwitz, 1979).

GP-CRA is a dummy variable, equal to one for three of the CRAs with global partners (Brilliance, Lianhe_Fitch, and Chengxin_Moody) and zero for the other five domestic CRAs. Holding the issuer characteristics constant, the coefficient on the GP-CRA would be significantly positive if the global-partnered CRAs have more stringent rating standards than their domestic brethren. In other words, global-partnered CRAs would assign lower ratings, holding the issuer characteristics constant.

In addition to the accounting ratios and market-based variables, we also include the Local SOE and Non-SOE dummy variables (with the Central SOE as the base) in the ordered probit model. Given the perceived government backing of SOEs, particularly those of the central government, we expect the type of issuer ownership should significantly affect the bond ratings. Other control variables include year dummies and industry dummies.

Column 1 of Table 6 reports the descriptive statistics of the explanatory variables for a sample of 465 bond issues with complete accounting ratios and market-based variables. Columns 2 to 5 report the variable means for each rating category. Not surprisingly, for bonds with lower ratings, the coverage ratio and market capitalization are lower, suggesting that issuers with lower interest coverage ratios and smaller market capitalization are more likely to receive lower ratings. Equity Beta and Market Model Errors are higher for lower-rated bonds, indicating that issuers with higher systematic and idiosyncratic risks are rated lower. Issuers of lower-rated bonds also have higher market to book ratios. These results are consistent with findings from prior studies. On the other hand, univariate analysis does not indicate clear differences in leverage and profitability ratios between highly-rated issues and lower-rated issues.

Table 7 reports the results of the ordered probit model of ratings. In the Column 1 Model, we include the accounting ratios, Log of Market Cap, and Market to Book ratio. Consistent with the univariate analysis, Log of Market Cap and Market to Book Ratio are significant determinants of bond ratings. The coefficient of Total Debt Ratio is also significantly positive, indicating higher Total Debt Ratio is associated with lower bond ratings. However, the coefficients on the two profitability measures are not significant.

In the Column 2 Model, we add the Equity Beta, Market Model Errors, and two dummy variables for the issuer ownership types. The coefficients on Equity Beta and Market Model Errors are both significantly positive, suggesting that issuers with higher systematic risk and idiosyncratic risk are rated lower. The coefficient on the Local SOE is positive, though not significant. The coefficient on Non-SOE is positive and significant at the 1% level, suggesting that, holding accounting and other variables constant, ratings on Non-SOE bonds are lower than those on Central SOE bonds. The coeffi-

Table 6
Market/accounting ratios and bond ratings.

	Whole sample	AAA	AA+	AA	AA−
Bond rating	2.348 (0.870)	–	–	–	–
Log of coverage ratio	1.885	2.143	1.958	1.758	1.570
	(0.868)	(0.848)	(0.987)	(0.811)	(0.505)
Log of market cap	2.455	3.513	2.543	2.287	1.571
	(0.992)	(0.951)	(0.744)	(1.322)	(0.415)
Market to book ratio	1.965	1.235	1.879	2.290	2.637
	(1.253)	(0.554)	(1.278)	(1.388)	(1.251)
Total debt ratio	0.584	0.606	0.564	0.583	0.595
	(0.151)	(0.167)	(0.161)	(0.140)	(0.109)
Long term debt ratio	0.167	0.201	0.183	0.142	0.191
	(0.111)	(0.113)	(0.115)	(0.102)	(0.134)
Operating profit margin	0.152	0.185	0.167	0.127	0.214
	(0.120)	(0.133)	(0.121)	(0.100)	(0.186)
Return on equity	0.107	0.118	0.114	0.098	0.106
	(0.050)	(0.041)	(0.059)	(0.048)	(0.061)
Equity beta	1.172	1.031	1.185	1.224	1.236
	(0.251)	(0.227)	(0.283)	(0.228)	(0.172)
Market model error	0.020	0.014	0.022	0.022	0.023
	(0.008)	(0.004)	(0.014)	(0.005)	(0.004)
No. of obs.	465	107	105	237	16

This Table reports the accounting ratios and market-based variables for a sample of 465 bonds with complete accounting and market equity information. The variables are defined in Appendix A. The first column reports the variable means for the whole sample. The next four columns report the variable means for each rating category. The numbers in parentheses are standard deviations.

Table 7
Regression models of bond ratings.

	Ordered probit (1)	Ordered probit (2)	Ordered probit (3)	Ordered probit (4)	OLS
Intercept	−1.196 (0.452)***	−4.242 (0.638)***	−4.521(0.653)***	−4.437(0.671)***	1.986 (0.224)***
Intercept2	1.821 (0.439)***	−0.793 (0.600)	−1.050 (0.612)*	−0.828 (0.627)	
Intercept3	3.086 (0.455)***	0.821 (0.602)	0.584 (0.611)	0.922 (0.631)	
Log of coverage ratio	−0.107 (0.095)	−0.211 (0.099)**	−0.177 (0.101)*	−0.215 (0.105)**	−0.073 (0.038)**
Total debt ratio	1.772 (0.540)***	1.314 (0.577)**	1.382 (0.578)**	1.220 (0.594)**	0.523 (0.215)**
Long term debt ratio	−0.954 (0.778)	−0.404 (0.863)	−0.199 (0.870)	−0.313 (0.908)	−0.284 (0.315)
Operating profit margin	0.051 (0.684)	0.569 (0.787)	0.569 (0.791)	0.442 (0.817)	0.205 (0.284)
Return on equity	1.814 (1.565)	0.399 (1.667)	0.088 (1.676)	−0.039 (1.784)	0.124 (0.631)
Log of market cap	−1.448 (0.103)***	−1.588 (0.121)***	−1.622 (0.124)***	−1.774 (0.135)***	−0.535 (0.031)***
Market to book ratio	0.639 (0.063)***	0.671 (0.071)***	0.693 (0.072)***		
Equity beta		1.989 (0.326)***	1.969 (0.330)***		
Market model error		16.823 (9.015)*	16.298 (9.183)*	18.538 (9.134)**	6.711 (3.525)*
Local SOE		0.082 (0.192)	0.113 (0.194)	0.183 (0.199)	−0.054 (0.070)
Non-SOE		1.102 (0.203)***	1.205 (0.209)***	1.261(0.218)***	0.364 (0.074)***
GP-CRA			0.328 (0.137)**		0.137 (0.051)***
Lianhe_Fitch				0.776 (0.247)***	
Brilliance				0.504 (0.222)**	
Dagong				0.160 (0.245)	
Jincheng				0.201 (0.455)	
Pengyuan				−0.900 (0.299)***	
Lianhe				0.218 (0.247)	
Chengxin				0.174 (0.239)	
Year dummies	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes
(Pseudo) R-squared	(0.64)	(0.74)	(0.74)	(0.77)	0.67
No. of obs.	465	465	465	465	465

