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Foreign Investment, Reputation and the Predictability of Chinese Credit Ratings

Xing-yue Zhan[1,*], Chao-hung Yu[1]

[1]*School of Finance and Accounting, Fuzhou University of International Studies and Trade, China*
[*]*Corresponding author. Email: xingyuezhan@foxmail.com*

ABSTRACT
This study examines how foreign investment in Chinese credit rating agencies affects the predictability of Chinese bond market ratings from January 1, 2013, to June 30, 2019. Empirical results show that the latest rating issued by both domestic and Sino-foreign rating agencies can reflect the probability of default, at least that of default in rating day. Furthermore, rating agencies with large market shares downgrade ratings to speculative grade near the day of default, even downgrading on the day of default. Reputation effects may prompt rating agencies in which foreign companies invest or with whom they cooperate to downgrade ratings sharply.
Keywords: *Sino-foreign credit rating agencies,credit rating, rating adjustment, reputation effect*

1. INTRODUCTION

Credit ratings can alleviate information asymmetry between investors and bond issuers (Ashbaugh-Skaife et al. [1]; Bedendo et al. [2]; Bosch & Steffen [3]). Because investors cannot directly obtain the internal information of the bond issuer, they tend to receive a hint regarding the credit risk from credit ratings.

However, studies question the timeliness and accuracy of ratings (Altman & Rijken [4]; Griffin et al. [5]; Loffler [6]; Salvade [7]; Skreta & Veldkamp [8]). Early studies express their concerns about accuracy of ratings in Chinese market (Livingston et al. [9]). Meanwhile, Livingston et al. [9] indicate that international investors are heighten interested in Chinese bond market, and they also indicate that the credit risk AA+ ratings express in Chinese market is similar to that BBB ratings do in international market, but high-level rating results do not necessarily represent high values (Griffin et al. [5]). Information regarding bond credit risks is concealed by high-level ratings.

The "11 Chaori" bond default aroused the vigilance of investors accompanying the intensifying wave of bond defaults. After the event of first bond default, the Chinese credit rating industry has developed rapidly. Competition between rating agencies is complex and intense, and it may motivate rating agencies to reduce rating quality to obtain larger market shares (Griffin et al. [5]; Guttler & Wahrenburg [10]; Salvade [7]; Skreta & Veldkamp [8]).

Before 2018, no international credit rating agencies were allowed to enter the Chinese market. Thus, they must cooperate with or invest in Chinese credit rating agencies to participate in this market. Livingston et al. [9] state that different credit rating agencies receive different attitude about ratings from investors in Chinese market, who are likely to select rating agencies with large market share.

We first examine the effects of foreign investment in rating agencies (called Sino-foreign rating agencies) on the relationship between the latest rating (or rating at the day of default) and the probability of default. Our hypothesis argues that rating agencies receiving foreign capital investments value international reputation and subsequently improve rating quality rather than catering to issuers' interests in gaining greater Chinese market shares. Although we find some cases that credit rating agencies downgrade ratings to speculative level after the day of default, a regression model will be examined to investigate whether the latest rating (or rating at the day of default) issued by Sino-foreign rating agencies reflects the probability of default more accurately than ratings issued by domestic rating agencies does.

We then examine the effects of market share on rating adjustments. That is, we assume that reputation effects are an incentive for Chinese rating agencies who may downgrade ratings sharply when they have large market shares. According to a argument of Mariano [11], rating inflation cannot be restrained by reputational concerns. Livingston et al. [9] also indicate the rating inflation in Chinese bond market. Hence, rapid rating downgrades can be a hint of rating inflation. If no evidence supports our hypothesis, reputation effects in the Chinese rating industry may be affected by a complex competition environment.

We also examine whether ratings are responsive when a bond is rated by rating agencies with large market shares or with foreign capital investment. We assign numerical values to the days on which ratings are downgraded to speculative grade as a proxy for response speed.

This study provides a reference for investors who tend to make investment decisions based on credit ratings and evidence for the effectiveness of credit ratings. The regression results indicate that ratings issued by Sino-foreign rating agencies are significantly correlated with the probability of default. In addition, no evidence suggests an association between large market shares and rapid rating

downgrades. Moreover, market shares sizes are negatively correlated with the number of days in advance of default ratings are downgraded to speculative grade level, which means that rating agencies with good reputations tend to downgrade ratings to speculative grade on or close to the day of bond default.

To provide further evidence, the total sample is classified into a Sino-foreign group and domestic group. Our results indicate that ratings from Sino-foreign rating agencies are slightly more efficient than those from domestic rating agencies, and both ratings can provide credit risk information to investors.

To explore whether our regression results are affected for the only rating agency (Shanghai Brilliance) that cooperates with an international rating agency (S&P), we reclassify our sample into two subgroups. The results are consistent with previous regression results, except for the relationship between market share and rating adjustment. Some evidence suggests that if the rating agency is invested in by or cooperates with a foreign company, the rating agency with large market share downgrades ratings sharply.

This study provides several contributions to the literature: First, we establish an ordinary least squares regression model to examine whether reputational concerns incentivizes responsive ratings, and our concentration on the number of days in advance of default ratings are downgraded to speculative grade level provides ideas for future research. Second, this study collects available data on both corporate and enterprise bonds, expanding the current literature on Chinese data.

This study proceeds as follows: Section 2 is a brief review of competition among rating agencies, reputation effects, and an introduction to the Chinese bond market. Section 3 presents our data and methodology. Section 4 presents statistical analysis and empirical results. Section 5 provides the conclusion.

2. LITERATURE REVIEW

2.1. Competition, Reputation and Background in Chinese Market

Credit rating is the product of rating agencies, who rely on products to improve institutional reputation and expand the market. Most rating agencies adopt the issuer-paid model because rating agencies cannot resolve the free rider problem, and bond issuers are motivated to buy high-level ratings (White [12]).When a bond issuer has the right to select rating agencies and to seek a more favorable rating result, rating agencies inevitably compete. Griffin et al. [5], Skreta & Veldkamp [8], Salvade [7], and Guttler & Wahrenburg [10] indicate that competition among rating agencies can adversely affect rating quality.

