ESI Preprints **Not Peer-reviewed**

The Impact of Credit Rating Adjustments on Bond Spreads: Evidence from China

Sinbad Kurbonov
Bobur Nasriddinov
Kessellie Traore Mulbah
SILC Business School, Shanghai University, China

Doi: 10.19044/esipreprint.4.2024.p1

Approved: 04 April 2024
Posted: 08 April 2024

Cite As:
Kurbonov S., Nasriddinov B. & Mulbah K.T. (2024). *The Impact of Credit Rating Adjustments on Bond Spreads: Evidence from China*. ESI Preprints.
https://doi.org/10.19044/esipreprint.4.2024.p1

Abstract

This paper investigates the impact of credit rating adjustments on bond spreads in the Chinese bond market, using a comprehensive dataset spanning from 2016 to 2022. Employing regression analysis and heterogeneity tests, the study explores the relationship between credit ratings, credit rating adjustments, and bond spreads, considering various control variables and the moderating effect of listing status. The findings reveal that credit rating adjustments significantly influence bond spreads, with upgrades narrowing spreads and downgrades widening them. Additionally, adjustments related to external support and firm performance were found to affect spreads, highlighting the importance of managing credit ratings for issuers. The study offers insights for investors, issuers, regulators, and academics, emphasizing the significance of credit rating information in investment decisions and market supervision. Overall, the research contributes to a better understanding of the dynamics between credit rating adjustments and bond pricing in China's bond market, with implications for financial stability and economic development.

Keywords: Credit rating, bond spreads, credit rating adjustments

Introduction

In the global financial market, the bond market assumes a central role due to its deep capital pool and abundant investment opportunities. It serves as a crucial avenue for governments and enterprises to secure long-term funding and acts as the central platform for investors to diversify risks while maintaining and increasing the value of their assets. Credit ratings, as a pivotal measure for assessing the default risk of debt instruments, offer a lens through which the bond market is perceived (Kariya et al., 2019). These ratings enable investors to gain insight into complex financial information and gauge credit risk, establishing them as one of the core factors influencing bond pricing.

For instance, corporate bonds within the S&P 500 index exhibit significant yield differentials between investment-grade (BBB- and above) and non-investment-grade (BB+ and below) categories. These disparities underscore the profound impact of credit ratings on investment return expectations. Moreover, credit rating adjustments (CRAs), whether upward or downward, can trigger swift market reactions. Statistics reveal that changes in credit ratings can lead to immediate fluctuations in bond spreads, often within the range of five to ten basis points (Gilchrist et al., 2021). These fluctuations may be even more pronounced during specific economic events or financial crises. Such adjustments not only reflect the financial health, operational performance, and market confidence of bond issuers but also underscore the bond market's remarkable sensitivity and its capacity to respond rapidly to new information.

The objective of this paper is to conduct a comprehensive analysis of the specific effects of credit rating adjustments on bond spreads. This analysis enhances the understanding of market dynamics, aids investors in predicting market movements, provides bond issuers with a scientific foundation for their decision-making, and contributes to policymakers' efforts to maintain financial stability and advance economic development. Thus, this research holds significant importance in the realm of finance and practical applications as it explores the intricate relationship between minor shifts in credit ratings and their profound impact on bond spreads.

Literature review

Theoretical framework and models

Since the emergence of credit rating agencies, the role of credit ratings has become indispensable within the bond market. Credit ratings not only signify a company's credit risk but also serve as the linchpin of bond pricing. Theoretical scholars have dedicated significant efforts to establish connections between micro-level credit risk characteristics and macro-level

market behaviors. Their objective has been to unveil the underlying mechanisms that govern the impact of credit rating changes on bond pricing.

