ATLANTIS PRESS
Advances in Economics, Business and Management Research, volume 70
International Conference on Economy, Management and Entrepreneurship（ICOEME 2018）

An Empirical Analysis on the Impact of RMB Exchange Rate Fluctuation on Stock Index Futures

Taking Shanghai and Shenzhen 300 Stock Indexes as an Example

Jiehui Li
College of Finance
Fujian Jiangxia University
Fuzhou, China 350108

Jinlan He
Shenzhen Houhe Travel Technology Co., Ltd.
Shenzhen, China 518000

***Abstract*—Using the measurement method to study the fluctuation of RMB exchange rate will have a series of profound effects on stock index futures. This paper will take the Shanghai and Shenzhen 300 stock index futures as the example. In this paper, the author will establish a three-variable VAR model: US dollar, Euro, and Japanese yen exchange rate against RMB to analyze the impact of RMB exchange rate fluctuations on stock index futures. The empirical test shows that after the "811" exchange rate reform, there is no long-term stable cointegration relationship between RMB exchange rate changes and stock index futures. According to the results of impulse response function analysis, there is linkage between China's exchange rate fluctuations and Shanghai and Shenzhen 300 stock index futures price. From the current point of view, the impact is still very limited.**

Keywords—VAR model; stock index futures; cointegration relationship

I. INTRODUCTION

In 2015, the stock market fluctuated sharply. This was a nightmare for the A-share market. When the market was shocked, the "811 Exchange Reform" came unexpectedly, which directly led to a sharp drop in the RMB exchange rate by nearly 2% in a short period of time. In the three days of the "811 Exchange Reform", the depreciation of the RMB exceeded 3%, and the value of RMB depreciated by 1136 basis points. This measure has greatly exceeded market expectations. In this process, the RMB exchange rate depreciation process has great impact on the expectation of RMB depreciation, which makes the foreign exchange reserves shrink sharply, and the price of the futures market has changed drastically. The parties in this society pay more attention to the research in the field of financial futures, such as stock index futures trading strategy, hedging scheme design, product development model, and risk control management experience. However, from the relevant literatures that have been searched, scholars have studied more about the mutual influence between the foreign exchange market and the stock market. The research and accumulation of the foreign exchange market and the futures market is not deep enough. It is worth exploring. There are still many problems to be studied. The domestic futures market and the foreign exchange market are in the same economic context. Is there a dynamic link between the two? Will the interaction between stock index futures and RMB exchange rate fluctuations affect each other? For the Chinese market that is developing so rapidly today, this issue is worthy of further discussion. To this end, this paper takes Shanghai and Shenzhen 300 stock index futures as an example, and empirically analyzes whether the fluctuation of the RMB exchange rate is related to the change of the Shanghai and Shenzhen 300 stock index futures through the VAR model. First, it explores the potential constraints, analyzes the results from the empirical test and proposes relevant countermeasures.

II. LITERATURE REVIEW

Domestic research on the correlation of exchange rate changes on stock index futures started relatively late. Since the beginning of this issue, the research perspective of domestic scholars has been deepening and changing. At the beginning, some scholars studied the basic theory that the impact of exchange rate changes on stock prices. Most researchers in China have studied this problem. A small number of researchers have come to the conclusion that the RMB exchange rate has positive impact on stock prices. Most researchers have different conclusions.

The article of Ba Shusong (2009) and Yan Min (2009) uses the information transmission model (VAR-MEGARCH) to make the analysis. In the long run, the appreciation of RMB caused the stock price to rise to a certain extent. Negative correlations reflect the true relationship between the two in this period of time. In recent years, there also have articles on the correlation between China's exchange rate changes and various indices. Dong Liegang (2015) studied the relationship between the Chinese commodity index and the exchange rate based on mature foreign markets. In this paper, it first analyzes the price transmission mechanism of exchange rate fluctuations from a price perspective, and analyzes the impact of commodity futures prices on exchange rates from the perspectives of capital account, inflation and current account. Yang Liu (2017) uses VAR model to analyze the impact of RMB exchange rate changes on China's second-tier market index, and divides the data into two parts based on time for empirical analysis. It is concluded that the long-term impact of RMB exchange rate fluctuations on the GEM index is significant. Foreign scholars have studied the impact of exchange rate on stock index futures. Almost everyone uses relevant data from developed countries. China's exchange rate system has been linked to single dollar until July 21, 2005. The stock market and the foreign exchange market are isolated. China's stock index futures are listed late. The research scholars in China have begun to study the relationship between exchange rate and stock index futures.