Moody's, S&P, and Fitch dominate the international credit rating industry and have large market shares. However, the competition among credit rating agencies is more intense in the Chinese market. One reason for this is that the value of ratings was recognized by rating users in 2014. Prior to this, most of bonds had AAA ratings or AA ratings. Hence, credit ratings exert relatively weak effects. In 2014, the government planned to resolve this situation gradually, shifting risks to the bond issuer companies who should originally have assumed risks. In that year, the first default event occurred, and the wave of bond default intensified in the following years. Therefore, competitive relationships between Chinese credit rating agencies have not existed as long as competition among international agencies. Chinese credit rating agencies now play a major role in bond markets and face fierce competition.

One important factor between rating quality and rating agencies' competition is reputation. This argument is mainly concerned with whether reputational concerns cause rating agencies to exercise caution in relation to ratings: If rating agencies pay more attention to their reputation, the rating results are less affected by issuers, and rating agencies might exhibit more concern regarding investor feedback. Mathis et al. [13] provide evidence that inadequate confidence in rating agencies causes a decrease in circulation and high bond yield spread, inducing rating agencies to attempt to improve their reputations. However, when investors regain confidence in ratings, this motivation is removed (Mathis et al. [13]).

From perspective of investors, credit rating is a information resource. Murcia et al. [14] describe credit rating as a proxy of credit risk. Becker & Milbourn [15] also mention that credit ratings allow investors to identify potential risk information using simple symbols. Poor reputation can prompt investors to question ratings issued by rating agencies. If a rating agency wishes to maintain public trust, they must attend to their reputations. Kraft [16] argues that "Rating Catering" is unpopular if accompanied with higher reputational costs. Reputation is the foundation for the long-term development of rating agencies, thus they will be more cautious in the face of reputation effect (Cheng & Neamtiu, [17]). Nevertheless, Mariano [11] believes reputational concerns to intensify rating inflation. Their study reveals that if a rating agency issues a bad rating, new rating agencies have the opportunity to issue good ratings, gain a foothold, and increase their competitiveness.

According to Becker & Milbourn [15], competition weakens the effects of reputation incentives, lowering the quality of credit ratings. Whether Chinese credit rating agencies cater to bond issuer companies (Griffin et al. [5]; Salvade [7]; Skreta & Veldkamp [8]) or to the maintenance of their reputations among investors (Cheng & Neamtiu [17]; Kraft [16])—in fiercely competitive environments—remains uncertain.

2.2. Foreign Investment and Home Bias

If Chinese credit rating agencies tend to gain greater market shares among competitors, they are incentivized to issue high ratings for their clients. International rating agencies are potentially more concerned Chinese domestic rating agencies are regarding their international reputations, and this can reduce the incentive for rating shopping among

Chinese clients. Yalta & Yalta [18] indicate that the United States receives a higher sovereign credit rating level and provide evidence that subjective factors cause rating agencies to exhibit home bias in sovereign credit ratings.

In particular, international credit rating agencies were prohibited from entering the Chinese bond market directly before 2018. Therefore, some domestic rating agencies are invested in by or cooperate with international rating agencies. Both China Lianhe Credit Ratings Co., Ltd. (hereafter, Lianhe Credit) and China Chengxin International Rating Co., Ltd. (hereafter, Chengxin International) received foreign investment, whereas the remaining rating agencies received only domestic capital. In addition, 74.84% of Lianhe Credit shares were held by Lianhe Credit Information Service Co., Ltd., with the remaining 25.15% held by Feline Investment Pte. Ltd. Beijing Zhixiang Information Management Consulting Co., Ltd. held 70% of the shares of Chengxin International, and Moody's held 30% of the shares. United Credit Ratings Co., Ltd. (hereafter, United Credit) is a wholly owned subsidiary of China Lianhe Credit Rating Co., Ltd., China Chengxin Securities Evaluation Co., Ltd. is a wholly owned subsidiary of Chengxin International Credit. Notably, Shanghai Brilliance Credit Rating & Investors Service Co., Ltd. (hereafter, Shanghai Brilliance) cooperated with S&P from 2008, but S&P did not held no Shanghai Brilliance shares. This fact distinguishes Shanghai Brilliance from other rating agencies. We therefore explore whether domestic rating agencies cater to bond issuers' requirements that untimely ratings be issued, and we also explore whether rating agencies with foreign investment (Sino-foreign rating agencies) aim for timely and responsive ratings. In addition, this study provides further evidence for the effects of reputation incentives on rating. As the proxy for credit rating agencies' reputations, we adopt the ratios of the issue sizes of bonds rated by each rating agency to the issue size of all bonds in the entire corporate and enterprise bond market (Hu et al. [19]).

2.3. The Predictability of Chinese Credit Rating

Investors wish for rating agencies to issue rating results as soon as possible after bond credit risks change. Becker & Milbourn [15] and Bedendo et al. [2] indicate that rating is a important source of information for the identification of bond risks particularly by investors. However, numerous studies indicate investor doubts regarding rating agencies and rating quality. For instance, ratings react slowly to credit risks change (Altman & Rijken [4]; Loffler [6]), and rating inflation applies (Griffin et al. [5]; Salvade [7]; Skreta & Veldkamp [8]).

Before analyzing data in the Chinese market, we compare rating symbols for three international credit rating agencies and Chinese rating agencies in Table 1. Notably, the rating symbols of medium- and long-term bonds in the Chinese market are identical and are divided into three classes (A, B, and C) and nine grades (such as AAA, AA, and A). Except for the AAA and C grades, other grades can be modified by the addition of a (−) or (+) sign to represent degrees within the grades. Therefore, this study assigns the same numerical value to rating symbols for all Chinese rating agencies. Investors more easily understand rating results issued by different rating agencies, because additional knowledge regarding rating symbols is not required.

