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

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Abstract

Given the critical role of credit ratings in signaling issuer creditworthiness and influencing investor behavior, this paper aims to elucidate how adjustments in these ratings affect bond market spreads. Utilizing a comprehensive dataset spanning from 2016 to 2022, this research focuses on the Chinese bond market. Through regression analysis and heterogeneity tests, 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 also affect spreads, highlighting the importance of managing credit ratings for issuers. Overall, this study offers insights for investors, issuers, regulators, and academics, providing 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, listing status, financial market

Introduction

In the global financial market, the bond market plays a central role due to its deep capital pool and abundant investment opportunities. It serves as a

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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., 2020). 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 often serve as the primary source of investor insight regarding the caliber and market potential of bonds, whether being issued or already in circulation (Michalski & Low, 2024). Theoretical scholars have dedicated significant efforts to establishing connections between micro-level credit risk characteristics and macro-level market behaviors. Their objective is 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

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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 (Hu et al., 2019).

At the heart of the theory of information asymmetry is the idea that credit ratings play a particularly crucial role when bond issuers have more extensive information about their financial position than bond buyers. As a result, 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 (Piccolo & Shapiro, 2022; Khorram et al., 2023). 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 information.

Empirical studies and research advancements

Pioneering studies in the field of CRAs, such as those by Hand et al. (1992), lay the foundational understanding of its dynamics, finding a significant correlation between credit downgrades and declines in stock prices. Subsequent research by Beaver et al. (2006) further confirms the adverse effects of downgrades on bond prices, highlighting that market participants might react even before the official rating announcements. It reveals the intricate interplay between rating changes and the bond market.

The quest to analyze these relationships evolves with the availability of refined datasets and advanced statistical techniques. For example, Dichev and Piotroski (2001) utilize credit rating changes as informational events and apply event study methods to explore their impact on both bond and stock markets. Their findings highlight the substantial and immediate market response to rating adjustments, suggesting 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 advances, scholars like Jorion and Zhang (2007), Gao et al. (2022), and deHaan et al. (2023) employ more complex panel regression techniques to investigate the influence of credit rating changes on bond prices.

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They reaffirm the significant impact of rating changes on bond spreads and emphasize the critical role of information releases' timing in the market.

Research gap and study relevance

Despite extensive research demonstrating that credit rating adjustments are crucial factors affecting bond pricing, there remains a notable deficiency in studies specifically examining the immediate and multidimensional impacts of these changes within the context of the Chinese bond market. This gap is significant given China's unique regulatory environment and the rapid development of its financial markets. Consequently, this research aims to address this gap by extending the existing academic discourse and offering practical insights that can inform investors and policymakers about the nuanced impacts of credit ratings in an emerging market setting.

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 attracts additional investors, leading to increased demand for the bond (Gao et al., 2022). This surge in demand likely elevates 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, elevating the perceived risks associated with the bond. Investors, in reaction, require a higher yield as compensation for assuming greater risk (Saadaoui et al., 2022). Such 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, 2015). 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

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adjustments offers insights into the dynamics of the bond market and the impact of these adjustments on bond pricing (Gilchrist et al., 2020). This is crucial for assessing the risk-return tradeoff and making investment decisions aligned with individual risk preferences.

This research considers three types of credit rating adjustments:

Overall Credit Rating Adjustment — This holistic evaluation of an issuer's creditworthiness incorporates 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 during distress. A positive adjustment may enhance market confidence and lower perceived risk, contributing to narrowing credit spreads. Conversely, a negative adjustment may raise concerns about support, leading to a widening of spreads.

Company-Level Adjustment — This 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. Allen and Alves (2016) acknowledge that listed companies are subject to more stringent disclosure requirements and regulatory oversight than non-listed companies. As a result, there is typically greater transparency and availability of information for listed companies. This increased transparency allows market participants to access and easily analyze relevant information, including credit rating adjustments. Consequently, the impact of credit rating adjustments on bond credit spreads may be more pronounced in listed

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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 that 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 is 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 underscores 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 and bond pricing. Additionally, the longitudinal nature of this sample provides a unique ability to observe changes in bond spreads over time, offering valuable insights into the research area within the specific context of China.

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Variables definition

In this research paper, the dependent variable under scrutiny 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. It serves 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, we employ the independent variable FinalRating1. It represents the average rating assigned to a bond by leading Chinese credit rating agencies, including Brilliance, Lianhe, and Chengxin. The rating scale extends from 1 to 13, with 1 indicating the lowest rating (C) and 13 signifying 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 provides a holistic assessment of the issuer's creditworthiness, incorporating a variety of factors that affect the issuer's capacity to fulfill its financial obligations. Thus, Adj_tot captures shifts in the issuer's overall risk profile, reflecting either improvements 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 in times of distress. Adj_fir, the fourth variable, relates to the credit rating adjustment sub-indicator that considers firm-level characteristics, including financial performance, industry-specific factors, and business operations.

