The Impact of the Stock Index Futures “Regulation” Policy and “Deregulation” Policies on the Spot Market Volatility

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Abstract: In 2015, the China Financial Futures Exchange implemented a strong regulation policy on the trading of stock index futures. After which following the past few years, it carried out a few more policy adjustments to restore the capacity of index futures trading. This paper implies the ARMA-GARCH model to study the impact of policy adjustments on spot market volatility. The results show that: (1)The strong regulation policy during the stock market crash reduced the spot volatility; (2) The subsequent deregulation policy adjustments activated the futures’ function, which further reduced the spot market volatility.

Key Words: Index Futures; Spot Market; Volatility; Trading Policy Adjustment

1 Introduction

The China Financial Futures Exchange initially introduced CSI-300 index future (CSI-300-IF) in 2010, the first stock index future product in China. Subsequently the CSI-500 index future and Shanghai Stock Exchange 50ETF future were introduced in 2015, which basically formed the market structure of stock index futures trading in China.

The China Financial Futures Exchange(CFFEX) implemented a strong restriction policy on the trading of stock index futures in 2015. After which following the past few years, it carried out five more policy adjustments to restore the capacity of index futures trading. In the late 2015, a severe "market crash" hit China's stock market, with the Shanghai Composite Index falling by nearly 30% in ten days, resulting in many limitations of trading. Many think that the trading of stock index futures is one of the reasons for the severe crash in the stock market. Therefore, CFFEX significantly tightened the trading policy of stock index futures, attempting to influence the spot market by regulating the futures trading. After which during the period from 2017 to 2022, CFFEX have conducted five deregulation policies to restore trading, by lowering transaction fees etc.. Despite several adjustments, the total amount of index futures trading still lags far behind compared with which before the restrictions in 2015.

There are extensive research focusing on the relationship between stock index futures and spot prices. However, the introduction of stock index futures in China was relatively late, and the adjustment of futures trading policies was relatively frequent. Scholars have conducted little research on the impact of stock index futures trading policy adjustments on the spot market. The stock index futures market in China has special characteristics in institutional design, investor

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composition and other aspects. It is very meaningful to study the impact of policy adjustments in stock index futures trading on the spot market. Therefore, this article conducts quantitative analysis and research on the impact of stock index futures policy adjustments on the volatility of the spot market. Policy based financial institutions and financial regulatory authorities often try to regulate the market through easily controllable policy adjustments, especially in China's financial system, where regulatory authorities play an irreplaceable and important role. Can the policy adjustments on index futures trading be transmitted to the spot market? How will these policy adjustments affect the spot market? Clarifying these issues can help improve the effectiveness of policies.

2 Literature Review

In terms of the impact of stock index futures trading on spot market volatility, some scholars believe that stock index futures trading exacerbates spot market volatility. For example, Harris (1989), Furbush (1989) and Bae et al. (2004) conducted research on the US and South Korean stock markets respectively, and the results showed that stock index futures trading enhanced stock spot volatility[1,2,3]. Other research has shown that stock index futures trading can reduce the volatility of the spot market. Drimbetas (2007), Santoni(1987) and Robinson (1994) studied the Greek, United States and London stock markets respectively, and found a negative correlation between stock index futures trading activity and spot price volatility[4,5,6]. Robinson also concluded that the launch of the FTSE 100 stock index futures contract reduced spot market volatility by approximately 17%. Ausloos et al. (2020) studied the Shanghai and Shenzhen 300 Index using the TGARCH model, and concluded that futures trading can reduce spot market volatility[7].

There are also studies indicating that stock index futures trading has no significant impact on spot market volatility (Board et al., 2001; Chen et al., 2015)[8,9]. Until now scholars have drawn inconsistent conclusions based on different stock markets and sample data. This may be related to the current state of the stock market, as well as the trading purposes and behaviors of the investors.