Various models, such as the Jarrow-Turnbull model and the structural methods in the Merton model, have been developed to explore these relationships (Jarrow & Turnbull, 1995; Merton, 1974). These models often operate under the assumption that market participants have equal access to all relevant credit information and, consequently, adjust bond prices based on this shared knowledge. However, the theory of information asymmetry introduces an alternative perspective, positing that information distribution in the market is uneven, especially in the context of CRAs, leading to pronounced biases in asset pricing (Xiaolu et al., 2019).

At the heart of the theory of information asymmetry is the idea that credit ratings assume a particularly crucial role when bond issuers have more extensive information about their financial position than bond buyers. Moreover, the study by Cleary (1999) underscores the significant role of credit ratings in mitigating this uneven information distribution. Additionally, the communication of new information through rating adjustments can trigger a rapid reassessment of bond prices within the market.

Scholars have also explored the relationship between market efficiency and credit ratings, aiming to understand the immediate market response to rating adjustments and the implications of this response for bond spread fluctuations. This theoretical dialogue not only clarifies how credit ratings influence bond pricing by shaping investors' risk perceptions but also highlights the role of rating adjustments as vehicles for conveying critical message.

Empirical studies and research advancements

Pioneering studies in the field of CRAs, such as Hand et al. (1992), laid the foundational understanding of its dynamics, finding that credit downgrades significantly correlate with declines in stock prices. Subsequent research by Beaver et al. (2006) further confirmed the adverse effects of downgrades on bond prices, pointing out that market participants might react even before the official rating announcements, revealing the intricate interplay between rating changes and the bond market.

The quest to analyze these relationships evolved with the availability of refined data sets and advanced statistical techniques. For example, Dichev and Piotroski (2001) utilized credit rating changes as informational events and applied event research methods to explore their impact on both bond and stock markets. Their findings highlighted the substantial and immediate market response to rating adjustments, discovering that the heterogeneity in

these responses might be tied to factors such as the anticipation of rating changes, the prevailing market environment, and bond-specific attributes.

As research advanced, scholars like Jorion and Zhang (2007) employed more complex panel regression techniques to investigate the influence of credit rating changes on bond prices. In doing so, they not only reaffirmed the significant impact of rating changes on bond spreads but also emphasized the critical role of the timing of rating agency information releases in the market.

Overall, the amalgamation of these empirical studies demonstrates that credit rating adjustment is a crucial factor affecting bond pricing, with the market impact of rating changes being immediate and multidimensional, covering a wide range of factors from rating expectations to the psychological responses of market participants. However, there is a noted scarcity of recent papers evaluating the impact of CRAs on bond pricing, particularly in the context of China. Consequently, this research aims to address this gap by delving into the specific effects of credit rating adjustments on bond spreads within the Chinese bond market, offering a contemporary examination of this relationship.

Research hypotheses

Credit rating and bond pricing

Credit ratings transmit crucial information to market participants. An upgrade in credit rating signals an improvement in the issuer's creditworthiness, which is anticipated to attract additional investors, leading to an increased demand for the bond (Gao et al., 2022). This surge in demand is likely to elevate bond prices, resulting in a decrease in yields and, consequently, a narrowing of credit spreads.

Conversely, a downgrade in credit rating indicates deteriorating credit quality, which elevates the perceived risks associated with the bond. In reaction, investors may require a higher yield as compensation for assuming greater risk (Saadaoui et al., 2022). This heightened yield expectation causes credit spreads to widen as bond prices decline.

Given the pivotal role of credit ratings in the bond market and the well-documented relationship between rating changes and investor behavior, it is plausible to hypothesize that credit ratings exert a statistically significant influence on bond credit spreads, with upgrades leading to a narrowing of spreads and downgrades causing them to widen.

Hypothesis 1: Credit rating has a statistically significant impact on bond credit spreads.

Credit rating adjustments and bond credit spreads

Credit rating adjustments play a critical role in the bond market as they provide valuable information to investors, issuers, and regulators (Cooke & Bailey, 2023). These adjustments serve as indicators of the creditworthiness and risk profile of bond issuers, allowing market participants to make informed investment decisions. Observing and analyzing credit rating adjustments offers insights into the dynamics of the bond market and the impact of these adjustments on bond pricing (Gilchrist et al., 2020), which is crucial for assessing the risk-return tradeoff and making investment decisions that align with individual risk preferences.