In summary, whether in foreign countries or at home, the theoretical research on the impact of exchange rate on stock index futures is gradually deepening. The related systems and complete theories have not been formed. In general, there is certain correlation between RMB exchange rate and stock index futures. With the accelerated process of China's financial market reform and the gradual opening of capital accounts and financial accounts, the correlation between RMB exchange rate and stock index futures volatility is getting closer. At the same time, the fluctuations in the RMB exchange rate and the stock price index, and the further deepening of the marketization process of the foreign exchange market and the stock index market will have impact on the stable development of China's financial market and the real economy.

III. EMPIRICAL ANALYSIS OF VAR MODEL TEST

A. Sample Selection and Raw Data

The sample interval selected in this paper is the monthly data from August 2012 to December 2017, with a total of 65 data.

In order to make the data more representative, this paper selects the closing price of the Shanghai and Shenzhen 300 stock index futures to represent the price of stock index futures. Shanghai and Shenzhen 300 stock price index is the earliest and stable, with a mature and rich indicator system. Shanghai and Shenzhen 300 stock price index has 60% of market depth. After the exchange rate reform in 2005, China's exchange rate composition is no longer pegged to the US dollar. Instead, it implements management-controlled, floating, dollar-based "a basket of currencies" exchange rate mechanism. According to China's foreign economic exchanges and the economic strength represented by various currencies, we choose the exchange rate of the US dollar, Euro, and the Japanese yen against RMB to represent the basic situation of China's RMB exchange rate. The author uses the direct quotation method to show the exchange rate of 1 US dollar against RMB and 1 Euro against RMB, and the exchange rate of 100 units of Japanese yen against PMB. The data comes from Sina Finance. The relevant information of the four variables is shown in "Table I". "Fig. 1", "Fig. 2", "Fig. 3" and "Fig. 4" depict the trend of the Shanghai and Shenzhen 300 stock index futures, the exchange rate of RMB against the US dollar, and the exchange rate of RMB against Japanese yen from July 2012 to December 2017.

TABLE I. BASIC SITUATION OF THE FOUR VARIABLES

Representation symbol	Variable name	Definition method	Logarithm	Difference
IF	Shanghai and Shenzhen 300 stock index futures	The closing quotation of Shanghai and Shenzhen 300 stock index futures	LNIF	DLNIF
USDCNY	The US dollar/RMB exchange rate	direct quotation 1 US dollar in exchange for the amount of RMB	LNUSDCNY	DLNUSDCNY
EURCNY	The euro/RMB exchange rate	direct quotation 1 Euro in exchange for the amount of RMB	LNEURCNY	DLNEURCNY
JPYCNY	The Japanese yen/RMB exchange rate	direct quotation 100 Japanese yen in exchange for the amount of RMB	LNJPYCNY	DLNJPYCNY

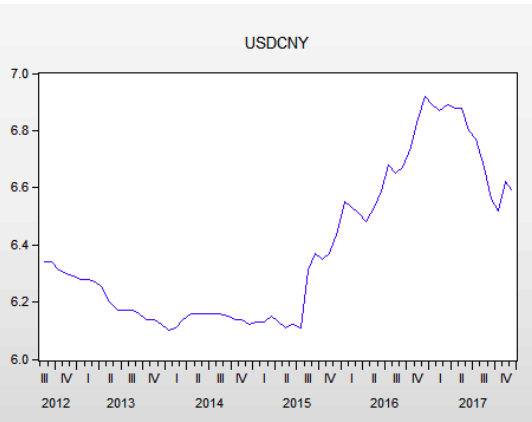

Fig. 1. Curve of the Shanghai and Shenzhen 300 stock index futures.

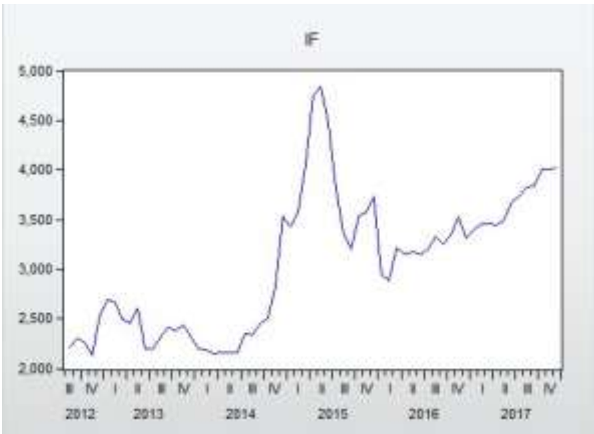

Fig. 2. Graph of USD/RMB exchange rate.

