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How does the Loosening Policy of Stock Index Futures Affect the Asymmetric Effect of Futures and Spot Markets

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Abstract. By constructing EGARCH (1,1) model, this paper uses the logarithmic returns of CSI 300, SSE 50 and CSI 500 stock index futures in the capital market from 2016 to 2023 to study the leverage effect of each loosening policy on the futures and spot markets. The study found that after the futures market experienced the restriction policy in 2015, the three loosening policies did not cause the market to form an asymmetric effect, and the promulgation of the fourth and fifth loosening policies successfully restored the leverage effect of the market. The reason may be that the first three loosening policies have a short time span and low intensity, and fail to effectively schedule investor sentiment to increase futures trading volume. At the same time, through the Granger causality test, it is found that the information transmission function of the Shanghai and Shenzhen 300 stock index futures market has not been effectively 'repaired'.

Keywords: Stock Index Futures; Leverage Effect; Loosening Policy; EGARCH Model.

1. Introduction

The futures market is based on the development of the spot market, and the spot price is the basis of futures pricing. In theory, the futures market has the function of price discovery for the spot market, so the regulatory authorities can pass the policy intention to the futures market through policy means. Since February 20,2010, the China Securities Regulatory Commission officially approved the CSI 300 stock index futures contracts and business rules of the China Financial Futures Exchange, the main system of the stock index futures market has been released. On April 16,2010, the CSI 300 stock index futures contracts were officially listed. In 2015, the A-share market changed. In order to stabilize the spot market, control risks and prevent the market from falling, China Financial Futures Exchange announced on September 2, 2015 that since September 7, 2015, the margin will increase to 40 %, and the closing fee will increase to 23/10,000. One-day opening of more than 10 shares is considered an abnormal transaction. As the promulgation of the restriction policy has stabilized the spot market to a certain extent, CICC has ' loosened ' the stock index futures market to varying degrees in 2017,2018,2019 and 2023 respectively, and has continuously relaxed restrictions on margin ratios, non-set insurance policy opening limits and current position handling fees (see the Table 1 below for details). China's capital market is not perfect and mature enough. Can the adjustment of the five loosening policies really affect the leverage effect of the stock index futures spot market ? If it can have an impact, what is the mutual guiding relationship between the futures and spot markets ? The research on these issues will help to promote the in- depth reform of China 's securities market and promote the sustainable development of China 's capital market.

2. Literature Review

Since the launch of the world's first stock index futures in the United States, Chinese and foreign scholars' research on market volatility, mutual guiding relationship, leverage effect and other issues has not been able to reach a consistent answer. Some scholars believe that stock index futures aggravate market volatility.

Table 1. The stock index futures market has been "relaxed" to varying degrees, and restrictions on margin ratios, open position limits for non-fixed policies and current position fees have been continuously relaxed

	margin rate	The daily opening limit of non-set insurance policy	Clearance handling fee
Before the promulgation of the restriction policy	8%	nil	0.23 per ten thousand
position limit(2015.9.7)	Non-hedging :40% hedging :20%	10 shares	23 per ten thousand
The first loosening(2017.2.17)	IF,IH :20% IC :speculation for 30% hedging :20%	20 shares	9.2 per ten thousand
The second loosening(2017.9.18)	IF,IH : 15% IC :speculation for 30% hedging :20%	20 shares	6.9 per ten thousand
The third loosening(2018.12.3)	IF,IH : 10% IC : 15%	50 shares	4.6 per ten thousand
The fourth loosening(2019.4.19)	IF,IH : 10% IC : 12%	500 shares	3.45 per ten thousand
The fifth loosening(2023.3.20)	nil	nil	2.3 per ten thousand

Lawrence Harris (1989) used cross-sectional data to analyze S&P500 data and concluded that the opening of stock index futures aggravates the volatility of the spot market. Similarly, Antonios (1995) studied the impact of high-frequency futures trading on spot market volatility. The results show that futures trading increases this volatility and accelerates the speed of information flow into the spot market. In addition, Bae and Kwon (2004) found that after the introduction of KOSPI200 stock index futures in the Korean capital market, the stock market spot price fluctuations are more intense.Zhang Xiaoyan and Shen Zhonghua (2011) used the TGARCH model to select the 5-minute high-frequency data of the CSI 300 stock index futures, and found that the introduction of China 's first stock index futures aggravated the volatility of the spot market. Other scholars believe that it reduces the volatility of the market. Bessembinder (1992) conducted an in-depth empirical study by applying the GRACH model, revealing the positive role of stock index futures in reducing the volatility of the spot market. This reduction effect may be attributed to the hedging mechanism of stock index futures and its unique function in promoting the information transmission of futures and spot markets. Li Yaqing (2018) found that there is a long-term cointegration relationship between the CSI 500 stock index futures and the underlying stock index return series, and there is a two-way Granger causality. When the market is stable, the CSI 500 stock index futures can reduce the fluctuation of the stock index.

