US and Chinese Bond Market Dynamic: A Study on the Determinants of Credit Spreads

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Abstract: The US bond market is the largest and most matured capital market in the world. Though the Chinese bond market is comparable and has grown significantly to become the third-largest bond market in the world, it has yet to capture much academic attention. This paper utilizes the panel data regression and sets regimes by fitting data into the panel threshold regression to explore the determinants of credit spreads within both successful and developing bond markets. The so-called "rigid repayment" within the Chinese capital market has resulted in the market experiencing similar overall effects as the US bond market prior to 2014. However, the recent declining trend of rigid repayment has resulted in a different dynamic for the Chinese bond market. The US bond market is statistically driven much more by macro variables than firm variables, whereas the credit spread of Chinese corporate bonds statistically has shown a trend of being affected by company performance since 2014.

1. Introduction

The US and Chinese economies have been the centre of focus since trade tensions escalated between the two countries. The study of the two different economic systems and their dynamic could offer different perspectives to interested parties while allowing many to learn more about the economic environment. The US has possessed the largest and most established bond market for decades, whereas the Chinese bond market has only recently been growing rapidly since its rise to the third-largest bond market in 2015 (GSAM, 2015). Despite China's obvious success within the market, non-government bonds have not received much academic attention (Livingston, Poon, & Zhou, 2018). This paper studies the effects of several critical macro factors as well as firm-specific variables that may explain the bond market behaviours of China and the US.

2. Literature Review

The study of credit spread determinants began when Black and Scholes (1973) created basic structural models to explain how contingent claims can be used to value equity and debt. Later, Merton (1974), Longstaff and Shwartz (1995), and Duffee (1998) all further investigated the model and posited a reversed relationship between risk-free rates and credit spreads. Although other studies have proven that the structural model cannot satisfactorily explain the observed yield (Huang &

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Huang, 2012), the empirical study still portrays how credit spreads could be affected by potential variables. Fama and French (1996) found that credit spreads will be widened as economic conditions weaken. Other empirical literature, including studies by Morris, Neale, and Rolph (1998), Bevan and Garzarelli (2000), and Davies (2004), have found a positive relationship between the risk-free rate and credit spread. Davies (2007) expanded on his previous literature by presenting details of the alternate inflationary environment with an extended data set. This study shows that regime-switching econometric techniques enhance explanatory power. The application of regime-switching techniques proved to be effective, as the regime was initially designed for modelling the business cycle.

Additional literature compares and studies different markets. Landschoot's study (2008) is especially intriguing, as it compares US and European bond markets and analyses how their credit spreads react differently to macro factors. Table 1 below presents the summarized conclusion of the effects of defined determinants on credit spreads as studied by different scholars. In this table, plus and minus signs indicate the relationship. One study (Cavallo & Valenzuela, 2009) explores the determinants of the option-adjusted spread as reason to eliminate features of callable bonds. Their research shows that corporate bond spreads are primarily affected by firm-level performance, further confirming that investors are more acutely responding to unfortunate situations than positive ones due to the insufficient information being released within emerging markets. Therefore, investors are more prone to herding. The latest study by Bhojraj and Sengupta (2003) suggests similarities between US and Chinese bond markets. For example, sinking fund provisions are typically used to mitigate default risks. However, another study shows that the sinking fund provision has a positive effect on yield spread in both markets, which indicates the risk effects of the provisions (Livingston, Poon, & Zhou, 2018).

Table 1: Literature Review Summary - Regression Results on the Determinants of Credit Spread.

Author	Spread Component	Sign	Author	Spread Component	Sign
Collin-Duferesne and Goldstein and Martin*	Leverage ratio	+	Landschoot***	US Yield Slope	-
	10-yr Treasury	-		below-Average bid-ask spread	+
	Yield Slope	+		above-Average bid-ask spread	+
	Vix	+		below-Average Probability of Default	-
	S&P	-		above-Average Probability of Default	+
	Volatility Smirk	+		Taxation	+
Guntay and Hackbarth**	Profit	-		S&P	-
	Leverage ratio	+		Vix	+
	Duration	+		US 3-month US Treasury Bill	-

*based on the results for the leverage ratio between 15%-25% (Collin-Dufresne, Goldstein, & Martin, 2001)
**based on the results derived from short-run SETAR (inflationary regime) (Güntay & Hackbarth, 2008)
***results based only on the US results (Landschoot, 2008)

3. Data Description

3.1. US Data

This study is based on market data shared by Bloomberg and the US Federal Reserve Economic Data (FRED) website. Because this study explores the post-crisis effect on the bond markets, the data's time period ranges from December 2008 to August 2018. This range of data satisfies the need for valid market data and offers the completion of company financial reports. This paper studies 269 corporate bonds from 50 US firms in various sectors. All the bonds chosen for the study are bullet bonds for simplicity. The detailed breakdown is shown in Table 2.