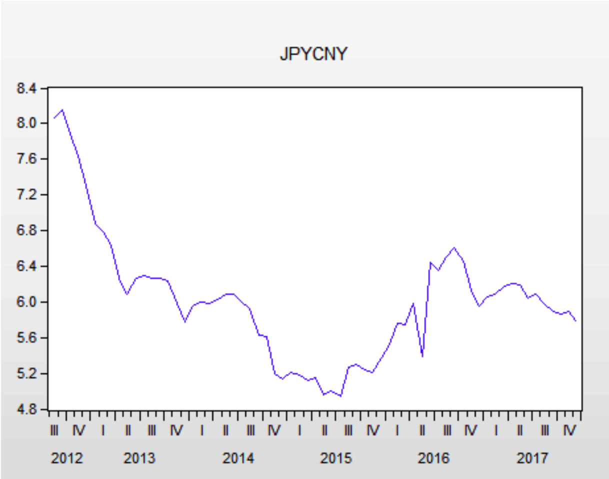

Fig. 3. Curve of the exchange rate of Euro/RMB.

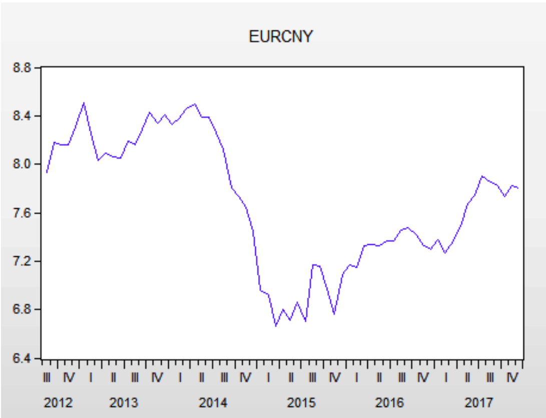

Fig. 4. Curve of the exchange rate of Japanese yen.

In “Fig. 1”, “Fig. 2”, “Fig. 3”, we clearly see that from July 2012 to May 2015, Shanghai and Shenzhen 300 stock indexes first peaked, and then fell, and tend to grow slowly in 2016. The exchange rate of the US dollar against RMB has been slow downward trend since 2012, and has been continuously adjusted in the upward trend since July 2015. The exchange rate of Euro against RMB first fell to a low point and did not begin to rise until July 2015. The Japanese yen against the RMB has been constantly adjusting from the overall downward trend since 2012.

B. Sequence Test

1) The sequence's stationarity test (unit root test): The premise of analyzing the time sequence is to ensure the stability of the sequence, and the non-stationary time sequence participates in the regression modeling analysis, which leads to the pseudo-regression problem. Therefore, before performing the analysis, it is necessary to perform a unit root test on the original variable sequence to judge the sequence's stationarity. If the sequence is stable, the modeling can continue. If the sequence is a non-stationary sequence, differential processing is required. For smooth modeling, the ADF unit root check of the original sequence is required. The original hypothesis is that there is one unit root in the sequence, and the alternative hypothesis is that there is no unit root. The results are shown in “Table II” below:

TABLE II. ADF UNIT ROOT TEST RESULTS FOR ALL SEQUENCES

Sequence	ADF value	Threshold at 1% level	Threshold at 5% level	Threshold at 10% level	P ratios
IF	-1.727399	-3.538362	-2.908420	-2.591799	0.4128
USDCNY	-1.168528	-3.536587	-2.907660	-2.591396	0.6830
EURCNY	-1.168528	-3.536587	-2.907660	-2.591396	0.6830
JPYCNY	-3.112481	-3.536587	-2.907660	-2.591396	0.0306

As can be seen from "Table II", after performing the unit root test on the original sequence, only the P value of the JPYCNY variable is less than 5%, and the P value of the dependent variable IF and the other two independent variables USDCNY and EURCNY are 0.6830, greater than 5.%. The original hypothesis that the sequence has a unit root cannot be rejected, and the sequence is considered to be non-stationary. Therefore, the first-order difference test is performed on the original sequence, and the unit root test is performed. The results are shown in "Table III" below:

TABLE III. ADF UNIT ROOT TEST RESULTS AFTER FIRST-ORDER DIFFERENCE

First-order difference sequence	ADF value	Threshold at 1% level	Threshold at 5% level	Threshold at 10% level	P ratios
DIF	-6.041509	-3.538362	-2.908420	-2.591799	0.0000
DUSDCNY	-5.452358	-3.538362	-2.908420	-2.591799	0.0000
DEURCNY	-7.528294	-3.538362	-2.908420	-2.591799	0.0000
DJPYCNY	-8.714180	-3.538362	-2.908420	-2.591799	0.0000

[a] Note: D represents the first-order difference of the sequence.