In the world's major futures markets, high-frequency and substantial changes in trading policies are relatively rare. Therefore, there are few studies on the volatility of stock index futures by changing trading policies, and there are few domestic studies on the background of only loosening policies after market stability in 2017. Liang Zhaohui et al. (2019) used ARMA-GARCH and Granger causality test to analyze the yield of CSI 300 stock index futures from 2010 to 2018. It was found that the price discovery function of stock index futures was inhibited under restrictive policy

conditions, and the volatility of the stock market became larger. Chen Chunliu (2018) divided the data into pre-restriction and post-restriction, adopted GARCH and EGARCH models, and used dummy variables to represent the restriction policy. He concluded that the restriction policy not only reduced the volatility of the stock market but also improved the asymmetry of the stock market. The research results of Yang (2018) show that the change of trading rules of stock index futures does not have a significant impact on the key indicators such as liquidity, volatility and information transmission of China's stock market, so it should not be regarded as the key driving factor of China's stock market crash.

On the contrary, the study emphasizes that the defects of the current stock index futures supervision mechanism and the lack of relevant laws and regulations are the deep-seated reasons for the stock market crash. Fang Xianming and Feng Xiangyu (2021) selected the spot yield data of CSI 300, SSE 50 and CSI 500 from April 16,2015 to April 19,2019, and found that restrictive policies significantly reduced the volatility of the spot market, while the gradual loosening of stock index futures transactions slowly increased the volatility of the spot market.

To sum up, whether at home or abroad, the research on the market volatility of stock index futures has been done in detail, but there are few studies on the domestic market, especially after the capital market is stable in 2017 and based on the background of loosening policy. Through the analysis of the stable market at the present stage, it is of great significance to further deepen the reform and healthy development of the capital market in the future. Therefore, this paper selects the logarithmic return rate of three stock index futures of CSI 300, SSE 50 and CSI 500 index future contracts from January 1, 2016 to September 28, 2023 as the research object. Through a more in-depth analysis of the policy, from a longer time dimension, the impact of each loose policy adjustment on different stock index futures trading, spot market volatility and symmetry of futures and spot markets is observed, and it is found that the loose trading policy adjustment of the three stock index futures is not completely consistent. In the study, it is also compared and analyzed in order to find a more universal law.

3. Model Construction and Sample Description

3.1. Model Construction

GARCH model is a statistical model used to describe the heteroscedasticity of volatility in time series data. This model was first proposed by Tim Bollerslev in 1986 and has become an important tool in financial metrology. GARCH model is widely used to analyze the volatility of stock prices, exchange rates and other financial assets. The E-GARCH model is a statistical model for modeling the heteroscedasticity of volatility in time series data. It is an extension of the traditional GARCH model by introducing more complex forms to capture the nonlinear dynamics of volatility. The E-GARCH model is usually used in the financial field, especially for analyzing the volatility of stock prices, exchange rates and other financial assets. In the research process, the basic expression of the empirical test model is as follows:

$$\ln(\sigma_t^2) = \alpha_0 + \sum_{i=1}^{m} \alpha_i \left| \frac{a_{t-i}}{\sigma_{t-i}} \right| + \gamma_i \frac{a_{t-i}}{\sigma_{t-i}} + \sum_{j=1}^{s} \beta_j \ln(\sigma_{t-j}^2) \tag{1}$$

$$a_t = \sigma_t \varepsilon_t \tag{2}$$

The formula (1) is the E-GARCH (m, s) model, which represents the logarithm of the conditional variance of the financial time series, that is, the logarithmic volatility. This paper uses it to describe the volatility of the index and spot returns of the three index futures of CSI 300, SSE 50