Table 2: Descriptive Statistics of the Variables for the Selected US Corporate Bonds.

Variables	Mean	Standard Deviation	Min	50^{th} Percentile	Max	N
CredSpread	184.70	90.78	-309.00	169.00	2209.00	31356
RoA	3.81	3.53	-33.40	3.31	30.60	31384
IntCov	7.07	19.21	-140.30	4.08	489.61	31384
DtoA	30.14	8.71	1.38	30.88	65.57	31384
DtoEBITDA	3.42	3.72	-1.65	3.25	100.86	31384
EMBI	969.70	136.04	499.30	991.41	1254.60	31384
SP500	0.45	1.64	-5.06	0.64	4.44	31384
Vix	18.91	7.70	9.51	16.60	46.35	31384
IndProd	100.10	5.22	87.07	101.82	107.79	31116
Inflation	0.15	0.31	-1.04	0.12	0.97	31384
Tbill	30.71	48.36	1.00	10.00	196.00	31384
USDollar	81.11	8.02	69.06	77.16	95.39	31384
Yldslope	170.50	68.26	25.00	170.00	283.00	31384

3.2. Chinese Data

There is a phenomenon called “rigid repayment” within the Chinese bond market that occurs when there are potential defaulting risks that lead to bond issuers searching for a third-party institution to pay back investors with cash advancements. This allows issuers to maintain solid reputations. Rigid repayment does not stem from any legal provisions but rather questionably accepted practices within the market. In 2014, Zhongcheng Trust—one of the largest trusts in China—was facing the challenge of paying back a $3 billion RMB debt from its own pocket. Though the company fulfilled its rigid repayment, the situation resulted in both the market and investors alike panicking about how negatively the process can affect the market (Zhu, 2014). Since then, the use of rigid repayments has been waning.

Based on this event, the present study divides the bond data from the Chinese market into two parts. One set of data represents market activity before 2014, while the other set represents market activity after 2014. All Chinese bond data studied in this paper is from the Wind Database, the largest capital market database in China. Corporate bonds from infrastructure sectors are not included in the data, largely because there are huge discrepancies in the estimators of default risks. This means that some bonds have more default risks than others in terms of infrastructure. All bonds selected for the study have an ‘A’ credit rating. For reference, credit ratings are the investment grades of corporate bonds within the Chinese capital market. Because of the discrepancies in the availability of market information, only bonds with sufficient information are kept. The detailed breakdown is shown in Table 3 on the following page.

Table 3: Descriptive Statistics of the Selected Chinese Corporate Bonds.

Variables	Mean	Standard Deviation	Min	50th Percentile	Max	N
CredSpread	3.02	2.45	-4.33	2.68	17.63	20679
RoA	0.02	0.03	-0.09	0.01	0.35	20667
DtoA	56.86	15.70	0.00	58.27	95.20	20667
DtoEBIT	116.34	1355.01	-15000.00	35.07	49592.24	20679
CSI300Index	1.35	6.97	-21.04	0.91	25.81	20679
yeartomatu	4.92	1.87	0.84	4.67	21.54	20679
yield_slope	0.53	0.32	0.03	0.52	1.83	20679
Inflation	1.82	0.52	0.80	1.80	4.50	20679
lnm2	11.84	0.16	11.36	11.88	12.03	20679
lnmGrowth	11.62	1.97	8.07	11.75	16.07	20679
GDP	6.99	0.32	6.70	6.87	8.10	20679
GDPGrowth	7.01	0.33	6.70	6.90	8.10	20679
convrate	0.74	0.15	0.00	0.74	1.22	20679

