

Differences in credit ratings of Chinese and foreign enterprises and their determinants

Chiang Hsien-Feng Frank *Packer1*

Abstract: The Chinese characteristics of the credit rating market for Chinese firms are relatively obvious: few firms are rated by both domestic and foreign rating agencies, and domestic ratings for the same firm are on average 6-7 notches higher than international ratings. Although the rating symbols used by domestic and foreign rating agencies are almost the same, they may represent different meanings and have different benchmark effects. In this paper, we propose a method to adjust international ratings for the rating benchmark effect, which makes the adjusted international ratings and domestic ratings highly comparable. On this basis, we further empirically examine the differences in rating determinants of domestic and foreign rating agencies from the perspective of rating decisions. We find that, in terms of the probability of assigning a higher domestic rating to a firm than the adjusted international rating, asset size and leverage are positively affected due to the greater positive weight assigned to them by the domestic rating agencies, and profitability and ownership state attributes are negatively affected due to the greater positive weight assigned to them by the foreign agencies. These effects are robust to controlling for various other variables, scenarios. The conclusions of this paper have implications for rating-related regulatory policy.

Abstract: The market for the credit ratings of Chinese firms featured China-specific characteristics: little overlap of the coverage of domestic and global rating agencies. Domestic agencies rate firms that are jointly rated higher by 6-7 notches on average; the ratings scales of the domestic and global agencies appear to be different despite the similar symbols. Domestic agencies rate firms that are jointly rated higher by 6-7 notches on average; the ratings scales of the domestic and global agencies appear to be different despite the similar symbols. It may be due to the effect that a firm with same credit risk has different relative orders when they are put in different rating systems. After the global ratings are adjusted, by a method provided by us, so as to align global and domestic scales, we test whether the determinants of ratings are similar across global and domestic agencies. We find that larger asset size and higher leverage tend to result in firms receiving higher domestic ratings than adjusted global ratings, but higher profitability or state-ownership are more likely to result in firms receiving higher adjusted global ratings than domestic ratings. This is because asset size is weighed more heavily as a positive factor by domestic agencies, and leverage is weighed more heavily as a negative factor by global agencies. Profitability and state-ownership are weighed more positively by global rating agencies. The impact of the variables is generally stable across a variety of robustness checks. The results suggest a number of policy implications. The results suggest a number of policy implications.

Keywords: credit rating discrepancy, rating benchmark effect, financial regulation,

Disclaimer: The People's Bank of China Working Papers publishes the research results of the staff of the People's Bank of China system in order to facilitate academic exchanges and seminars. The contents of the papers represent the authors' personal academic views only, and do not represent the People's Bank of China. If you need to quote, please indicate the source as "Working Papers of the People's Bank of China".

Disclaimer: The Working Paper Series of the People's Bank of China (PBC) publishes research reports written by staff members of the PBC, in order to facilitate scholarly exchanges. The Working Paper Series of the People's Bank of China (PBC) publishes research reports written by staff members of the PBC, in order to facilitate scholarly exchanges. The views of these reports are those of the authors and do not represent the PBC. For any quotations from these reports, please state that the source is PBC working paper series.

¹ Xianfeng Jiang (jxianfeng@pbc.gov.cn), Institute of Finance, People's Bank of China; Frank Packer (Frank.Packer@bis.org), Bank for International Settlements (BIS). The authors would like to thank Wan Cunzhi, Liu Bin, Gao Ming, Song Weiwei, Chen Zhenrong, and Liu Jing for their comments and suggestions, and in particular, Ma Jun for his support and guidance of this study and Zhu Jiliang and Wang Xin for their help in data collection. The contents of this paper are the authors' personal views and do not represent the views of the People's Bank of China or the BIS.

I. Introduction

Over the past few years, the number of bond issuances by ^{Chinese}² companies has been increasing. This means that the range of debt solvency of issuers has expanded, with a natural increase in the number of high-credit-risk firms, as evidenced by a significant increase in the number of debt defaults. At the same time, the ratings of most enterprises by domestic rating agencies are still in the high AA to AAA range. In contrast, foreign rating ^{agencies}³ rate Chinese firms at much lower levels, on average 6-7 notches lower.⁴ This has led many to question the comparability of domestic and foreign rating agency ratings. Studying this issue and finding a way to compare the two types of ratings and explain the reasons for the differences can clear up some of the incomplete understanding of the Chinese corporate ratings market, provide a reference for the formulation of relevant regulatory policies, and contribute to the promotion of the healthy development of the Chinese corporate ratings market.

In reality, domestic and foreign rating agencies are in a market where connectivity needs to be improved: international rating agencies are not recognized to rate in the domestic market, but can rate Chinese companies in the international market. At the same time, domestic rating agencies provide domestic ratings mainly in the domestic market.

On the surface, the rating symbols used by domestic and foreign rating agencies are almost the same, and the differences in ratings between domestic rating agencies are very small, and the ratings of foreign rating agencies are also very close to each other, but the differences in ratings between domestic and foreign rating agencies are very large. Therefore, we analyze all domestic rating agencies' ratings as one group and all foreign rating agencies' ratings as another group for their comparison.

One possible reason for the wide variation in domestic and foreign rating results is that rating symbols have different meanings among domestic and foreign rating agencies. Rating symbols reflect the relative high or low probability of a firm's default, depending on the firms to which they are being compared. Since domestic rating agencies primarily refer to all domestic firms in their ratings, while foreign rating agencies refer to firms around the world in their ratings, the same rating symbol may represent different meanings when used by domestic and foreign rating agencies, which we refer to as the rating benchmark effect. We propose a simple model to account for this and suggest a method to adjust the former ratings by aligning the ratings of international rating agencies to those of domestic rating agencies. Most of the adjusted international ratings are in the same

position as the domestic ratings, but about 24% are still higher or lower than the domestic ratings.

We analyze the predictive role of commonly used qualitative and quantitative indicators of credit risk with respect to domestic ratings, and adjusted international ratings. Although the differences between domestic and international ratings of Chinese firms are widely known, to our knowledge, our study is the first to discuss in academic detail the comparability of domestic and international ratings and their determinants, and the first to provide comprehensive empirical evidence on the differences between domestic and international rating agencies in their rating decisions for Chinese firms.

We conduct an empirical analysis using a cumulative logistic model that reflects the order of rating levels. We find that large asset size and high leverage favor firms with higher domestic ratings than adjusted international ratings because domestic rating agencies give more weight to asset size as a positive factor, and foreign rating agencies treat leverage as a negative factor with more weight. We also find that high profitability or ownership of state-owned attributes

² Unless otherwise indicated, all references to "domestic" or "China" herein are to mainland China.

³ Some domestic rating agencies have operations in several countries. Nonetheless, for simplicity, the terms "international rating agencies" and "foreign rating agencies" are used herein to refer to those based abroad, and the term "domestic rating agencies" to refer to those based in China. Domestic rating agencies" refers to rating agencies headquartered in the country.

⁴ See analysis in Section 4 below.

The reason that international ratings, which are more conducive to the adjustment of firms, are higher than domestic ratings is that they are regarded by international rating agencies as positive factors with greater weight.

The above determinants of differences in rating decisions by domestic and international rating agencies are robust to controlling for the effects of retained earnings, interest coverage ratios, and industry dummy variables, and after accounting for the effects of replacing international ratings by international rating agencies with Greater China ratings, different international rating adjustment methods, and differences in accounting reporting regimes on the financials.

In terms of the quantitative impact of the variables, the analysis of scenarios in which the non-dummy variable changes by one standard deviation, or where the state ownership attribute is set differently from the baseline scenario, reveals that the magnitude of the impact is more pronounced in the case of asset size and the state ownership attribute, and more limited in the case of leverage and profitability.

The rest of the paper is structured as follows: after the literature review in Section 2, we present in Section 3 the Section 4 describes the market system for rating Chinese companies, including market characteristics and the regulatory use of ratings.

It describes a sample of domestic and international ratings and analyzes the differences in their distributions; Section 5 proposes a simple model to explain the different meanings of domestic and international rating agency rating symbols as a result of the rating benchmark effect, and suggests a corresponding methodology to adjust the international ratings to make them comparable to the domestic ratings; and Section 6 provides an explanation of the differences in the distribution of domestic and international rating agency ratings in the context of a sample of domestic and international ratings.

Decision differences are analyzed empirically, and various robustness tests are conducted in Section 7. Finally, we summarize the main findings and discuss the corresponding policy implications.

II. Literature review

Our study builds on two main categories of existing literature. The first category is related to the analysis of the factors influencing differences in rating decisions, which mainly includes the determinants of differences in the decisions of U.S. rating agencies, and the factors influencing differences in the rating decisions of U.S. rating agencies and local major rating agencies outside the U.S. There is not much literature in the latter subcategory. The second category of literature is related to the analysis of credit risk in the Chinese market and the role of Chinese

domestic rating agencies, and there is even less literature in this category, mainly because of the relatively short history of the development of China's domestic bond market and rating industry.

Early research in the first strand of the literature on differences in rating decisions by U.S. rating agencies focused on Moody's

(The ratings of the two major rating agencies, Moody's (1985) and Standard & Poor's (S&P, hereinafter referred to as "S&P"), are intertwined with the ratings of non-financial corporations. Ederington (1985) and Ederington (1986) found that 60% of Moody's and S&P's ratings of non-financial corporations could be explained by financial indicators related to credit risk, and that the pattern of rating determinants did not differ significantly between the two. The inconsistency between their ratings is mainly related to industries with high uncertainty, especially the financial sector (Morgan 2002). Indicators of asset transparency, including market-to-book (MAB) ratios, intangible assets, and firm size have some predictive power for rating differences (Morgan 2002). In a recent study, Bowe and Larik (2014) show that predictors of rating differences also include corporate governance characteristics and that Moody's tends to assign higher weights to these factors.

Other studies have analyzed the impact of other rating agencies on competition in the U.S. ratings industry, particularly the tendency for ratings shopping by smaller firms to lead to possible ratings overvaluation (ratings inflation). Although some rating agencies tended to assign higher ratings than Moody's and S&P ratings in an average sense, after examining the ratings of Moody's, S&P, and the then third (Duff & Phelps) and fourth (Fitch) largest U.S. rating agencies, Cantor and Packer (1997) found that sample selection related to rating shopping bias (the tendency of highly rated firms to select smaller rating agencies) could not explain the rise in average rating grades.

More recently, Becker and Milbourn (2011) find that Fitch's increased competition with Moody's and S&P in the structured finance industry since the 1990s has not only led to an increase in Fitch's own rating ratings compared to the previous period, but also led to an increase in the rating ratings of Moody's and S&P, which has led to a decline in the correlation between ratings and bond yields. Skreta and Veldkamp (2009) show that rating shopping is related to the complexity of the assets being rated, while Bolton, Freixas, and Shapiro (2012) argue that rating shopping and overvaluation are more likely to occur during periods of economic upturn.

However, the differences between U.S. rating agency ratings are much more dwarfed by the differences between the ratings of Moody's and S&P and those of other national rating agencies, and are especially pronounced when it comes to ratings of non-U.S. firms. 早在 the 1990s, Beattie and Searle (1992) and Cantor and Packer (1994) found that among U.S. firms and non-U.S. firms rated by both U.S. and non-U.S. rating agencies, there was consistently a large discrepancy between ratings by Moody's, S&P, and non-U.S. rating agencies: the former were more conservative, or had lower ratings. The lower ratings of the US rating agencies may be related to the historical development of their rating industry: in the US, there was a bond market and several waves of debt defaults more than 100 years before the emergence of the rating industry (Sylla 2002). When the US rating agencies first started rating, they assigned many ratings of BBB and below, with the *BBB5 evolving* in subsequent years to become the regulatory threshold for rating investment grade and speculative grade. In many countries with emerging bond markets, the *raison d'être* of the rating agencies is related to meeting regulations for bond issuance or bond investment. Often these regulations require ratings above a certain level, so rating agencies are forced to assign higher ratings.

The difference in ratings between United States and non-United States rating agencies in Asia is striking. In Japan, which has long been the largest bond market in Asia, the ratings of Japanese rating agencies in the 1990s were, on average, two to four times higher than the ratings of foreign rating agencies (mainly Moody's and S&P) for firms that were rated by a combination of domestic and foreign rating agencies.

ratings (Watanabe 1995; BCBS 2000; Packer 2002). GlobalCapital (2013) reports even greater differences in ratings between U.S. and South Korean rating agencies in South Korea, and Joe and Oh (2016) find that some foreign-owned firms are assigned higher ratings by domestic South Korean rating agencies than by foreign rating agency ratings. As for Chinese domestic rating agencies' ratings that are much higher than foreign rating agencies' ratings (on average, more

than six notches higher), the

Facts, which have been widely reported (Lee 2006; Law 2015), have also received attention from some scholars (Wilson 2006; Kennedy 2008; Dhawan and Yu 2015).

However, there is very little academic discussion on whether domestic and foreign rating agencies consider different factors or assign different weights when rating domestic firms. We only collect one relevant study (Ismail, Oh, and Arsyia 2015), who examine panel data including five developed and nine emerging market countries, analyze firms rated by both U.S. rating agencies and local rating agencies, and find that the difference in domestic and foreign ratings of high P/E firms in emerging market countries is significant, but the difference in domestic and foreign ratings of high leverage firms in emerging market countries is ratio firms have little difference in domestic and foreign ratings. They do not consider whether the rating symbols of local rating agencies and those of United States rating agencies have the same meaning.

Foreign rating agencies have been criticized because their ratings are often significantly lower than those of local rating agencies. One of the criticisms is that foreign rating agencies do not understand the influencing factors behind credit risk in the local environment. In the case of Japan, Packer's (2002) study shows that foreign and local rating agencies do not take into account the impact factors behind credit risk in the local environment in their ratings.

⁵ *Until* roughly the 1970s, rating symbols were not followed by symbols such as + and -.

The same factor. Although the sample of defaults was relatively small at that time, JCIF's (1999) study of default data also supports the idea that foreign rating agencies are tougher on their rated subjects than Japanese domestic rating agencies.

In China, whether domestic and foreign rating agencies consider different impact factors when assigning different rating grades has not been systematically studied. However, there have been some relevant hypothetical explorations (Wilson 2006), and some reports also point to some features of ratings in China: rating shopping behavior of firms (Law 2015), the possibility of domestic rating agencies grouping together in order to limit the emergence of low ratings (Wilson 2006), and restricting the entry of foreign rating agencies (Lee 2006). To the best of our knowledge, no one has provided rigorous empirical evidence on the above hypotheses or characteristics.