This Table reports the results of regression models of bond ratings. The first four columns report the results of ordered probit regression models. The dependent variable is an ordinal variable, Bond Rating, from 1 (for AAA) to 4 (for AA−). The explanatory variables are defined in Appendix A. In the fourth column, we replace the GP-CRA dummy with a series of dummy variables for each CRA. Bonds rated by Chengxin_Moody are the base case. The last column reports the results of an OLS model. The dependent variable is a cardinal Bond Rating variable. The numbers in the parentheses are standard errors.
***, **,* The coefficient is statistically significant at the 1%, 5% and 10% levels respectively.

cient on Log of Coverage Ratio is significantly negative in the Column 2 model. The pseudo R-squared is 0.74, comparable to prior studies with US data.

In the Column 3 Model, we include the GP-CRA dummy variable. The coefficient on the GP-CRA is positive and significant at the 5% level. This indicates that the ratings from global partnered CRAs are lower than ratings by the domestic CRAs, holding the issuer accounting ratios and market-based variables constant. The finding suggests that the global-partnered CRAs, as a group, have significantly more stringent rating standards than their domestic counterparts.

In the Column 4 model, we replace the GP-CRA dummy with a series of CRA dummy variables. We use the Chengxin_Moody as the base case.[28] The coefficients on the two global-partnered CRAs (Lianhe_Fitch and Brilliance) are significantly positive. The coeffi-

[28] We use Chengxin_Moody as the base case because it rates more bonds in the sample than any other CRA.

cient on Pengyuan is significantly negative while the coefficients on the other four domestic CRAs are not significant. The findings suggest that two of the global-partnered CRAs maintain significantly more stringent rating standards and one of the pure domestic CRAs (Pengyuan) has significantly more lax standards than the other CRAs. Chengxin_Moody has similar rating standards as the other four pure domestic CRAs. Thus, not all global-partnered CRAs are equally stringent in their rating standards and not all domestic CRAs are lax in rating standards. The rating standards vary significantly between different Chinese CRAs.

To estimate the magnitude of the impact of the independent variables on bond ratings, we also run an OLS regression model of ratings on the same set of independent variables and the results are reported in the last column of Table 7. The signs and significant levels of the OLS regression coefficients are similar to those of the ordered probit models.

The OLS coefficient of the Non-SOE dummy is 0.364, indicating that ratings on non-SOE bonds are about one-third of a notch lower than those on Central SOE bonds. The coefficient on the GP-CRA is 0.137, indicating that the ratings from global partnered CRAs are, on average, about one tenth of a notch lower than ratings by the domestic CRAs.

Overall, the empirical results in this section indicate that Chinese bond ratings do contain publicly available information on default risk. Furthermore, ratings standards vary for different CRAs.

4. Analysis of bond offering yields

4.1. Methodology

In this section, we empirically investigate the determinants of Chinese bond offering yields, particularly the role played by credit ratings, in the following regression model:

$$\text{Yield Spread}_i = \alpha + \sum_{j=1}^{3} \gamma_j{}^{*}\text{Rating}_{j,i} + \beta_1{}^{*}\text{GP} - \text{CRA}_i + \text{control variables} + \varepsilon_i \quad (2)$$

Yield Spread is the difference, in percentage, between the bond yield to maturity at issuance and Chinese Treasury yield of similar maturity.[29] Rating_j is a series of dummy variables with AAA rated bonds as the base case. If Chinese bond ratings are informative about default risk, we expect the coefficients on the rating dummy variables to be significantly positive and larger for lower ratings. If Chinese bond investors trust the ratings from the global-partnered CRAs more than ratings of their domestic counterparts, the coefficient on the GP-CRA dummy variable is expected to be significantly negative, i.e., investors require lower yields on bonds with a certification from the more reputable global-partnered CRAs.

In addition to the rating variables, there are three sets of control variables that are expected to affect bond yields: bond types and features, issuer types and characteristics, and other control variables.

First, we control for the different types of bond issues: Financial, Corporate, MTN, and Enterprise bonds with Enterprise bonds as the base case. As these types of bonds are regulated by separate government agencies that set different approval requirements, the bond yield spreads might reflect the different regulatory environments. In addition, we control for various bond features: Bond Maturity, Issue Amount, Callable dummy, Putable dummy, Sinking Fund dummy, Senior Bond dummy. It is well documented in prior literature that bond features are significant determinants of offering yields (see, for example, Livingston and Zhou, 2010).