This research considers three types of credit rating adjustments:

Overall Credit Rating Adjustment — This is a holistic evaluation of an issuer's creditworthiness, incorporating a comprehensive assessment of the issuer's ability to meet its financial obligations. An adjustment to this rating signifies a fundamental change in the issuer's overall risk profile, affecting investor perception. Therefore, changes in the overall credit rating may have a broad and profound impact on bond credit spreads, with upgrades indicating improved creditworthiness and potentially leading to a narrowing of spreads, while downgrades may widen spreads due to heightened perceived risk.

Supporting Adjustment — This sub-indicator reflects the extent of government or shareholder willingness and ability to support the issuer. Adjustments are made based on the issuer's relationship with external entities that can provide financial support in times of distress. A positive adjustment may enhance market confidence and lower perceived risk, contributing to a narrowing of credit spreads, whereas a negative adjustment may raise concerns about support, leading to a widening of spreads.

Company-Level Adjustment — It focuses on issuer-specific firm-level characteristics, such as financial performance, industry-specific factors, and business operations. Positive adjustments may signal improved financial health or enhanced competitive positions, potentially narrowing credit spreads. Conversely, negative adjustments might indicate deteriorating financial performance, leading to widened spreads.

Therefore, considering these different types of credit rating adjustments, the second hypothesis aims to explore how the Chinese bond market responds to various adjustment factors, serving as the basis for empirical analysis:.

Hypothesis 2: The impact of credit rating adjustment on bond credit spreads does not vary according to the type of adjustment.

The impact of cras in listed and non-listed companies

The study includes the bond evaluation of both listed and non-listed firms. It is acknowledged that listed companies are subject to more stringent disclosure requirements and regulatory oversight compared to non-listed companies (Allen & Alves, 2016). As a result, there is typically greater transparency and availability of information for listed companies. This increased transparency allows market participants to access and analyze relevant information, including credit rating adjustments, more easily. Consequently, the impact of credit rating adjustments on bond credit spreads may be more pronounced in listed companies, where investors have better access to information and can make more informed decisions.

Furthermore, listing on a stock exchange often enhances investor confidence and improves liquidity for a company's securities. The presence of a liquid market facilitates the efficient pricing of bonds and enables investors to buy or sell securities with relative ease (Saadaoui et al., 2022). In the context of credit rating adjustments, the increased investor confidence and liquidity associated with listed companies may amplify the market response to such adjustments. Investors in listed companies may be more sensitive to credit rating changes, leading to a more significant impact on bond credit spreads compared to non-listed companies.

Thus, the third hypothesis suggests that the impact of credit rating adjustments on bond credit spreads is more significant in listed companies compared to non-listed companies. The reasons provided include greater market transparency and information availability, increased investor confidence and liquidity. By focusing on listed companies, this hypothesis aims to explore the specific dynamics and effects of credit rating adjustments within a well-regulated and transparent market environment.

Hypothesis 3: The impact of credit rating adjustments on bond credit spreads is significant only in listed companies.

Methods

Sample selection

The selection criteria for the sample are meticulously designed to ensure the bonds in the dataset have a complete credit rating history and visible credit spreads, facilitating the analysis of the impact of credit rating adjustments on bond pricing. For this analysis, information on firm performance was sourced from the China Stock Market and Accounting Research (CSMAR) database, renowned for its thoroughness and reliability in providing comprehensive financial and market data for all listed companies in China. The widespread reliance on the CSMAR database in empirical research concerning Chinese firms highlights its accuracy and

dependability as a primary data source, thus grounding this paper's findings in a database that assures the highest level of precision.