In contrast to the limited research on Chinese firm ratings, there has been a considerable amount of literature analyzing the credit risk assessment of Chinese firms from firm-level data, most of which take into account the important characteristics of the Chinese economy in terms of the large number of Chinese-owned and non-state-owned firms. On the one hand, non-state-owned firms may face discrimination when it comes to bank financing (Culla and Xu 2005; Allen, Qian, and Qian 2005), have higher borrowing costs, and find it more difficult to obtain credit in times of tight monetary policy (Lu, Zhu, and Zhang 2012). On the other hand, Li, Yue, and Zhao (2009) find that NSOEs have less debt and investment but are more profitable; Fan, Huang, and Zhu (2013) find that NSOEs perform better and are more ^早 out of financial distress than SOEs when faced with financial distress; Ai et al. (2015) also find that SOEs have higher default rates (2015) also found that SOEs have a higher default rate.

Like the non-ratings literature focusing on the Chinese economy, this paper focuses on the important role of the nature of ownership of SOEs and non-SOEs in the decisions of rating agencies. As the above literature suggests, although SOEs have some advantages when it comes to financing, they may have higher credit risk. This has not been conclusively evidenced when the nature of ownership is considered as a negative or positive factor in rating agency decision making both domestically and internationally. This paper attempts to extend the ratings literature in this respect and controls in the empirical analysis for factors commonly used in credit risk analysis (Altman 1993; Harrington 2003; Fridson and Alvarez 2011).

III. Institutional characteristics of the rating market for Chinese enterprises

(i) Characterization of the rating market

对中国企业的评级市场的市场连通程度不明显，这主要和债券市场联通程度不高相联系⁶。一方面，国内外企业债券市场整合度有待提高⁷。另一方面，国内债券市场的整合程度也不高（蒋贤锋和史永东，2010）：公司债在交易所债券市场发行和交易，主要受证监会监管；企业债多在银行间 Corporate bonds are issued and traded in the exchange bond market, which is mainly supervised by the Securities and Futures Commission (SFC); corporate bonds are mostly issued and traded in the interbank bond market, which is mainly supervised by the People's Bank of China (PBOC) and self-regulated by the Association of Interbank Market Dealers (AIBMD).

As different domestic bond markets are subject to different regulatory regulations and supervisory authorities, the fact that a rating agency is recognized by the regulators of one type of bonds does not mean that it can automatically be recognized by the regulators of other types of bonds. At present, the independent rating agencies that can recognize the ratings of the above types of bonds by the regulators are: Dagong Global Credit Rating Co. Ltd. (Peng Yuan Credit Appraisal) and Shanghai Far East Credit Appraisal Co., Ltd. (Shanghai Far East) are recognized to rate corporate bonds in the exchange bond market and inter-bank market.

⁶ In 2012, the PBOC led the establishment of a ministerial coordination mechanism for corporate credit bonds, which has and will continue to improve the connectivity of China's bond market and the connectivity of the ratings market in the future.

⁷ Chinese regulators have opened up more and more channels for foreign firms to enter the Chinese market in recent years.

(excluding other bonds) are rated, and therefore the analysis below also incorporates rating data from Pengyuan Credit and Shanghai Far East⁸.

In addition, there are two domestic rating agencies with wholly domestic ownership and foreign equity participation that are commercially acting in a manner equivalent to being recognized by all regulators for rating purposes through a common holding company: United Credit Rating Co. Ltd. (CCSIC) and China Chengxin Securities Appraisal Company Limited (CCSAC) (hereinafter referred to as "China Chengxin International Credit Rating Company Limited") and China Chengxin Securities Appraisal Company Limited (hereinafter referred to as "China Chengxin Securities Appraisal Company Limited"). The controlling shareholders of both China Chengxin and China Chengxin Rating Company Limited are Union Credit Management Company Limited, and Fitch, a foreign rating agency, holds 49% of the shares of Union Credit Management Company Limited. Moody's, a foreign rating agency, holds a 49% stake in CITIC. Table 1 describes the profile of these domestic rating agencies.

Table 1: List of Major Domestic Rating Agencies

Rating Group or Code	English Company Name	Bank bond market regulator endorsement	Exchange Bond Market Supervision in Chinese	Bonds Full name	Chinese Supervision of	Abbreviation in English	Website	Full name
China Chengxin (China)	Chengxin	0	1	0	Zhong Cheng (person who is honest and sincere)	China Chengxin Securities Appraisal Company Limited	www.ccxr.com.cn	
National Integrity Credit Management Company Limited	Shanghai Far East Credit Rating Company Limited	FarEast	0	1 ³	letter of credit deed (i.e. the deeds of great-grandfather)	Shanghai Far-East Credit Rating Company Limited	www.sfecr.com	
great-Division grandfather	Dagong ChengxinI	1	1	1	great-Zhong Cheng (person who is honest and sincere)	Dagong Global Credit Rating Company Limited	www.dagongcredit.com	
Pengyuan	Pengyuan Credit Rating	0	1 ³	1	believe in a country of faith	Pengyuan Credit Rating Company Limited		
two-character surname Dongfang	Orien	1	1	1	meet the orient with (circu	Golden Credit Rating Company Limited	www.dfratings.com	

on LTD.
company Pengyuan Credit
Rating Co., LTD. www.pyrating.cn

⁸ Despite the small number of ratings from Shanghai Far East in our sample, we include it in our analysis mainly because it is the most^早 domestic credit rating agency in China founded by a non-banking institution. The exclusion of Shanghai Far East from our sample does not change the conclusions of this paper.

Note: 1. The table does not list the qualifications for rating bank credit or other credit products. 2. All columns except the first one refer to the relevant information of the rating group or company itself, or its wholly-owned subsidiaries, or its controlled subsidiaries. 3. The accreditation information of each rating agency is obtained from the websites of each of them and the most recent public information or reports as follows: according to the document of Development and Reform of Caijin [2003] No. 1179, United Credit Information, CITIC, Dagong International, Shanghai New Century, United Credit Information, Shanghai Far East and Shanghai New Century have the qualifications for rating corporate bond issues. According to Document No. 1179 of Development and Reform Finance and Jin [2003], United Credit Information, China Chengxin International, Dagong International, Shanghai Far East and Shanghai New Century have the qualification of rating for corporate bond issuance; and in June 2014, the People's Bank of China listed the ratings of Dagong International, Shanghai New Century, United Credit Information, China Chengxin International and Dongfang as the ratings of the six rating agencies that can be utilized in the inter-bank bond market (<http://www.pbc.gov.cn/jinrongshichangsi/147160/147171/147358/147406/2806822/index.html>); and the SEC has issued a series of guidelines on rating qualifications in SEC Agency Zi [2007] No. 223, [2007] No. 250, [2] No. 3, and [2] No. 4, [2] No. 5, [2] No. 6, and [2] No. 7. 007] No. 310, CSRC License [2008] No 714, [2011] No 893, [2014] No. 417 respectively recognized the qualification of China Chengxin Securities, Shanghai New Century, Dagong, Tianjin Zhongcheng Credit Appraisal Company Limited (the successor of United Ratings), Dongfang, and Shanghai Far Eastern to rate bonds on the exchange market. As per the latest information, Pengyuan and Shanghai Far East are not qualified to rate non-corporate bonds issued in the interbank market. 4. Prior to Guo Fa [2015] No. 11, the rating agencies for the rating of bonds investable by insurance funds were also required to be recognized by the CIRC. This table has no regulatory or legal implications. Source: Organized by the authors.

Another manifestation of poor connectivity in the ratings market is the restricted participation of foreign rating agencies in rating Chinese companies. China's current laws and regulations do not prohibit foreign rating agencies from rating Chinese companies, but the rating industry has been included in the restricted investment catalog of the Catalogue for the Guidance of Foreign Investment Industries since 2007. In this environment, although major international rating companies, including Moody's, S&P, and Fitch, have set up subsidiaries or representative offices in China, no wholly foreign-owned foreign rating company has yet been recognized to provide ratings in the domestic market. Although Moody's and Fitch hold shares in domestic rating agencies, these domestic rating agencies are nominally independent of international rating agencies. At the same time, the issuance of bonds by Chinese companies overseas is more likely to be regulated by local overseas regulators, who generally do not impose mandatory requirements on corporate or bond ratings. Under these circumstances, internationally renowned rating agencies are free to provide rating services when Chinese companies issue bonds overseas.

(ii) Regulatory use of ratings

Credit ratings are used in a number of regulations, mainly in the form of

threshold requirements for bond issuance or investment. 早在 1992, the State Council required corporate bonds to be rated before issuance (Guo Fa [1992] No. 68). Since then, many regulations have required ratings to be obtained prior to the issuance of various types of bonds (especially public offerings), and some regulations have further required a minimum rating level for bond issuance, such as the SEC's requirement that corporate bonds should be rated AAA prior to public offerings (SEC Decree No. [2007] 49, No. [2015] 113)

⁹.

The regulatory use of ratings is not only reflected in the bond issuance thresholds, but also in the issuance schedules of highly rated companies

The procedure may also be simplified. For example, the approval process for the issuance of corporate bonds by enterprises rated AAA was simplified in 2013 (Circular No. 957 of the Development and Reform Office of the Ministry of Finance [2013]), and the approval for the issuance of corporate bonds guaranteed by AAA-rated enterprises or assets was also simplified in 2015.

The use of ratings in regulation is also reflected in other aspects, including bank capital requirements, fund investment guidelines, bond trading guidelines, and insurance company investment guidelines. For example, credit bonds generally require a main body rating of AA and above for exchange-traded pledge repurchase transactions; money market funds can only invest in bonds with a main body rating of AA+ and above; and for non-financial bonds issued domestically that insurance companies can invest in, the CIRC has set the main body rating to be A or above (CIRC [2012] No. 58).¹⁰ The CIRC has also set a standard of "A" or above for the main body rating of domestically-issued non-financial bonds that insurance companies can invest in.

⁹ The State Council changed the SEC's approval of credit rating agencies engaging in securities services from front-loaded to back-loaded in Guo Fa [2014] No. 50.

¹⁰ For details of the documents related to the relevant provisions, please refer to the Business Guidelines on the Admission Criteria for Pledge Repo Eligibility and the Valuation of Discount Coefficients for Standard Coupons (Revised Version of Calendar Years), SEC Decree No. 120 (2015), SEC Announcement [2015] No. 30, and CIRC Issuance [2012] No. 58, among others. In addition, the State Council changed the administrative license of the CIRC regarding the approval of credit rating agencies in which insurance companies may invest in corporate bonds in Guo Fa [2015] No. 11.

Overall, many of China's regulatory thresholds for rating requirements are set at AA+ or AAA, in contrast to the broader range of rating thresholds in developed market regulation (Cantor and Packer 1994). Of course, Chinese regulators also take into account the fact that the vast majority of bonds issued abroad are not rated by domestic rating agencies, but only by foreign rating agencies, and therefore set different thresholds for ratings by domestic and foreign rating agencies. For example, the minimum rating requirement for offshore non-financial bonds that insurers can invest in is a debt rating of BBB- and above by an internationally recognized rating agency (Insurance Supervision and Administration [2015] No. 33).

China's regulators are also aware of the reality that domestic rating agencies have little international business, and have therefore taken into account the regulatory role of international rating agency ratings. For example, the recognized rating agencies listed by the SFC for QDII management are all international rating agencies, including Moody's, S&P, Fitch and Dominion Bond Rating Service Limited (SFC [2007] No. 81).

While the use of ratings is regulated, the industry itself is also regulated. One example is that, in order to promote transparency and international communication in the rating industry, regulatory authorities require rating symbols to be consistent with internationally recognized symbols. In 2006, the People's Bank of China (PBOC) issued a guideline (Yinfa [2006] No. 95) regulating the use and meaning of rating symbols in China. Among them, the long-term issuer rating symbols are the same as S&P's long-term issuer rating symbols, which are still used by major domestic rating agencies. In addition, regulators have also made efforts to promulgate regulations (NDRC Circular [2012] 3451, SFC Decree [2007] 50, and RTA Announcement [2013] 1) to combat rating shopping and vicious competition.

IV. Ratings and distribution characteristics of domestic and foreign rating agencies

(i) Samples and data

Taking the long-term issuer ratings of Chinese nonfinancial firms in effect in ²⁰¹⁵¹¹ as a sample, we collect rating data from multiple sources. The number of domestic ratings comes from the Vantage database. Since some firms may have been rated multiple times from the same rating agency in a year, and some firms' ratings were not updated because they did not maintain the same rating for a long time before they were withdrawn, we determine the rating level of a firm by a particular rating agency in 2015 according to the following ratings time principle: if

a firm has a rating record in 2015, we take the rating time in 2015

The ratings most^早 of the year are 2015 ratings; if a business has only pre-2015 ratings and the latest

ratings in 2013 or later, we took the rating with the latest rating as the 2015 rating. For

international ratings data, due to their incomplete recording in commonly

used commercial databases, we obtained the ratings from the rating agency

We obtained the list of Chinese companies rated by Moody's from the

publication We obtained the list of Chinese companies rated by Moody's

from Moody's publication "Inside China"¹¹ (Moody's 2016) ("Moody's List"). As

the Moody's List lists Chinese companies in 2016 2

The ratings in effect as of January 1 were not listed, so we checked

each company's rating history on Moody's Chinese website

(http://www.moodys.com/pages/default_ch.aspx) to determine the 2015 ratings.

Moody's website records four categories of long-term issuer ratings: long-term issuer ratings,

long-term corporate family ratings, senior unsecured ratings, and supported senior

unsecured ratings. (supported senior unsecured rating). These ratings also

differentiate between local and foreign currency ratings. For a business, the

¹¹ Prior to 2015, the number of firms rated by both domestic and international rating agencies was relatively small.

We matched the ratings on Moody's List in the order of long-term issuer ratings, long-term corporate family ratings, senior unsecured ratings and supported senior unsecured ratings for local currency ratings and in the same order for foreign currency ratings. Once matched, we treated the ratings in that category as a rating category on Moody's List and then determined the 2015 ratings in accordance with the rating timing principles described above.

We obtained a list of Chinese companies rated in 2015 from S&P ("S&P list") and their most recent ratings at that time, and then retrieved all historical ratings for these companies from Capital IQ (<http://www.capitaliq.com>). S&P assigns long-term issuer foreign currency ratings, long-term issuer local currency ratings and Greater China Regional ratings to Chinese companies. Among them, the Greater China Regional rating is based on international ratings (S&P 2014a; S&P 2014b) and indicates the ranking of a firm's debt solvency in the Greater China region, which is not capped by China's sovereign rating, up to AAA. We match long-term issuer local currency ratings, long-term issuer foreign currency ratings, and ratings from S&P's list in the order of the ratings in order to identify the rating categories and then determine the 2015 ratings in accordance with the rating timing principles described above.¹²

Table 2: Sample size of ratings by rating agency

rating agency						
	Rating Agency Code		Frequency		Percentage	Frequency
A: All	Percentage					
original domestic ratings	B: All of the multiple ratings screened by the lowest-ranking principle	ChengxinI	765	19	660	20
		Pengyuan	746	19	618	19
		Dagong	684	17	599	18
		LianheI	616	16	550	17
		Brilliance	604	15	512	15
		LianheS	201	5	132	4
		ChengxinS	186	5	127	4
		Orient	153	4	111	3
		FarEast	4	0	1	0
		International ratings	Moody	150	50	102
	SP	149	50	78	43	

Part A of Table 3 presents the number of rated firms by rating company. China Chengxin International, Pengyuan Credit, Dagong International, United Credit and Shanghai New Century are the major players in the domestic ratings market, accounting for 86% of the total of about 4,000 domestic ratings in the sample. The number of international ratings we could obtain from Moody's and S&P for this study was around 300, much lower than the number of domestic

ratings. Of these, Moody's and S&P have approximately the same market share of international ratings.