and CSI 500.Among them α_0 is the intercept term, α_{t-i} is the external disturbance sequence of the return on assets in the past. The positive α_{t-i} contribution to the logarithmic volatility is α_i ($1 + \gamma_i$) $\left| \varepsilon_{t-i} \right|$, and the negative α_{t-i} contribution is α_i ($1 - \gamma_i$) $\left| \varepsilon_{t-i} \right|$. α_i is called ARCH parameter, which represents the influence degree of external disturbance on the current fluctuation. β_i is called GARCH parameter, which represents the degree of influence of previous volatility on current volatility. $\sigma_t^2\_j$ represents the impact of previous fluctuations on current fluctuations. Leverage effect of α_{t-i} represented by γ_i. In Equation (2), ε_{t-i} is an independent and identically distributed random variable with a mean of 0 and a variance of 1. Note that $\varepsilon_t = a_t / \sigma_t$, we reformulate (1) as follows:

$$ln\ (\sigma_t^2) = \alpha_0 + \sum_{i=1}^{m} \alpha_i\ (\left| \varepsilon_{t-i} \right| + \gamma_1 \varepsilon_{t-i}) + \sum_{i=1}^{m} \beta_1\ \ln\ (\sigma_{t-i}^2) \tag{3}$$

The meaning of each parameter in formula (3) is the same as that in formula (1).

3.2. Sample and Descriptive Statistics

Considering the abnormal volatility of the stock market in 2015, in order to dilute the impact of market anomalies on the return rate of stock index futures, this paper selects the return rates of CSI 300, CSI 500, SSE 50 index futures and spot on 1885 trading days from January 4,2016 to September 28,2023 as the research objects, and uses EGARCH model and Granger causality test to explore the impact of futures loosening policy on spot and futures volatility and the mutual guidance relationship between futures and spot. All data are from the wind database. The yield of futures and spot is:

$$R_t^{\mathrm{f}} = ln(x_t / x_{t-1}) \tag{4}$$

$$R_t^{\mathrm{s}} = ln(y_t / y_{t-1}) \tag{5}$$

R_t^{f} and R_t^{s} respectively represents the logarithmic yield of futures and spot on t day, x_t and y_t respectively represents the closing index and closing price of futures and spot on t day.

In order to more intuitively show the statistical distribution of the logarithmic yield of futures and spot, this paper makes descriptive statistics on three kinds of stock index futures and spot. Descriptive statistics include six sample intervals before the first loosening policy (from January 4,2016 to February 16,2017), the first loosening to the second loosening (from February 17,2017 to September 15,2017), the second loosening to the third loosening (from September 18,2017 to November 30,2018), the third loosening to the fourth loosening (from December 3,2018 to April 19,2019), the fourth loosening to the fifth loosening (from April 22,2019 to March 20,2023), and the fifth loosening to the present. See Table 2 for detailed data.

According to the data from Table 2 (a-c), it can be found that the indexes and futures of CSI 300, SSE 50 and CSI 500 have the characteristics of left or right deviation in each stage. At the same time, the kurtosis of each stage is > 3, so the three index futures have the distribution characteristics of peak and thick tail in each stage, so the distribution is significantly different from the normal distribution, which is suitable for the fitting conditions of EGARCH model. The average of the three stock index futures and spot logarithmic return rates reached the highest between the third and fourth loosening, and the standard deviation of the CSI300 spot logarithmic return rate and the SSE 50 spot logarithmic return rate reached the highest between the third and fourth loosening. The rest reached the highest standard deviation before the first loosening policy was promulgated, and then showed a downward trend. After the promulgation of the fifth loosening policy, each standard deviation was reduced to less than 1 (%).

Table 2. CSI 300 spot yield descriptive statistics (a)