4. Methodology

The main body of this paper utilized the panel data model to explain which variables contribute to the credit spread of corporate bonds from the US and China. By using data for the same cross-section units, we are able to examine the dynamic relationship between different variables while controlling for the unobserved effects of the relationship using panel data (Wooldridge, 2002). The following linear panel data model is studied in correlation to the US bond market. The time is denoted as *t*, and the individual bond is denoted as *i*. The credit spread is further explained by the factors of the T-Bill, Emerging Markets Bond Index, S&P500, Volatility Index, Industrial Production Index, inflation, US dollar, and firm-specific factors of profitability, liquidity, and leverage. Although most relevant literature establishes the changes of credit spread as dependent variables, credit spread without changes is also applied to this study as shown in equation (1). This application is inspired by Cremers, Driessen, Maenhout, and Weinbaum (2008), who argued that credit spreads are not expected to be non-stationary, as they are economically ex-ante expected returns. There is no strong econometric evidence showing its non-stationary features. Therefore, to regress on credit spread changes rather than levels would potentially introduce more noise into the model.

$$\begin{aligned} CreditSpread_{i,t} = \beta_0 + \beta_{i,t}Tbill + \beta_{i,t}EM + \beta_{i,t}SP500 + \beta_{i,t}Vix + \beta_{i,t}IndProd + \beta_{i,t}Inflation \\ + \beta_{i,t}USDollar + \beta_{i,t}RoA + \beta_{i,t}IntCov + \beta_{i,t}DtoA + \beta_{i,t}DtoEBITDA + \mu_{it}\ , \\ t = 1,2,3 \ldots N \end{aligned} \quad (1)$$

The Panel Threshold Model (2) is applied to combat the issues of heterogeneity (Wang, 2015) as well as to explore how different market conditions affect the determinants of credit spreads.

$$y_{i,t} = \mu + x_{i,t}\ (q_{i,t} < \gamma)\beta_1\ + x_{i,t}\ (q_{i,t} \geq \gamma)\beta_2\ + u_i\ + e_{i,t}$$
$$\text{Where } X_{it}(q_{i,t},\gamma) = \begin{cases} X_{it}I(q_{i,t} < \gamma) \\ X_{it}I(q_{i,t} \geq \gamma) \end{cases} \quad t = 1,2,3 \ldots N \quad (2)$$

For Chinese bonds, the threshold panel model cannot be applied for two reasons. First, the limited data restricts the application of the panel threshold model because the technique applied within this paper requires balanced data. Data must be continuous in each defined period. Second, even after analysing the minimal data available, there is no strong evidence showing the threshold effects within those datasets. This could be the result of the features of the Chinese bond market that are not entirely market driven. Therefore, equation (3) is applied to Chinese dataset.

$$CreditSpread_{i,t} = \beta_0 + \beta_{i,t}CSI300 + \beta_{i,t}yeartomatu + \beta_{i,t}yield_{slope} + \beta_{i,t}dloprc + \beta_{i,t}Inm2 + \beta_{i,t}lnmGrowth + \beta_{i,t}Inflation + \beta_{i,t}GDP + \beta_{i,t}GDPGrowth + \beta_{i,t}convrate + \beta_{i,t}RoA + \beta_{i,t}DtoA + \beta_{i,t}DtoEBIT + \mu_{it}, \quad t = 1,2,3 \ldots N \tag{3}$$

5. Results

The overall signs of all the determinants are indicated in Table 4, and the preliminary results shown in Table 5 indicate how certain determined factors are statistically relative to credit spreads. The table sequentially displays the results. Column (1) includes only firm-specific factors. The coefficient of the profitability (ROA) of the firm is significant and shows a negative sign, which is consistent with Güntay and Hackbarth’s study (2008). The coefficient of short-term liquidity (interest coverage) is also negative, while the coefficient of the leverage ratio (debt/asset) is positive. This is not statistically significant for the probability of defaulting (debt/EBITDA). The results make practical sense, as credit spreads are the measurement of credit risks for firms. In short, the more profitable the firms are, the less likely they are to default on their debts. This allows them to pay back on their short-term interests. As a result, credit spreads will be narrow. It can be said that the higher the leverage ratio, the more likely firms are to default on their issued bonds, largely because of the heightened burden. This would make such firms financially risky. However, the low R-square indicates that this model does not explain US corporate credit spreads well. Column (2) incorporates the Emerging Markets Bond Index into the model. Because it is statistically relevant to the explanation of credit spreads with a negative sign, it accurately indicates that US bond credit spreads are related negatively to the performance of the Emerging Markets Bond Index. One explanation for this is that investors tend to go to emerging markets to seek additional profits when the US bond market only produced modest bond returns. Therefore, increased demand is signalled by the boosted Emerging Markets Bond Index. Another point worth noting is that interest coverage is not statistically significant anymore, largely because the incorporation of the Emerging Markets Bond Index is strong enough to eclipse the interest coverage factor. The overall R-square improved by approximately 21%, indicating that the inclusion of macro factors enhances the explanatory power of the panel data regression model.