To facilitate the quantitative analysis that follows, we refer to the ratings research literature (Packer, Cantor, and Cole 1997) to digitize the rating scale. Specifically, we assign numbers 17 through 2 to ratings AAA or Aaa through B- or B3, in that order, and number 1 to ratings CCC or Caa and below. We exclude ratings of D, as well as ratings of firms that have defaulted, or had their ratings withdrawn.

(i) Differences between domestic and foreign rating agency ratings

As mentioned earlier in Section 3, the long-term issuer rating symbols of the domestic rating agencies were standardized after 2006 to be the same as those of the well-known international rating agency S&P. Since Moody's and S&P's long-term issuer

¹² In the following analysis, we use the terms "Moody's" and "SP" to denote the two rating agencies, Moody's and S&P, respectively. For ease of presentation, we also use *cnSP* denotes S&P, but refers to the ratings it provides for the Greater China region.

Pedestrian rating symbols correspond to each other, so that, at least superficially, the rating symbols themselves can be compared directly across rating agencies within the same range. We treat the international ratings of Moody's and S&P together as one group (the international ratings group), the Greater China ratings of S&P as one group, and the ratings of all domestic rating agencies together as one group (the domestic ratings group). Table 3 reports the statistical distribution of the ratings in each group.

Table 3: Distribution of all ratings (all samples)

Rating	NumericRating	Freq_Domestic	prop_Domestic	Freq_Global	prop_Global	Freq_cnRegional	prop_cnRegional
AAA (Aaa)	17	507	12.81			18	12.08
AA+(Aa1)	16	743	18.77			7	4.7
AA (Aa2)	15	2011	50.8			12	8.05
AA-(Aa3)	14	551	13.92	17	5.69	1	0.67
A+(A1)	13	75	1.89	20	6.69	17	11.41
A (A2)	12	16	0.4	16	5.35	14	9.4
A-(A3)	11	15	0.38	33	11.04	13	8.72
BBB+(Baa1)	10	9	0.23	32	10.7	16	10.74
BBB(Baa2)	9	11	0.28	29	9.7	1	0.67
BBB-(Baa3)	8	5	0.13	29	9.7	7	4.7
BB+(Ba1)	7	2	0.05	19	6.35	13	8.72
BB(Ba2)	6	6	0.15	13	4.35	12	8.05
BB-(Ba3)	5	2	0.05	33	11.04	9	6.04
B+(B1)	4			25	8.36	4	2.68
B (B2)	3	1	0.03	19	6.35		
B-(B3)	2	1	0.03	6	2.01	3	2.01
CCC(Caa)	1	4	0.1	8	2.68	2	1.34
number of firms		3310		180		149	
number of ratings		3959		299		149	
mean of ratings		15.16		8.09	-34.65***	10.74	-12.71***
median of ratings		15		8	15426.5**	11	113686.5***

Note: 1. Columns "Freq_Domestic" and "prop_Domestic" show the frequency or proportion of domestic ratings, while tables "Freq_Global", "prop_Global", "Freq_cnRegional" and "prop_cnRegional" show the frequency and proportion of international ratings, and the frequency and proportion of ratings for Greater China. 2. In the "mean" row, columns "Freq_Domestic", "Freq_Global" and "prop_cnRegional" show the frequency and proportion of international ratings, and the frequency and proportion of ratings for Greater China. In the "mean" row, the columns "Freq_Domestic", "Freq_Global", "Freq_cnRegional" are the average of the values for domestic ratings, international ratings, and Greater China ratings.

The data in the table show a feature that has been found in many other countries: the ratings of domestic rating agencies are significantly higher than the ratings of international rating agencies. In particular, the numerical average of the domestic ratings is 15.16 (equivalent to the average of the international ratings of the international rating agencies).

The average numerical rating is 7.07 notches higher than the average international rating (AA/Aa2) and 4.42 notches higher than the Greater China rating. The t-test (not reported) shows that the difference in the mean numerical ratings is significant at

the 1% level. Differences in median international, Greater China and domestic ratings are also significant.¹³

Ratings from domestic and foreign rating agencies also differ significantly in other distributional characteristics. Compared to the more than 97 percent of domestic ratings that are A+ and above, international and Greater China ratings are more evenly distributed across the entire range from CCC to AAA. The difference in the distribution of AA and above ratings is even more pronounced: the percentage of domestic ratings is 81 percent, the percentage of international ratings is zero, and the percentage of Greater China ratings is only 25 percent.

¹³ Due to the similarity of the results of the median and mean comparisons, our analysis in this paper only presents the results of the mean comparisons and not the median comparisons.

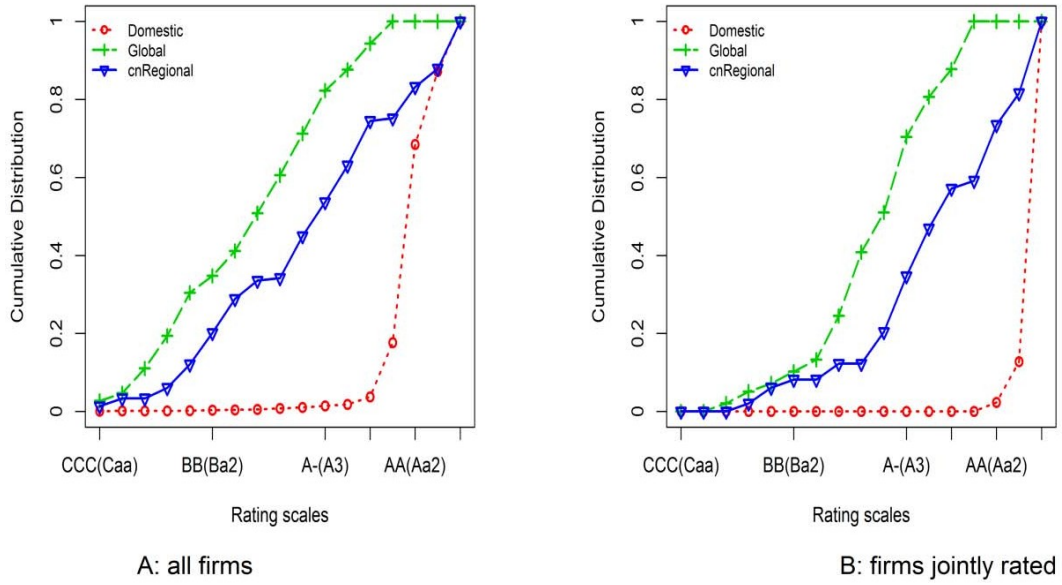


Figure 1: Cumulative Experience Distribution of Domestic Ratings, International Ratings and Greater China Ratings

Note: The distribution of intermediate points is linearly interpolated.

The differences between the overall distributions of ratings across categories are made clearer in the cumulative experience distributions in Section A of Figure 1. The cumulative probability is greater for international ratings and Greater China ratings than for domestic ratings in any given rating. Statistically, domestic ratings first-order stochastically dominate) international ratings and Greater China ratings.

The sample selection effect of domestic and foreign rating agencies on rated firms is small and cannot explain the above apparent differences. The sample selection effect is manifested by the fact that the credit risk of firms rated by domestic rating agencies is lower than the credit risk of firms rated by foreign rating agencies. Clearly, there is no such sample selection problem for co-rated firms (firms rated by both domestic and foreign rating agencies). For the 58 co-rated firms in the sample, the average domestic rating is 16.8, which is about 6.8 grades higher than the average international rating and about 4.1 grades higher than the Greater China rating. Thus, when excluding sample selection effects and focusing on the co-rated firms, the comparison of the differences in the mean domestic and international rating agency ratings remains significant, and the stochastic predominance relationship between the overall distributions remains unchanged (Section B of Figure 1).

Our treatment of blending all domestic rating agency ratings together and also

blending all foreign rating agency ratings together does not exaggerate comparisons of rating differences. Section A of Table 4 presents the statistical characteristics of the ratings sample for firms that are rated by both of the rating agencies together. The difference in mean values between the domestic ratings of a single domestic rating agency and the international ratings of a single foreign rating agency ranges from 5 to 9 notches, and The mean difference between ratings in Greater China ranges from 2 to 6 ratings at the same time. At the same time, the difference in the mean between domestic ratings is less than 0.5 rating and the difference in the mean between international ratings is almost 0. Therefore, the comparison between ratings of each rating agency is consistent with the results of the comparison that mixes domestic ratings agencies together and foreign ratings agencies together.

Table 4: Statistical indicators of ratings of jointly rated enterprises

rating agency coding	ChengxinI	ChengxinS	Dagong	FarEast	LianheI	LianheS	Orient	Pengyuan	cnSP	MoodSP ^y
Panel A. mean difference										
Brilliance	0	0	0.28		0.07	0	-0.33	-0.06	3.78	6.57
ChengxinI		0.08	0.26		0.09	0	-0.33	-0.04	2.91	5.83
ChengxinS			0.12		-0.11			0	5.57	8.11
Dagong					-0.17	-0.38	-0.52	-0.25	3.06	6.31
FarEast										
LianheI						-0.05	-0.25	-0.11	4.33	6.36
LianheS							0.4	0.15	6.5	8.25
Orient								0.36		
Pengyuan										
cnSP										2.76
Moody										2.69
Panel B. Spearman correlation										
Brilliance	0.95	1	0.55		0.96		0.77	0.67	0.69	0.76
ChengxinI		0.9	0.89		0.89	1		0.67		0.35
ChengxinS			0.89		0.93			0.82	0.8	0.84
Dagong					0.86	0.54	0.26	0.31	0.43	0.43
LianheI						0.87	0.66	0.62	0.44	0.45
LianheS							0.75	0.63	0.77	0.77
Orient								0.09		
cnSP										0.99
Moody										1

Table 5: Number of enterprises with common ratings between rating agencies

grader structural code	ChengxinI	ChengxinS	Dagong	FarEast	LianheI	LianheS	Orient	Pengyuan	cnSP	MoodSP ^y
Brilliance	14		29	0	14	8	6	36	9	7
ChengxinI		76	54	1	44	3	6	45	22	24
ChengxinS			8	1	9	1	0	9	7	9
Dagong				0	46	8	21	79	16	16
FarEast					1	1	0	0	0	0
LianheI						58	16	70	15	14
LianheS							5	13	4	4
Orient								25	1	1
Pengyuan									1	0

cnSP	119	14
		9
Moody		11
		9

(ii) Rank correlation between ratings

Since rating results indicate the relative magnitude of the credit risk of the rated firms, another measure for comparing differences in ratings across rating agencies is the rank correlation, which reflects the relative position of the ratings. Although the difference between the means of the two sets of ratings is relatively large, they may reflect the same relative ranking results for credit risk (i.e., a large rank correlation). On the other hand, two sets of ratings with small differences in mean values may reflect very different relative credit risk ranking outcomes (i.e., small rank correlation). For rank correlation, we use the Spearman correlation coefficient.

We calculated their rank correlation coefficients for the co-rated firms in Section B of Table 4, which shows that there is a strong correlation between domestic ratings and a large correlation (close to 1) between international ratings, but the correlation between domestic ratings and international ratings is very small, and in some cases even negative. This suggests that domestic ratings have some commonalities, as do international ratings, but that there are significant differences between them.

Part B of the previous Figure 1 shows that Greater China ratings are distributed between international and domestic ratings. A comparison of rank correlations further shows that Greater China ratings fall into the international ratings camp: the rank correlation coefficient between Greater China ratings and international ratings is close to 1, while the rank correlation coefficient between Greater China ratings and domestic ratings is well below 1.

(iii) Consolidated rating data

Based on the previous comparisons, for the purposes of the regression analysis below, we further merge the two sets of ratings, the domestic ratings and the international ratings: the international ratings from Moody's and S&P are merged into another set. When a firm has ratings from more than one rating agency, we use the lowest rating principle to take the lowest rating as the rating for that firm. The lowest rating principle is widely used in Chinese regulation (CBRC [2012] Order 1, IAIS [2012] Circular 93) and US regulation (OCC 2007)¹⁴. We also discuss alternative treatments for determining a rating from multiple ratings in Section 7.²¹⁵. As a result of the grouping and multiple rating screening described above, the total sample size was reduced from 4407 to 3639.

Given the difference in mean values between the Greater China ratings and the international ratings, we treat the Greater China ratings as an additional separate group. Also, because of the strong rank correlation between the Greater China ratings and the international ratings, we replace the international ratings with the Greater China ratings as a robustness analysis in Section 7.1.

V. Decomposition of rating benchmark effects

As discussed above, domestic ratings and international ratings have different meanings, mainly in terms of the benchmarks used to compare the debt-servicing capacity of the same firm: domestic ratings measure a firm's ranking in the mainland Chinese market, while international ratings portray a firm's relative position in the global market. Due to the different benchmarks, the ranking of the same firm is likely to be different, which we call the "rating benchmark effect". In this section, we try to propose a simple model to explain this effect and suggest a feasible way to decompose it.

(i) A simple model of the rating benchmark effect

¹⁴ In 2012, the OCC "eliminated references to ratings in its regulation of investment securities, securities offerings, and capital-equivalent deposits in foreign banks" (OCC Bulletin 2012).

¹⁵ How one of the multiple ratings is determined may lead to different outcomes (Bongaerts, Cremers, and Goetzmann 2012; He, Qian, and Strahan 2016).

Assume that there are two types of rating agencies: domestic rating agencies (d) and foreign rating agencies (f), which provide domestic and international ratings, respectively.¹⁶ For the rated firms denoted by the vector $x \in \mathbb{R}^k$, the rating estimation function of the domestic rating agencies is $h^d(x)$. At the same time, rating agencies face some uncertainties or shocks, such as uncertainty about x , peer competition pressure, pressure from rated firms, and so on. We denote these uncertainties by ξ^d , which is assumed to be independent of x . We use ξ to denote these uncertainties by ξ . For $n = 2, \dots, N$, if the sum of the rating estimation function and the realized rating shocks falls in some rating interval $A^d = (-\infty, a^d]$, $A^d = [a^d, \infty)$ and $A^d = [a^d, a^{d+1})$, then the rating agency assigns a rating of $r^d(x)$ to the firm. We call a^d the rating threshold and requires $a^d < a^{d+1} < \dots < a^N$. In other words, the rating agency gives a rating of $r^d(x)$.