Index Futures	Sample Period	Mean Value (%)	Median (%)	Maximum Value(%)	Minimum Value(%)	Standard Deviation(%)	Skewness	Kurtosis
CSI 300 Index Spot	Limition	0.00301	-0.07424	4.03	-7.19	1.28	-1.5476	11.1579
	February 17,2017 to September 15,2017	0.07803	0.09133	1.78	-1.86	0.61	0.2360	3.6119
	September 18,2017 to November 30, 2018	-0.06565	0.00760	4.23	-4.92	1.26	-0.3689	4.6799
	December 3,2018 to April 19,2019	0.26	0.03548	5.78	-4.05	1.43	0.5878	5.1325
	April 22,2019 to March 20,2023	-0.00229	0.01869	5.51	-8.21	1.25	-0.5406	6.6109
	Present	-0.05831	-0.17	2.85	-2.33	0.86	0.3970	3.5950
CSI 300 Index Futures	Limition	0.00727	0.02105	11.6	-11.67	2.02	-0.4504	15.7868
	February 17,2017 to September 15, 2017	0.07242	0.02701	2.44	-3.44	0.78	-0.1884	5.8212
	September 18,2017 to November 30, 2018	-0.05401	0.04977	4.95	-5.91	1.48	-0.5392	5.0637
	December 3,2018 to April 19,2019	0.23	-0.02024	7.10	-3.63	1.57	0.9618	6.2708
	April 22,2019 to March 20,2023	-0.00089	0.02055	7.97	-10.57	1.34	-0.6182	0.1990
	Present	-0.05504	-0.13	2.88	-2.60	0.87	0.4643	4.0157

SSE 50 spot yield descriptive statistics (b)								
Index Futures	**Sample Period**	**MeanValue(%)**	**Median (%)**	**Maximum Value(%)**	**Minimum Value(%)**	**Standard Deviation (%)**	**Skewness**	**Kurtosis**
SSE 50 Index Spot	Limition	0.01688	0.02024	3.50	-6.10	1.17	-1.1963	9.9752
	February 17,2017 to September 15,2017	0.08391	0.04538	2.70	-1.59	0.68	0.6381	4.3179
	September 18,2017 to November 30,2018	-0.03301	0.05472	3.76	-4.72	1.30	-0.3668	4.2851
	December 3,2018 to April 19,2019	0.22	0.15	6.09	-3.80	1.41	0.7076	5.9017
	April 22,2019 to March 20,2023	-0.01336	-0.00341	6.58	-7.26	1.25	-0.2143	6.1788
	Present	-0.04040	-0.11	3.09	-2.33	0.90	0.6399	4.0749
SSE 50 Index Futures	Limition	0.02551	0.05506	4.10	-6.09	1.33	-0.7175	7.1810
	February 17,2017 to September 15,2017	0.09233	0.05211	3.17	-2.06	0.81	0.4633	4.4350
	September 18,2017 to November 30,2018	-0.03650	0.05200	4.59	-5.88	1.43	-0.5736	4.9689
	December 3,2018 to April 19,2019	0.22	0.09216	7.35	-3.75	1.52	1.0368	8.0676
	April 22,2019 to March 20,2023	-0.013100	-0.01448	8.83	-10.32	1.35	-0.3048	9.9000
	Present	-0.03729	-0.12	3.05	-2.73	0.94	0.6308	4.3186

CSI 500 spot yield descriptive statistics (c)								
Index Futures	**Sample Period**	**Mean Value(%)**	**Median (%)**	**Maximum Value(%)**	**Minimum Value(%)**	**Standard Deviation (%)**	**Skewness**	**Kurtosis**
SSE 50 Index Spot	Limition	-0.03454	0.08223	4.98	-8.93	1.78	-1.4441	8.8116
	February 17,2017 to September 15,2017	0.03360	0.13	2.14	-4.20	0.94	-0.8547	5.6421
	September 18,2017 to November 30,2018	-0.14	-0.03838	4.85	-7.22	1.44	-0.8779	6.5615
	December 3,2018 to April 19,2019	0.28	0.15	5.44	-3.98	1.57	0.4371	3.9073
	April 22,2019 to March 20,2023	0.0076	0.08694	4.02	-9.08	1.34	-1.0352	7.9740
	Present	-0.06968	-0.02912	2.21	-2.55	0.83	-0.2901	3.4682
SSE 50 Index Futures	Limition	-0.01528	0.08370	7.38	-9.75	2.03	-0.9842	7.9473
	February 17,2017 to September 15,2017	0.03386	0.09306	2.49	-4.39	1.09	-0.8029	5.5404
	September 18,2017 to November 30,2018	-0.15	-0.07837	5.75	-8.73	1.65	-0.9288	7.3419
	December 3,2018 to April 19,2019	0.28	0.05153	6.41	-2.92	1.70	0.8104	4.0709
	April 22,2019 to March 20,2023	0.00629	0.08049	5.33	-10.61	1.43	-1.1557	10.3449
	Present	-0.06158	-0.07559	2.17	-2.36	0.80	-0.1611	3.6245