Overall, there are extensive research focusing on the relationship between stock index futures and spot prices, but there is relatively little research on the impact of policy adjustments of futures on spot market. The adjustment of stock index futures trading policies by the China Financial Futures Exchange is relatively frequent, but scholars have little research on the implementation effects of several deregulation policies since 2017. This article conducts quantitative analysis and research on the impact of policy adjustments to stock index futures trading policies on the spot market.

3 Research design, sample description, and model construction

3.1 Adjustment of Trading Policies for Stock Index Futures

Table 1 Adjustment of Trading Policies for Stock Index Futures

	Time	Margin/%		Excessive trading /hands	Commission/‰
		non-hedge	hedging		
Before Market Crush	Before 2015-08-26	10	10	NA	0.023
Regulation	2015-09-07	40	20	10	2.3
1st deregulation	2017-02-16	20	20	20	0.92
2nd deregulation	2017-09-15	15	15	20	0.69
3rd deregulation	2018-12-03	10	10	50	0.46
4th deregulation	2019-04-19	10	10	500	0.345
5th deregulation	2021-08-16	10	10	500	0.173

Prior to the 2015 stock disaster, there was no specific restrictions on the trading of stock index futures(Table 1), and the trading volume of futures had repeatedly reached new highs. After the stock market crush, in September 2015, the China Financial Futures Exchange implemented a strict regulation policy on stock index futures trading, resulting in a decrease of over 95% in its trading volume. This measure have distinguished the margin fees for non-hedging and hedging trading, increasing the ratio to 40% and 20% respectively. This treatment reflects CFFEX's encouragement of index futures hedging transactions, which relatively reduces the transaction costs of hedging compared to non-hedging.

During 2017-2019, index futures had very little trading going on, and the stock market was also a bear market. Due to the urgent need of hedging, CFFEX deregulated its restrictions on index futures for the first time in February 2017. Afterwards, CFFEX gradually relaxed the trading of stock index futures for four times, as shown in Table 1. The deregulation policy in 2019 raised the excessive trading standard to 500 hands, which was relatively the most critical deregulation. After that, the trading volume of stock index futures increased from an average of less than 40000 hands per day to around 100000 hands.

3.2 Descriptive Statistic

The CSI300 futures was officially listed for trading on April 16, 2010. In the first two years, the trading volume of futures gradually increased, and it exceeded the daily trading volume of 500000 hands for the first time in September 7, 2012. Therefore, this article selects the price data of the CSI300 and CSI300 stock index futures from September 7, 2012 to March 31, 2022, totaling 2323 trading days, all of which are from the Wind database. Firstly, calculate the daily returns (%) of spot and futures:

$$R_t = 100 \times \ln\left(\frac{P_t}{P_{t-1}}\right) \quad (1)$$

In equation (1), R_t represents the *t* day yield of spot and futures, P_t represents the *t* day closing price of spot and futures, and P_{t-1} represents the *t-1* day closing price of spot and futures.

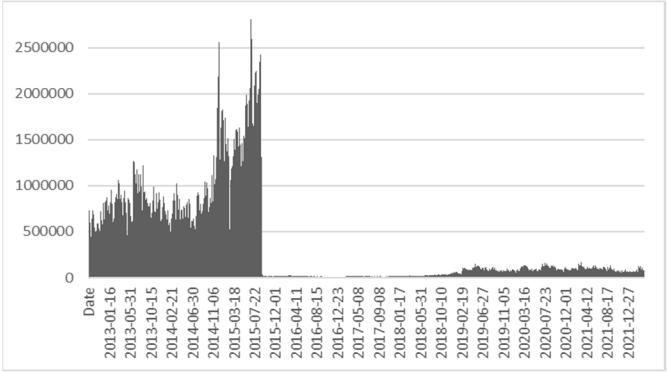

Fig1. The Daily Trading Volume of CSI300

Based on the evolution of index futures trading in China, referring to the trading volume of index futures (Figure 1), and combining the policy adjustment of the CFFEX (the most critical deregulation policy in 2019), the research sample can be divided into three stages, as shown in Table 2.