The event of $n \in \square \equiv \{1, 2, \dots, N+1\}$ and the event of a rating shock $\xi^d - h^d(x) \in A^d$ are equivalent. In this way, the rating decision of the rating agency consists of the group of the rating estimation function $h^d(x)$, the rating shock ξ^d , the rating threshold $\{a^d\}$ into. Similarly, the rating decisions of foreign rating agencies are determined by $\{h^f(x), \xi^f, \{a^f\}\}$ with rating intervals $\{A^f\}$.

Definition. For ease of presentation, for two sets $A, B \subseteq \mathbb{R}$, if for any $a \in A, b \in B$ there is a $a > b$ that

Then we write $A > B$. Similarly, $A \geq B$ is similarly defined. External researchers and market participants cannot observe rating shocks, and therefore assume with probability $\Pr(r^f(x) = n)$, $\Pr(r^d(x) = n)$, respectively, that domestic and foreign rating agencies assign ratings n to firms.

The model is simple, but has implications for the comparison of domestic and international rating agency ratings:

- (1) The rating benchmark effect is important in comparisons between domestic and international ratings, where the same rating symbol may represent different meanings. If the rating thresholds (a^d, a^f) of domestic and foreign rating agencies are different, the

even if they have the same rating estimator $(h^d(x), h^f(x))$, face the same rating shocks (ξ^d, ξ^f) .

The final rating will be different. An example would be if the rating thresholds satisfy $a^d = a^f$, the rating estimator is the same, the rating shocks are the same and $\xi^d + h^d(x) \in A^d$, then the domestic rating

The rating is $r^d(x) = n + 3$, and the international rating is $r^f(x) = n$. At this point, $n+3$ for the domestic rating is equivalent to n for the international rating.

- (2) If the rating shock satisfies $\Pr(\xi^d \leq a^d + h^d(x)) \leq \Pr(\xi^f \leq a^f + h^f(x))$ for all $x \in X$ and $n = 1, \dots, N$, then the domestic ratings first-

order stochastically predominate over the international ratings for all firms characterized by x . The rating shock is a stochastic shock with the following properties. When $n = N$, $\Pr(r^d(x) \leq N + 1) = \Pr(r^f(x) \leq N + 1) = 1$; when $n \leq N$, since $\Pr(r^d(x) \leq n) = \Pr(\xi^d - h^d(x) \leq a^d) = \Pr(\xi^d \leq a^d + h^d(x))$, $\Pr(\xi^d \leq a^d + h^d(x)) \leq \Pr(\xi^f \leq a^f + h^f(x))$ implies that $\Pr(r^d(x) \leq n) \leq \Pr(r^f(x) \leq n)$, which is the definition of first-order stochastic dominance. We see the possibility of first-order stochastic dominance of domestic ratings over international ratings.

(3) The domestic and international ratings of two firms (x, y) randomly maintain their relative positions in the following sense: if $h^f(x) \geq h^f(y)$ is equivalent to $h^d(x) \geq h^d(y)$, then the interrelationships between the domestic ratings $\Pr(r^d(x) > r^d(y)) \geq \mu$ implies that the international ratings are interrelating with each other $\Pr(r^f(x) \geq r^f(y)) \geq \mu$, and the international ratings are interrelating with each other $\Pr(r^f(x) \geq r^f(y)) \geq \mu$ implies interrelationship between domestic ratings $\Pr(r^d(x) > r^d(y)) \geq \mu$. The reason is as follows: Since $r^f(x) > r^f(y) \rightarrow \xi^f - h^f(x) > \xi^f - h^f(y) \rightarrow h^f(x) < h^f(y)$ and the assumptions, we can get $\xi^d - h^d(x) > \xi^d - h^d(y)$, i.e. $r^d(x) \geq r^d(y)$. Therefore, $\Pr(r^d(x) \geq$

¹⁶ The previous presentation shows that the Greater China ratings are a conversion of S&P's international ratings, so we will not discuss the Greater China ratings separately.

$r^d(y) \geq \Pr(r^f(x) > r^f(y))$. If we interpret the reality of one firm's rating being higher than another firm's rating as the former firm receiving a higher rating than the latter with a higher probability, then ratings randomly maintaining relative position can be interpreted as the probability that if one firm's domestic rating is higher than the other's domestic rating, the probability that the former's international rating is higher than the latter's international rating is also higher. The random relative positioning of ratings should be reflected in the adjustment of international or domestic ratings.

- (4) If for $\square^d = \{n \in \square: A^d = \bigcup_{m \in B} A^d_m\}$ and $\square^f = \{n \in \square: A^f = \bigcup_{m \in B} A^f_m\}$, then we can define the following new

Rating (or adjusted rating): $\square^{adj} = \{n^{adj}_1, \dots, n^{adj}_{N^{adj}+1}\} \subseteq \square$. $n^{adj}_1 < n^{adj}_2 < \dots < n^{adj}_{N^{adj}+1}$ is the same given by $\{A^d\}$ and $\{A^f\}$ and $\{A^{adj}_k\}$ composed of $\square^{adj} = \{A^{adj}_1, \dots, A^{adj}_{N^{adj}+1}\}$ in A^{adj}

with subscript k. For $k = 1, \dots, N^{adj}$, we require that $A^{adj}_k < A^{adj}_{k+1}$. We call A^{adj}_k the tuning

Adjusted Rating Intervals. Unlike the original rating range (A^f, A^d) which relied on the rating agencies, the adjusted rating range

intervals are the same for both domestic and foreign rating agencies. In order to better represent the rating interval since the rating

grade benchmark effect, we write the adjusted rating as $n^{adj}(A^{adj})$, then the adjusted rating of the international rating can be

to write

into: $n^{adj}(A), n(A), r(x) \in \square^f \quad r^f(x)$

$$r^f_{adj}(x) = \{n^{adj}_m(A^d), \text{ where } m \in \square^d \text{ and } A^f_{r^f(x)} \subseteq A^d_m, \quad r^f(x) \notin \square^f_0\}$$

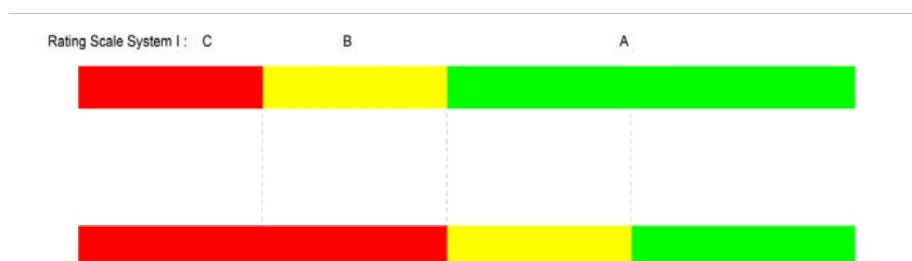
Adjusted ratings for domestic

ratings can be written as:

$$r^d_{adj}(x) = \{n^{adj}_m(A^f), \text{ where } m \in \square^f \text{ and } A^d_{r^d(x)} \subseteq A^f_m, \quad r^d(x) \notin \square^d_0\}$$

Figure 2 provides a more graphic depiction of two types of hypothetical rating systems with different rating thresholds. They satisfy the above

Adjustment of rating conditions.



¹⁷ Clearly there is u^N $\left(\bigcup_{i=1}^N u^i \right) \cup \left(\bigcup_{n \in \mathbb{Q}^d} u^n \right) \cup \left(\bigcup_{n \in \mathbb{Q}^d} f(n) \right)$.

Figure 2: Two types of hypothetical rating systems with different rating thresholds

Proposition 1. (1) Uniqueness of $n^{adj}(A^{adj})$: any such that $m^{adj}(A^{adj}) \geq m^{adj}(A^{adj})$ and

$A^{adj} \geq A^{adj}$ Equivalent other adjustment ratings $m^{adj}(A^{adj})$, giving the same relative position as $n^{adj}(A^{adj})$

Sorting. In other words, if $n^{adj}(A^{adj}) \geq n^{adj}(A^{adj})$ then $m^{adj}(A^{adj}) \geq m^{adj}(A^{adj})$.

(2) If $(\bigcup_{n \in \square_0} A^d) \cup (\bigcup_{n \in \square_0} A^f) = \emptyset$, then $\square^f \subseteq \square$, $\square^d \subseteq \emptyset$, and $N^{adj} \leq$

N.

Proof. (1) Suppose there exists another class of adjusted ratings $m^{adj}(A^{adj})$ such that $m^{adj}(A^{adj}) \geq m^{adj}(A^{adj})$ and $A^{adj} \geq A^{adj}$ are equivalent, but give different relative positions than $n^{adj}(A^{adj})$. Thus, for

For two adjustment ratings $n^{adj}(A^{adj}) > n^{adj}(A^{adj})$ there are two other adjustment ratings

$m^{adj}(A^{adj}) \leq m^{adj}(A^{adj})$. Following the question, $m^{adj}(A^{adj}) \leq m^{adj}(A^{adj})$ implies that $A^{adj} \leq$

A^{adj} . and $n^{adj}(A^{adj}) > n^{adj}(A^{adj})$ implies that $A^{adj} > A^{adj}$. hence a contradiction.

(2.1) Assume that $\square^f = \emptyset$. $(\bigcup_{n \in \square_0} A^d) \cup (\bigcup_{n \in \square_0} A^f) = \emptyset$ implies that $\square =$

For any i , A^d is the union of at least 1 A^f . Suppose there exists an A^d which is the concatenation of at least two A^f .

Then for some j , $A^d \cap A^d \subseteq \emptyset$, which contradicts the definition of a rating interval. Therefore, for any i

can only be $A^d = A^f$, which contradicts $\square^f = \emptyset$.

(2.2) Assume that $N^{adj} > N$. Thus, there exist n_1 elements of \square^d and n_2 elements of \square^f such that $n_1 +$

$n_2 > N$. By the construction of \square^d there exist at least n_1 rating intervals A^f and $i \in \square^f$. By the construction of \square^f

We know that there exist n_2 rating intervals A^f and $i \in \square^f$. Thus, there exist $n_1 + n_2 > N$ rating intervals

A^f , which contradicts the construction of the rating interval. \square

Proposition 2. (1) Existence of adjusted ratings: given a realization of the rating shock

$r^f(x)$ and $r^d(x)$, adjusted ratings $r^{adj}_f(x)$, $r^{adj}_d(x)$ exist. (2) Adjusted ratings and original ratings are as intended by the following

meanings are probabilistically equivalent: (2.1) If $n \in \square^f$, then $\Pr(r^f(x) = n) = \Pr(r^{adj}_f(x) =$

$n^{adj}(A^f))$; if $n \notin \square^f$ and there is $u_n A^f = A^d$ for $m \in \square^d$, then

$\sum_f u_n A^f = A^d$ $\Pr(r^f(x) = n) = \Pr(r^{adj}_f(x) = n^{adj}(A^f))$; (2.2) if $n \in \square^d$ So. $\Pr(r^d(x) = n) = \Pr(r^{adj}_d(x) = n^{adj}(A^d))$; if $n \notin \square^d$ and for $m \in \square^f$ there are $u_n A^d = A^f$

$$u_n A_n = A_m, \text{ then } \sum_{n \in \Omega^d} \Pr(r^d(x) = n) = \Pr(r^{\text{adj}}(x) = n^{\text{adj}}(A_m)).$$

Proof. (1) Given the realization of a rating shock, the rating decision is a deterministic problem. Consider the original domestic rating $r^d(x)$. When $r^d(x) \in \Omega^d$, the definition of adjusted ratings implies $r^d(x) = n^{\text{adj}}$ ($r^d(x)$). When $r^d(x) \notin \Omega^d$ when assuming that $(\cup_{d \in \Omega^d} A^d) \cup (\cup_{f \in \Omega^f} A^f) = \Omega$ implies that there exists an $m \in \Omega^f$ such that $A^d \subset A^m$. Since $n^{\text{adj}}(A^f)$ is defined for the whole set A^f , it is natural to have a definite set for its subset A^d .

Meaning. The existence of adjusted ratings for raw international ratings is similar.

(2) Consider the case of domestic ratings; the case of international ratings is similar. When the rating shock is uncertain, the event $r^d(x) \in \Omega^d$ is equivalent to the existence of $n \in \Omega^d$ such that $\xi^d - h^d(x) \in A^d$ or equivalently the event $r^{\text{adj}}(x) = n^{\text{adj}}(A^d)$. The former with probability $\Pr(r^d(x) = n)$ and the latter with probability $\Pr(r^{\text{adj}}(x) = n^{\text{adj}}(A^d))$. Therefore, they are equal. If $r^d(x) \notin \Omega^d$, then there exists $n^{\text{adj}} \in \Omega^f$ such that $A^d \subseteq A^f$ and m is equal to n^{adj} . connection, there exist $B^d \subseteq \Omega^d$ and $r^d(x) \in B^d$ such that $A^f = \cup_{d \in B^d} A^d$. The probability of the event A^f is

ratings.

Although the similarity in the distribution of adjusted international ratings and domestic ratings is substantially higher compared to the large difference between original international ratings and domestic ratings, there are some differences between the two, with about 24 percent of adjusted international ratings not equal to domestic ratings, suggesting that adjusted international ratings and domestic ratings do not rank exactly the same in terms of their relative positions. After removing the benchmark effect, differences in rating decisions between domestic and foreign rating agencies may lead to differences in rating outcomes. The next empirical analysis attempts to answer which factors determine rating decision differences. For reasons of simplicity of presentation, all foreign rating agency ratings that follow refer to ratings adjusted according to the procedure described above.

VI. Empirical analysis of rating decisions by domestic and foreign rating agencies

(i) Analytical models of differences in rating decisions

Because this paper focuses on differences in rating decisions by domestic and foreign rating agencies, and to overcome possible correlations to simplify the analysis, we combine domestic ratings and adjust international ratings for a sample of firms that are rated jointly by domestic and foreign rating agencies by assigning 1 (or -1, 0) to those samples whose international ratings are lower than (or higher than, or equal to) the domestic ratings, and then conduct regression analyses. In this way, only 1 regression equation needs to be estimated instead of estimating two separate equations for separate regressions of domestic and international rating agency ratings. Since -1, 0, and 1 are sequential discrete numbers, we use the following cumulative Logistic regression model:

$$(1) \text{logit}(y_m) = a_m + \beta' * X.$$

In Equation (1), $r_{adj}^1 = m \in (0,1)$ is a comparison between international and domestic ratings¹⁸, $y_m \equiv \text{prob}(r_{adj}^1 \geq m|X)$ is the probability of the opposite cumulative distribution based on the variable X ¹⁹, and $\text{logit}(y_{m,adj}) = \log \frac{y_m}{1-y_m}$.

a_m is a constant term dependent on m . $a_0 \geq a_1$ is assumed to satisfy the monotonically non-increasing characterization of the probability of the opposite cumulative distribution. β is the coefficient of the explanatory variable $X = (x_1, \dots)$, independent of m . β' is the transpose of β . These settings effectively make the model a fixed-ratio model (proportional odds model, Agresti (2002)) that captures the difference in rating decisions of domestic and foreign rating agencies: whether or not a particular variable contributes to explaining the probability that a domestic rating is higher than an international rating.