Furthermore, the coefficients of all firm-specific factors have been slightly altered as a result of macroeconomic factors being included. From column (2) to column (9), the explanatory power is enhanced by incorporating various macro factors. Column (9) illustrates results with all elements included. The S&P 500 Index can be regarded as an indicator of market riskiness. It is positively correlated with credit spreads, which can be explained in two ways. First, the bloom of the stock market indicates a thriving economic environment. Investors tend to pursue great returns with great risks, and the sound development of corporations is expected as a result. This results in fewer default risks at the corporate level, as companies are more likely to be able to afford their debt. Second, the increasing trend in the S&P 500 index would likely cause a decrease in demand within the bond market, which would be the result of investors moving to the stock market to pursue better returns. This would drag the bond price down in a way that would widen credit spreads further.

The resulting relationship between credit spreads and the T-Bill is not consistent with the Merton framework, which argues that the overall effect of the increased risk-free rate would decrease effective borrowing costs at the corporate level. Therefore, increasing corporate bond prices would mean a drop in yield and a narrowed credit spread (Merton, 1974). However, this paper later further explores the determinants of credit spreads by using the Volatility Index, and the Industrial Production Index indicates a consistent view with Merton's research. The negative sign of the yield slope, which is an indication of the rate of future short-term interests, is also consistent with Merton's work.

The effects of the Industrial Production Index are sequentially varied, which may be justified by its correlation with other factors, especially inflation, as the addition of inflation is the turning point for the effects of the industrial production to go from positive to negative. This makes more sense, as a good industrial production index is a sign of a well-conditioned economy that is indexed to the inflation. The credit spread would be narrowed under good economic circumstances because there would be less financial risk amongst the companies.

Overall, most of the macro factors show statistical significance in explaining the credit spreads of US corporate bonds (as shown in Table 5). The results could be explained by the effectiveness of the US market, although there are still credit risks associated with companies. The credit spread of US corporate bonds could be more related to market factors than firm-specific variables.

Table 4: Results of Panel Regression Model - US Corporate Credit Spreads.

Spread Component	Sign
Profitability(ROA)	-
Leverage Ratio(DtoA)	+
Emerging Bond Market Index	-
S&P	-
Volatility Index	+
Industrial Production Index	+
Inflation	-
Treasury Bill	-
US Yield Slope	-
US Dollar	-

However, the issue of homogeneity is unavoidable when it comes to panel data. In order to achieve a more robust analysis and conclusion, the issues of homogeneity need to be addressed. Davies (2007) stated that "regime switching econometric techniques are found to enhance explanatory power" (p. 196). He also suggested that the regime-switching techniques could additionally apply to more sophisticated models, such as PSTAR, which would offer further insight into the study of credit spread determinants. He used SETAR by basing the inflationary regime on different sets of data, which helped him to conclude how the economic environment affects bonds using different features. In this paper, the regime panel regression is applied to combat the homogeneity of issues as a means of gaining more insightful explanatory data. Additionally, it helps in generating different insights on the behaviour of credit markets across different regimes. A similar model type, known as PSTR, is applied in this paper to gain further results. Meanwhile, I incorporate the inflationary regime, the Industrial Production Index regime, and the Volatility Index regime. These three factors are critical for representing market conditions, which will affect all other factors. While Davies (2007) categorized his data into two parts while applying credit ratings, I used data synthetically to show that all bonds selected for this study are similarly investment graded, which proves that the embedded riskiness of these bonds is quite similar. Of all regime models, the panel Volatility Index regime enhanced the explanatory power the most by indicating the highest R-square of 43%.

Table 5: Panel Data Regression (Firm Specific Factors Followed by Macro Factors).