4. Empirical Results and Analysis

4.1. Verification of Stationarity

In order to test the stability of the data and avoid spurious regression, the ADF test is carried out on the CSI 300, SSE 50 and CSI 500 index and futures logarithmic return rate. The following table is the test results:

Table 3. The test results

	ADF statistics	1% critical value	5% critical value	10% critical value	P-value
CSI300 futures	-12.5609	-3.9675	-3.4144	-3.1293	0.0000
CSI300 spot	-12.3130	-3.9675	-3.4144	-3.1293	0.0000
SSE50 futures	-12.721	-3.9675	-3.4144	-3.1293	0.0000
SSE50 spot	-12.5293	-3.9675	-3.4144	-3.1293	0.0000
CSI500 futures	-12.5559	-3.9675	-3.4144	-3.1293	0.0000
SSE50 spot	-11.9024	-3.9675	-3.4144	-3.1293	0.0000

From the above table, the above data can reject the null hypothesis that the sequence has a unit root at the 99 % confidence level, so the above sequences are stationary sequences.

4.2. ARCH-LM Test

Table 4. The test results

	lag	x^2	P
CSI300 futures	1	267.433	0.000
	2	273.154	0.000
CSI300 spot	1	16.577	0.000
	2	41.476	0.000
SSE50 futures	1	48.228	0.000
	2	50.047	0.000
SSE50 spot	1	21.879	0.000
	2	33.269	0.000
CSI500 futures	1	7.966	0.005
	2	36.514	0.000
SSE50 spot	1	7.003	0.008
	2	93.102	0.000

Since the logarithmic rate of return is a stationary sequence, the ARCH-LM test is further performed to observe whether the sequence has conditional heteroscedasticity. Since the sequence is not normally distributed, it can be assumed that the sequence obeys the T distribution. If the sequence has conditional heteroscedasticity, a GARCH model can be established for further analysis. The test results are shown in the table 4.

According to the test results, the variance of the logarithmic returns of the three stock index futures is not homogeneous when the lag order is 1-12, that is, the residual has the ARCH effect, that is, the volatility clustering (due to space, only the test results when the lag order is 1 and 2 are shown), so the GARCH model can be established.

4.3. The Leverage Effect of Policy Adjustment on the Logarithmic Yield of Stock Index Futures

The EGARCH (1,1) model is established for each sample period of different stock index futures. The EGARCH (1,1) model form is:

$$ln(\sigma_t^2) = \alpha_0 + \alpha_1 \frac{|a_{t-i}|}{\upsilon_{t-i}} + \gamma_1 \frac{a_{t-i}}{\upsilon_{t-i}} + \beta_1 ln(\sigma_t^2{}_{-i})$$

The following parameter table of spot logarithmic volatility regression is obtained:

Table 5. Parameter table of spot logarithmic volatility regression

	coefficient	Limition	2017.2.17-2017.9.15	2017.9.18-2018.11.30	2018.12.3-2019.4.19	2019.4.22-2023.3.20	present
CSI300 spot	$\alpha 0$	-13.535*** **(0.334)**	-3.706* **(2.066)**	-0.504*** **(0.124)**	-15.104*** **(1.517)**	-0.835*** **(0.140)**	-1.838* **(1.019)**
	$\alpha 1$	1.079*** **(0.059)**	-0.342** **(0.151)**	0.126** **(0.053)**	0.325 **(0.245)**	0.231*** **(0.022)**	-0.369*** **(0.128)**
	$\gamma 1$	0.551 **(0.018)**	-0.074 **(0.079)**	-0.056** **(0.027)**	0.127 **(0.085)**	-0.081*** **(0.012)**	-0.166 **(0.107)**
	β_1	-0.449*** **(0.039)**	0.612*** **(0.206)**	0.953*** **(0.012)**	-0.743*** **(0.189)**	0.926*** **(0.016)**	0.778*** **(0.114)**
SSE spot	$\alpha 0$	-0.092*** **(0.014)**	-16.619*** **(1.963)**	-0.561*** **(0.177)**	-11.288*** **(5.556)**	-0.959*** **(0.192)**	-1.089*** **(0.003)**
	$\alpha 1$	-0.070*** **(0.018)**	0.035 **(0.167)**	0.188*** **(0.060)**	0.313 **(0.235)**	0.218*** **(0.218)**	-0.501*** **(0.014)**
	$\gamma 1$	0.011 **(0.021)**	-0.342*** **(0.107)**	-0.025 **(0.033)**	-0.012 **(0.104)**	-0.064*** **(-0.064)**	-0.172*** **(0.063)**
	β_1	0.986*** **(1.27E-14)**	-0.649*** **(-0.649)**	0.952*** **(0.019)**	-0.297 **(0.666)**	0.910*** **(0.022)**	0.845*** **(1.61E-14)**
CSI500 spot	$\alpha 0$	-11.966*** **(0.484)**	-2.869*** **(0.699)**	-1.726*** **(0.470)**	-13.484*** **(1.479)**	-8.631 **(19.001)**	-1.424*** **(0.546)**
	$\alpha 1$	0.308*** **(0.071)**	-0.396*** **(0.117)**	0.054 **(0.071)**	1.034*** **(0.317)**	0.010 **(0.046)**	-0.215*** **(0.083)**
	$\gamma 1$	0.323*** **(0.041)**	-0.547*** **(0.136)**	-0.264*** **(0.050)**	0.117 **(0.110)**	0.010 **(0.035)**	-0.239** **(0.096)**
	β_1	-0.452*** **(0.061)**	0.670*** **(0.076)**	0.804*** **(0.051)**	-0.503*** **(0.210)**	0.010 **(2.181)**	0.836** **(0.059)**