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

Finally, a 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	Difference between bond's issuance interest rate and the same maturity treasury rate.
Credit Rating Adjustment	Adj_tot	Issuer's main credit rating
Credit Rating Adjustment Sub-Indicator	Adj_sup	Rating adjustment based on the external support willingness from governments or shareholders
Credit Rating Adjustment Sub-Indicator	Adj_fir	Rating adjustment based on firm-level characteristics

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Maturity	Maturity	Log of bond's maturity length
Proceeds	Proceeds	Log of bond issue size in USD
Bond Index	BondIndex	China's total bond index on issuance date
Volatility	Volatility	Standard deviation of the bond index 60 days before issuance
Guarantee	Guarantee	Indicates if the bond is guaranteed
Callable	Call	Indicates if the bond is callable
Listed Firm	ListedFirm	Indicates if the issuer is a listed firm

Research models

The first model investigates the direct impact of credit ratings on bond spreads. This analysis is essential to understand how variations in credit ratings, denoted by the variable FinalRating1, influence the pricing of bonds in terms of their spread over the risk-free rate. The model is structured as follows:

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

The second model expands the analysis to consider the impact of different types of credit rating adjustments on bond spreads. This model is vital for dissecting how specific changes to credit ratings, rather than static ratings, affect bond market behavior. The model is specified below:

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

Where:

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

Both models are implemented using Generalized Linear Models (GLM) to account for the non-normal distribution of the bond spread and accurately reflect the nature of the relationship between the independent and dependent variables. The selection of GLM is justified by its flexibility in handling different types of error distributions and its ability to model complex relationships within financial data.

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, indicating a wide range of bond spreads over the observed period. This suggests significant fluctuations in perceived risk or return expectations among investors.

For FinalRating1, the mean value is 12.1729, hinting that a significant proportion of bonds issued in China are rated AAA, indicating high

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creditworthiness. In terms of credit rating adjustments (Adj_tot and Adj_sup), these variables show similar distributions. However, Adj_fir, assessing adjustments based on firm-level characteristics, has a notably smaller mean value of 0.0275, indicating limited variability and suggesting that firm-specific adjustments are relatively minor on average.

The bond size, represented by Proceeds, displays a relatively narrow range, with a minimum value of 18.8262 and a maximum of about 22.3327. This indicates 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, showing 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

Table 3 presents the results of the initial mainline regression analysis. The table's first column shows a regression analysis where Spread serves as the dependent variable and FinalRating1 as the independent variable. The second column expands the regression model to include interactions with various control variables.

The coefficient for FinalRating1 is negative in both models, recorded at -0.8920 in Model 1 and -0.7221 in Model 2, and these findings are statistically significant at the 1% level. This signifies that an improvement in the credit rating is associated with a reduction in bond spread. Therefore, these

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results confirm Hypothesis 1 of the study, supporting the assertion that higher credit ratings lead to 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

Table 4 showcases the outcomes of the second mainline regression analysis. The initial column details a regression with Spread as the dependent variable and Adj_tot, Adj_sup, & Adj_fir as the independent variables. The regression model is expanded in the second column to incorporate additional interactions with these control variables.

A statistically significant positive coefficient of 0.4156 for Adj_tot indicates that increases in the issuer's main credit rating adjustment lead to corresponding rises in spreads. In contrast, Adj_sup shows a notable negative coefficient of -0.3706, signifying at the 5% significance level that higher positive values of Adj_sup are associated with lower spreads, revealing an inverse relationship. Similarly, Adj_fir demonstrates a significant negative coefficient of -0.4354, suggesting that positive adjustments based on firm-level characteristics correlate with lower spreads. Given the differing impacts of these variables on Spread, Hypothesis 2, which posited a uniform effect of credit rating adjustment on bond credit spreads, is rejected.

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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

The heterogeneity test examines the moderating role of the ListedFirm binary variable on the relationship between CRAs and bond spread, impacting bond pricing. The findings in Table 5 are illuminating. All types of credit rating adjustments are statistically significant at the 1% level for non-listed firms. However, while Adj_tot remains significant at the 5% level for non-listed companies, CRAs related to the issuer's ability and willingness to receive government or shareholder support show no significance. Furthermore, CRAs based on firm-level characteristics demonstrate significance at the 10% level. Therefore, these results provide evidence supporting Hypothesis 3.

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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

Discussion

This research extends the existing literature on credit ratings and bond spreads by specifically analyzing the impact of credit rating adjustments within the Chinese bond market. Consistent with the theory of information asymmetry, the results indicate that markets react more sensitively to credit rating adjustments when more comprehensive information is available, particularly in the case of listed firms. This aligns with Hu et al. (2019), who argue that uneven information distribution can lead to pronounced market reactions.

The outcomes from the first model validate the foundational theory posited by Beaver et al. (2006) and further explored by Gao et al. (2022), demonstrating that an upgrade in credit ratings typically leads to narrower bond spreads. It signals an improvement in the issuer's credit quality and reduced risk of default. The former can attract more investors leading to increased demand for the bond and driving bond prices up. Conversely, downgrades expand spreads, echoing findings from Saadaoui et al. (2022), which suggest that such downgrades can cause some investors to sell the bond, reducing demand and driving prices down.

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Furthermore, the study addresses the highlighted gap by Jorion and Zhang (2007) concerning the responsiveness of markets to different types of credit rating adjustments. The distinct impacts of adjustments based on overall creditworthiness, governmental support, and firm-specific characteristics suggest that investors differentiate between sources of risk and adjust their expectations accordingly.

Conclusion

This study increases our understanding of the dynamics between credit rating adjustments and bond pricing within the Chinese bond market. It shows the critical role of specific types of credit rating adjustments and their differentiated impacts on bond spreads, providing valuable insights for theoretical financial models and practical market applications.

Policymakers and financial analysts are advised to consider these findings when crafting regulatory and investment strategies, ensuring that they are well-suited to the evolving dynamics of Chinese and global financial markets. This study suggests that more nuanced approaches considering different CRAs can lead to more stable and predictable financial markets.

Future research should extend this analysis to other emerging markets to validate the universality of these findings and explore their applicability to different regulatory and economic environments. Investigating the long-term effects of credit rating adjustments on market stability and economic development will be particularly valuable. This continued exploration will enrich our global understanding of financial markets and help develop more resilient financial systems worldwide.

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