(ii) Explanatory variables

When rating firms, rating agencies disclose a large number of relevant metrics to reflect the reasonableness of the rating. Given the availability of data and the relevant literature, we address a number of indicators that have been shown to be associated with the credit worthiness of firms

(creditworthiness)-related, or firm-level variables X related to the Chinese system are empirically analyzed. The main explanatory variables include: asset size, leverage, profitability, and nature of ownership. The source of data is the Vantage database²⁰.

Asset size. In general, the larger the asset size of a firm, the stronger its ability to withstand credit risk. We use the natural logarithm of net fixed assets in RMB 1,000 as a variable of asset size, denoted by Net_PPE , which measures a firm's ability to meet its debt obligations through the sale of fixed assets in the face of financial distress (Altman 1993), and may also be related to a firm's information transparency, operational uncertainty (Ismail, Oh, and Arsyia 2015).

Leverage. We define leverage as the ratio of the book value of total assets to the book value of owners' equity²¹, expressed as Leverage . Higher leverage implies greater liabilities, less ability for firms to raise further debt or roll over debt, and potentially lower debt-servicing capacity; however, high leverage may also imply greater financing capacity for firms and potentially higher debt-servicing capacity.

Profitability. Typically, greater profitability means greater credit worthiness of a business, and thus a higher rating. We measure profitability as the ratio of earnings before interest and taxes (EBIT) to the book value of total assets, denoted by EBIT . It reflects a company's ability to continue as a going concern and is not directly related to debt interest expense or capital structure.

Nature of Ownership. Since a distinctive feature of China's economy is the relatively large share of state-owned economy, we focus on the effect of whether or not the nature of ownership is a state-owned enterprise, expressed as a dummy variable for *State_Ownerships*. A large body of literature shows that whether it is state-owned or not has an impact on the credit worthiness of a firm, but there is no consensus on the direction of the impact. We propose to experiment in this area. The definition of ownership nature is adopted from the Vantage database: *State_Ownerships* is 1 if the firm's largest shareholder, or ultimate controller, is the Chinese government or its affiliates, or the local government or its affiliates; otherwise, it is 0.²² *The State_Ownerships are defined by the Vantage database.*

In addition, we try to control for other important variables that may affect corporate ratings by including retained earnings, interest coverage ratio, utility industry dummy variables, and real estate industry dummy variables as control variables in the empirical score

¹⁸ If $m = -1$, then the opposite cumulative distribution $\text{prob}(r^1 \geq m) = 1$ is constant.

¹⁹ Our setting here differs from the traditional cumulative logistic regression model $y_m = \text{prob}(r^1 \leq m|X)$ in order to better represent the sign of the variable coefficients and the consistency of the direction of the variable's effect on domestic ratings over international ratings. If set up as a traditional model, negative coefficients imply positive correlation; in the setting of this paper, negative coefficients indicate negative correlation.

²⁰ Since this paper examines ratings for 2015, the explanatory variables are taken from 2014 data.

²¹ Since a significant portion of the firms are not listed, we do not use market value leverage.

²² We do not take into account interactions between the nature of ownership and other variables because these interactions are not robust in the later robustness analysis.

Analysis. In particular, retained earnings is the ratio of retained earnings to total assets at book value, denoted by Retained_Earnings; interest coverage is the ratio of EBIT to interest expense, denoted by EBIT2Int; and the utility industry dummy variable (Ind_Util), and real estate industry dummy (Ind_Re) are dummy variables for the industry in which the firm operates.²³

Table 6: Statistical Characteristics of Firms' Data Categorized by Domestic Ratings, Adjusted for International Ratings

Rating	Frequency	Statistics measured in word	Net_PP_E	Leverage	EBIT	EBIT2Int	Retained_Earnings	Ind_R_E	Ind_Util	State_Ownerships
A: Domestic grading										
AA(Aa2)	2	mean	11.93	3.87	0.02	3.37	0.05	0.5	0	0.5
		median	11.93	3.87	0.02	3.37	0.05	0.5	0	0.5
		std.	1.85	2.53	0.02	4.32	0.02	0.71	0	0.71
AA+(Aa1)	6	mean	14.16	2.83	0.05	2.31	0.15	0.17	0	0.67
		median	14.03	2.97	0.04	2.14	0.19	0	0	1
		std.	1.69	0.68	0.04	1.57	0.11	0.41	0	0.52
AAA(Aaa)	42	mean	17.58	3.49	0.04	4.21	0.14	0.1	0.14	0.95
		median	17.56	3.1	0.03	2.08	0.08	0	0	1
		std.	1.28	1.57	0.03	5.1	0.13	0.3	0.35	0.22
B: International grading										
AA(Aa2)	2	mean	14.43	3.97	0.02	3.75	0.13	0.5	0	0
		median	14.43	3.97	0.02	3.75	0.13	0.5	0	0
		std.	1.68	2.4	0.01	3.79	0.12	0.71	0	0
AA+(Aa1)	11	mean	15.78	4.15	0.03	1.7	0.09	0.18	0	0.91
		median	16.73	3.62	0.02	1.62	0.06	0	0	1
		std.	2.34	1.73	0.03	1.56	0.09	0.4	0	0.3
AAA(Aaa)	37	mean	17.43	3.18	0.04	4.63	0.15	0.08	0.16	0.95
		median	17.61	2.95	0.04	3.14	0.1	0	0	1
		std.	1.71	1.37	0.03	5.29	0.13	0.28	0.37	0.23

Note: 1. Column 3 represents the statistics, "mean", "median" and "std." represent the mean, median and standard error respectively.

2. In the above table, we have kept only the samples for which all variables have valid values.

Table 6 presents the statistical characteristics of all explanatory and control variables by domestic rating, adjusted international rating. Part A is categorized by domestic ratings and part B is categorized by adjusted international ratings. As can be seen, compared to international ratings, firms with low domestic ratings have smaller mean values for asset size and leverage, and higher mean values for the dummy variable for state ownership. Comparisons in other areas are not

significant.

(iii) Combined regression results

We analyze the above model using the `vglm` function of the VGAM (Yee 2010) package for R (R Core Team 2016), and present the estimation results for the comparison of domestic and international ratings in Table 7.24.²⁵ The first and second rows are the constants α_0 , α_1 corresponding to the rating comparison results of 0 and 1. and the cumulative Logistic model requires that the I

²³ We do not include other industry dummy variables due to the small sample size and the inclusion of other industry dummy variables would make the estimation infeasible, or difficult to interpret. In addition, many databases keep only the industry attributes of a firm's current state, and only a few databases keep a record of the firm's historical industry. In the Vantage database, the Vantage industry records the historical state of the firm.

²⁴ We set the optimization steps to 0.02, 0.04, 0.06, 0.08, and 0.1, respectively, from which we select the estimate with the largest value of the log-likelihood function.

²⁵ Estimates comparing domestic and Greater China ratings are presented in Section 7.1.

For example, α_0 is greater than α_1 in every regression equation. Testing the LR values for which all non-constant factor coefficients are zero is significant at the 1% level.²⁶ The original and adjusted McFadden pseudo- R^2 (Long 1997) show that, compared to other regressions that introduce control variables one by one or that include all of them, the overall estimation of the regression equation that includes only the four explanatory variables of asset size, pole ratio, profitability, and the nature of ownership achieves good results. The overall estimation of the regression equation yields good results.

Table 7: Basic Combined Regression Results

	(1)	(2)	(3)	(4)	(5)	(6)
α_1	-7.02 (3.29)**	-9.24 (3.8)**	-7.84 (3.38)**	-8.57 (3.65)**	-6.9 (3.49)**	-10.05(4.25)**
α_2	-13.76 (4.15)***	-16.28 (4.82)***	-14.76 (4.29)***	-15.7 (4.68)***	-13.65 (4.27)***	-17.56(5.38)***
Net_PPE	0.75 (0.25)***	0.88 (0.29)***	0.74 (0.25)***	0.9 (0.29)***	0.75 (0.25)***	0.91 (0.31)***
Leverage	0.72 (0.27)***	0.72 (0.28)***	0.91 (0.33)***	0.68 (0.27)**	0.73 (0.31)**	1 (0.41)**
EBIT	-22.14 (14.18)	-29.08 (20.58)	-36.76 (18.86)*	-25.98 (15.33)*	-21.9 (14.4)	-39.46 (24.31)
State-Ownership	-3.36(1.3)***	-2.84 (1.44)**	-3.13(1.3)**	-3.55 (1.36)***	-3.47 (1.69)**	-3.33 (1.86)*
EBIT2Int		0.03 (0.15)				-0.02 (0.17)
Retained_Earnings			6.62 (4.94)			6.49 (5.52)
Ind_Util				-2.11 (1.55)		-1.35 (1.83)
Ind_Re					-0.16 (1.51)	-1.1 (1.86)
LogL	-24.91	-22.37	-24.07	-23.79	-24.9	-20.97
LR test	20.37***	20.84***	22.05***	22.62***	20.39***	23.64***
McFadden R ²	0.29	0.32	0.31	0.32	0.29	0.36
Adjusted McFadden R ²	0.12	0.1	0.11	0.12	0.09	0.06
OBS	53	50	53	53	53	50

Notes: 1. α_1 , α_2 denote constant terms corresponding to domestic ratings equal to international ratings, and domestic ratings higher than international ratings, respectively. 2. For the coefficients, the first value is the estimate, the number in parentheses is the standard deviation, and the statistical test is the normal approximation, with ***, **, * denoting significance at the 1%, 5%, and 10% levels, respectively.

In the first regression equation with only explanatory variables, the coefficients on asset size and leverage are positive and the coefficients on profitability and nature of ownership are negative. Translated into terms of the effect on rating outcomes, the effect of asset size and leverage on domestic ratings above international ratings is positive, and the effect of profitability and nature of ownership is negative. Firms with large assets and high leverage are more likely to receive a domestic rating above the international rating, while firms with high profitability or the nature of state ownership have a higher probability of receiving an international rating above the domestic rating.

There is no change in the direction of the above four explanatory variables when control variables are introduced one by one in equations 2 through 5 or when all control variables are included in equation 6. Asset size, leverage, and nature of ownership are significant at the 5% or 10% level in all regression equations, and profitability is only significant at the 10% level in 2 equations, but the direction of the effect remains stable.

In the regression equation including the control variables, none of the control variables are significant at the 10% level. This on the one hand explains why we treat them as control variables and on the other hand may lead to further future research on the important role of these control variables.

(iv) Separate regressions: identifying factor impact mechanisms and measuring economic significance

In the combined regression equation, when a factor positively affects the difference in rating decisions (hereafter, specifically the case where domestic ratings are higher than international ratings), there are at least two driving reasons. On the one hand, domestic rating agencies assign positive weights when they give relatively high domestic ratings, while foreign rating agencies assign negative weights when they give relatively high international ratings. On the other hand, both domestic rating agencies and foreign rating agencies assign positive (or negative) weights to relatively high domestic ratings or international ratings when they are given, but the former's weights

²⁶ Since the setup of non-constant factor coefficients varying by rating class resulted in a regression equation that was not estimable for our sample, we do not report the LR value of the test for the original hypothesis that all non-constant factor coefficients are independent of the rating class, i.e., the constant proportions assumption (proportional odds assumption) (Agresti 2002).

greater (or lesser) in absolute terms. Given the other variables, any of the above reasons for any one aspect of the factor will cause the factor to positively affect the probability of differences in rating decisions. If we can identify specific causes, that will deepen our understanding of the mechanisms by which each factor affects rating decisions.

To this end, we run separate regressions for domestic ratings and international ratings according to equation (1).²⁷ Unlike the previous combined regressions in which the dependent variable is the comparative value of domestic ratings and international ratings, the independent variables in the separate regressions are the specific domestic ratings or international ratings, i.e., 15(AA), 16(AA+), 17(AAA). The corresponding constant terms α_1 , α_2 denote the opposite cumulative probabilities of domestic ratings or international ratings AA+ and AAA, respectively.

**Table 8: Separate regression results:
domestic ratings**

	(1)	(2)	(3)	(4)	(5)	(6)
α_1	-19.99 (5.89)***	-18.35 (5.78)***	-20.48 (6.01)***	-19.89 (5.98)***	-26.3 (8.23)***	-50.62 (21.76)**
α_2	-24.62 (6.96)***	-22.5 (6.93)***	-25.29 (7.2)***	-24.5(7.05)***	-31.88 (9.79)***	-56.61 (23.9)**
Net_PPE	1.56 (0.44)***	1.47 (0.44)***	1.51 (0.44)***	1.55 (0.45)***	2.03 (0.64)***	3.64 (1.58)**
Leverage	0.25 (0.46)	0.12 (0.48)	0.46 (0.63)	0.25 (0.46)	-0.25 (0.54)	-1.55 (1.16)
EBIT	-22.2 (19.84)	-31.87 (25.25)	-30.39 (26.96)	-22.03 (19.86)	-38.65 (24.43)	-122.98 (63.59)*
State-Ownership	1.68 (1.17)	1.18 (1.28)	2 (1.38)	1.66 (1.18)	3.51 (1.74)**	13.32 (6.92)*
EBIT2Int		0.15 (0.22)				-0.38 (0.37)
Retained_Earnings			5.21 (10.14)			10.3 (15.14)
Ind_Util				0.51 (5.1)		-3.85 (7.04)
Ind_Re					3.15 (1.93)	16.36 (8.31)**
LogL	-10.32	-9.41	-10.17	-10.31	-8.51	-3.16
LR test	40.7***	34.14***	41.01***	40.73***	44.32***	46.65***
McFadden R ²	0.66	0.64	0.67	0.66	0.72	0.88
Adjusted McFadden R ²	0.47	0.38	0.44	0.44	0.49	0.5
OBS	53	50	53	53	53	50

Notes: 1. α_1 , α_2 are constant terms corresponding to ratings AA+ and AAA. 2. For each coefficient, the first value is the estimate, the number in parentheses is the standard deviation, and the statistical test is the normal approximation, with ***, **, * denoting significance at the 1%, 5%, and 10% levels respectively.