[29] In this section, we limit our sample to bonds with fixed coupon rates.

The second set of control variables are the types of bond issuers and issuer characteristics. Issuer types are based on ownership structure: Central SOEs, Local SOEs and Non-SOEs with Central SOEs as the base case. It is well documented that the Chinese SOEs have easier access to bank loans and receive favorable loan terms, likely due to the implicit guarantees by the central or local governments. If Chinese bond investors, overwhelmingly commercial banks, assume an implicit government backing on SOE bonds, particularly those by Central SOEs, we expect the coefficients on the Non-SOE dummy variable to be significantly positive. In addition, some issuing firms have publicly traded equities. To control for the difference in the listing status of the issuing firm's equity, we include a Listed dummy, equal to one for an issuer with publicly traded equity and zero otherwise. Issuers with publicly traded equity are likely to be more transparent due to disclosure requirements and analysts' coverage.[30] Hence, we expect bonds issued by firms with public equity to have lower yields and the coefficient on the Listed dummy to be negative. The last issuer characteristic variable is the age of the issuer, Issuer Age.

The last set of control variables includes the bond's trading venues, year dummies and issuer industry dummies. The Interbank dummy is set equal to one for bonds traded in the interbank market and zero for exchange-traded bonds. As the trading volume in the interbank market is much higher than that of the exchange market, the liquidity of bonds traded in the interbank market is likely to be higher than that of the exchange traded bonds (GSAM, 2015). Thus, we expect the coefficient on the Interbank dummy to be negative. Year dummies and industry dummies are included to control for fixed year and industry effects.

4.2. Empirical results

Column 1 of Table 8 reports the regression results. The numbers in the parentheses are cluster-robust standard errors. First note that the coefficients on the rating dummy variables are all significantly positive, indicating that AA+, AA and AA− rated bonds pay significant yield premiums over AAA rated bonds. Furthermore, the size of the coefficients increases as rating gets lower. This result is consistent with Poon and Chan's (2008) finding that Chinese bond ratings are informative and investors do pay attention to bond ratings, contrary to some critics' argument of rating irrelevance in China (see, for example, Kennedy, 2003 and Lee, 2006).

In addition, the differences in the rating dummy coefficients are very large. A one-notch difference in rating results in a difference of about 50 to 70 basis points in yield spreads, consistent with the univariate analysis in the Section II. In studies of the US and European bond markets, the yield difference between AAA rated bonds and AA rated bonds is typically about 20 to 30 basis points, and the difference between AAA rated and A rated bonds ranges from 40 to 100 basis points. Appendix B summarizes findings in three studies on the US and European bond markets over different time periods. On average, a one-notch difference in investment grade ratings results in a yield difference of 9 to 18 basis points. The finding of large differences in yields between adjacent notch-level Chinese ratings further suggests that rating scales by the Chinese CRAs are very coarse and are not comparable to the scales used by international CRAs. A notch-difference in Chinese credit rating is similar to a letter-difference (or three-notch difference) in international credit ratings.

[30] Chinese public firms are required to file annual, semi-annual and quarterly reports with the China Securities Regulatory Commission (CSRC) in addition to special reports on significant matters, acquisitions, and clarifications. When firms apply for public equity issuance, they must provide a prospectus to the CSRC and, after receiving approval from the CSRC, disclose information contained in the prospectus to the general public (OECD, 2011).

Table 8
Regressions of bond yield spreads.

Intercept	2.058 (0.186)***	1.977 (0.133)***	1.766 (0.180)***
AA+	0.517 (0.031)***	0.640 (0.039)***	0.510 (0.031)***
AA	0.989 (0.031)***	1.066 (0.035)***	0.985 (0.032)***
AA−	1.742 (0.074)***	1.943 (0.136)***	1.760 (0.075)***
GP-CRA	−0.178 (0.025)***	−0.070 (0.031)**	
AA+*GP-CRA		−0.183 (0.046)***	
AA*GP-CRA		−0.101 (0.038)***	
AA−*GP-CRA		−0.285 (0.147)**	
Bond maturity	−0.020 (0.008)***	−0.018 (0.006)***	−0.016 (0.008)**
Issue amount	−0.004 (0.005)	−0.004 (0.003)	−0.002 (0.005)
Callable dummy	−0.439 (0.143)***	−0.436 (0.112)***	−0.361 (0.137)***
Putable dummy	0.152 (0.164)	0.155 (0.126)	0.079(0.144)
Sinking fund dummy	0.658 (0.085)***	0.628 (0.046)***	0.607 (0.078)***
Senior dummy	−0.665 (0.133)***	−0.651 (0.112)***	−0.577 (0.129)***
Financial	−0.594 (0.122)***	−0.606 (0.072)***	−0.633 (0.118)***
Corporate	−0.259 (0.105)***	−0.262 (0.071)***	−0.405 (0.104)***
MTN	0.087 (0.085)	0.068 (0.046)	0.095 (0.076)
Local SOE	0.155 (0.038)***	0.157 (0.024)***	0.167 (0.038)***
Non-SOE	0.570 (0.059)***	0.573 (0.039)***	0.581 (0.060)***
Listed	0.029 (0.038)	0.031 (0.029)	0.018 (0.037)
Issuer age	−0.003 (0.001)**	−0.003 (0.001)***	−0.002 (0.001)*
Interbank	−0.046 (0.016)***	−0.048 (0.022)**	−0.034 (0.016)**
Lianhe_Fitch			−0.011 (0.031)
Brilliance			0.001 (0.039)
Dagong			0.087 (0.034)***
Jincheng			0.259 (0.067)***
Pengyuan			0.282 (0.040)***
Lianhe			0.491 (0.131)***
Chengxin			0.401 (0.110)***
Year dummies	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes
R-squared	0.65	0.65	0.66
No. of Obs.	4968	4968	4968