Table 1 Rating symbols and numerical values assigned

Rating Symbols			Numerical value assigned
Moody's	**S&P,Fitch**	**Chinese credit rating agencies**	
Investment Grade			
Aaa	AAA	AAA	19
Aa1	AA+	AA+	18
Aa2	AA	AA	17
Aa3	AA-	AA-	16
A1	A+	A+	15
A2	A	A	14
A3	A-	A-	13
Baa1	BBB+	BBB+	12
Baa2	BBB	BBB	11
Baa3	BBB-	BBB-	10
Ba1	Speculative Grade		
Ba2	BB+	BB+	9
Ba3	BB	BB	8
B1	BB-	BB-	7
B2	B+	B+	6
B3	B	B	5
Caa1	B-	B-	4
Caa2	CCC+	CCC	3
Caa3	CCC	CC	2
Ca	CCC-	C	1
C	CC		
	C		
	D		

Note: This table describes credit rating symbols in Moody's, S&P, Fitch, and Chinese credit rating agencies in the Chinese corporate bond market and the enterprise bond market and provides the numerical values assigned in this study. Nine Chinese credit rating agencies in this study have the same rating symbols for medium- and long-term bonds. Ratings definitions are from Standard & Poor's (S&P) Ratings Definitions from Sept 18, 2019, rating symbols and definitions of Moody's, and Fitch's ratings definitions. Moody's rating definition omits the classification of investment grade and speculative grade. Therefore, Moody's rating symbols are not divided into two grades.

After the assignment of numerical values to rating symbols, Figure 1 depicts the trend chart for the rating adjustment of default bonds in the Chinese market to investigate the effects of rating. Four typical cases of default bond rating adjustment are featured. In group A, default bonds ratings were downgraded to 9 or below before the day of default (9 represents the bond rating BB+, which is the cutoff point between the investment grade and the speculative grade). This indicates that a rating agency can accurately predict the bond default risk and reflect this in ratings. In group B, the bond ratings were downgraded after or on the day of default, and the ratings were at the investment grade level on the day

of default. In the ratings definitions of rating agencies, the investment grade represents low (general) default risk and strong (general) liquidity. Therefore, in the Chinese bond market, some ratings are unresponsive to credit risk. If the rating agency does not downgrade ratings to BB+ in time before the default, investors who make investment decisions based on the rating suffer losses.

To investigate the predictability of Chinese credit rating in general, we analyze a sample of default bonds from January 1, 2013, to June 30, 2019 in the Wind Database, remove bonds with missing ratings, and present in Table 2. As shown in Table 2, of the 143 default bonds, the largest number of ratings (i.e., 51) was issued by United Credit. The second and third largest numbers were issued by Pengyuan Credit Rating Co., Ltd. (hereafter, Pengyuan) and Dagong Global Credit Rating Co., Ltd. (hereafter, Dagong), with 32 and 28 ratings, respectively. A possible reason for this might have been that Dagong, Pengyuan, and United Credit took the top four market shares in our sample. However, ratings issued by China Chengxin Securities Rating Co., Ltd. (hereafter, Chengxin Securities) accounted for 32% of the bonds from the total sample (the largest market share in our sample), and the number of default bonds rated by Chengxin Securities was much less than those rated by the three aforementioned rating companies (with 20 default bonds).

As Cheng & Neamtiu [17] provide a proxy of ratings' timeliness, who apply four time segments (9, 6, 3 and 1 months) before the default date as the proxy, this study follows their studies and adjusts the proxy according to Chinese market's sample. A significant different between this study and Cheng & Neamtiu [17] is that we consider the time of rating downgrade to speculative grade level as the cut off point rather than the time of bond default. Notably, 64 of 143 default bonds (44.76% of the subset of default bonds) were downgraded to speculative grade level on the day of default or even failed to be downgraded after the day of default. This demonstrates that some bond ratings issued by Chinese credit rating agencies fail to predict bond credit risks. Simultaneously, Chinese credit rating agencies issued downgrades to speculative grade for the ratings of 29 default bonds at most 10 days before default, and this indicates a lack of timeliness in the Chinese rating industry. For unskilled investors or investors who do not monitor rating adjustments frequently, this risk warning signal is not recognized in time.

As mentioned, United Credit and Chengxin International are two rating agencies with foreign capital investment, and these two agencies held the top four market shares with Pengyuan and Dagong. In the column for agencies failing to downgrade or downgrading on the day of default, bonds rated by United Credit and Chengxin Securities—the wholly owned subsidiary of Chengxin International—accounted for 46.87% (30 of 64). Notably, United Credit issued ratings for 51 default bond and 16 of them were at investment grade level on the day of default (approximately 31.37%); Chengxin Securities issued ratings for 20 default bond, and 14 (70%) were at investment grade on the day of default. This reveals different rates of unresponsiveness for the two Sino-foreign rating agencies.

Table 2 Time distribution of rating downgrade to speculative grade

Rating agencies	**Not downgrade**	**Downgrade at the day of default**	**Downgrade *t* days before default**						**Sum**
			$t \leq 10$	(10,30]	(30,60]	(60,90]	(90,120]	(t>120)	
United Credit	5 9.80%	11 21.57%	8 15.69%	11 21.57%	0 0.00%	11 21.57%	2 3.92%	7 5.88%	51
Pengyuan	4 12.50%	11 34.38%	7 21.88%	0 0.00%	0 0.00%	2 6.25%	3 9.38%	5 15.63%	32
Dagong	0 0.00%	15 53.57%	5 17.86%	1 3.57%	1 3.57%	2 7.14%	0 0.00%	4 14.29%	28
Chengxin Securities	3 15.00%	11 55.00%	6 30.00%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	20
Golden Credit	0 0.00%	3 37.5%	3 37.5%	0 0.00%	0 0.00%	0 0.00%	2 25.00%	0 0.00%	8
Chengxin International	0 0.00%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	1 50.00%	1 50.00%	2
Shanghai Brilliance	0 0.00%	1 50.00%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	1 50.0%	2
Number of default bonds	12 8.39%	52 36.36%	29 20.28%	12 8.39%	1 0.70%	15 10.49%	8 5.59%	14 9.79%	143
	64 44.76%		79 55.24%						143

Note: Full names of rating agencies in the table: United Credit, Pengyuan Credit Rating Co., Ltd., Dagong Global Credit Rating Co., Ltd., China Chengxin Securities Rating Co., Ltd., Golden Credit Rating International Co., Ltd., Chengxin International, and Shanghai Brilliance."Downgrade t days before default" represents a rating downgrade to speculative grade t days ahead of the default. (a,b] represent the range of t. Our sample contains nine credit rating agencies, two of which issue no ratings for default bonds: China Lianhe Credit Ratings Co., Ltd., and Fareast Credit Ratings Co., Lt