Table 2 Sample Division

Sample Stage	Time Period	CSI300 State	Excessive Trading
Stage 1	2012.09.07-2015.09.06	Active Period	No limit
Stage 2	2015.09.07-2019.04.18	Dormant Period	10-50 hands
Stage 3	2019.04.19-2022.03.31	Recovery Period	500 hands

Based on the sample division of the data mentioned above, descriptive statistical analysis is conducted on the full sample, active period (stage 1), dormant period (stage 2), and recovery period (stage 3), respectively. Overall, the skewness of both spot and futures yield is negative, with kurtosis greater than 3, and J-B statistics are significant. This shows that both spot and futures return series are left skewed peak and fat tail distributions, and their distribution characteristics are significantly different from normal distribution, which meets the conditions of the GARCH model.

3.3 Empirical model construction

The characteristic of stock return series is heteroscedasticity (volatility aggregation), so the Generalized ARCH Model (GARCH) is used to analysis the return data (Bollerslev, 1986)[10]. The basic expression form of the GARCH model is as follows: the average model is equation (2), where $\varepsilon_t = \sqrt{h_t} e_t$; The heteroskedasticity model is equation (3).

$$x_t = f(t, x_{t-1}, x_{t-2}, \dots) + \varepsilon_t \quad (2)$$

$$h_t = \omega + \sum_{j=1}^{p} \eta_j h_{t-j} + \sum_{i=1}^{q} \lambda_i \varepsilon_{t-i}^2 \quad (3)$$

The deterministic information fitting model $f(t, x_{t-1}, x_{t-2}, \dots)$ in equation (2) is usually set as the ARMA model and ε_t is the model fitting residual. Equation (3) is a GARCH model fitting of conditional variance (spot volatility). To ensure the long-term stability of the model, simultaneous parameter conditions need to be met: $\eta_j \in [0,1)$ $\lambda_i \in [0,1)$ and $0 \leq \sum_{j=1}^{q} \eta_j +$

$\sum_{i=1}^{p} \lambda_j < 1$.

The strong trading restriction policy in September 2015 brought index futures trading from an active period to a dormant period, while the deregulation policy in April 2019 brought index futures trading from a dormant period to a recovery period. The following study examines the changes in spot market volatility before and after these two policy shifts.

Firstly, the ADF unit root test was conducted on the index return series and index futures return series. The results showed that both sequences rejected the assumption of non-stationary sequences at a significance level of 99%, and both sequences are stationary time series. Next, based on the autocorrelation coefficient graph and partial autocorrelation coefficient graph, combined with AIC and SC information criteria, determine the lag term of the mean equation, and fit ARMA((2), (2)) as the mean regression equation, as shown in equation (4). Among them, R_t is the t day yield of spot, R_{t-2} is the yield of the previous two days, ε_{t-2} represents the external information shock of the previous two days, and ε_t is the residual term. c, α_2, β_2 are the constant term and the fitting coefficient of the independent variable, respectively. After fitting the ARMA((2), (2)) equations, perform ARCH-LM testing on the residual sequence. The results indicate that the sequence exhibits heteroscedasticity at a 99% significance level, indicating that there is aggregation volatility that requires fitting the GARCH model. The study by Ausloos et al. (2020) on the GARCH model family showed that the GARCH(1,1) model has the best fitting effect on stock prices [5]. This article uses the GARCH (1,1) model to fit the volatility of spot returns and constructs the model ARMA((2), (2)) - GARCH (1,1), as shown in equations (4) and (5). In order to study the impact of policy adjustments on the spot market, this article uses the dummy variable method to represent the different stages of policy implementation. Select the year before and year after the implementation of policy adjustments (240 trading days) as dummy variables and add them to the variance equation. Set d_1=1 a year before September 7, 2015 when the policy implemented, and d_1=0 for the rest of the model. Set d_2=1 a year after September 7, 2015 when the policy implemented, and d_2=0 for the rest of the model. Set d_3=1 a year before April 19, 2019 when the policy implemented, and d_3=0 for the rest of the model. Set d_4=1 a year after April 19, 2019 when the policy implemented, and d_4=0 for the rest of the model.