	(9)	(8)	(7)	(6)	(5)	(4)	(3)	(2)	(1)
	CS	CS	CS	CS	CS	CS	CS	CS	CS
RoA	-4.095***	-2.582***	-2.586***	-2.575***	-2.946***	-2.956***	-2.951***	-2.979***	-2.986***
	-0.158	-0.132	-0.131	-0.131	-0.13	-0.13	-0.129	-0.129	-0.128
IntCov	-0.094***	-0.028	-0.028	-0.025	0.006	0.007	0.032	0.026	0.023
	-0.03	-0.025	-0.025	-0.025	-0.024	-0.024	-0.024	-0.024	-0.024
DtoA	1.351***	1.143***	1.155***	1.120***	0.924***	0.910***	0.669***	0.683***	0.664***
	-0.099	-0.082	-0.081	-0.082	-0.081	-0.081	-0.082	-0.082	-0.081
DtoEBITDA	-0.004	0.481***	0.496***	0.473***	0.310***	0.296***	0.146	0.134	0.052
	-0.122	-0.101	-0.1	-0.1	-0.104	-0.104	-0.104	-0.104	-0.103
Emerging~x	-0.288***	-0.291***	-0.299***	-0.296***	-0.298***	-0.313***	-0.327***	-0.304***	
	-0.002	-0.002	-0.003	-0.003	-0.003	-0.003	-0.005	-0.005	
SP500	-3.564***	-3.524***	-3.566***	-3.715***	-3.960***	-4.015***	-4.040***		
	-0.197	-0.198	-0.195	-0.196	-0.195	-0.195	-0.194		
Vix	-0.220***	1.198***	1.260***	1.080***	0.955***	0.951***			
	-0.052	-0.065	-0.066	-0.066	-0.073	-0.073			
IndProd	2.992***	3.120***	2.581***	2.752***	1.728***				
	-0.085	-0.087	-0.091	-0.1	-0.115				
Inflation	6.834***	4.193***	4.301***	5.388***					
	-1.063	-1.065	-1.065	-1.061					
Tbill	0.153***	0.180***	0.051***						
	-0.008	-0.01	-0.013						
USDollar	-0.319***	-0.594***							
	-0.079	-0.081							
Yldslope	-0.176***								
	-0.01								
_cons	160.214***	438.053***	442.175***	454.467***	133.064***	121.251***	195.883***	220.272***	357.230***
	-3.081	-3.442	-3.432	-4.505	-10.138	-10.297	-10.938	-12.514	-14.578
R-sq	0.036	0.341	0.348	0.349	0.374	0.375	0.383	0.383	0.39
adj. R-sq	0.028	0.336	0.343	0.343	0.369	0.37	0.377	0.378	0.384
N	31356	31356	31356	31356	31088	31088	31088	31088	31088
Standard errors in parentheses									
*	p<0.1	**	p<0.05	***	p<0.01				

The application of the inflationary regime model helps the study to further explore the determinants of the credit spreads. First, I started by fitting the data into a single threshold model by using the STATA function ‘xthreg,’ setting the grid to the 400s to reduce computational costs (Wang, 2015), and setting the bootstrap (300). This single threshold model then returned a significant F-statistics value that indicates the rejection of the null hypothesis of no threshold. Next, I moved directly to a triple-threshold model to test how many possible thresholds the inflation regime should have. In other words, I analysed how many structural breaks there are within the inflationary panel regime model. As indicated in Table 6, the double-threshold model is chosen as the probability value, which indicates that we should reject the null hypothesis of no threshold. Also, the MSE is the lowest in the double-threshold model. Separately, the explanatory power has improved based on the higher R-square, which is at 41.06%. This result is consistent with Davies's findings (2008) that indicate regime-switching econometric techniques can enhance the explanatory power. The critical threshold is set at 0.17% and 0.30%. Therefore, when changes on the CPI Index exceed 0.30%, the coefficient of the inflation relative to the credit spreads will be -41.95. Likewise, if the changes on the CPI Index are between 0.17% and 0.30%, the coefficient of the inflation relative to the credit spreads will be 123.58. If the inflation is lower than 0.17%, the coefficient of the inflation relative to the credit spreads will be 22.73. In this case, it can be summarized that a relatively high inflation in excess of 0.30% would lead to a negative correlation between credit spreads and inflation. If the changes in inflation are lower than 0.17% or between 0.17% and 0.30%, the inflation positively impacts credit spreads. This can be further explained by supply and demand within the market. When the changes in the CPI Index are obvious, an inflationary environment will most likely occur. This would result in higher borrowing costs. The higher borrowing costs would then cause firms to avoid taking on debts. The supply of the bonds would decrease, while the prices of the bonds would increase and the credit spreads would narrow. The risk measurement of the corporate bonds is negatively impacted when the market experiences low changes in inflation. In other words, a substantial increase in inflation would indicate a blooming economic market. Most investors would invest their money into stock markets, which would lead to less demand within bond markets. Therefore, the credit spreads would widen as a result of decreased demand. Basically, investors would seek higher compensation for their investments when they see the improvements in the market.