This Table reports the results of bond yield spread regressions. The dependent variable is the bond treasury yield spreads (in percentage), or the difference between the bond yield at issuance and Chinese Treasury yield of similar maturity. The explanatory variables include the following. 1) Categorical rating variables with AAA rated bonds as the base case. 2) Bond feature variables (Bond Maturity, Issue Amount, Callable Dummy, Putable Dummy, Sinking Fund, and Senior Dummy). 3) Types of bond dummy variables (Financial, Corporate, Enterprise, and MTN) with Enterprise bonds as the base case. 4) Issuer ownership dummies (Central SOE, Local SOE and Non-SOE) with Central SOE bonds as the base case. 5) Issuer characteristics variables (Listed and Issuer Age). 6) Trading venue variable (Interbank and Exchange) with Exchange listed bonds as the base case. 7) Type of CRAs. GP-CRA equal to one for three of the global-partnered CRAs and zero otherwise. Also included are year dummies and industry dummies. The detailed definitions of the explanatory variables are contained in Appendix A. In the last column, we replace the GP-CRA dummy with a series of dummy variables for each CRA. Bonds rated by Chengxin_Moody are the base case. The numbers in parentheses are cluster-robust standard errors.
***, **,* The coefficient is statistically significant at the 1%, 5% and 10% levels respectively.

The coefficient on global-partnered CRAs (GP-CRA) is −0.178 and significant at 1%, suggesting that yield spreads on bonds rated by global-partnered CRAs are, on average, 18 basis points lower than those on domestic CRAs rated bonds. This empirical result suggests that Chinese bond investors differentiate between CRAs based on their perceived reputation. Ratings issued by more reputable CRAs provide a stronger certification of the bond's credit quality.

In terms of different types of bonds, the coefficients on Financial bonds and Corporate bonds are significantly negative, suggesting lower yield spreads on these two types of bonds than Enterprise bonds. The coefficients on the Local SOE and Non-SOE dummy variables are significantly positive, indicating a funding advantage of SOEs of the central government. Non-SOEs (Local SOEs) have to pay an additional yield of 57 (16) basis points over central government SOEs. Interbank-traded bonds have a slightly lower yield spreads (5 basis points) than exchange rated bonds, likely due to a lower liquidity premium.

Some findings in Table 8 are surprising and counter-intuitive. The significantly positive coefficient on the Sinking Fund dummy indicates higher yield spreads on bonds with sinking fund provision. While sinking fund provisions can mitigate default risk over time, prior research argues that they are more likely to be included in riskier debt (Myers, 1977, Smith and Warner, 1979). Thus, the significantly positive coefficient on the Sinking Fund dummy is likely due to selection bias. Bhojraj and Sengupta (2003) have a similar finding of significantly higher yield spreads on US bonds with sinking fund provisions. The significantly negative coefficient on the Callable dummy is surprising. A detailed examination shows that 113 of the 127 callable bonds are Financial bonds. As reported in Section IV.C and Table 10, the coefficient on the Callable dummy becomes positive after excluding Financial bonds.

With a GP-CRA dummy in the Column 1 Model, we implicitly assume that the impact of global-partnered CRAs is uniform across different rating categories. It is plausible that the certification effect is not constant, but stronger for lower credit quality bonds. To test this possibility, we interact the GP-CRA dummy with the rating dummies and report the results in the second column of Table 8. Note that the coefficient on GP-CRA drops to −0.07, suggesting that yields on bonds rated AAA by global-partnered CRAs are 7 basis points lower than their domestic CRA rated counterparts. The coefficients on the GP-CRA and rating dummy interaction terms are more negative, particularly the interaction between GP-CRA and AA− rating. This finding is consistent with the conjecture that the certification effect of global-partnered CRAs is stronger for lower credit quality bonds.

Another implicit assumption with a single GP-CRA dummy in the Column 1 model is that bond investors treat the eight CRAs as two groups: global-partnered or pure domestic. It is plausible that investors differentiate individual CRAs. The Column 3 Model uses a series of CRA dummies with Chengxin_Moody as the base case. Interestingly, the coefficients on Lianhe_Fitch and Brilliance, the other two global-partnered CRAs, are not significant, while the coefficients on the five domestic CRAs are all significantly positive at the 1% level. In addition, the coefficients on the five domestic CRAs vary considerably from 0.087 to 0.491, suggesting that Chinese bond investors further differentiate the ratings from the five domestic CRAs.

Overall, the findings are mixed with regard to the quality of Chinese bond ratings. The empirical evidence shows bond ratings to be informative and revealing about bond offering yields. Furthermore, there is evidence that reputation matters in the Chinese rating industry. However, the large yield spreads on highly rated Chinese bonds suggest that Chinese credit ratings are not comparable with the rating scales of international CRAs. While Chinese ratings do seem to differentiate bonds of different quality, non-comparability is a potential concern for foreign investors not familiar with the Chinese bond market. More importantly, there is strong evidence that Chinese bond ratings are coarse, resulting in pooling of bonds with significantly different default risks into one rating category.

4.3. Robustness checks

We find that bonds rated by global-partnered CRAs have lower yield spreads. A concern about this finding is potential selection bias. The issuing firm's choice of CRAs may not be random, but possibly driven by some unobservable issuer characteristics. If these issuer characteristics are also correlated with bond yields, the results in Table 8 may be biased. We use two approaches to address the potential selection bias.

First, we use the Heckman's two-stage correction model (Heckman, 1979). This two-stage treatment procedure is commonly used in the finance literature to address self-selection problems

Table 9
Regressions of bond yield spreads with Heckman correction.