$$R_t = c + \alpha_2 R_{t-2} + \beta_2 \varepsilon_{t-2} + \varepsilon_t \quad (4)$$

$$\sigma_t^2 = \omega + \eta_1 \sigma_{t-1}^2 + \lambda_1 \varepsilon_{t-1}^2 + \varphi_1 d_1 + \varphi_2 d_2 + \varphi_3 d_3 + \varphi_4 d_4 \quad (5)$$

4 Empirical Results and Analysis

Use Eviews10 to fit the ARMA((2), (2))-GARCH (1,1) model (equations (4) and (5)), and the results are shown in Table 3. From the regression results we can conclude, $\eta_j \in [0,1)$ $\lambda_i \in [0,1)$ and $\eta_1+\lambda_1<1$, which meets the parameter conditions required by the GARCH model. The ARCH-LM test was conducted again on the fitted model, and the results showed that there was no ARCH effect in the model and the regression equation is stable. The regression results show that φ_1 (the regression coefficient of the dummy variable d_1) is greater than φ_2 (the regression coefficient of the dummy variable d_2). Indicating that the implementation of the regulation policy on index futures in 2015 significantly reduced the volatility of the spot market. At the same time, φ_3 and φ_2 are both smaller than φ_1, indicating that a significant decrease in trading volume of index futures can mitigate the volatility of the spot market. During the 2015

stock market crash, index futures trading was very active, with lots of shorting on the market, speculative trading tend to be the dominant power. After the implementation of the restriction policy, the daily trading volume of index futures decreased by more than 95%, and the adjusted policy also differentiated the margin for hedging and non-hedging transactions. This significantly reduced the speculative trading of index futures, leading to a decrease in the volatility of the underlying spot index.

Table 3 Test Result of the GARCH Model

Parameters	Coefficient	Z-statistic
c	0.0481**	2.3377
α_2	0.6721***	2.8283
β_2	-0.6974***	-3.0359
ω	0.0155***	4.1502
η_1	0.9114***	150.3603
λ_1	0.0794***	13.4816
φ_1	0.0667***	2.6546
φ_2	0.0161*	1.8021
φ_3	0.0377**	2.4844
φ_4	0.0103*	1.5737

Note：Statistical significance (two-sided) at the 10%, 5%, and 1% level is denoted by *, **, and ***, respectively.

In table 3, the regression results show that φ_4 (the regression coefficient of the dummy variable d_4) is smaller than φ_3 (the regression coefficient of the dummy variable d_3). Indicating that the deregulation policy of index futures in April 2019 further reduced the volatility of the spot market. The spot volatility in the early recovery period (Stage 3) is lower than that in the later dormant period (Stage 2). This may be because an increasing trade in index futures brought out its hedging function. After the trading of index futures being significantly restricted, there was an extreme lack of risk hedging opportunities in the market. After the implementation of deregulation policies, instead of selling all the stocks, when there appears to be risks in the stock market, investors can hedge against systemic risks by shorting index futures, which prevents severe fluctuations in the spot market.

5 Conclusion

By constructing the ARMA-GARCH model, this study investigates the impact of stock index futures trading policy adjustments on spot market volatility. Research has found that: The regulation policy in 2015 made speculative trading decreased, thereby reduced the volatility of spot market; The subsequent deregulation policy has brought out the hedging functions of futures, further reduced spot volatility.

According to the findings, the following policy recommendations are proposed: Moderate stock index futures trading should be allowed under the premise of regulation on speculative behavior. The deregulation policy of loosening trading restrictions should be gradually promoted. Stock index futures, as an important risk hedging tool, currently have a much lower variety and quantity in the Chinese market compared to developed markets. Investors urgently need risk hedging tools. In addition, promoting the trading of stock index futures is beneficial for

attracting investments into the market. Moderate trading of stock index futures will be able to exert futures' hedging and price discovery functions, which promotes the long-term healthy development of the stock and futures markets in China.

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