The study's extensive sample includes an impressive 24,370 observations, spanning the years 2016 to 2022. This substantial sample size not only strengthens the statistical power of the analysis but also enables a detailed and rigorous examination of the complex relationship between credit rating adjustments (CRAs) and bond pricing. Additionally, the longitudinal nature of this sample provides the unique ability to observe changes in bond spreads over time, offering valuable insights into the research area within the specific context of China.

Variables definition

In this research paper, the dependent variable being scrutinized is the bond credit spread, denoted as Spread. This variable measures the differential between the effective interest rate at the bond's issuance and the contemporaneous treasury rate for an identical maturity period, serving as an indicator of the extra yield demanded by investors to offset the perceived risk associated with the bond.

To evaluate the credit quality of the bonds, the independent variable FinalRating1 is employed. It represents the average rating assigned to a bond by leading Chinese credit rating agencies such as Brilliance, Lianhe, and Chengxin. The scale of these ratings extends from 1 to 13, where 1 indicates the lowest rating (C) and 13 signifies the highest rating (AAA).

The second explanatory variable, Adj_tot, denotes the credit rating adjustment based on the issuer’s principal credit rating. This adjustment offers a holistic assessment of the issuer's creditworthiness, incorporating diverse factors affecting the issuer’s capacity to fulfill its financial obligations. Adj_tot thus captures shifts in the issuer’s overall risk profile, mirroring either enhancements or declines in their credit status.

The third independent variable, Adj_sup, reflects the credit rating adjustment sub-indicator focused on the ability and willingness of governments or shareholders to support the issuer. It evaluates the issuer’s connections with external entities capable of offering financial backing during distress. Adj_fir, the fourth variable, pertains to the credit rating adjustment sub-indicator related to firm-level characteristics, considering issuer-specific factors like financial performance, industry-specific considerations, and business operations.

ListedFirm serves as the moderating variable in this study, assigned a value of 1 for listed companies and 0 for non-listed firms. It distinguishes between listed and non-listed entities, facilitating an exploration of potential variances in how credit rating adjustments impact the dependent variables, contingent on the firm's listing status.

Lastly, the compilation of control variables is detailed in Table 1 below, providing a comprehensive framework for the analysis.

Table 1. Variable definition

Variables	Symbol	Operational Definition
Bond Spread	Spread	Effective interest rate at the time of bond issuance - Treasury rate for the same maturity period
Credit Rating Adjustment	Adj_tot	Issuer's main credit rating
Credit Rating Adjustment Sub-Indicator	Adj_sup	Rating adjustment based on the ability and willingness of governments or shareholders to support the issuer
Credit Rating Adjustment Sub-Indicator	Adj_fir	Rating adjustments based on information on firm-level characteristics
Maturity	Maturity	ln (Maturity of an issued bond)
Proceeds	Proceeds	ln (Bond issue size in USD)
Bond Index	BondIndex	China total bond index on the date of bond issuance
Volatility	Volatility	The standard deviation of the bond index for the 60 days prior to bond issuance
Guarantee	Guarantee	Whether the bond is guaranteed by a third party
Callable	Call	Whether the bond is callable
Listed Firm	ListedFirm	Whether a bond issuer is a listed firm or not

Research model

To examine the impact of credit rating (FinalRating1) on the bond spread (Spread), this paper focuses on regression analysis using the following econometric model:

$$Spread_t = \beta_0 + \beta_1 * FinalRating1_t + \beta_2 * X_t + \varepsilon_t$$

To examine the relationship between credit rating adjustments and the bond spread, this study utilizes the below model:

$$Spread_t = \beta_0 + \beta_1 * Adj\_tot + \beta_2 * Adj\_sup + \beta_3 * Adj\_fir + \beta_4 * X_t + \varepsilon_t \quad (2)$$

Where:

- X_t denotes a vector of control variables;
- ε_t represents the error term, capturing unexplained variation of the bond spread.