	Probit model of CRA types	Bond yield spread regression with Heckman correction
Intercept	−1.403 (0.311)***	1.836 (0.298)***
GP-CRA market share	0.939 (0.103)***	
AA+	0.061 (0.073)	0.502 (0.032)***
AA	0.096 (0.071)	0.983 (0.034)***
AA−	0.065 (0.129)	1.736 (0.094)***
GP-CRA		−0.166 (0.025)***
Inverse mills ratio		0.200 (0.099)**
Bond maturity	−0.030 (0.014)**	−0.020 (0.01)**
Issue amount	0.001 (0.009)	−0.004 (0.005)
Callable dummy	1.149 (0.266)***	−0.406 (0.137)***
Putable dummy	−1.051 (0.345)***	0.108 (0.183)
Sinking fund dummy	0.010 (0.124)	0.660 (0.087)***
Senior dummy	0.863 (0.246)***	−0.638 (0.148)***
Financial	0.623 (0.174)***	−0.509 (0.135)***
Corporate	−0.731 (0.191)***	−0.340 (0.119)***
MTN	0.880 (0.124)***	0.197 (0.096)**
Local SOE	−0.347 (0.080)***	0.121 (0.037)***
Non-SOE	−0.399 (0.097)***	0.537 (0.065)***
Listed	−0.016 (0.073)	0.037 (0.042)
Issuer age	0.006 (0.003)***	−0.002 (0.001)
Interbank	0.139 (0.053)***	−0.024 (0.032)
Year dummies	Yes	Yes
Industry dummies	Yes	Yes
(Pseudo) R-squared	(0.25)	0.65
No. of obs.	4797	4797

This Table reports the bond yield spreads regression after correcting for selection bias. We first estimate a probit model on the choice of CRA types (global-partnered or domestic CRAs) and report the selection model in the first column. The dependent variable is a dummy, equal to 1 for bonds rated by global-partnered CRAs and 0 for bonds rated by domestic CRAs. The explanatory variables are defined in Appendix A. We then calculate the inverse Mills ratio and include it in the bond yield spreads regression as an additional variable to detect and correct for possible selection bias. The results are reported in the second column. The numbers in parentheses are standard errors.

(see, e.g., Maddala, 1983, for technical details). The first stage contains a probit model of the issuing firm's choice of the two types of CRAs. One important explanatory variable in the first stage probit model is the GP-CRA Market Share, provincial market shares of the three global-partnered CRAs. The variable is defined as the percentage of bonds in the issuing firm's home province rated by global-partnered CRAs one year prior to the bond issuance. Xu and Weng (2011) suggests geographic fragmentation of the Chinese rating market. In addition, since about three quarters of the bonds in our sample are issued by local SOEs, provincial governments likely play a crucial role in an issuer's choice of CRAs. Global-partnered CRAs' local market share in a specific province, particularly over the previous year, is unlikely to be directly correlated with error terms of the bond yield spread regression. Thus, it meets the exclusion restriction criteria and is not included in the second stage bond yield spread regression.

Column 1 of Table 9 reports the results of the probit model of CRA choices.[31] The dependent variable is set to 1 for bonds rated by global-partnered CRAs and 0 otherwise. The coefficient on GP-CRA Market Share is positive and highly significant, suggesting that issuers are more likely to choose global-partnered CRAs if these CRAs have a larger local market share in the previous year. Next, we calculate the Inverse Mills Ratio based on the first stage probit selection model in Column 1 of Table 9 and then rerun the bond yield spread regression model with the Inverse Mills Ratio as an additional explanatory variable. Column 2 of Table 9 reports the results of the second stage bond yield spread regression. The coefficient on the Inverse Mills Ratio is positive and significant at the 5% level, suggesting there is some selection bias.[32] However, the coefficient on the GP-CRA dummy remains negative and significant at the 1% level, indicating the results are robust with the correction for potential selection bias.

Heckman's two-stage correction model, while commonly used, requires strong assumptions on both the first stage selection model and the second stage outcome model (see detailed discussion by Tucker, 2010). In a second approach, we take advantage of a group of 104 unique bond issuers which have acquired ratings from both the global-partnered and domestic CRAs during the sample period. We call these bond issuers CRA Switchers. We run the bond yield spread regression on the 508 bonds issued by the CRA Switchers with issuer fixed effects. With issuer fixed effects, we effectively control for all observed or unobserved issuer characteristics, alleviating concerns about potential selection bias. The results of the issuer fixed effect regression model are reported in the first column of Table 10. The coefficient on GP-CRA is −0.1 and significant at the 5% level. This provides further evidence that the lower yields on bonds rated by global-partnered CRAs are not solely driven by selection bias.

The results in Table 8 indicate that yields on Financial bonds are significantly lower. Financial bonds are issued by banks and other financial institutions, which are typically different from non-financial firms in terms of leverage and credit risk. To check if our results are robust with the exclusion of Financial bonds, the yield spread regression is rerun on a subsample of non-Financial bonds. The results are reported in the second column of Table 10. Coefficients on most explanatory variables are very similar to those in Table 8. Interestingly, the coefficient on the Callable dummy turns into positive, though not significant. Thus, it seems that the negative coefficient on the Callable dummy in Table 8 is driven by callable Financial bonds.

In Section III, we use a sample of non-financial bonds issued by companies with publicly listed equity to examine the determinants of bond ratings. For the yield spread regressions, we use a much larger sample that includes non-listed firms. To ensure consistency and robustness, the yield spread regression is repeated for non-financial listed firms and the results are reported in the third column of Table 10. [33] Again, the coefficients on most explanatory variables of interest, such as rating dummies, GP-CRA dummy, and types of issuers (SOEs or non-SOEs) are similar to the main results in Table 8.