Table 6. Parameter table of futures logarithmic volatility regression

	coefficient	Limition	2017.2.17-2017.9.15	2017.9.18-2018.11.30	2018.12.3-2019.4.19	2019.4.22-2023.3.20	present
CSI300 futures	$\alpha 0$	-0.073*** **(0.019)**	-17.678*** **(2.549)**	-12.807*** **(3.312)**	-14.676*** **(1.515)**	-0.809*** **(0.114)**	-4.349*** **(-3.588)**
	$\alpha 1$	0.073*** **(0.016)**	-0.099 **(0.124)**	0.144 **(0.099)**	0.372* **(0.203)**	0.261*** **(0.017)**	-0.702*** **(-4.703)**
	$\gamma 1$	0.007 **(0.024)**	-0.042 **(0.082)**	0.052 **(0.058)**	0.240*** **(0.087)**	-0.099*** **(0.010)**	-0.252** **(-2.082)**
	β_1	0.999*** **(0.002)**	-0.828*** **(0.253)**	-0.502 **(0.391)**	-0.704*** **(0.184)**	0.929*** **(0.013)**	0.489*** **(3.701)**
SSE futures	$\alpha 0$	-0.031** **(0.015)**	-12.472*** **(3.185)**	-10.929*** **(1.935)**	-14.284*** **(1.618)**	-1.077*** **(0.163)**	-1,907*** **(3.45E-14)**
	$\alpha 1$	-0.046** **(0.019)**	-0.031 **(0.184)**	0.335*** **(0.093)**	0.190 **(0.149)**	0.285*** **(0.019)**	-0.808*** **(0.001)**
	$\gamma 1$	0.044 **(0.028)**	-0.315** **(0.123)**	0.048 **(0.056)**	0.252*** **(0.060)**	-0.090*** **(0.011)**	-0.130*** **(0.050)**
	β_1	0.994*** **(1.06E-14)**	-0.288 **(0.325)**	-0.252 **(0.226)**	-0.671*** **(0.192)**	0.900*** **(0.019)**	0.735*** **(9.48E-15)**
CSI500 futures	$\alpha 0$	-11.481*** **(0.892)**	-1.667*** **(0.361)**	-1.585*** **(0.321)**	-12.690*** **(1.751)**	-0.602*** **(0.076)**	-1.625*** **(0.477)**
	$\alpha 1$	-0.260*** **(0.092)**	-0.397*** **(0.081)**	0.027 **(0.068)**	0.615** **(0.251)**	0.246*** **(0.020)**	-0.305*** **(0.082)**
	$\gamma 1$	0.071 **(0.066)**	-0.264*** **(0.086)**	-0.301*** **(0.043)**	0.156 **(0.138)**	-0.091*** **(0.015)**	-0.307*** **(0.083)**
	β_1	-0.489*** **(0.115)**	0.786*** **(0.044)**	0.812*** **(0.038)**	-0.489** **(0.229)**	0.952*** **(0.009)**	0.809*** **(0.051)**

Among them, taking the CSI 500 index as an example, for the EGARCH (1,1) model regressed by the CSI 500 spot after the implementation of the fifth stock index futures loosening policy, the constant term is - 1.625, α_1 is - 0.305, γ_1 indicates the role of bringing good news and bad news to the spot market. γ_1 is not 0, indicating that the role of good news and bad news brought to the spot market is asymmetric. The impact of good news is-0.305-0.307 = -0.612, and the impact of bad news is-0.305 + 0.307 = 0.002, indicating that the impact of good news is greater than the impact of bad news.