Results

Descriptive statistics

The analysis begins with an examination of the variable Spread, which exhibits a mean value of approximately 2.885 and a standard deviation of around 1.497. The minimum and maximum values are approximately -0.04 and 6.3, respectively. This range suggests that bond spreads have varied widely over the observed period, indicating fluctuations in perceived risk or return expectations among investors.

For the variable FinalRating1, the mean value is approximately 12.1729, which implies that a significant proportion of bonds issued in China are rated AAA, indicating high creditworthiness. In terms of credit rating adjustments (Adj_tot and Adj_sup), these variables display similar distributions. However, Adj_fir, which assesses adjustments based on firm-level characteristics, has a notably smaller mean value of 0.0275, suggesting limited variability and indicating that firm-specific adjustments are relatively minor on average.

The bond size, represented by Proceeds, shows a relatively narrow range with a minimum value of approximately 18.8262 and a maximum value of approximately 22.3327. This indicates that the size of bond issues within the dataset does not vary extensively. The feature Guarantees is present in only 5.5% of the issued bonds, indicating that the majority of bonds do not have a third-party guarantee. Similarly, only 6.9% of all bonds are Callable, suggesting that the option for early redemption by the issuer is not commonly incorporated into bond agreements in this dataset. Lastly, the data reveals that nearly 80% of the bonds were issued by non-listed enterprises, highlighting a significant prevalence of bond issuance among private or non-public entities within the observed market segment.

Table 2. Descriptive statistics

Variables	Obs	Mean	Std. Dev.	Min	Max
Spread	24,370	2.8854	1.4970	-.04206	6.3
FinalRating1	12,994	12.1729	1.0125	1	13
Adj_tot	12,994	1.2374	1.5285	-13	10
Adj_sup	12,994	1.2045	1.4618	-4	10
Adj_fir	12,994	.0275	.4285	-14	4
Maturity	24,370	.2676	1.1420	-2.4986	2.3026
Proceeds	24,370	20.5483	.7192	18.8262	22.3327
BondIndex	24,370	184.2168	11.0003	167.3813	201.8325
Volatility	24,370	1.1153	.6020	.2331	2.2712
Guarantee	24,370	.0551	.2282	0	1
Call	24,370	.0691	.2536	0	1
ListedFirm	24,370	.1960	.3970	0	1

Mainline regressions

In Table 3, the outcomes of the initial mainline regression analysis are presented. The first column of this table displays a regression analysis where the variable Spread is the dependent variable, and FinalRating1 is the independent variable. In the second column, the regression model is expanded to incorporate interactions with various control variables.

The coefficient for FinalRating1 is negative in both models, with values of -0.8920 in Model 1 and -0.7221 in Model 2, and these findings are statistically significant at the 1% level. This indicates that an improvement in the credit rating is correlated with a reduction in the bond spread. Thus, these results validate Hypothesis 1 of the study, supporting the proposition that higher credit ratings are associated with narrower bond spreads.

Table 3. Mainline regression (1)

Variables	Spread	Spread
FinalRating1	-0.8920***	-0.7221***
	(0.0225)	(0.0216)
Maturity		0.5460***
		(0.0083)
Proceeds		-0.1889***
		(0.0158)
BondIndex		-0.0553***
		(0.0026)
Volatility		-0.2056***
		(0.0176)
Guarantee		-0.0701
		(0.0762)
Call		0.6808***
		(0.0315)
ListedFirm		-0.0557**
		(0.0262)
Constant	13.1888***	25.8548***
	(0.2851)	(0.6295)
N	16,637	16,637
Year Fixed Effect	Yes	Yes

Note: t statistics in parentheses, * p < .1, ** p < .05, *** p < .01

In Table 4, the results of the second mainline regression are depicted. The first column illustrates a regression where Spread serves as the dependent variable, and Adj_tot, Adj_sup, & Adj_fir act as the independent variables. In the second column, this regression is expanded to include additional interactions with the above control variables.