**Table 9: Separate regression results:
international ratings**

	(1)	(2)	(3)	(4)	(5)	(6)
α_1	-4.24 (2.81)	-3.63 (3.03)	-4.14 (2.86)	-3.71 (2.85)	-5.45 (3.28)*	-5.01 (3.5)
α_2	-6.85 (2.97)**	-6.36 (3.18)**	-6.75(3)**	-6.31 (2.99)**	-8.09 (3.47)**	-7.85 (3.7)**
Net_PPE	0.38 (0.18)**	0.4 (0.2)**	0.38 (0.18)**	0.33 (0.18)*	0.44 (0.2)**	0.46 (0.23)**
Leverage	-0.33 (0.23)	-0.41 (0.25)	-0.35 (0.27)	-0.29 (0.23)	-0.43 (0.27)	-0.66 (0.36)*
EBIT	15.77 (15.14)	3.15 (20.88)	17.08 (16.51)	14.02 (14.39)	13.07 (15.63)	2.25 (20.95)
State-Ownership	2.53 (1.04)**	1.94 (1.1)*	2.49 (1.07)**	2.45 (1.04)**	3.1(1.34)**	3.53 (1.75)**
EBIT2Int		0.2 (0.21)				0.15 (0.22)
Retained_Earnings			-0.84 (4.45)			-2.26 (4.76)
Ind_Util				3.12 (4.98)		3.09 (5.63)
Ind_Re					0.95 (1.31)	2.48 (1.91)
LogL	-29.26	-25.96	-29.24	-28.61	-28.97	-24.32
LR test	19.64***	16.56***	19.68***	20.94***	20.22***	19.82**
McFadden R ²	0.25	0.24	0.25	0.27	0.26	0.29
Adjusted McFadden R ²	0.1	0.04	0.07	0.09	0.08	0

OBS	53	50	53	53	53	50
-----	----	----	----	----	----	----

Notes: 1. α_1 , α_2 are constant terms corresponding to ratings AA+ and AAA. 2. For each coefficient, the first value is the estimate, the number in parentheses is the standard deviation, and the statistical test is the normal approximation, with ***, **, * denoting significance at the 1%, 5%, and 10% levels respectively.

Tables 8 and 9 report the results of the separate regressions. The results of the separate regressions, which include only explanatory variables, are consistent with the results of the combined regressions, showing that there are multiple mechanisms for the effect of explanatory variables on differences in the rating decisions of domestic and foreign rating agencies: even if different explanatory variables affect differences in rating decisions in the same direction, the mechanisms behind them may be different.

²⁷ Technically, the implicit assumption of equation (1) is that both domestic rating shocks and international rating shocks are independently and identically distributed (Train 2009). Strong conditions are required for both the separate and combined regressions to adhere to the cumulative logistic form, so the separate regressions in this paper are illustrative only. We expect similar conclusions using other forms of separate regressions.

Both asset size and leverage positively affect rating decision differences, but for different reasons. The asset size coefficient is 1.56 for domestic ratings and 0.38 for international ratings, so the positive impact of asset size comes from the higher positive weight assigned to it by domestic rating agencies. The positive effect of leverage is due to the fact that domestic rating agencies treat it as a positive factor (with a coefficient of 0.25), while foreign rating agencies treat it as a negative factor (with a coefficient of -0.33).

The driving reasons behind the negative impact on profitability and the nature of ownership are also distinct from each other. While the opposite view of profitability by domestic and foreign rating agencies leads to a negative impact, the negative impact of ownership nature is due to the fact that both domestic and foreign rating agencies view it as a positive factor, but the latter has a greater weight. Profitability has a coefficient of -22.2 in the domestic ratings regression, whereas it has the opposite sign in the foreign ratings regression, at 15.77; the coefficient of nature of ownership is positive in both regressions, but it is smaller in the domestic ratings regression (1.68) than in the international ratings regression (2.53).

The mechanism of the effect of each of the above explanatory variables on the difference in rating decisions is robust when real estate industry dummy variables are excluded are introduced. When the real estate industry dummy variable is introduced, the mechanisms for the effects of asset size and profitability remain the same, and the mechanisms for the effects of leverage and the nature of ownership change, but the adjusted McFadden R^2 shows that the inclusion of the real estate industry dummy variable instead slightly reduces the overall explanatory power of the separate regressions.

In order to account for the economic significance of each factor, i.e., to measure the specific magnitude of the impact, we analyze the quantitative magnitude of the impact of each explanatory variable on the domestic ratings and the international ratings using separate regression equations that include only the explanatory variables. We set the values of all explanatory variables to values around their respective *medians*²⁸, treating this as the base case. We then examined the change in the probabilities of domestic ratings and international ratings by adding or subtracting one standard deviation at a time from the value of one nondummy variable, or by setting the dummy variable to the opposite of its median, while fixing the values of the other variables.

Table 10: Scenario Analysis of the Impact of Factors on Domestic Ratings, International Ratings

independent variable	Direction of change	Domestic rating effects			International rating effects		
		AA	AA+	AAA	AA	AA+	AAA

probability of experience		0.04	0.15	0.81	0.06	0.23	0.72
base	0	0	0.22	0.77	0.03	0.24	0.73
Net_PPE	-	0.07	0.82	0.11	0.06	0.39	0.55
	+	0	0.01	0.99	0.01	0.13	0.86
Leverage	-	0	0.29	0.7	0.02	0.17	0.82
	+	0	0.16	0.83	0.04	0.33	0.63
EBIT	-	0	0.12	0.88	0.04	0.34	0.62
	+	0.01	0.37	0.62	0.02	0.16	0.82
State_Ownerships	-	0.01	0.59	0.39	0.25	0.57	0.18

Note: 1. The "base" row is the base case, indicating that all explanatory variables except Net_PPE are set to their respective medians, and that Net_PPE is set to the median.

_PPE is set at 0.9 times its median.² Other rows indicate the value of the dummy variable that changes by 1 standard deviation or changes the dummy variable to the opposite of the base case when other variables are fixed, relative to the base case. Where + denotes an increase, - a decrease, and - in the nature of ownership denotes that the base case is a state-owned enterprise, but the scenario is analyzed as a non-state-owned enterprise.³ The columns starting from the third denote the estimated probability of the corresponding rating.

The probability of a AAA rating in the base case is close to the actual case. In the actual scenario, the frequency-based probability of a domestic AAA rating is 0.81, and the probability of an international AAA rating is 0.72. In the base case, the estimated probability of a domestic AAA rating is 0.77, and the probability of an international AAA rating is 0.73, which are 0.04 and -0.01, respectively, from the corresponding probabilities in the actual scenario.

²⁸ Specifically, we set the asset size value to 0.9 times its median value and the other variables to their median values. If the values of all variables were set to the median value, the predicted probability of a domestic rating of AAA would be higher than the proportion of frequencies in the calculations from the actual data. If the values of the other factors were adjusted, we would expect similar results.

Since the impact of each variable on the probability of rating is monotonic, in the discussion that follows, we analyze only the case of a 1 standard deviation increase for the nondummy variables, and for the dummy variables, we analyze the impact when they are set differently from the baseline case.

The effects of asset size and the nature of ownership are clear. For asset size, a 1 standard deviation increase raises the probability of domestic rating AAA to 0.99, which is much higher than the upgraded probability of international rating AAA of 0.86, by 28.57 percentage points for the former and 17.81 percentage points for the latter. For the nature of ownership, relative to SOEs in the base case, the probability of a domestic rating of AAA for non-SOEs falls to 0.39, much higher than the probability of an international rating of AAA for non-SOEs (0.18), with both falling by more than 49 percentage points. On the other hand, the increase in the probability of an international rating of AAA for SOEs relative to non-SOEs is higher than the increase in the probability of a domestic rating of AAA.

The overall impact of leverage and profitability was smaller in magnitude. The increase in leverage increases the probability of a domestic-rated AAA by only 7.79 percentage points, but decreases the probability of an international-rated AAA by 18.18 percentage points. In response to the increase in profitability, the probability of a domestic-rated AAA falls to 0.62, a decrease of 19.48 percentage points, while the probability of an international-rated AAA rises to 0.82, a decrease of 6.49 percentage points.

VII. Robustness analysis

(i) Do the regression results also hold for comparisons between Greater China ratings and domestic ratings?

As mentioned earlier in Section 4, S&P offers a broad range of ratings for Chinese companies on top of its international ratings.

China ratings. Figure 1 shows that the Greater China ratings fall between the original international and domestic ratings, with the rank correlation coefficient indicating that the Greater China ratings are closer to the original international ratings. Since the adjusted international ratings are based on the relative position of the original international ratings, we would expect the same conclusion to exist for the comparison between the adjusted Greater China ratings and the domestic ratings. For this reason, we similarly adjusted the original Greater China ratings according to the Adjusted International Ratings methodology and repeated the combined regression in Section 6.3 for the data comparing them to the domestic ratings.

Table 11: Regression results comparing Greater China ratings with domestic ratings

	(1)	(2)	(3)	(4)	(5)	(6)
α_1	-9.62 (4.67)**	-10.75 (5.38)**	-16.5 (6.89)**	-11.17 (5.32)**	-9.72 (4.72)**	-15.25 (7.03)**
α_2	-19.7 (6.71)***	-20.88 (7.53)***	-29.38 (9.72)***	-21.5 (7.39)***	-19.76 (6.69)***	-27.82 (9.81)***
Net_PPE	1.13(0.4)***	1.22 (0.46)***	1.43 (0.52)***	1.26 (0.46)***	1.13(0.4)***	1.36 (0.55)**
Leverage	0.87 (0.4)**	0.82 (0.39)**	1.73 (0.61)***	0.84 (0.4)**	0.84 (0.48)*	1.79 (0.78)**
EBIT	-59.88 (25.44)**	-85.36 (36.22)**	-110.88 (39.43)***	-64.09 (26.84)**	-60.21 (25.5)**	-123.21 (47.15)***
State-Ownership	-5.16 (2.09)**	-5.24 (2.03)***	-5.81 (2.29)**	-5.27 (2.11)**	-4.98 (2.58)*	-6.35 (2.75)**
EBIT2Int		0.26 (0.19)				0.24 (0.31)
Retained_Earnings			21.16 (8.13)***			19.99(9)**
Ind_Util				-2.24 (2.4)		0.41 (3.72)
Ind_Re					0.24 (2.1)	-1.23 (2.58)
LogL	-12.77	-11.28	-8.53	-12.28	-12.77	-8.03
LR test	22.92***	25.2***	31.41***	23.91***	22.92***	31.71***
McFadden R ²	0.47	0.53	0.65	0.49	0.47	0.66
Adjusted McFadden R ²	0.23	0.23	0.36	0.2	0.18	0.25
OBS	45	43	45	45	45	43

Notes: 1. α_1 , α_2 denote constant terms corresponding to domestic ratings equal to international ratings, and domestic ratings higher than international ratings, respectively. 2. For the coefficients, the first value is the estimate, the number in parentheses is the standard deviation, and the statistical test is the normal approximation, with ***, **, * denoting significance at the 1%, 5%, and 10% levels, respectively.

Table 11 presents the results of the combined regressions, where adjusting for Greater China ratings and domestic ratings comparisons is somewhat more significant relative to adjusting for international ratings and domestic ratings comparisons, and all of the variables that were originally statistically significant remain so.

significant and maintains the same sign. In addition, profitability and retained earnings increase in significance. A slight difference is that the adjusted McFadden R^2 indicates that retained earnings should be included as a control variable.

(ii) Are regression results affected by international rating adjustment methods?

Regression results may be affected by noise in the international rating adjustment methodology. In the previous analysis, we adjusted the raw international ratings after matching the domestic ratings in order from highest to lowest (or top to bottom). Noise in adjusting international ratings occurs when the combined raw international rating ratios do not exactly match the corresponding domestic rating ratios. For this reason, we consider adjusting international ratings by matching raw international ratings and domestic ratings in reverse order from low to high, and then see if the regression results change.²⁹

**Table 12: Combined regression results
after adjusting international ratings
in reverse order**

	(1)	(2)	(3)	(4)	(5)	(6)
α_1	-10.73 (5.04)**	-11.36 (5.44)**	-16.68 (7.59)**	-11.81 (5.47)**	-13.73 (6.11)**	-16.69 (9.24)*
α_2	-20.41(6.6)***	-21.06 (6.88)**	-29.01 (10.31)***	-21.78 (7.25)***	-23.46 (7.59)***	-28.27 (11.5)**
Net_PPE	1.08 (0.37)***	1.16 (0.42)***	1.27 (0.48)***	1.19 (0.44)***	1.16 (0.38)***	1.25 (0.55)**
Leverage	0.34 (0.54)	0.24 (0.59)	1.21 (0.76)	0.26 (0.56)	0.05 (0.57)	0.95 (0.97)
EBIT	-33.44 (20.54)	-52.43 (27.36)*	-82.61 (32.4)**	-37.82 (22.66)*	-36.64 (20.55)*	-83.64 (35.71)**
State-Ownership	-3.39 (2.32)	-3.89 (2.28)*	-3.42 (2.67)	-3.5 (2.31)	-1.05 (3.36)	-2.85 (4.28)
EBIT2Int		0.22 (0.19)				0.11 (0.35)
Retained_Earnings			20.87 (9.57)**			18.72 (10.28)*
Ind_Util				-1.47 (2.26)		1.04 (3.35)
Ind_Re					3.19 (3.31)	0.98 (4.54)
LogL	-10.68	-9.16	-7.61	-10.44	-9.97	-7.08
LR test	16.77***	19.18***	22.91***	17.25***	18.18***	23.34***
McFadden R^2	0.44	0.51	0.6	0.45	0.48	0.62
Adjusted McFadden R^2	0.13	0.14	0.23	0.09	0.11	0.09
OBS	53	50	53	53	53	50

Notes: 1. α_1 , α_2 denote constant terms corresponding to domestic ratings equal to international ratings, and domestic ratings higher than international ratings, respectively. 2. For the coefficients, the first value is the estimate, the number in parentheses is the standard deviation, and the statistical test is the normal approximation, with ***, **, * denoting significance at the 1%, 5%, and 10% levels, respectively.

Table 12 presents the results of the combined regressions after applying the reverse-order adjustment to international ratings. Compared to the regressions after using sequentially adjusted international ratings, the results here are generally consistent, with the significance and direction of asset size and profitability remaining unchanged, and the significance of leverage and nature of ownership declining and no longer significant, but the direction is still robust.

(iii) Are regression results affected by differences in accounting reporting systems?

When Chinese companies issue bonds in markets outside mainland China, they are usually required by local regulations to comply with local or international financial reporting systems. Although China's financial reporting system has gradually converged with the basic principles of international standards, there are still some differences (Ding and Su 2008; Eng, Sun, and Vichitsarawong 2013). As an example, Yanzhou Coal Mining Company Limited reported net profit attributable to shareholders of the parent company in its 2014 financial report of RMB 2,284.17 million under the Chinese accounting system and RMB 766.16 million under IFRS (Yanzhou Coal Mining Company Limited 2015). Firms in the sample may use different accounting reporting systems to report financial data, which may lead to bias in the analysis.

²⁹ Another possible noise in international rating adjustments comes from how a final rating is determined in multiple ratings. In addition to the minimum rating principle in multiple ratings used earlier, there are at least maximum and average principles for determining the final rating from multiple ratings (Packer, Cantor, and Cole 1997). Using the highest rating principle and the average rating principle to determine the final rating before matching international and domestic ratings does not change the underlying regression results.