It can be seen from "Table III" that P values are equal to zero under the threshold of the first-order difference that is less than 1% of the confidence level. The unit roots have been eliminated. It is in line with the conditions of smooth modeling.

2) Cointegration test: After the first-order difference, the data is verified to have no unit root, which eliminates the influence of heteroscedasticity. And the sequence is stable and satisfies the modeling conditions. In this paper, Johansen cointegration test is used to test the VAR (1) model Johansen cointegration test of the Shanghai and Shenzhen 300 stock index futures prices, the US dollar against RMB, the euro against RMB, and Japanese yen against RMB. The test results are shown in "Table IV":

TABLE IV. TRACE STATISTICS TEST RESULTS

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized No.of CE(s)	***Eigenvalue***	***Trace Statistic***	***Critical Value 0.05***	***Prob.****
None *	0.308686	43.59403	47.85613	0.1188
At most 1 *	0.189337	19.96775	29.79707	0.4250
At most 2	0.067613	6.533944	15.49471	0.6324
At most 3	0.031576	2.053482	3.841466	0.1519

a. Trace test indicates no cointegration at the 0.05 level

As can be seen from "Table IV", the trace statistic corresponding to each hypothesis is smaller than the corresponding critical value. Each corresponding P value is greater than the confidence level by 5%. The original hypothesis cannot be rejected, and there is no association in the sequence. The whole relationship satisfies the VAR modeling conditions.

C. Establishment, Estimation and Verification of VAR Model

1) Establishment of VAR model: The general form of the VAR model is as follows:

$$Y_t = A_1 Y_{t-1} + A_2 Y_{t-2} + A_3 Y_{t-3} + \cdots + A_p Y_{t-p} + BX_t + \varepsilon_t \text{ ,} \quad t = 1,2,3..n \qquad (1)$$

General Training Module: Y_t represents endogenous variable of the K in the same period. X_t represents external variable of d . A_1 and B represents the corresponding coefficient matrix to be estimated. P stands for the lag period of endogenous variables. n represents the number of data samples. ε_t is the motivations of K . The k-dimensional VAR (P) model is expressed as a vector as follows:

$$\begin{pmatrix} Y_{1t} \\ Y_{2t} \\ Y_{3t} \\ \vdots \\ Y_{kt} \end{pmatrix} = A_1 \begin{pmatrix} Y_{1t-1} \\ Y_{2t-1} \\ Y_{3t-1} \\ \vdots \\ Y_{kt-1} \end{pmatrix} + \ldots + A_p \begin{pmatrix} Y_{1t-p} \\ Y_{2t-p} \\ Y_{3t-p} \\ \vdots \\ Y_{kt-p} \end{pmatrix} + B \begin{pmatrix} X_{1t} \\ X_{2t} \\ X_{3t} \\ \vdots \\ X_{dt} \end{pmatrix} + \begin{pmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \\ \vdots \\ \varepsilon_{kt} \end{pmatrix} \quad t = 1,2,3...n \qquad (2)$$

2) Choice of the number of lag periods: There are three methods in the market that are often used to calculate the number of lag periods, such as the likelihood ratio (LR) test, the Akaike Information Criterion (AIC), and the Schwarz Information Criterion (SC). This paper selects two methods to determine the number of lag periods of the model, including AIC and SC minimization criteria. As shown in "Table V" below:

TABLE V. SELECTION OF LAG PERIOD OF VAR MODEL

Lag period	**LogL**	**LR**	**FPE**	**AIC**	**SC**	**HQ**
0	-504.7224	NA	272.0312	16.95741	17.09704	17.01203
1	-257.0218	454.1177*	0.120525*	9.234061*	9.932176*	9.507132*
2	-242.6044	24.50965	0.12802	9.286813	10.54342	9.778341
3	-232.7073	15.50545	0.159877	9.490243	11.30534	10.20023
4	-224.7391	11.42105	0.216583	9.75797	12.13156	10.68641

a. * indicates the lag order selected by the standard

b. LogL: log likelihood function value

c. AIC: Akaike Information Guidelines

d. SC: Schwarz Information Guidelines

After testing, the minimum AIC and SC values of the lag period are 9.234061 and 9.932176, respectively. Therefore, the lag period is selected as the lag phase of the VAR model. Therefore, this paper chooses the VAR model with a lag phase to verify the impact of the exchange rate factor on Shanghai and Shenzhen 300 stock index futures price index.