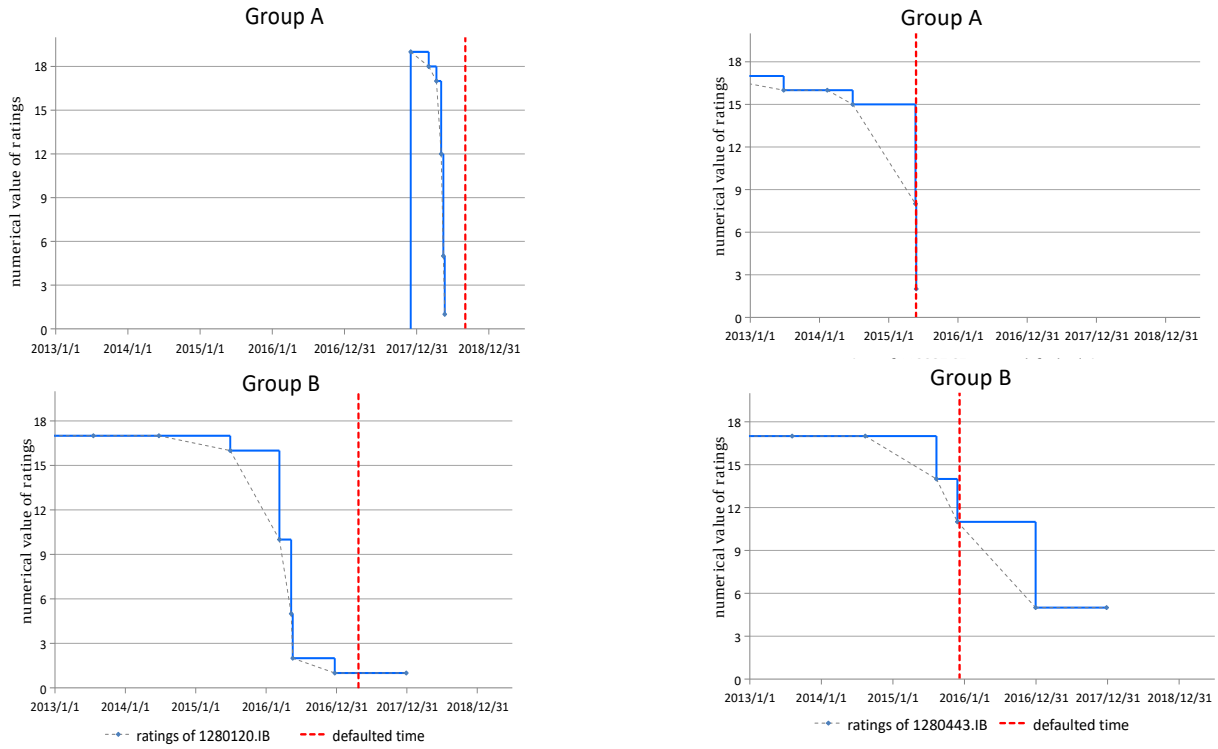

Figure 1 Bond default time and changes to credit ratings. Group A contains default bonds with ratings downgraded to BB+(9) or below before the day of default (the red line). Group B contains default bonds with investment grade ratings on the day of default. Due to space limitations, the graphs of other default bonds are omitted. The source for ratings adjustment is Wind Database

On the basis of the analysis provided, some ratings were downgraded to speculative grade level after default for both Sino-foreign and domestic agencies. Moreover, two Sino-foreign agencies exhibit different rates for unresponsive ratings. Therefore, this study investigates whether foreign investment in Chinese rating agencies affects the ability of ratings to predict default probabilities and whether Sino-foreign rating agencies are more concerned regarding market share (reputation).

3. DATA AND METHODOLOGY

3.1. Data Source

The data sets are assembled from January 1, 2013, to June 30, 2019, using corporate and enterprise bond data from the Wind Database. Financial-specific and bond-specific data are then collected from the Wind Database. The shareholding proportion of United Credit and Chengxin International are summarized from their office websites. The ratings of corporate bonds and enterprise bonds at different time points are manually sorted from bonds' historical ratings. Table 2 provides default bond data to June 30, 2019, with some financial-specific data proving insufficient. After the exclusion of sample bonds with missing data, the final sample includes 8416 bonds, 131 of which are reported default events, and the others of which are normal bonds. The earliest default bond is "11 Chaori" on March 5, 2014.

3.2. Model and Variables

According to the previous discussion, this study establishes the following three sets of models to estimate the relationship among Sino-foreign rating agencies, the predictability of credit ratings, and the effect of reputational concerns. First, the Probit model is adopted to explore the effects of credit ratings issued by Sino-foreign rating agencies on the probability of default.

Model 1

$$\begin{aligned}\Pr(Default=1|X_i) &= \alpha_0+\beta_1 JOINT*CR_{new,i}+\gamma_1 MKS_i \\ &+\theta_1 GDP_{new,i}+\theta_2 LIST_i+\theta_3 PROP_i+\theta_4 BAL_i \\ &+\theta_5 MAT_i+\theta_6 GUAR_i+\sum_{j=1}^{8}\kappa_j IND_j+\varepsilon_i\end{aligned} \quad (1)$$

Here, the dependent variable *Default* refers to the probability of default for the corporate bonds, *Default* equals 1 if the bond is subject to default, otherwise it equals 0; *JOINT* is a

dummy variable, and it equals 1 if the rating agency has foreign capital investment—that is, it takes the value 1 when the rating agency is United Credit or Chengxin International—otherwise it takes the value 0.

Because United Credit is a wholly owned subsidiary of China Lianhe Credit Rating Co., Ltd., China Chengxin Securities Evaluation Co., Ltd. is a wholly owned subsidiary of Chengxin International Credit. Therefore, the Sino-foreign joint venture rating agency in the *JOINT* variable includes four rating agencies. A cooperative relationship exists between Shanghai Brilliance and S&P, but Shanghai Brilliance is not a Sino-foreign rating agency. Therefore, this study did not include Shanghai Brilliance among Sino-foreign rating agency variables.