Comparing the data, it can be found that the logarithmic volatility of the CSI 300 index has a significant asymmetry effect between the second and third loosening and the fourth loosening so far, and the impact of bad news from the fourth to the fifth loosening is greater than that of good news, and the impact of good news from the fifth loosening so far is greater than that of bad news. The CSI 300 futures market has a significant leverage effect after the promulgation of the third loosening policy. The impact of good news is greater than that of bad news between the third and fourth loosening and the fifth loosening so far, and the opposite is true between the fourth and fifth loosening. The SSE 50 spot logarithmic volatility has a significant leverage effect between the first and second loosening and the fourth loosening so far. After the first implementation of the loosening policy, it is not sure which is the greater impact of good and bad news. The impact of bad news is greater than that of good news between the fourth and fifth loosening, and the

impact of good news is greater than that of bad news since the fifth loosening. The SSE 50 futures have a leverage effect in the first, second and third relaxations. The impact of four or five relaxations of bad news is greater than that of good news, and the impact of good news is greater than that of bad news since the fifth relaxation. The CSI 500 spot has a significant asymmetric effect before the third loosening and after the fifth loosening. Except that the impact of bad news is greater than that of good news when the restriction policy is removed, the rest is that the impact of good news is greater; The asymmetric effect of CSI 500 futures is significant between the first and third loosening policies and after the fourth loosening policy. The impact of good news between the first and second loosening and after the fifth loosening is greater, and the fourth and fifth loosening is the opposite. At the same time, in addition to the CSI 300 and CSI 500 spot, the leverage effect of the remaining spot and futures showed a fluctuating rise. There are differences in whether the three stock index futures have symmetrical effects. According to the data of the trading volume of the stock index futures of the China Financial Futures Exchange, the positions of the three stock index futures have increased slightly in the first two loosenings, and the positions of the three have increased significantly in the third loosening. The positions of the CSI 300 and SSE 50 stock index futures reached 60 % before the limit, and the positions of the CSI 500 stock index futures exceeded the limit. Therefore, the period of leverage effect of the CSI 500 stock index futures with larger relative trading volume is significantly different from that of the CSI 300 and SSE 50. The larger margin ratio and the relatively small risk will also affect the difference in the asymmetric effect between the CSI 500 and the CSI 300 and the SSE 50.

It can be seen from the analysis that the first three loosening policies are not significant for the asymmetric effect of the capital market. After the stock market crash and restrictive measures in 2015, on the one hand, because the transaction cost of stock index futures is still at a high level compared with that before control after several loosening policies, and investors still need time to improve their confidence in the market, the trading volume of stock index futures has not been greatly improved; on the other hand, the interval between the first three loosening policies is relatively short, and the relevant nature of the capital market needs to be observed through a longer time dimension. In addition, factors such as margin ratio, handling fees and opening limits are only part of the market. Other factors such as market liquidity, investor sentiment, and macroeconomic factors will also affect the overall behavior of the market. After the fourth and fifth loosening policies significantly reduced the margin ratio and increased the one-day opening limit, the leverage effects of all stock index futures were all significant.

4.4. Granger Causality Test

In order to test whether the information of CSI 300, SSE 50 and CSI 500 spot market will affect each other and lead to leverage effect in the spot market, the Granger causality test is used to explore the relationship between the information of the three stock index futures markets. The following table is the Granger causality test results:

Based on the above Granger causality test, the information of the past logarithmic return of CSI 300 futures can provide information about the future logarithmic return of CSI 300 spot, that is, the change of the logarithmic return of CSI 300 futures can predict the change of the logarithmic return of spot to a certain extent. Therefore, the CSI 300 futures have an interactive relationship with the information between the spot, the SSE 50 spot and the CSI 500 spot. When the SSE 50 and CSI 500 spot (futures) markets receive good or bad news about the futures (spot) market, the leverage effect in the market begins to appear ; the futures and spot market of CSI 300 only has the one-way influence of futures on spot, that is, when the CSI 300 spot market has bad (good) news, it will not have a corresponding impact on the futures market.