A statistically significant positive coefficient of 0.4156 can be observed for Adj_tot. This finding suggests that as the issuer's main credit

rating adjustment increases, there is a corresponding rise in spreads. Shifting our focus to Adj_sup, a noteworthy negative coefficient of -0.3706 can be found. At the 5% significance level, higher positive values of Adj_sup are linked to lower spreads. In other words, there exists an inverse relationship between Adj_sup and Spread. Consideration of the variable Adj_fir reveals a statistically significant negative coefficient of -0.4354. This result indicates that positive adjustments based on firm-level characteristics are associated with lower spreads. In summary, there is an inverse correlation between Adj_fir and Spread. Since the effects are not similar, Hypothesis 2 is rejected.

Table 4. Mainline regression (2)

Variables	Spread	Spread
Adj_tot	0.4114	0.4156**
	(0.2503)	(0.1867)
Adj_sup	-0.2431	-0.3706**
	(0.2503)	(0.1868)
Adj_fir	-0.4070	-0.4354**
	(0.2544)	(0.1903)
Maturity		0.6062***
		(0.0094)
Proceeds		-0.4743***
		(0.0173)
BondIndex		-0.0478***
		(0.0029)
Volatility		-0.2167***
		(0.0197)
Guarantee		0.5760***
		(0.0739)
Call		0.4681***
		(0.0339)
ListedFirm		-0.1012***
		(0.0287)
Constant	1.7923***	21.1921***
	(0.0219)	(0.7023)
N	16,637	16,637
Year Fixed Effect	Yes	Yes

Heterogeneity test

To examine the moderating influence of the binary variable ListedFirm on the relationship between CRAs and bond spread, which ultimately impacts bond pricing, a heterogeneity test is conducted. The findings presented in Table 5 offer valuable insights. For instance, it is

evident that all types of credit rating adjustments exhibit statistical significance at the 1% level for non-listed firms. However, while Adj_tot remains significant at the 5% level for non-listed enterprises, CRAs based on the issuer's ability and willingness of government or shareholders to provide support do not show significance. Additionally, CRAs based on firm-level characteristics only demonstrate significance at the 10% level. Therefore, this research provides evidence to support Hypothesis 3.

Table 5. Heterogeneity test: listed versus non-listed

Variables	Listed Spread	Non-listed Spread
Adj_tot	3.8986***	0.1735**
	(0.0939)	(0.0758)
Adj_sup	-4.0263***	-0.1145
	(0.0880)	(0.0759)
Adj_fir	-4.1412***	-0.1521*
	(0.1368)	(0.0853)
Maturity	0.6988***	0.5898***
	(0.0228)	(0.0103)
Proceeds	-0.4333***	-0.4848***
	(0.0392)	(0.0193)
BondIndex	-0.0360***	-0.0501***
	(0.0065)	(0.0032)
Volatility	-0.3112***	-0.2048***
	(0.0406)	(0.0222)
Guarantee	0.5215**	0.5929***
	(0.2092)	(0.0784)
Call	0.1149	0.5438***
	(0.0772)	(0.0385)
Constant	18.2272***	21.8020***
	(1.4913)	(0.7835)
N	3,326	13,311
Year Fixed Effect	Yes	Yes

Conclusion

This research investigates the impact of credit rating adjustments on bond spreads within the context of Chinese firms. The study employs a robust dataset from 2016 to 2022, comprising 24,370 observations. Several significant conclusions are drawn from an empirically supported analysis.

Firstly, credit ratings and any adjustments related to them are important market information events, which can significantly affect bond pricing. When a credit rating is adjusted upwards, it signals an improvement in the issuer's credit quality and reduced risk of default. This can attract more investors, leading to increased demand for the bond and driving bond

prices up. As a result, bond yields and spreads tend to narrow after an upgrade. On the contrary, a downward credit rating adjustment reflects deteriorating credit quality and a heightened risk of default. This can cause some investors to sell the bond, reducing demand and driving prices down. As a result, bond spreads tend to widen after a downgrade.