3) Estimation of VAR model: We use the statistical software Eviews7.0 to estimate the VAR model by the lag phase. The output results are shown in "Table VI" below:

TABLE VI. VAR MODEL ESTIMATION RESULTS

	IF	USDCNY	EURCNY	JPYCNY
IF(-1)	0.843740	-2.02E-05	-3.98E-05	-0.000105
	(0.07947)	(1.5E-05)	(4.9E-05)	(6.7E-05)
	[10.6174]	[-1.33758]	[-0.80927]	[-1.56088]
USDCNY(-1)	122.5464	0.974548	0.045667	0.208892
	(144.022)	(0.02739)	(0.08923)	(0.12178)
	[0.85089]	[35.5832]	[0.51180]	[1.71536]
EURCNY(-1)	-116.3967	-0.056700	0.872260	-0.070717
	(99.1122)	(0.01885)	(0.06140)	(0.08380)
	[-1.17439]	[-3.00832]	[14.2054]	[-0.84384]
JPYCNY(-1)	-18.40885	0.003364	0.066218	0.847091
	(62.5876)	(0.01190)	(0.03878)	(0.05292)
	[-0.29413]	[0.28260]	[1.70775]	[16.0068]
C	727.3922	0.643301	0.410506	0.415254
	(1167.92)	(0.22210)	(0.72357)	(0.98753)
	[0.62281]	[2.89649]	[0.56734]	[0.42050]
R-squared	0.888563	0.971763	0.928208	0.908754
Adj. R-squared	0.881008	0.969849	0.923341	0.902567
Sum sq. resids	3487831.	0.126129	1.338707	2.493610
S.E. equation	243.1374	0.046236	0.150632	0.205584
F-statistic	117.6119	507.6150	190.7041	146.9000
Log likelihood	-439.8011	108.5266	32.93766	13.03278
Akaike AIC	13.90003	-3.235208	-0.873052	-0.251024
Schwarz SC	14.06870	-3.066545	-0.704389	-0.082362
Mean dependent	3071.011	6.385156	7.683125	5.989531
S.D. dependent	704.8438	0.266273	0.544044	0.658622

a. Note: ( ) is the standard deviation of the coefficient, and [ ] is the t-statistic of the coefficient.

In order to clearly analyze the results of the VAR model estimation output, we present the estimation results as vectors in the following form:

$$\begin{pmatrix} IF \\ USDCNY \\ EURCNY \\ JPYCNY \end{pmatrix} = \begin{pmatrix} 0.84374 & 122.5464 & -116.3967 & -18.40885 \\ -2.02E-05 & 0.974548 & -0.056700 & 0.003364 \\ -398E-05 & 0.045667 & 0.872260 & 0.066218 \\ -0.000105 & 0.208892 & -0.070717 & 0.847091 \end{pmatrix} * \begin{pmatrix} IF_{t-1} \\ USDCNY_{t-1} \\ EURCNY_{t-1} \\ JPYCNY_{t-1} \end{pmatrix} + \begin{pmatrix} 727.3922 \\ 0.643301 \\ 0.410506 \\ 0.415254 \end{pmatrix}$$

$$R^2 = \begin{pmatrix} 0.888563 \\ 0.971763 \\ 0.928208 \\ 0.908754 \end{pmatrix} \quad \bar{R}^2 = \begin{pmatrix} 0.881008 \\ 0.969849 \\ 0.923341 \\ 0.902567 \end{pmatrix} \qquad (3)$$

The estimation results of the model in "Table 6" show the overall goodness of the model. In terms of R^2, the USDCNY equation has the best goodness of fit, reaching 97.1763%. Followed by the EURCNY equation, the goodness of fit is 92.8208%. The goodness of fit of the IF equation is the lowest, and the goodness of fit is 88.8563%.