Table 7. The Granger causality test results

null hypothesis	F-value	P-value	Conclusion
The logarithmic return of CSI300 futures is not the Granger cause of the logarithmic return of CSI 300 spot.	1.608	0.008	Reject
CSI 300 spot logarithmic return is not the Granger cause of theCSI 300 futures logarithmic return.	1.243	0.136	Accept
The logarithmic return of SSE 50 futures is not the Granger cause of the logarithmic return of SSE 50 spot.	3.307	0.019	Reject
SSE 50 spot logarithmic return is not the Granger cause of the SSE 50 futures logarithmic return.	3.318	0.019	Reject
The logarithmic return of CSI 500 futures is not the Granger cause of the logarithmic return of CSI 500 spot.	2.852	0.014	Reject
CSI 500 spot logarithmic return is not the Granger cause of the CSI 500 futures logarithmic return	6.767	2.914E-06	Reject

5. Conclusion and Implications

Based on the trading data of China 's capital market from 2016 to 2023, this paper constructs the EGARCH (1, 1) model to empirically analyze the leverage effect of the logarithmic volatility of the stock index futures market after the adjustment of trading policies in recent years. The results show that: (1) the loosening policy will gradually make the leverage effect of stock index futures appear, and the market is more and more sensitive to information; (2) After five times of loosening policy, the information from the CSI 300 spot market has no significant impact on the CSI 300 futures market. (3) The gradual emergence of market asymmetric effect will further stimulate the volatility of market prices, provide opportunities for arbitrage, and attract more traders to participate in the market.

The enlightenment of this paper is as follows: (1) further liberalize the control of stock index futures trading, create an effective market to make the stock index futures market give full play to its information transmission function, and promote its regulation and control of China 's macro economy; (2) The implementation of different varieties of stock index futures discrimination, classification control rather than one size fits all trading policy, to ensure that the various stock index futures to achieve information transmission, price discovery and other functions while preventing its excessive volatility level; (3) Prudent use of restrictive trading policies and control of stock index futures trading can stabilize the market in a short period of time to appease investor sentiment, but it will also make the market lose vitality, and need to implement a relaxation policy for a long time to make the market return to normal levels.

References

[1] Harris L. S&P 500 Cash Stock Price Volatilities[J], Journal of Finance, 1989, 44(5): 1155-1175.

[2] Antonios Antoniou, Phil Holmes. Futures trading, information and spot price volatility: evidence for the FTSE-100 stock index futures contract using GARCH[J]. Journal of Banking and Finance, 1995, 19(1): 117-129.

[3] Bae S C, Kwon T H, Park J W. Futures trading, spot market volatility and market efficiency: The case of the Korean index futures markets[J]. Journal of Futures Markets, 2004, 24(12):1195-1228.

[4] Bessembinder H, Seguin P J. Future-Trading Activity and Stock Price Volatility[J]. Journal of Finance, 1992, 47: 2015-2034.

[5] Zhang Xiaoyan, Shen Zhonghua. Research on the Impact of the launch of Stock Index Futures on the volatility of China's stock market: An Empirical Analysis based on high-frequency data of CSI 300 Stock Index futures [J]. Investment Research, 2011, 30(10): 112-122.

[6] Li Yaqing. Study on the Influence of China Securities 500 Stock Index Futures on Spot Market Volatility [D]. Northwest A&F University, 2018.

[7] LIANG Zhaohui, Li Luyao, Nie Rong, Li Anwen. Research on the Influence of Stock Index Futures on Stock Market volatility [J]. Price Theory and Practice, 2019(05): 84-87.

[8] Chen Chunliu. Research on the Impact of restricted Stock Index Futures on the volatility of Stock Spot Market [D]. Guangdong University of Foreign Studies, 2018.

[9] Yang Huawei, Wu Chaoqi, Liu Wei. Study on the impact of Stock Index Futures trading Rules Change on Stock market quality [J]. Zhejiang Finance, 2018(09): 43-51.

[10] Fang Xianming, Feng Xiangyu. Whether the adjustment of stock index futures trading policy can affect the volatility of Spot market [J]. China Economic Problems, 2021(04): 188-200. (in Chinese)