5. Conclusion

We study the Chinese bond market and the credit ratings. First, we find the Chinese bond ratings contain information on default risk that bond investors can use to set offering yields. Second, Chinese bond investors differentiate ratings from different CRAs based on their perceived reputation. Third, rating standards vary significantly among different Chinese CRAs. Two of the three global-partnered CRAs have more stringent rating standards and one domestic CRA has significantly more lax standards.

While informative, Chinese bond ratings are not comparable to the ratings by the international CRAs, although they use similar alpha-numerical symbols. Based on the bond Treasury yield spreads, we estimate that an AAA (AA+) rating by the Chinese CRAs is, on average, similar to an A (BBB) rating by international

[31] Note that the number of observations in Table 9 is slightly lower than that in Table 8. We lose bonds issued in 2009 and some bond issues whose home provinces have no bond rated by CRAs in the previous year.

[32] In an appendix, Livingston and Zhou (2016) provides a concise discussion of the methodology. It also describes the calculation of the Inverse Mills ratio and the interpretation of the coefficient.

[33] The size of this subsample of bonds by non-financial listed firms is slightly smaller than the bond rating model because it excludes bonds with step-up, floating coupons or other coupon adjustment mechanism.

Table 10
Bond yield spreads: subsample analyses.

	Issues by CRA switchers	Non-financial issues	Non-financial issues by listed firms
Intercept	–	1.162 (0.071)***	1.354 (0.300)***
AA+	0.783 (0.150)***	0.534 (0.024)***	0.430 (0.074)***
AA	0.802 (0.153)***	1.006 (0.024)***	1.172 (0.075)***
AA–	1.327 (0.276)***	2.052 (0.074)***	2.497 (0.136)***
GP-CRA	−0.100 (0.046)**	−0.160 (0.018)***	−0.103 (0.060)*
Bond maturity	0.003 (0.011)	0.008 (0.006)	0.090 (0.023)***
Issue amount	0.006 (0.011)	−0.022 (0.004)***	−0.011 (0.013)
Callable dummy	0.364 (0.389)	0.165 (0.104)	–
Putable dummy	−0.155 (0.277)	−0.137 (0.103)	–
Sinking fund dummy	0.345 (0.123)***	0.616 (0.044)***	–
Senior dummy	–	–	–
Financial	–	–	–
Corporate	−0.345 (0.151)**	−0.156 (0.070)**	−0.088 (0.191)
MTN	0.015 (0.116)	0.082 (0.045)*	−0.049 (0.162)
Local SOE	–	0.191 (0.023)***	0.123 (0.057)**
Non-SOE	–	0.701 (0.045)***	0.462 (0.077)***
Listed	–	−0.037 (0.030)	–
Issuer age	−0.261 (0.061)***	−0.004 (0.001)***	−0.008 (0.004)**
Interbank	−0.014 (0.041)	0.010 (0.022)	−0.012 (0.188)
Year dummies	Yes	Yes	Yes
Industry dummies	No	Yes	Yes
Issuer fixed effect	Yes	No	No
R-squared	0.90	0.66	0.70
No. of obs.	508	4657	380

This table reports bond yield spreads regression for three subsamples. In Column 1, the subsample include 508 bonds by CRA Switchers, or issuers who have acquired ratings from both global-partnered CRAs and domestic CRAs during the sample period. We control for the issuer fixed effect in this regression model. In Column 2, we exclude financial issues. In Column 3, we exclude financial issues and bond issues by issuers without publicly listed equities. The numbers in parentheses are standard errors.

CRAs. Foreign investors, particularly those entering the Chinese capital market for the first time, should be aware of this significant difference in rating scales.

More importantly, our empirical study finds that the Chinese rating scales are very coarse. A notch difference in ratings results in, on average, a difference of 58 basis points in yields. In contrast, prior studies on the US and Europe bond markets find a one-notch difference in investment grade ratings is associated with a 9- to 18-basis-point difference in yields. Thus, a one-notch difference in Chinese ratings is likely equivalent to a one-letter difference in international ratings, suggesting a very crude and coarse Chinese rating scale. A crude and coarse rating scale pools bonds with significant differences in default risk into the same rating category, failing to differentiate them based on default risk and making bond ratings less informative. This is not conducive to the development of a healthy and robust bond market.

Under a bilateral trade agreement with the US in May 2017, the Chinese government pledged permission for international CRAs to have direct access to the Chinese domestic bond market (Wildau, 2017). The entry of more established CRAs in a fast developing bond market and its impact would be of great future research interest.

Appendix A. Variable definitions

This table defines the variables used in the study.

Variable name	Definition
Issuer age	Age (in years) of the issuer at the time of bond issuance
Bond maturity	Years to bond maturity
Bond ratings	An ordinal variable from 1 (for AAA rating) to 4 (for AA– rating)
Coupon rate	Coupon rate in percentage of bonds with fixed coupons

(*continued on next page*)