Fortunately, S&P's Capital IQ ("Capital IQ") database provides a form of standardization of financial ^{data30} that allows for some comparability of financial data across financial standards. Therefore, we use the Capital IQ standardized financial data ("standardized financial data" and the previously used financial data "unstandardized financial data") to perform the combined regression analysis.

Table 13: Combined regression results using standardized financial data

	(1)	(2)	(3)	(4)	(5)	(6)
α_1	-3.59 (3.45)	-3.31 (3.39)	-3.78 (3.55)	-4.42 (3.6)	-6.03 (3.71)	-6.87 (4.03)*
α_2	-9.16 (3.86)**	-8.65 (3.75)**	-9.36 (3.96)**	-10.11 (4.07)**	-11.86 (4.23)***	-12.8 (4.59)***
Net_PPE	0.5 (0.23)**	0.44 (0.22)**	0.49 (0.23)**	0.57 (0.24)**	0.59 (0.23)**	0.63 (0.25)**
Leverage	0.39 (0.22)*	0.36 (0.21)*	0.43 (0.26)*	0.37 (0.22)*	0.28 (0.22)	0.28 (0.26)
EBIT	-19.52 (12.82)	-18.93 (12.71)	-22.04 (16.52)	-21.23 (13.13)	-23.04 (13.35)*	-27.9 (17.6)
State-Ownership	-2.5(1.15)**	-1.86 (1.23)	-2.47 (1.16)**	-2.52 (1.16)**	-1.17 (1.38)	-0.77 (1.48)
EBIT2Int		-0.01 (0.02)				-0.01 (0.02)
Retained_Earnings			1.21 (4.8)			1.42(5)
Ind_Util				-1.21 (1.26)		-1.16 (1.33)
Ind_Re					2.22 (1.41)	2.15 (1.48)
LogL	-26.71	-25.86	-26.68	-26.21	-25.41	-24.23
LR test	11.66**	13.36**	11.72**	12.67**	14.27**	16.62**
McFadden R ²	0.18	0.21	0.18	0.19	0.22	0.26
Adjusted McFadden R ²	-0.01	-0.01	-0.03	-0.02	0	-0.05
OBS	49	49	49	49	49	49

Notes: 1. α_1 , α_2 denote constant terms corresponding to domestic ratings equal to international ratings, and domestic ratings higher than international ratings, respectively. 2. For the coefficients, the first value is the estimate, the number in parentheses is the standard deviation, and the statistical test is the normal approximation, with ***, **, * denoting significance at the 1%, 5%, and 10% levels, respectively.

We report the results of the combined regression using standardized financial data in Table 13. Compared to the previous regression coefficients using unstandardized financial data, the direction of the regression coefficients here remains unchanged, suggesting that the results are more robust. However, the significance of the variables has decreased, suggesting that the differences in the separate regressions in Section 6.4 may stem from differences in the data used by domestic and international rating agencies, which may be a worthwhile direction for future research. This does not suggest that differences in rating decisions using unstandardized financial data are not important in practice. On the contrary, analyses using unstandardized financial data reflect differences in rating decisions implied by publicly available data and have some policy implications.

(iv) Do the regression results change when extended from jointly rated firms?

The samples analyzed in the previous section are firms that have been jointly rated by domestic and foreign rating agencies. Since the rating targets are the same, this excludes the influence of individual factors of the rated enterprises on the analysis of rating decisions. However, the sample size of jointly rated enterprises is small, only around 50. So, when the sample of jointly rated firms is expanded in the future, will the above regression results still hold?

To partially answer this question, we analyze the top 3 ratings (AA, AA+, AAA) in the sample of all domestic ratings,³² which are also the domestic rating ranges of all co-rated firms and account for 82.38 percentage points of the total sample of domestic ratings.³³ We add a new dummy variable, *AccAltMkt*: 1 if a firm is co-rated by a domestic or foreign rating agency to reduce public concern about its credit risk; 0 otherwise. Given the likelihood that a firm having an international rating reduces public concern about its credit risk, we add a new dummy variable, *AccAltMkt*: 1 if the firm is co-rated by a domestic or foreign rating agency; 0 otherwise.³³ Financial data for firms are from Vantage.

³⁰ Details of the criteria can be found in the Capital IQ data

³¹ Due to the lack of detail in Capital IQ's data on industry variables and state ownership for Chinese firms, the values of these variables are still taken from the Vantage database.

³² We do not analyze the extended sample of international ratings for two reasons: first, adjusting the international ratings of firms with only international ratings and no domestic ratings to the domestic ratings of jointly rated firms could generate new noise and lead to more estimation bias; second, it is difficult for us to identify the nature of the ownership of the majority of firms without domestic ratings from publicly available data.

³³ The regression results do not change much when the *AccAltMkt* variable is removed due to the relatively small number of firms that are co-rated.

Table 14: Full Sample Regression Results for Domestic Ratings

	(1)	(2)	(3)	(4)	(5)	(6)
α_1	-13.02 (0.52)***	-13.49 (0.55)***	-13.9 (0.56)***	-13.24 (0.53)***	-13.46 (0.54)***	-15.12 (0.62)***
α_2	-14.89 (0.54)***	-15.39 (0.58)***	-15.79 (0.58)***	-15.11 (0.55)***	-15.34 (0.57)***	-17.06 (0.65)***
Net_PPE	0.75 (0.03)***	0.78 (0.04)***	0.77 (0.03)***	0.76 (0.03)***	0.78 (0.04)***	0.85 (0.04)***
Leverage	-0.04 (0.04)	-0.06 (0.04)	0.03 (0.04)	-0.04 (0.04)	-0.06 (0.04)	0 (0.04)
EBIT	9.11(1.5)***	9.54 (1.55)***	4.89 (1.72)***	9.89 (1.54)***	9.3 (1.51)***	5.83 (1.84)***
State-Ownership	1.65 (0.16)***	1.69 (0.16)***	1.8(0.16)***	1.71 (0.16)***	1.66 (0.16)***	1.88 (0.17)***
EBIT2Int		0(0)				0(0)
Retained_Earnings			3.22 (0.65)***			3.4 (0.68)***
Ind_Util				-0.45 (0.17)**		-0.31 (0.18)*
Ind_Re					0.64 (0.2)***	0.76 (0.21)***
AccAltMkt	2.97 (0.45)***	3.08 (0.49)***	2.91 (0.46)***	2.96 (0.45)***	2.8 (0.44)***	2.88(0.5)***
LogL	-1601.59	-1499.15	-1588.55	-1597.99	-1596.17	-1475.57
LR test	1136.49***	1070.53***	1162.58***	1143.69***	1147.33***	1117.69***
McFadden R ²	0.26	0.26	0.27	0.26	0.26	0.27
Adjusted McFadden R ²	0.26	0.26	0.26	0.26	0.26	0.27
OBS	2380	2174	2380	2380	2380	2174

Notes: 1. α_1 , α_2 denote constant terms corresponding to domestic ratings equal to international ratings and domestic ratings higher than international ratings, respectively. 2. For the coefficients, the first value is the estimate, the number in parentheses is the standard deviation, and the statistical test is the normal approximation, ***, **, * denotes significance at the 1%, 5%, and 10% levels, respectively. 3. Data for the independent variables are from Vantage.

We report the regression results for the extended sample of domestic ratings in Table 14. As expected, having an international rating is associated with a higher domestic rating, and the coefficient on AccAltMkt is significantly positive. More importantly, the main results under the small sample still hold under the extended sample: the effects of asset size and nature of ownership are positive, and the effect of leverage is insignificant. Due to the large increase in sample size in the extended sample, the significance of other variables rises and the direction of the effect is in the expected direction. For example, profitability and retained earnings significantly and positively affect the rating results. This suggests that the conclusion in Section 6.4 that international rating agencies tend to give high ratings to high profitability firms due to the insignificance of profitability among the domestic rating factors may not hold true after the sample is expanded. In addition, the extent to which sample selection of rated firms affects domestic and international rating agency rating differences may also yield valuable conclusions after the sample is expanded in the future.

VIII. Summary

The connectivity of the rating market for Chinese enterprises is not clearly characterized. Domestic enterprises can only be rated by domestic rating agencies in the domestic market, and foreign rating agencies are not qualified to rate domestic enterprises in the domestic market. At the same time, international rating agencies can rate Chinese enterprises in the international market, while the demand for ratings by domestic rating agencies in the international market is not very strong.

Our research shows that the ratings of domestic rating agencies are much higher than those of international rating agencies. The reason for this may be related to the rating benchmark effect: for the credit risk of the same firm, domestic ratings mainly measure its ranking among the credit risks of all domestic firms, while international ratings try to reflect its ranking among the credit risks of all firms globally. In other words, although the rating symbols used by domestic and international rating agencies correspond to each other, they represent different connotations of credit risk. The rating benchmark effect can be clearly seen in the large difference between domestic and international ratings: the former are on average 6-7 notches higher than the latter. No such large differences are shown between domestic rating agency ratings, or between foreign rating agency ratings. We give a simple model to explain the benchmark effect and propose a way to adjust international ratings after addressing the benchmark effect, which removes the benchmark effect better.

Adjusted international and domestic ratings are strongly comparable after removing the rating benchmark effect, but still about 24 percent of firms rated jointly by domestic and foreign rating agencies have adjusted international and domestic ratings that are not exactly equal. For this reason, we further explain the differences in rating outcomes in terms of the domestic rating agencies' rating decision functions - translated from observable public data into rating symbols. Using a cumulative logistic model according to the characteristics of the rating data, we find that firms with larger assets or higher leverage are more likely to be assigned domestic ratings higher than the adjusted international ratings by domestic rating agencies, and firms with high profitability or state-owned ownership are more likely to be assigned adjusted international ratings higher than the domestic ratings by foreign rating agencies. These empirical results hold when controlling for retained earnings, interest coverage, and industry dummy variables, and are largely unchanged in various robustness tests such as international rating adjustment methods, differences in financial reporting systems, and extended samples. This suggests that domestic and foreign rating agencies differ in their views of the factors that reflect the credit risk of Chinese firms, even when rating benchmark effects are excluded.

The results of the analysis in this paper can provide some reference implications for policy research related to the rating market for Chinese firms:

(1) Implementation of the State Council's decision to liberalize foreign investment access restrictions in some service industries, including rating services (Guo Fa [2017] No. 5). The difference between the rating decisions of domestic and foreign rating organizations is not only reflected in the huge difference between the rating results reflected by the rating symbols, but more in their different views on what are the most important factors affecting the credit risk of Chinese companies. If foreign rating agencies can publish more rating opinions on domestic enterprises, it may promote the background knowledge understanding, thinking and interpretation of regulators and investors when making relevant decisions from the perspective of expanding multi-dimensional thinking on Chinese corporate credit risk. In addition, international rating agencies and domestic rating agencies may be less likely to be influenced by the shopping behavior of rated companies than domestic rating agencies, thus potentially providing more independent rating results, which is conducive to promoting the overall development of the domestic rating market. In the past and at present, we have better protected the development of China's domestic rating industry and bond market in its early stage through policies such as regulator management, qualification setting, and industrial guidance for foreign investment. Under the premise of the gradual integration of China's financial markets, including the bond

market, into the international market and the deepening degree of economic openness, further liberalization of the rating market for domestic enterprises is also a due policy option. Therefore, the conclusions of this paper provide some empirical support for Guo Fa [2017] No. 5 on the direction of further reform of China's rating market. In the future, relevant departments should introduce relevant measures to implement the decision of the State Council.

(2) If credit rating agencies' ratings are used in regulation as one of the criteria for calculating capital requirements, it should be made clear that domestic and international ratings are treated differently. Although market participants and regulators may already distinguish between domestic and international ratings in their specific practices, some of our regulations do not make this clear. For example, some regulations note that firms have two or more credit ratings and require that the second-highest rating be selected as the regulatory rating for calculating risk weights. If the distinction between domestic and international ratings is not made clear, and an enterprise has both a domestic and an international rating, unnecessary compliance disputes may arise because domestic ratings are generally much higher than international ratings.

(3) If credit rating agency ratings are used in regulation as a criterion for classifying bonds as investment grade and speculative grade, they should be treated differently, taking into account the realistically large differences between domestic and international ratings. Internationally, the BBB- rating is the dividing line between investment grade and speculative grade (see the U.S. Senate report entitled "Financial Oversight of Enron The SEC and Private-sector Watchdogs" in 2002). BBB-

Bonds rated BBB- and above are considered investment grade, while bonds rated BB+ and below are considered speculative grade. If the investment grade of foreign bonds is set at the international rating of BBB- and above, the investment grade of domestic bonds may be rated at AA- and above, taking into account the difference of domestic ratings, which are on average more than 6 grades higher than the international ratings. The investment grade of bonds in some of our current regulations is set much lower than this. This may pose some financial stability risks in a scenario of high financial volatility, but may also be justified in an environment where invisible collateral is prevalent in China. Relevant regulators may consider setting and adjusting the minimum rating level dynamically, depending on domestic and international circumstances.