I applied the same technique and process for setting the Volatility Index regime model. As a result of threshold testing, a single threshold is statistically significant for the Volatility Index. Therefore, when the Volatility Index exceeds 34.54, it will negatively impact credit spreads. Similarly, the Volatility Index will have a positive impact on credit spreads when it is lower than 34.54. In a relatively high volatility market, investors would become more opposed to risks and favour the bond market over the stock market. In the event of increased demand, bond markets will experience narrowed credit spreads. In contrast, in a low volatility market, people would seek more profit by taking risks. It can be concluded that a bond market experiencing low volatility would not be favoured.

Table 6: Panel Threshold Regression Model – Testing for Inflation Regime.

Threshold	RSS	MSE	Fstat	Prob	Crit10	Crit5	Crit1
Single	93200000.00	3009.71	511.77	0.00	199.78	222.89	240.72
Double	91600000.00	2957.88	542.67	0.00	134.70	144.26	157.22
Triple	91100000.00	2940.24	185.86	0.96	560.56	607.47	685.90

It can be concluded that the credit spreads of corporate bonds in the US are mostly related to macroeconomic factors, as some of the firm-specific factors became less statistically significant once the macroeconomic factors were added to the model. Most US firms are able to issue investment-grade bonds and typically have the ability to pay them back, though there are still credit risks. The credit spreads of the bonds will be most affected by market movements and economic conditions. As a result, the inflation regime will affect the market in two different ways. When it exceeds a certain range, the impact inflation will have on credit spreads will be positive. Similarly, low-impact inflation will negatively impact credit spreads, which will indicate a deflationary environment.

Table 7: Panel Threshold Regression Model - Double Threshold Inflationary Regime.

Model	Threshold	Lower	Upper
Th-1	0.17	0.17	0.18
Th-21	0.17	0.17	0.20
Th-22	0.30	0.29	0.30

Threshold	RSS	MSE	Fstat	Prob	Crit10	Crit5	Crit1
Single	9.3E+07	3.0E+03	5.1E+02	0.0E+00	1.9E+02	2.1E+02	2.5E+02
Double	9.2E+07	3.0E+03	5.4E+02	0.0E+00	1.4E+02	1.5E+02	1.6E+02

CredSpread	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
RoA	-3.06	0.13	-24.18	0.00	-3.30	-2.81
IntCov	0.03	0.02	1.11	0.27	-0.02	0.07
DtoA	0.61	0.08	7.64	0.00	0.45	0.77
DtoEBITDA	0.08	0.10	0.79	0.43	-0.12	0.28
EmergingIndex	-0.29	0.00	-59.01	0.00	-0.30	-0.28
SP500	-3.14	0.19	-16.20	0.00	-3.53	-2.76
Vix	0.87	0.07	12.10	0.00	0.73	1.01
IndProd	1.67	0.11	14.70	0.00	1.45	1.89
Tbill	0.08	0.01	6.72	0.00	0.06	0.11
USDollar	-0.23	0.08	-2.80	0.01	-0.38	-0.07
Yldslope	-0.12	0.01	-12.85	0.00	-0.14	-0.11
Threshold						
0	-41.95	2.15	-19.55	0.00	-46.16	-37.75
1	123.58	4.55	27.13	0.00	114.65	132.51
2	22.73	1.34	16.9	0.00	20.10	25.37
_cons	302.30	14.44	20.93	0.00	273.99	330.60
sigma_u	55.89					
sigma_e	54.55					
rho	0.51					