Variable name	Definition
Central SOE	=1 if WIND classifies the issuer as a state owned enterprise (SOE) by Chinese central government
Local SOE	=1 if WIND classifies the issuer as a SOE by a Chinese local government
Non-SOE	=1 if WIND classifies the issuer as some entity other than SOE
Corporate	=1 if WIND classifies as Corporate bond issues
Enterprise	=1 if WIND classifies as Enterprise bond issues
Financial	=1 if WIND classifies as Financial bond issues
MTN	=1 if WIND classifies as Medium Term Notes.
GP-CRA	=1 for the three CRAs with global partnership (Lianhe_Fitch, Chengxin_Moody and Brilliance)
GP-CRA market Share	Percentage of bonds in the issuer's home province rated by global-partnered CRAs in the previous year
Equity beta	Market model equity beta estimated with daily stock returns from two years prior to bond issuance
Market model error	Market model residual standard error estimated with daily stock returns two years prior to bond issuance
Exchange	=1 if the bond is traded in Shanghai or Shenzhen Stock Exchange
Interbank	=1 if the bond is traded in the interbank market
Issue amount	Gross amount of bond issue in billions of RMB
Listed	=1 if the issuer has public traded equity
Log of coverage ratio	Natural log of the three-year average interest coverage ratio prior to bond issuance
Log of market cap	Natural log of the market capitalization (in billion RMB) at the end of calendar year prior to bond issuance
Long term debt ratio	Three-year average total long term debt to asset ratio prior to bond issuance
Total debt ratio	Three-year average total debt to asset ratio prior to bond issuance
Market to book ratio	Market to book ratio at the end of calendar year prior to bond issuance
Operating profit margin	Three-year average operating profit margin (EBIT/Revenue) prior to bond issuance

(*continued on next page*)

Variable name	Definition
Return on equity	Three-year average return on equity (net income/total equity) prior to bond issuance
Treasury spreads	Difference (in %) between the bond yield at issuance and Chinese Treasury yield of similar maturity

Appendix B

This Table reproduces the coefficients on bond rating dummy variables in bond yield spread regressions from three prior studies. AAA rated bonds are the base case. All coefficients are in percentage. Sironi (2003) studies a sample of European bank subordinate notes and debentures from 1991–2000. Livingston and Zhou (2010) examine a sample of US corporate bonds from 1983 to 2008. Kidwell et al. (1984) investigate a sample of US industrial and utility bonds from 1982 to 1983.

	Sironi (2003)[a]	Livingston and Zhou (2010)[b]	Kidwell et al. (1984)[c]
AA+	0.188	0.142	0.013
AA	0.287	0.241	−0.031
AA−	0.380	0.258	0.370
A+	0.500	0.388	0.505
A	0.541	0.496	0.723
A−	0.736	0.672	1.043
BBB+	0.749	0.839	1.288
BBB		0.982	1.734
BBB-		1.261	1.426
BB+ or lower		1.917	2.693

[a] From Column 1 of Table 4 on page 456.
[b] From Column 1 of Table 2 on page 523.
[c] From Column 3 of Table 2 on page 191. We reset the base case as AAA rated bonds for easy comparison.

References

Ai, J., Bailey, W., Gao, H., Yang, X., Zhao, L., 2017. Corporate default with chinese characteristics. Working Paper.

Baglole, J., 2004. Chinese credit ratings: a huge leap of faith. Far East. Econ. Rev. (January) 39–42.

Bailey, W., Huang, W., Yang, Z., 2011. Bank loans with Chinese characteristics: some evidence on inside debt in a state-controlled banking system. J. Financ. Quant. Anal. 46, 1795–1830.

News, Bloomberg, 2016. China coal miner faces bond date after flagging bailout in 2015. Bloomberg News (March).

Blume, M.E., Lim, F., Mackinlay, A.G., 1998. The declining credit quality of U.S. corporate debt: myth or reality? J. Finance 53, 1389–1413.

Bhojraj, S., Sengupta, P., 2003. Effect of corporate governance on bond ratings and yields: the role of institutional investors and outside directors. J. Bus. 76 (3), 455–475.

Chen, A.H., Mazumdar, S.C., Surana, R., 2011. China's corporate bond market development. Chin. Econ. 44 (5), 6–33.

Covitz, D., Harrison, P., 2003. Testing conflicts of interest at bond rating agencies with market anticipation: evidence that reputation incentives dominate. In: Federal Reserve Board FEDS, pp. 223–268. Working Paper.

CSRC, 2007a. Pilot rules on the issuance of corporate bonds. China Securities Regulatory Commission Order No.49. August 14, 2007. Retrieved March 29, 2016 from http://www.csrc.gov.cn/pub/zjhpublic/zjh/200804/t20080418_14512.htm [in Chinese].

CSRC, 2007b. Interim rules on the security market credit rating industry. China Securities Regulatory Commission Order No. 50. August 24, 2007. Retrieved March 29, 2016 from http://www.csrc.gov.cn/pub/zjhpublic/zjh/200804/t20080418_14513.htm [in Chinese].

CSRC, 2015. Measures for the administration of corporate bonds issuance and trading. China Securities Regulatory Commission Order No.113. January 15, 2015. Retrieved March 29, 2016 from http://www.chinaclear.cn/zdjs/editor_file/20150414122357350.pdf [in Chinese].

Dhawan, R., Yu, F., 2015. Are credit ratings relevant in China's corporate bond market? Chin. Econ. 48, 235–250.

Economist, 2014. A Moral Deficit. The Economist (October 18th, 2014).

Fan, L., Tian, S., Zhang, C., 2012. Why are excess returns on China's treasury bonds so predictable? the role of the monetary system. J. Bank. Finance 36, 239–248.

Gan, J., 2008. Privatization in China: experiences and lessons. In: Barth, J., Tatom, J., Yago, G. (Eds.), China's Emerging Financial Markets: Challenges and Opportunities. The Milken Institute Series on Financial Innovation and Economic Growth 2008.

Guo, Y., Gan, J., Xu, C., 2008. A nationwide survey of privatized firms in China. Seoul J. Econ. 21, 311–331.

GSAM, 2015. FAQ: China's bond market. Goldman Sachs Asset Manage.

Heckman, J.J., 1979. Sample selection bias as a specification error. Econometrica 47, 53–161.