Secondly, issuers should actively manage their credit ratings and the factors that determine them. An improvement in the overall rating or adjustments reflecting external support or firm performance were found to narrow bond spreads, reducing financing costs. However, adjustments to the overall rating tended to widen spreads. Issuers must focus on transparency, governance, and performance to achieve favorable ratings. Additionally, further research is necessary to understand the market's response to credit rating adjustments, including identifying early warning signals and assessing the impact on various bond types, thereby providing valuable insights for stakeholders, optimizing resource allocation, and promoting financial market stability.

Conflicts of Interests: The authors reported no conflict of interest.

Data Availability: All of the data are included in the content of the paper.

Funding Statement: The authors did not obtain any funding for this research.

References:

1. Allen, R., & Alves, M. (2016). How to improve the financial oversight of public corporations. *Fiscal Affairs Department How-To Notes*, 16(05), 1. https://doi.org/10.5089/9781475551983.061
2. Beaver, W. H., Shakespeare, C., & Soliman, M. T. (2006). Differential properties in the ratings of certified vs. non-certified bond rating agencies. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.596626
3. Cleary, S. (1999). The relationship between firm investment and financial status. *The Journal of Finance*, 54(2), 673–692. https://doi.org/10.1111/0022-1082.00121
4. Cooke, C., & Bailey, F. (2015). *The impact of credit rating changes on Jamaica's global bond prices.* Bank of Jamaica. https://boj.org.jm/uploads/pdf/papers_pamphlets/papers_pamphlets_The_Impact_of_Credit_Rating_Changes_on_Jamaicas_Global_Bond_Prices.pdf

5. Dichev, I. D., & Piotroski, J. D. (2001). The long-run stock returns following bond ratings changes. *The Journal of Finance*, 56(1), 173–203. https://doi.org/10.1111/0022-1082.00322
6. Gao, H., Huang, Y., & Mo, J. (2020). Boosted credit ratings in China: The effects of credit enhancement on bond pricing. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.3549270
7. Gilchrist, S., Wei, B., Yue, Z., & Zakrajsek, E. (2020). The Fed takes on corporate credit risk: An analysis of the efficacy of the SMCCF. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.3686961
8. Hand, J. R., Holthausen, R. W., & Leftwich, R. W. (1992). The effect of Bond rating agency announcements on bond and stock prices. *The Journal of Finance*, 47(2), 733. https://doi.org/10.2307/2329121
9. Hu, X., Huang, H., Pan, Z., & Shi, J. (2019). Information asymmetry and credit rating: A quasi-natural experiment from China. *Journal of Banking and Finance*, 106, 132–152. https://doi.org/10.1016/j.jbankfin.2019.06.003
10. Jarrow, R.A. &Turnbull, S.M. (1995). Pricing derivatives on financial securities subject to credit risk. *The Journal of Finance*, 50, 53-85. https://doi.org/10.1111/j.1540-6261.1995.tb05167.x
11. Jorion, P., & Zhang, G. (2007). Information effects of bond rating changes. *The Journal of Fixed Income*, 16(4), 45–59. https://doi.org/10.3905/jfi.2007.683317
12. Kariya, T., Yamamura, Y., & Inui, K. (2019). Empirical credit risk ratings of individual corporate bonds and derivation of term structures of default probabilities. *Journal of Risk and Financial Management*, 12(3), 124. https://doi.org/10.3390/jrfm12030124
13. Merton, R. C. (1974). On the pricing of corporate debt: The risk structure of interest rates. *The Journal of Finance*, 29(2), 449. https://doi.org/10.2307/2978814
14. Saadaoui, A., Elammari, A., & Kriaa, M. (2022). Credit rating announcement and Bond liquidity: The case of emerging Bond Markets. Journal of Economics, Finance and Administrative Science, 27(53), 86–104. https://doi.org/10.1108/jefas-08-2020-0314