The results of the Chinese bond regression model indicated in Table 9 show that the credit spread of corporate bonds is not significantly relative to firm-specific variables; instead, they are more relevant to market factors. This can be explained by "rigid repayment," as mentioned above. In this case, credit spreads are no longer a relevant indicator of the riskiness of the company. Because the regime is strong enough to protect all investors, there are no default risks for corporate bonds within the Chinese market. This further explains the negative relationship between credit spreads and the probability of defaulting (debt/EBIT), though this is not necessarily significant. As seen in column (8) and column (9), the more leverage firms have, the more they are able to issue a larger amount of debt. Therefore, the liquidity of the bonds results in narrow credit spreads. Much like the US bond study featured, Table 9 column (1) includes only firm-specific factors. Although the coefficient on the profitability (ROA) of the firm is statistically significant, the overall R-square is small enough that results can almost be ignored. From column (2) to column (10), the explanatory power is enhanced by incorporating various macro factors, which is the same in the study for the US bond market. Money supply is positively related to the credit spread of Chinese corporate bonds, whereas money supply growth, GDP, GDP growth, and the conversion rate to standard securities are all negatively related to the credit spread. The R-squares are all relatively small and around 15%, excluding column (10), which incorporates the conversion rate to standard securities. This can be explained by both the limited data and the volatile features associated with the developing market. Table 10 shows the regression results by applying the bond data after 2014. By examining column (2) through column (10), it becomes obvious that there is an interesting change in dynamic. Market factors appear to become less statistically significant when the model sequentially incorporates the macro data. However, there is significance for firm-specific factors, such as the probability of defaulting (debt/EBIT). Still, the coefficient of it is small enough that it can be ignored. These results are relevant in showing a trend within the changing dynamic of the Chinese bond market.

Table 8: Results of Panel Regression Model-Chinese Corporate Credit Spreads (After 2014).

Spread Component	Sign
Leverage Ratio (Debt/Asset)	+
Default Probability (Debt/EBIT)	-
CSI300	-
year to maturity	-
Inflation	+
conversion rate	-

6. Conclusion

To conclude, this paper extensively explores the potential determinants of the US bond market while applying the same technique of panel data regression analysis to the Chinese bond market. The two markets differ extensively. By showing the results of applying the same method of study, we can summarize that the US bond market is so matured that investors can rely on the market data. Because the market is tremendously large and transparent, investors are provided with more adequate information through analysed data. This data is especially important when researching investment-grade bonds, as their credit spread is still generally related to the macro environment. However, because the Chinese bond market is still developing, data is less ample. Prior to 2014, the Chinese market experienced similar trends as the US market because of its “rigid repayment” system. This system allowed default risks to be minuscule enough to be ignored. During that time, the credit spread of corporate bonds seemed to be relevant to only market factors. After 2014, there was a declining trend in rigid repayments. To allow the Chinese financial market to develop more quickly, robust provisions were set in place to control the debt hole. As a result, credit spreads now appear to be more statistically relevant to company performance but are much less relevant to market factors. Meanwhile, the application of the regime panel on US bond data improves explanatory power and provides more insightful information, which is consistent with Davies’s work (2007). A future study could apply the threshold technique to the Chinese bond market as the market continues to develop. This study is limited to the simplicity of the model applied as well as the insufficient variables included in the model. Despite this, the study still provides interesting insights into both the US bond market and Chinese bond market by utilizing the econometric techniques.

Table 9: Fixed Effect Panel Regressions – Post-2014 Selected Chinese Bond.