Hong, S., Lamar, M., 2016. China's corporate bonds too murky for many investors. Wall Street J. (June).

Jiang, X., Packer, F., 2017. Credit ratings of domestic and global agencies: what drives the differences in China and how are they priced? BIS Working Papers No 648.

Jiang, H., Stanford, M.H., Xie, Y., 2012. Does it matter who pays for bond ratings? historical evidence. J. Financ. Econ. 105, 607–621.

Kaplan, S.R, Urwitz, G., 1979. Statistical models of bond ratings: a methodological inquiry. J. Bus. 52, 231–261.

Kennedy, S., 2003. China's credit rating agencies struggle for relevance. China Bus. Rev. (November-December) 36–40.

Kennedy, S., 2008. China's emerging credit rating industry: the official foundations of private authority. China Q. (March) 65–83.

Kidwell, D.S., Marr, M.W., Thompson, G.R., 1984. SEC Rule 415: the ultimate competitive bid. J. Financ. Quant. Anal. 19, 183–195.

Kraft, P., 2015. Do rating agencies cater? evidence from rating-based contracts. J. Account. Econ. 59 (2-3), 264–283.

Lee, J.L., 2006. Credit raters in China take generous view. Wall Street J. (March).

Lin, X., Zhang, Y., 2009. Bank ownership reform and bank performance in China. J. Bank. Finance 33, 20–29.

Livingston, M., Zhou, L., 2010. Split bond ratings and information opacity premiums. Financ. Manage. 515–532.

Livingston, M., Zhou, L., 2016. Information opacity and Fitch bond ratings. J. Financ. Res. 39, 329–357.

Lockett, H., 2017. Citi first to fully include onshore Chinese debt in bond benchmarks. Financial Times (March).

Maddala, G.S., 1983. Limited-Dependent and Qualitative Variables in Econometrics. (Cambridge University Press, Cambridge, UK.

Myers, S.C., 1977. Determinants of corporate borrowing. J. Financ. Econ. 5, 147–175.

OECD, 2011. Corporate Governance of Listed Companies in China: Self-Assessment by the China Securities Regulatory Commission. OECD Publishing, Paris http://dx.doi.org/10.1787/9789264119208-en.

PBoC, 1997. Notice of enterprise bonds credit rating qualification for China ChengXin credit ratings co. ltd. and other credit rating institutions. People's Bank of China Order No.547 December 16, 2007. Retrieved March 29, 2016 from http://www.pbc.gov.cn/chubanwu/114566/114579/114661/748135/index.html [in Chinese].

PBoC, 2005. Administrative measures for the issuance of financial bonds in the national inter-bank bond market. People's Bank of China Order No.1. April 27, 2005. Retrieved March 29, 2016 from http://www.pbc.gov.cn/jinrongshichangsi/147160/147171/147358/147400/814739/index.html [in Chinese].

PBoC, 2008. Administrative measures for debt financing instruments of non-financial enterprises in the inter-bank bond market. People's Bank of China Order No. 1. September 4, 2008. Retrieved March 29, 2016 from http://www.pbc.gov.cn/jinrongshichangsi/147160/147171/147355/147383/2847458/index.html [in Chinese].

PBoC, 2016. People's Bank of China Public Notice No. 3, 2016. February 24, 2016. Retrieve March 29, 2016 from http://www.pbc.gov.cn/goutongjiaoliu/113456/113469/3021203/index.html [in Chinese].

Poon, W., Chan, K.C., 2008. An empirical examination of the informational content of credit ratings in China. J. Bus. Res. 61, 790–797.

S&P, 2009. Chinese Bond Market–An Introduction. Standards and Poor's March 2009.

Sheng, H., Zhao, N., 2013. China's State-Owned Enterprises: Nature, Performance and Reform. China's State-Owned Enterprises: Nature, Performance and Reform. World Scientific Publishing Co, Singapore.

Sironi, A., 2003. Testing for market discipline in the European banking industry: evidence from subordinated debt issues. J. Money Credit Bank. 35, 443–472.

Smith, C.W., Warner, J.B., 1979. On financial contracts and optimal capital structure: an analysis of bond covenants. J. Financ. Econ. 7, 117–161.

State Council, 1993. Regulations on administration of enterprise bonds. State Council of the People's Republic of China Order No.121. August 2, 1993. Retrieved March 29, 2016 from http://www.gov.cn/gongbao/content/2011/content_1860733.htm [in Chinese].

Council, State. Regulations on administration of enterprise bonds Order No.588. January 8, 2011. Retrieved March 29, 2016 from [in Chinese].

Sweet, C., Stynes, T., 2013. Suntech defaults on debt. The Wall Street Journal (March).

Tillman, V., 2007. Testimony of Vickie A. Tillman, Executive Vice President, Standard &Poor's Credit Market Services, before the Committee on Banking, Housing and Urban Affairs, United States Senate, September 26.

Trivedi, A., 2016. Foreign money could be slow to enter China's bond markets. Wall Street J. (February).

Tucker, J., 2010. Selection bias and econometric remedies in accounting and finance research. J. Account. Literat. 29, 31–57.

Wildau, G., 2017. Foreign investors welcome US credit agencies to China bond market. Financ. Times (May).

Xu, X., Weng, C.X., 2011. Introduction and suggestions on the Chinese securities credit rating system from a comparative perspective. Univ. Pennsylvania East Asia Law Rev. 6, 217–241.

Yam, S., 2015. How Chinese corporates owe a debt to ratings agencies? South China Morning Post (June).

Zhen, Y., 2013. China's Capital Markets (Chandos Asian Studies Series). Woodhead Publishing, Cambridge, UK.