*JOINT*CRnew* is the interaction term to examine the relationship between the latest (or day of default) rating and the probability of default. Presenting in Table 1, we assign values to ratings, with larger values representing better ratings. *GDPnew* represents the latest GDP or GDP at the time of default. *LIST*, *PROP*, and *GUAR* are all dummy variables. *LIST* equals 1 when the bond issuer is a listed company; *PROP* equals 1 when the bond issuer is a private company; and *GUAR* equals 1 when the bond has a guarantor. *BAL* is the proportion for the outstanding balance of bonds; *MAT* is the number of years remaining for bonds; *MKS* represents the market share of rating agencies, which is the ratio of the issuance of corporate bonds rated by rating agencies to the total issuance of all sample corporate bonds.

Furthermore, rating agencies may be promoted by reputation (market share) to adjust ratings. To obtain further evidence regarding the reputational effects of Sino-foreign rating agencies, Model 2 is considered:

Model 2

$$DCR = \alpha_0 + \beta_1 JOINT * MKS_i + \theta_1 DGDP_i + \theta_2 LIST_i + \theta_3 PROP_i + \theta_4 BAL_i + \theta_5 MAT_i + \theta_6 GUAR_i + \sum_{j=1}^{8} \kappa_j IND_j + \varepsilon_i \quad (2)$$

Model 2 focuses on the interaction term of the market share of rating agencies and the dummy of Sino-foreign rating agencies (*JOINT*MKS*) to verify the effects of reputation on credit rating. In this equation, if Sino-foreign rating agencies adjust their ratings more significantly due to reputation, reputational concerns affect ratings and restrain the behavior of rating agencies. Here, *DCR* indicates the value for the rating adjustment, which is calculated from the initial rating to the latest (or day of default) rating. Correspondingly, *DGDP* represents the change in GDP at the time of issue and the time of issue for the latest rating.

According to the previous discussion, nearly half (approximately 44.76%) of default bonds are not downgraded to speculative grade or are downgraded on the day of default. Therefore, this study established Model 3 to examine whether Sino-foreign rating agencies or agencies with greater market shares can identify credit risk earlier and adjust ratings to speculative grade in a timely manner.

Model 3

$$ADJD = \alpha_0 + \beta_1 JOINT_i + \beta_2 MKS_i + \theta_1 DGDP_i + \theta_2 LIST_i + \theta_3 PROP_i + \theta_4 BAL_i + \theta_5 MAT_i + \theta_6 GUAR_i + \sum_{j=1}^{8} \kappa_j IND_j + \varepsilon_i \quad (3)$$

In Model 3, *ADJD* is the number of days that rating agencies downgrade ratings to speculative grade before a default event. The number of days is assigned according to the classification in Table 2: *ADJD* takes the value of 0 if the rating is never adjusted to speculative grade or the value of 1 if the rating is downgraded to speculative grade on the day of default or after default, taking the value of 2 if the rating is adjusted 10 days before the respective default event (including on the 10th day), takes the value of 3 if the rating is downgraded between the 11th and 60th days, takes the value of 4 if rating is downgraded between the 61st and 120th days, and takes the value of 5 if the rating is downgraded 121 days before default. To summarize, the higher the assigned value of *ADJD* is, the more days in advance the downgrade to speculative grade occurs, which means the rating agency responds more quickly to credit risk. This study adopts Model 3 to investigate the relationship among Sino-foreign rating agencies, market share, and the predictability of ratings. The remaining variables in Model 2–Model 3 are defined in the same manner as those in Model 1.

4. EMPIRICAL RESULTS

4.1. Data Description

This section presents summary statistics and regression results. Our sample of 8416 bonds is rated by nine rating agencies. In Figure 2, Chengxin Securities accounts for the greatest market share (18.27%), with 16.33% of corporate bonds and enterprises bonds in the sample rated. The market shares of three credit rating agencies are closely similar. Dagong has the second greatest market share (15.20%), the third greatest share is Pengyuan's (14.69%), and the fourth greatest share is United Credit's (14.66%). The top four rating agencies account for 62.82% of the market share, and 61.48% of sample bonds are rated by these reputable rating agencies, which means that they exhibit strong market competitiveness in corporate bond and enterprise bond markets.

Table 3 presents a statistical summary of the entire sample. The default bonds account for 1.56%; 4079 of sample bonds (approximately 48.47%) were rated by Sino-foreign rating agencies; and a large difference existed in the latest ratings of the bonds, attributable to the poor ratings of default bonds. In our sample, listed companies accounted for 13%; private companies accounted for 15%, and most sample companies were locally administered state-owned enterprises; and the average ratio of outstanding balances was approximately 84%. The average number of years to bond maturity is 3.55 years. In these samples, 27% of the bonds are guaranteed, whereas most of the sample bonds have no guarantor.

In time distribution, 3, 11, 5, 10, 61, and 41 bonds were defaulted from 2014, 2015, 2016, 2017, 2018, and 2019, respectively. Table 4 shows the descriptive statistics of 131 default bonds in the sample. Sino-foreign rating agencies rated 54% of defaulted corporate bonds and enterprises bonds. The average value for the latest ratings of default bonds was 6 (B+), which qualifies as speculative grade. Notably, most default bonds were issued by private companies. This indicates a lower probability of default for bonds issued by state-owned enterprises. The average balance rate was 87% because 96 default bonds had not paid. Only 22% of default bonds had guarantors.

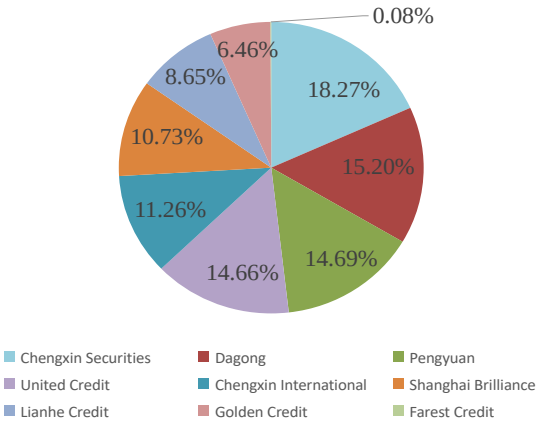

Figure 2 Market shares of Chinese credit rating agencies

In our sample, *DCR* exhibits a significant positive correlation with *CRnew*. In the empirical model of this study, *DCR* and *CRnew* do not simultaneously become explanatory variables, hence no collinearity problem occurs.