	(9)	(8)	(7)	(6)	(5)	(4)	(3)	(2)	(1)
	CS	CS	CS	CS	CS	CS	CS	CS	CS
RoA	2.599***	-0.572	0.081	-0.006	-0.069	-0.41	-0.631	-0.699	0.588
	-0.886	-0.876	-0.854	-0.846	-0.848	-0.841	-0.831	-0.831	-0.794
DtoA	0.005**	0.009***	0.007***	0.007***	0.007***	0.007***	0.007***	0.007***	0.004**
	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
DtoEBIT	0	0	0	0	0	0	-0.000*	-0.000*	0
	0	0	0	0	0	0	0	0	0
CSI300In~x	-0.001	0.001*	-0.001	-0.001	0	-0.001	-0.002*	-0.001	
	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	
yeartomatu	0.195***	0.165***	0.233***	0.169**	0.769***	0.805***	0.792***	0.835***	
	-0.012	-0.012	-0.013	-0.066	-0.088	-0.087	-0.087	-0.083	
yield_sl~e	0.379***	0.354***	0.366***	0.221***	0.215***	0.213***	0.136***		
	-0.023	-0.023	-0.026	-0.029	-0.029	-0.029	-0.028		
Inflation	-0.142***	-0.139***	-0.166***	-0.137***	-0.151***	-0.147***			
	-0.014	-0.015	-0.015	-0.015	-0.016	-0.015			
lnm2	-0.507	3.462***	2.619***	2.472***	3.167***				
	-0.516	-0.643	-0.64	-0.642	-0.612				
lnmGrowth	-0.090***	-0.071***	-0.076***	-0.048***					
	-0.009	-0.009	-0.009	-0.009					
GDP	-0.493***	-0.627***	-0.450***						
	-0.044	-0.068	-0.065						
GDPGrowth	0.154***	0.035							
	-0.059	-0.056							
convrate	-2.548***								
	-0.111								
_cons	2.453***	1.134***	1.137***	1.066***	7.344	-41.133***	-28.178***	-26.448***	-33.421***
	-0.107	-0.131	-0.127	-0.126	-6.386	-7.915	-7.909	-7.932	-7.562
R-sq	0.003	0.067	0.114	0.131	0.131	0.148	0.168	0.169	0.246
adj. R-sq	-0.102	-0.032	0.02	0.039	0.039	0.057	0.079	0.08	0.165
N	5754	5754	5754	5754	5754	5754	5754	5754	5754
Standard errors in parentheses									
*	p<0.1,	**	p<0.05,	***	p<0.01				

Table 10: Fixed Effect Panel Regressions – Post-2014 Selected Chinese Bond.

	(9)	(8)	(7)	(6)	(5)	(4)	(3)	(2)	(1)
	CS	CS	CS	CS	CS	CS	CS	CS	CS
RoA	-5.514***	-1.565	-1.532	-1.534	-1.379	-1.379	-1.283	-1.254	-0.469
	-1.19	-1.104	-1.104	-1.103	-1.101	-1.101	-1.101	-1.101	-1.087
DtoA	0.138***	0.083***	0.082***	0.084***	0.081***	0.081***	0.080***	0.080***	0.070***
	-0.004	-0.004	-0.004	-0.004	-0.004	-0.004	-0.004	-0.004	-0.004
DtoEBIT	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
	0	0	0	0	0	0	0	0	0
CSI300In~x	-0.010***	-0.008***	-0.007***	-0.005**	-0.004**	-0.006***	-0.004*	-0.006***	
	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	
yeartomatu	-0.887***	-0.906***	-0.921***	0.123	0.021	0.028	0.128	-0.371**	
	-0.017	-0.019	-0.019	-0.152	-0.178	-0.178	-0.18	-0.18	
yield_sl~e	0.116**	0.088*	-0.115*	-0.109*	-0.106*	-0.122**	0.035		
	-0.053	-0.053	-0.06	-0.06	-0.06	-0.061	-0.06		
Inflation	0.236***	0.210***	0.199***	0.224***	0.216***	0.156***			
	-0.032	-0.032	-0.034	-0.034	-0.034	-0.034			
lnm2	9.707***	8.927***	8.094***	9.121***	2.51				
	-1.397	-1.568	-1.586	-1.614	-1.623				
lnmGrowth	0.017	-0.014	-0.007	0.025					
	-0.016	-0.018	-0.019	-0.018					
GDP	-0.445***	0.548*	-0.493						
	-0.129	-0.317	-0.317						
GDPGrowth	-0.932***	-0.368							
	-0.272	-0.27							
convrate	-3.953***								
	-0.188								
_cons	-4.753***	2.505***	2.553***	2.161***	-117.723***	-108.157***	-94.848***	-107.957***	-20.728
	-0.239	-0.26	-0.261	-0.266	-17.257	-19.337	-19.713	-20.075	-20.244
R-sq	0.074	0.206	0.207	0.209	0.211	0.211	0.212	0.213	0.233
adj. R-sq	-0.016	0.129	0.129	0.132	0.134	0.134	0.135	0.135	0.158
N	18523	18523	18523	18523	18523	18523	18523	18523	18523
Standard									
*	p<0.1,	**	p<0.05,	***	p<0.01				

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