bibliography

- [1] Jiang, Xianfeng, and Shi, Yongdong, 2010, "Analysis of Market Harmonization, Risk Measurement, and Influencing Factors in the Treasury Bond Trading Market," *World Economy*, Vol. 2: 120-140.
- [2] Agresti, Alan. 2002. *Categorical Data Analysis*. 2nd Ed. New Jersey: Wiley.
- [3] Ai, Jing, Warren Bailey, Haoyu Gao, Xiaoguang Yang, and Lin Zhao. 2015. 'Corporate Default' with Chinese Characteristics." Mimeo.
- [4] Allen, Franklin, Jun Qian, and Meijun Qian. 2005. "Law, Finance and Economic Growth in China." *Journal of Financial Economics* 77 (1): 57-116.
- [5] Altman, Edward. 1993. *Corporate Financial Distress and Bankruptcy*. New York: John Wiley; Sons.
- [6] "Credit Ratings and Complementary Sources of Credit Quality Information." Basel Committee on Banking Supervision (BCBS) working paper No. 3, August, 2000. "Credit Ratings and Company Sources of Credit Quality Information." Basel Committee on Banking Supervision (BCBS) working paper No. 3, August, 2000.
- [7] Beattie, Vivien, and Susan Searle. 1992. "Bond Ratings and Inter-Rater Agreement." *Journal of International Securities Markets* 6: 167-72.
- [8] Becker, Bo, and Todd Milbourn. 2011. "How Did Increased Competition Affect Credit Ratings." *Journal of Financial Economics* 101 (3): 493-514.
- [9] Bolton, Patrick, Xavier Freixas, and Joel Shapiro. 2012. "The Credit Ratings Game." *Review of Financial Studies* 67 (1): 85 -111.
- [10] Bongaerts, Dion, K. J. Martijn Cremers, and William N. Goetzmann. 2012. "Tiebreaker: Certification and Multiple Credit Ratings." *Journal of Finance* 67 (1): 113-52.
- [11] Bowe, Michael, and Waseem Larik. 2014. "Splits Ratings and Differences in Corporate Credit Rating Policy between Moody's and Standard & Poor's." *Financial Review* 49 (4): 713-34.
- [12] Cantor, Richard, and Frank Packer. 1994. "The Credit Rating Industry." *Federal Reserve Bank of New York Quarterly Review*.
- [13] ---. 1997. "Differences of Opinion and Selection Bias in the Credit Rating Industry." *Journal of Banking and Finance* 21: 1395 -1417.
- [14] Culla, Robert, and Lixin Colin Xu. 2005. "Institutions, Ownership, and Finance: The Determinants of Profit Reinvestment among Chinese Firms." *Journal of Financial Economics* 77 (1): 117-46.
- [15] Dhawan, Raghav, and Fan Yu. 2015. "Are Credit Ratings Relevant in China's Corporate Bond Market?" *The Chinese Economy* 48 (3): 235-50.
- [16] Ding, Yuan, and Xijia Su. 2008. "Implementation of Ifrs in a Regulated Market." *Journal of Accounting and Public Policy* 27 (6) : 474-79. : 474-79.
- [17] Ederington, Louis. 1985. "Classification Models and Bond Ratings." *Financial Review* 4 (20). 237-62.
- [18] ---. 1986. "Why Split Ratings Occur." *Financial Management* 15 (1): 37-47.
- [19] Eng, Li Li, Li Sun, and Thanyalak Vichitsarawong. 2013. "The Valuation Properties of Earnings and Book Values Reported Under Ias, Domestic GAAP and U.S. GAAP: Evidence from China, Hong Kong, Japan, Korea and Singapore." *Advances in Accounting* 29 (2): 278-85.
- [20] Fan, Joseph, Jun Huang, and Ning Zhu. 2013. "Institutions, Ownership Structures, and Distress Resolution in China." *Journal of Corporate Finance* 23: 71-87.
- [21] Fridson, Martin, and Fernando Alvarez. 2011. *Financial Statement Analysis: A Practitioner's Guide*. 4th Ed. New York, USA: John Wiley.
- [22] FSB. 2012. "Roadmap and Workshop for Reducing Reliance on CRA Ratings: FSB Report to G20 Finance Ministers and Central Bank Governors." November 5, 2012. " Nov 5, 2012. URL http://www.fsb.org/wp-content/uploads/r_121105b.pdf (Financial Stability Board).
- [23] FSB, 2014, FSB Member Jurisdictions' Action Plans to Reduce Reliance on CRA Ratings: China. http://www.fsb.org/wp-content/uploads/c_140429e.pdf? page_moved=1.
- [24] GlobalCapital. 2013. "Korean Rating Agencies Overrated." May 15, 2013. URL <http://www.globalcapital.com/article/ k32v3x0kfrz0/korean-credit-rating-agencies-overrated-opinion>.
- [25] Harrington, Diana. 2003. *Corporate Financial Analysis: Decisions in a Global Environment*. 7th ed. Chicago, USA: Richard D. Irwin Inc.
- [26] He, Jie, Jun Qian, and Philip E. Strahan. 2016. "Does the Market Understand Ratings Shopping? Predicting Mbs Losses with Yields." *Review of Financial Studies* 29 (2): 457-85.
- [27] Ismail, Ashraf, Seunghack Oh, and Nuruzzaman Arsyia. 2015. "Split Ratings and Debt-Signaling in Bond Markets: a Note." *Review of Financial Economics* 24: 36-41.

- [28] "Characteristics and Appraisal of Major Rating Companies - Focusing on Ratings in Japan and Asia." Japan Center for International Finance (JCIF), report, Tokyo. Japan Center for International Finance (JCIF), report, Tokyo.

- [29] Joe, Denis Yongmin, and Frederick Dongchuhl Oh. 2016. "Did Foreign Ownership of Korean Credit Rating Agencies Improve Their Ratings?" *Contemporary Economic Policy* advanced published online at <http://onlinelibrary.wiley.com/doi/10.1111/coep.12176/abstract>.
- [30] Kennedy, Scott. 2008. "China's Emerging Credit Rating Industry: The Official Foundations of Private Authority." *China Quarterly* 193: 65-83. " *China Quarterly* 193: 65-83.
- [31] Law, Fiona. 2015. "Can All Chinese Debt Be Rated Top Quality?" *The Wall Street Journal* July 26, 2015.
- [32] Lee, Jane Lanhee. 2006. "Credit Raters in China Take Generous View." *The Wall Street Journal* p. 1 (March 22, 2006).
- [33] Li, Kai, Henry Yue, and Longkai Zhao. 2009. "Ownership, Institutions, and Capital Structure: Evidence from China." *Journal of Comparative Economics* 37 (3): 471-90.
- [34] Long, Scott J. 1997. *Regression Models for Categorical and Limited Dependent Variables*. Thousand Oaks, CA, USA: SAGE Publications.
- [35] Lu, Zhengfei, Jigao Zhu, and Weining Zhang. 2012. "Bank Discrimination, Holding Bank Ownership, and Economic Consequences: Evidence Bank Discrimination, Holding Bank Ownership, and Economic Consequences: Evidence from China." *Journal of Banking & Finance* 36 (2): 341-54.
- [36] Moody's. 2016. "Inside China." February 1, 2016.
- [37] Morgan, Donald. 2002. "Rating Banks: Risk and Uncertainty in an Opaque Industry." *American Economic Review* 92 (4): 874-88. -88.
- [38] OCC. 2007. "OCC Approves Basel II Capital Rule." November 1, 2007. URL <https://www.occ.gov/news-issuances/news-releases/2007/nr-occ-2007-123.html>.
- [39] OCC Bulletin. 2012. "Alternatives to the Use of External Credit Ratings in the Regulations of the Occ." June 26, 2012. <http://www.occ.gov/news-issuances/bulletins/2012/bulletin-2012-18.html>.
- [40] Packer, Frank. 2002. "Credit Ratings and the Japanese Corporate Bond Market." In *Ratings, Rating Agencies and the Global Financial System*, edited by Richard M. Levich, Giovanni Majnoni, and Carmen Reinhart, 139-58. Springer.
- [41] Packer, Frank, Richard Cantor, and Kevin Cole. 1997. "Split Ratings and the Pricing of Credit Risk." *Journal of Fixed Income* 7 (3): 72-82.
- [42] R Core Team. 2016. *R: A Language and Environment for Statistical Computing*. Vienna, Austria: R Foundation for Statistical Computing. <https://www.R-project.org/>.
- [43] S&P. 2014a. "Standard & Poor's National and Regional Scale Mapping Tables." https://www.standardandpoors.com/ru_RU/delegate/getPDF?articleId=1608102&type=COMME&NTS&subType=REGULATORY.
- [44] ---. 2014b. "Standard & Poor's National and Regional Scale Mapping Tables." published on September 30, 2014.
- [45] Skreta, Vasiliki, and Laura Veldkamp. 2009. "Ratings Shopping and Asset Complexity: a Theory of Ratings Inflation." *Journal of Monetary Economics* 56 (5): 678-95.
- [46] Sylla, Richard. 2002. "A Historical Primer on the Business of Credit Ratings." In *Ratings, Rating Agencies and the Global Financial System*, edited by R. Levich, G. Majnoni, and C. Reinhart, 19-40. Springer.
- [47] Train, Kenneth E. 2009. *Discrete Choice Methods with Simulation*. 2nd Ed. New York, USA: Cambridge University Press.
- [48] Watanabe, Shigeru. 1995. "Corporate Finance." In *Japanese Financial Markets*, edited by Shigenobu Hayakawa, 89 -Cambridge, UK: Gresham Books.
- [49] Wilson, Elliot. 2006. "X-Rated: The Dirty World of Chinese Debt." *Asiamoney* 17 (3): 20-22.
- [50] Yanzhou Coal Mining Company Limited. 2015. "2014 Annual Report by China Accounting Accords." www.yanzhoucoal.com.cn/gsgg/img/site8/20150330/001f3b3f23d31683583301.pdf.
- [51] Yee, Thomas W. 2010. "The VGAM Package for Categorical Data Analysis." *Journal of Statistical Software*. 32(10): 1-34. URL <http://www.jstatsoft.org/v32/i10/>.

Table of Contents of

serial number	capt Working Papers	author
No. 1 of 2014	A theoretical model of the policy interest rate transmission mechanism	Ma Jun, Wang Honglin
No. 2, 2014	A Study of Structural Inflation in China - Based on CPI versus PPI	Wu Ge, Cao
No. 3, 2014	The equilibrium real effective exchange rate of the renminbi and exchange rate imbalances measurements	Honggang Wang Bin
No. 4, 2014	International reform of the regulation of systemically important financial institutions: Paths and insights	bell shock
No. 5 of 2014	Research on China's Statistical Indicator System for Financial Inclusion	Zeng Zhaohui, Wu Xia, Li Wei, Liao Yanping, Liu Xi
No. 6 of 2014	The Impact of Offshore Market Developments on Domestic Monetary Policy	Wu Guopei, Wang Weibin, Wu Ge, Yang Ning
No. 7 of 2014	The contribution of China's total factor productivity to economic growth: Literature Review	Wang Yi, Zhai Chun
No. 8 of 2014	Green Finance Policies and Applications in China	Ma Jun, Shi
No. 9 of 2014	Characteristics and price method for compiling our new residential price index Applied research on numbers	Entertainment, Yao Bin
No. 10, 2014	China's macroeconomic forecast for 2015	Ma, Jun, Liu, Bin, Jia, Yandong, and Hong.
		Hao, Li Jianqiang, Yao Bin, Zhang Xiang
No. 1, 2015	Core Inflation Measurement and Applications	Yi Wang, Chunhua Shi, and Huan Ye
No. 2, 2015	China's Inclusive Financial Development Process and Empirical Research	Jiao Jinpu, Huang Tingting, and Wang Tiandu, Zhang Shaohua, Wang Jen
No. 3, 2015	Mobile Money: The Case of Africa and Implications	Wen Xinxiang and Ye Xiaolu
No. 4, 2015	Yield Curve Construction and Empirical Evidence of Wealth Management Products in China	Wu Guopui, Wang Dehui, Fu Zhixiang, Liang Zhifang
No. 5, 2015	A Study of Underlying Inflation Indicators in China	Marlene Amstad and Huan Ye, Ma Guonan (1934-), PRC

		politician, prime minister 1997-1998
No. 6, 2015	Forecasting Principles and Applications of Structural Time Series Models	Zhu Surong and Zhen Zhijian
	examine	
No. 7, 2015	Green	Finance Working Group on
	Building China's Green Financial System	
	Policy Discussion No. 8 of 2015	on the Reform of International
	Financial Benchmarks	Ray Yao
No. 9, 2015	China's Macroeconomic Report 2015 (Mid-year Update)	Ma Jun, Liu Bin, Jia Yandong, Li
		Jianqiang, Honghao, Xionglu
No. 10, 2015	Pricing of Municipal Bond Issues, Budget Constraints and Interest Rate Markets	Yan
	nationalization of agriculture (in Marxist theory)	g
No. 11, 2015	A dynamic study of (the interest rate transmission mechanism)	Ma, Jun, Shi, Kang, Wang, Honglin and Wang.
		liters
No. 12 of 2015	Interest rate corridors, interest rate stability and regulatory costs	Niu Muhong, Zhang Lina, Zhang Xiang, Song Xuetao, Ma Jun
No. 13 of 2015	Survey on the current situation of overcapacity in industrial enterprises Research - based on 696 industrial enterprises in Jiangsu Province empirical analysis	Haihui Wang and Xiaoguang Sun
No. 14 of 2015	The Impact of "Camp Reform" on the Tax Burden of Micro, Small and Medium-sized Enterprises	Wu Ming (1939-), PRC film director

	Empirical Research--Analysis from a Sample Survey in Huzhou City, Zhejiang Province	
No. 15, 2015 Yandong and Li	China's Macroeconomic Forecast for 2016	Ma, Jun, Liu, Bin, Jia, Jianqiang, Chen Hui, Xiong Lu
No. 1, 2016 Transmission of Monetary Policy Yandong, Zhang	The Role of the Yield Curve in the Ma Jun, Hong Hao, Jia	
No. 2, 2016 Difficulty in Promoting the PPP Model and Countermeasure Construction comment on	Exploring the Reasons for the Shi Hangyin, Li Hongjin, An Guojun Xiaofu Cui, Kai Cui, Hongfen Xu, Jinliang Li, Yan Wang, Ertao Cui	
Survey System No. 3, 2016 Xi, Niu	An International Comparative Study of the Business Sentiment Zhang, Ping, Pan, Mingxia, Ji,	
No. 4, 2016 Transmission of Banking System	Li-Hua, Fan Qi Monetary Policy through the Ji Min, Zhang Xiang, Niu Muhong and Ma spirited horse	
No. 5, 2016 volatility affect economic growth Growth and financial stability?	How financial cycles and financial Chen Yulu, Ma Yong, Ruan Zhuoyang	
No. 6, 2016 and Green Finance	Natural Resource Balance Sheets Hong Hao and Sun Wei Take Huzhou, Zhejiang as an example	
No. 7, 2016	Introduction to IMF Macrofinancial Analysis Content and Methodology Chengkun Yin, Guihuan Zheng, Xinhui Lu,	Jingjie Bai and Yuanji Lin
No. 8 of 2016	Global Risk Aversion and Capital Flows - 'Binary' Exploring the causes of the "paradox	Wu Ge, Lu Jian
No. 9 of 2016	Macroeconomic forecasts for 2016 (mid-year update)	Ma Jun, Liu Bin, Jia Yandong, Li
No. 11 of 2016	Methods of constructing the Treasury yield curve: international experience and insights	Jianqiang, Hui, Chen, Wu Guopei, Lv Junzhong, Xianfeng, Jiang, Wang, Chen Baoquan, Zhang Yan, awe-inspiring, Wu Wei, Fang Xiaowei
No. 10 of 2016	International Coordination of Monetary Policy under the Global Monitoring and Measuring Systemic Optimization Perspective	Sun Guofeng, Yin Hang, Chai Hang Financial Risks - The Basics
No. 12 of 2016		

No. 1, 2017	Research on China's Financial System	Tao Ling, Zhu Ying
	financial stability: theory with experience	Xu Zhong, China
No. 2, 2017	China's Practical Experience of Sound Monetary Policy and Currency Policy.	Financial Forum
	Policy theory trends	
No. 3, 2017	Monetary Policy Exchange Rates	Research Group
	and Capital Flows - For "Equalization" to "Equalization" - The Role of Monetary Policy in the Development of the Economy	Sun Guofeng, Li Wenche
No. 4, 2017	"Side triangles" to "unequal triangles."	Yang Jian, Yu Ziliang,
	China's Inter-Financial Institutions	Jia Yandong, Ma Jun
No. 5, 2017	Financial Flush from a Global Perspective.	Hsien-Feng Chiang, Frank
	Differences in Credit Ratings of Chinese and Foreign Enterprises and Their Determinants	Packer
	constituent	