4.2. The Predictability of Ratings Issued by Sino-foreign Rating Agencies

First, we perform logistic regression based on Model 1 and Model 2. This study applies two proxies of foreign investment in credit rating agencies. The *JOINT* variable takes the value of 1 if a credit rating agency is subject to foreign investment. As another proxy, the *JOINT* variable is the ratio of foreign investment in a credit rating agency.

In Table 5, Columns 1 and 2 feature regression results from Model 1. For bond ratings issued by Sino-foreign rating agencies, the latest credit rating has a negatively significant relationship with the probability of bond default. Statistically, when the latest rating increases by 1 numerical value, the probability of default decreases by 0.15%. The decrease in default probability is slightly more significant in Column 2 than in Column 1, with 0.55%. Correlations of *JOINT*CRnew* in Columns 1 and 2 are similar and significant. Therefore, the value assignment of *JOINT* does not greatly affect the regression results. In addition, no evidence suggests a correlation between the market shares of rating agencies and default probability.

In some cases analyzed above, rating agencies may downgrade ratings sharply. This fact shows some evidences to support research of Livingston et al. [9], who claim that rating inflation is found in Chinese credit rating industry. We expect that inflation can be released by international reputation concerns in Sino-foreign credit rating agencies. Therefore, the second regression model is adopted in Columns 3 and 4 in Table 5.

Table 3 Descriptive statistics

	DEFAULT	*JOINT*	*CRnew*	*DCR*	*MKS*	*DGDP*	*Control Variables*				
							LIST	*PROP*	*BAL*	*MAT*	*GUAR*
Mean	0.02	0.48	17.90	-0.07	0.13	0.22	0.13	0.15	0.84	3.55	0.27
Median	0.00	0.00	18.00	0.00	0.14	0.18	0.00	0.00	1.00	3.18	0.00
Max	1.00	1.00	19.00	3.00	0.18	3.81	1.00	1.00	1.00	17.34	1.00
Min	0.00	0.00	1.00	-17.00	0.00	-0.23	0.00	0.00	0.00	-0.20	0.00
Std.Dev	0.12	0.50	1.91	1.65	0.04	0.25	0.34	0.35	0.28	1.23	0.44
N	8416	8416	8416	8416	8416	8416	8416	8416	8416	8416	8416

Table 4 Descriptive statistics for default bonds

	ADJD	*JOINT*	*CRnew*	*DCR*	*MKS*	*DGDP*	*Control Variables*				
							LIST	*PROP*	*BAL*	*MAT*	*GUAR*
Mean	2.27	0.54	6.63	-10.47	0.15	0.24	0.25	0.92	0.87	1.63	0.22
Median	2.00	1.00	4.00	-14.00	0.15	0.23	0.00	1.00	1.00	1.62	0.00
Max	5.00	1.00	17.00	0.00	0.18	0.88	1.00	1.00	1.00	4.18	1.00
Min	0.00	0.00	1.00	-17.00	0.06	-0.08	0.00	0.00	0.00	-0.01	0.00
Std. Dev	1.54	0.50	6.24	6.21	0.02	0.18	0.44	0.28	0.29	1.18	0.42
N	131	131	131	131	131	131	131	131	131	131	131

Columns 3 and 4 show that no evidence suggests that the Sino-foreign rating agencies with different market shares tend to adjust ratings sharply. As such, Sino-foreign rating agencies with greater market shares do not make more significant adjustments than do agencies with lower market shares. However, this regression result does not provide the final conclusion. The effect of rating agencies' market shares on the adjustment of ratings requires further examination. One possible reason for this result is, for all Chinese credit rating agencies, rating inflation causes artificially high ratings, when the high credit risk of bonds is noticed, rating agencies will downgrade ratings sharply to more appropriate rating levels. The threat of reputation has impact on all credit rating agencies. Therefore, even rating agencies with low ranking in market share would downgrade ratings significantly when they receive some signal of risk.

Table 5 Accuracy of latest ratings and rating adjustment

	Default		***DCR***	
	JOINT= dummy variable （1）	JOINT= proportion of investment （2）	JOINT= dummy variable （3）	JOINT= proportion of investment （4）
C	7.9354*** (0.0000)	7.9175*** (0.0000)	0.0913 (0.3585)	0.0839 (0.3980)
*JOINT*CRnew*	-0.0015*** (0.0000)	-0.0055*** (0.0000)		
*JOINT*MKS*			-0.2610 (0.2944)	-0.5511 (0.5225)
MKS	0.0536 (0.1649)	0.0726* (0.0624)		
DGDP			-0.1801** (0.0280)	-0.1762** (0.0315)
GDPnew	-0.7036*** (0.0000)	-0.7023*** (0.0000)		
Control variables	Control	Control	Control	Control
Industry	Control	Control	Control	Control
R-squared	0.1347	0.1347	0.0668	0.0667
N	8416	8416	8416	8416

Note: This table shows regression with *Default* or *DCR* as the dependent variable. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. For Columns 1 and 2, the R-squared part should be pseudo R-squared. Due to space limitations, the empirical results for dummy variables *Industry* and *control variables* are omitted.

According to the empirical results of Model 1, the latest ratings of Sino-foreign credit rating agencies are associated with the risk of default. It seems like investors can rely on ratings as a source of information. However, if rating agencies cannot issue their accurate predication in advance, ratings make no sense to investors. To investigate whether the Sino-foreign rating agencies adjust ratings earlier than local rating agencies do and whether reputation concerns motivate credit rating agencies to identify and disclose credit risk, this study adopts Model 3 to provide evidence. In this Model, only 131 default bonds are used for the sample.

The regression results are presented in Table 6, and the results show that market share size is negatively associated with adjustment time. No evidence suggests a relationship between Sino-foreign rating agencies and the adjustment time. *MKS* exhibits negative statistical significance at the 1% level: When the market share decreases by 1%, the adjustment is issued 18% in advance. One reason for this is that 12 cases that did not adjust ratings after default events belonged to United Credit, Chengxin Securities, and Pengyuan, which are the top four rating agencies in the Chinese corporate and enterprise bond market. Chengxin Securities has the greatest market share in our sample, with 18.96%; they adjusted 11 ratings to speculative grade level after default and did not adjust three default bond ratings. Chengxin Securities' rate of adjustment delay is 63.64% (14 ratings were adjusted after default or were not adjusted in 22 cases by this agency), which greatly exceeds other rating agencies'.

This result indicates that foreign investment in Chinese credit rating agencies has no incentive for agencies to adjust ratings in advance, and the reputational threat has no impact on the predictability of rating agencies.

Table 6 The predictability of ratings

	ADJD	
	JOINT=dummy variable	JOINT=proportion of investment
C	4.2508*** (0.0002)	4.2894*** (0.0002)
JOINT	0.2810 (0.3356)	1.0251 (0.3631)
MKS	-18.4720*** (0.0017)	-18.7819*** (0.0022)
DGDP	2.4718*** (0.0037)	2.4597*** (0.0038)
Control variables	Control	Control
Industry	Control	Control
R-squared	0.4006	0.4001
N	131	131

Note: This table shows regression with *ADJD* as the dependent variable. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. Due to space limitations, the empirical results for the dummy variable *Industry* and *control variables* are omitted.

4.3. Differences between Sino-foreign and Domestic Rating Agencies

Although Table 5 and Table 6 show that latest ratings of Sino-foreign rating agencies reflect the probability of default, whether ratings by Sino-foreign rating agencies are more efficient than those by domestic rating agencies requires further investigation. To improve understanding, the full samples are divided into two subgroups: A Sino-foreign rating agencies subgroup (with 4079 samples) and a domestic rating agencies subgroup (with 4337 samples) for analysis.

In this section, the interaction terms in Model 1 and Model 2, (*JOINT*CRnew* and *JOINT*MKS*) are replaced by the two variables *CRnew* and *MKS*. The regression results for the subgroup samples are presented in Table 7.

In Columns 1 and 2, the coefficients for the latest credit rating (*CRnew*) are negatively significant at the 1% level for both Sino-foreign and domestic groups. That is, both Sino-foreign rating agencies and domestic rating agencies can issue ratings that reflect the credit risk of bonds, and the lower the latest credit rating is, the higher the probability of bond default is. Statistically, the effect of ratings issued by Sino-foreign rating agencies (with 5.14%) is slightly better than that of ratings issued by domestic rating agencies (with 4.36%). Furthermore, no evidence of a relationship between rating agencies' *MKS* and *DCR* is noted in either subset of the agencies in Table 7.

Table 7 Differences between two subgroups

	Default		***DCR***	
	Sino-Foreign rating agencies (n=4079)	Domestic Agencies (n=4337)	Sino-Foreign rating agencies (n=4079)	Domestic Agencies (n=4337)
	(1)	(2)	(3)	(4)
C	5.8726***	6.3405***	0.2065	0.1086
	(0.0000)	(0.0000)	(0.3132)	(0.4847)
CRnew	-0.0514***	-0.0436***		
	(0.0000)	(0.0000)		
MKS	0.1303***	0.1018**	-0.2749	-0.7640
	(0.0000)	(0.0194)	(0.7503)	(0.3028)
DGDP			-0.1996	-0.1299
			(0.1665)	(0.1717)
GDPnew	-0.4418***	-0.4974***		
	(0.0000)	(0.0000)		
Control variables	Control	Control	Control	Control
Industry	Control	Control	Control	Control
R-squared	0.7065	0.5045	0.0714	0.0670
N	4079	4337	4079	4337

Note: This table shows regression with *Default* or *DCR* as the dependent variable. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. For Columns 1 and 2, the R-squared part should be pseudo R-squared. Due to space limitations, the empirical results for the dummy variable *Industry* and *control variables* are omitted.

Our results provide evidence that impact of foreign investment in credit rating agencies on the predictability has only slightly difference with domestic rating agencies, and we find no correlation between market share and rating adjustment. As such, the latest (or day of default) rating can present the probability of default and rating inflation is not correlated with reputational concerns.

Another notable difference between Table 5 and Table 7 is the relationship between market share and probability of default. Table 5 contains no evidence to support a relationship between *MKS* and the probability of default. However, in our subgroups, *MKS* is positively significant at the 1% level for Sino-foreign rating agencies and at the 5% level for domestic rating agencies in Columns 1 and 2. When the market share of rating agencies increases 1%, the probability of default increases 13.03% (in Sino-foreign groups) and 10.18% (in domestic groups), respectively.

As prior analysis shows, the top four rating agencies in the Chinese market are also the top four rating agencies that issue ratings for default bonds. Half of the four rating agencies are Sino-foreign rating agencies, and half are domestic rating agencies. Furthermore, these top four rating agencies issue ratings for 122 default bonds (approximately 93.1% of the total default bonds in the sample). Therefore, the coefficients of *MKS* from two subsets are positively significant.

These regression and analysis results indicate that the latest ratings of bonds can reflect default probability for both Sino-foreign and domestic rating agencies. Simultaneously, the market shares of rating agencies exert no effects on ratings adjustment. The difference between the two subsets of rating agencies is that the predictability of ratings issued by Sino-foreign rating agencies slightly exceeds that for ratings issued by domestic rating agencies.

4.4. Robustness Testing

As mentioned elsewhere, our sample contains nine rating agencies, and four are Sino-foreign agencies. In particular, Shanghai Brilliance cooperated with S&P from 2008 but received no foreign investment. To examine whether regression results in this study are driven by our classification of rating agencies and provide further evidence to support the argument that foreign investment or international cooperation exerts little effect on the predictability of ratings, we reclassify our sample. In the new subgroups, Shanghai Brilliance is classified as subject to Sino-foreign and international cooperation.

In Table 8, the regression results for the total sample are qualitatively consistent with other results identifying an increase in default probability when rating agencies subject to foreign capital investments or cooperation with international agencies downgrade ratings or issue low bond ratings. In addition, no evidence supports the relationship between Sino-foreign and international cooperation group with large market shares and larger ratings downgrade; rating agencies with large market

shares downgrade ratings to speculative grade level when default is imminent.

Table 8 Rating agencies subject to Sino-foreign and international cooperation

	Default	***DCR***	***ADJD***
C	7.9752***	0.0645	4.1483***
	(0.0000)	(0.5208)	(0.0002)
*JOINT*CRnew*	-0.0019***		
	(0.0000)		
*JOINT*MKS*		0.1063	
		(0.6853)	
JOINT			0.1989
			(0.4827)
MKS	-0.0238		-17.5285***
	(0.5377)		(0.0022)
DGDP		-0.1666**	2.4228***
		(0.0422)	(0.0043)
GDPnew	-0.7057***		
	(0.0000)		
Control variables	Control	Control	Control
Industry	Control	Control	Control
R-squared	0.1400	0.0667	0.3983
N	8416	8416	8416

Note: This table shows regression with *Default* or *DCR* as the dependent variable. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. For Columns 1, the R-squared part should be pseudo R-squared. Due to space limitations, the empirical results of dummy variables *Industry* and *control variables* are omitted.

Some of the evidence provided in Table 9 is identical to that in Table 7 (original classifications of rating agencies without consideration of cooperation), except for in Column 3. The original subsets of rating agencies indicate no correlation between market share and rating adjustment. However, in Table 9, the coefficient of *MKS* is negatively significant at the 5% level: The higher the market share of rating agencies characterized by foreign investment and international cooperation is, the greater the downgrade of ratings is.

One explanation for the difference in regression results of model 2 is that credit rating agencies with foreign investment and international cooperation expose to threat of international reputation, and thus they tend to downgrade ratings sharply when some default signals are released. This fact is also consistent with argument of Livingston et al. [9], who reckon rating inflation exists in Chinese market.

We find some evidence that reputational concerns exist in these subsets of rating agencies and that these motivate them to adjust bond ratings. This result may be a consequence of rating inflation. For other models, new classifications for rating agencies can be applied as substitutes for the samples in this study.

Table 9 Differences between two new subgroups

	Default		***DCR***	
	Sino-Foreign and cooperation agencies (n=5052) (1)	Domestic and no cooperation agencies (n=3364) (2)	Sino-Foreign and cooperation agencies (n=5052) (3)	Domestic and no cooperation agencies (n=3364) (4)
C	5.0188***	7.5054***	0.3051*	0.0991
	(0.0000)	(0.0000)	(0.0626)	(0.6118)
CRN	-0.0502***	-0.0444***		
	(0.0000)	(0.0000)		
MKS	0.1642***	0.1301**	-1.4369**	0.1176
	(0.0000)	(0.0111)	(0.0425)	(0.8909)
DGDP			-0.1376	-0.2123*
			(0.2383)	(0.0659)
GDPnew	-0.3682***	-0.6011***		
	(0.0000)	(0.0000)		
Control variables	Control	Control	Control	Control
Industry	Control	Control	Control	Control
R-squared	0.6929	0.5190	0.0628	0.0862
N	5052	3364	5052	3364

Note: This table shows regression with *Default* or *DCR* as a dependent variable. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. For Columns 1 and 2, the R-squared part should be pseudo R-squared. Due to space limitations, the empirical results of dummy variables *Industry* and *control variables* are omitted.

5. CONCLUSIONS

This study investigates 8416 corporate bonds and enterprise bonds in the Chinese market from January 1, 2013, to June 30, 2019, and examines the effect of foreign investment in credit rating agencies on the predictability of ratings and the effect of reputational concerns on rating adjustment. In particular, we investigate whether the reputational concerns of rating agencies are enhanced by foreign investment because of concerns related to international reputation.

Although we find some cases that rating agencies downgrade ratings to speculative level after the day of default, the regression results demonstrate that the latest (or day of default) ratings are negatively correlated with default probability at 1% significant level. Furthermore, ratings issued by Sino-foreign rating agencies are slightly more effective than ratings issued by domestic rating agencies. If investors follow the update of ratings of a specific bond, they can still obtain hints about bond risk.

In addition, no evidence suggests that rating agencies with foreign investment are associated with the timeliness for the adjustment of ratings to speculative grade level. Therefore, our hypothesis that foreign investment may

impose pressure to rating agencies and promote them to issue accurate ratings in advance is rejected. That is, the effect of ratings issued by among credit rating agencies with or without foreign investment on investors' decision making is almost the same.

Our results differ from those of Cheng & Neamtiu [17], Kraft [16] and Hu et al. [19] who claim that reputation effects improve rating quality. The regression result reveals that the market share cannot motivate Chinese rating agencies to issue high quality ratings. For both Sino-foreign and domestic rating agency subsets, large market shares are positively associated with high default probability at 1% and 5% significant level respectively. Moreover, rating agencies with large market shares tend to downgrade the ratings of risky bonds to speculative grade level a few days before default or even fail to ever downgrade ratings. That is, Chinese credit rating agencies with good reputations are less concerned regarding their reputations. Another possibility is that adjustment delay is general in Chinese market, and thus it would make slightly damage to rating agencies.

No evidence is found of a relationship between rating adjustment and market share. This result is consistent with arguments of Mariano [11], who states that rating inflation cannot be restrained by reputational concerns. In particular, when Shanghai Brilliance, one agency cooperating with S&P, is added into the Sino-foreign group, a negative correlation is noted between the market share of agencies and the rating adjustment.

In March 2018, China opened up the Chinese market to foreign credit rating agencies. However, relevant data are insufficient for investigation. Future research requires sufficient data to investigate whether the participation of foreign credit rating agencies intensifies competition and influences the effects of ratings. This study analyzes only samples of corporate and enterprise bonds, and our sample excludes some Chinese credit rating agencies, such as the China Bond Rating Co., Ltd., which has the only investor-funded model in the Chinese credit rating industry. In addition, Chengxin Securities announced that they would terminate their business involvement in bond market credit ratings in February 2020. Chengxin International will assume this responsibility. The respective changes should be considered in future research.

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