The mathematical equation expression for the VAR model is as follows:

$$IF_t = 0.84374 * IF_{t-1} + 122.5464 USDCNY_{t-1} - 116.3967 * EURCNY_{t-1} - 18.40885 * JPYCNY_{t-1} + 727.3922 \qquad (4)$$

4) Stability test of VAR model: The eigenvalues of the VAR model in this paper are shown in “Fig. 5” below:

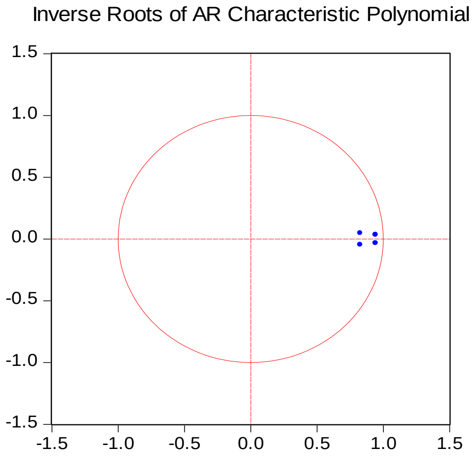

Fig. 5. The modulus distribution of the reciprocal of the AR eigenvalue.

As can be seen in "Fig. 5", the reciprocal modes of the VAR model eigenvalues are all distributed in the unit circle, indicating that the established VAR model is stable. And the model can further perform Granger causality test and impulse response function analysis.

5) Granger causality test: The test results are shown in "Table VII", "TableVIII" and "Table IX".

TABLE VII. GRANGER CAUSALITY TEST RESULTS OF RMB EXCHANGE RATE AGAINST THE US DOLLAR AND SHANGHAI AND SHENZHEN 300 STOCK INDEX FUTURES

Degree of freedom	Lag length	Granger causality	F value	P ratios	Conclusion
62	1	DUSDCNY → DIF	0.51998	0.4737	accept
61	2	DUSDCNY → DIF	0.48953	0.6155	accept
60	3	DUSDCNY → DIF	0.32282	0.8088	accept
59	4	DUSDCNY → DIF	0.22264	0.9245	accept
58	5	DUSDCNY → DIF	0.21035	0.9565	accept
57	6	DUSDCNY → DIF	1.14179	0.3546	accept
56	7	DUSDCNY → DIF	1.29772	0.2758	accept
55	8	DUSDCNY → DIF	1.02328	0.4357	accept
54	9	DUSDCNY → DIF	0.9871	0.4678	accept
53	10	DUSDCNY → DIF	1.08437	0.4024	accept
52	11	DUSDCNY → DIF	0.96074	0.5012	accept
51	12	DUSDCNY → DIF	0.90015	0.5587	accept
50	13	DUSDCNY → DIF	1.12653	0.3873	accept
49	14	DUSDCNY → DIF	0.80083	0.6597	accept
48	15	DUSDCNY → DIF	0.74116	0.7174	accept

TABLE VIII. GRANGER CAUSALITY TEST RESULTS OF RMB EXCHANGE RATE AGAINST EURO AND SHANGHAI AND SHENZHEN 300 STOCK INDEX FUTURES

Degree of freedom	Lag length	Granger causality	F value	P ratios	Conclusion
62	1	DEURCNY → DIF	1.85157	0.1788	accept
61	2	DEURCNY → DIF	4.00877	0.0236	reject

TABLE IX. GRANGER CAUSALITY TEST RESULTS OF RMB EXCHANGE RATE AGAINST JAPANESE YEN AND SHANGHAI AND SHENZHEN 300 STOCK INDEX FUTURES

Degree of freedom	Lag length	Granger causality	F value	P ratios	Conclusion
62	1	DJPYCNY → DIF	0.04215	0.838	accept
61	2	DJPYCNY → DIF	0.24668	0.7822	accept
60	3	DJPYCNY → DIF	0.44428	0.7223	accept
59	4	DJPYCNY → DIF	0.32089	0.8627	accept
58	5	DJPYCNY → DIF	0.44051	0.8179	accept
57	6	DJPYCNY → DIF	0.364	0.8977	accept
56	7	DJPYCNY → DIF	0.19815	0.9841	accept
55	8	DJPYCNY → DIF	0.31138	0.957	accept
54	9	DJPYCNY → DIF	0.47636	0.8805	accept
53	10	DJPYCNY → DIF	0.28094	0.981	accept
52	11	DJPYCNY → DIF	0.36505	0.9596	accept
51	12	DJPYCNY → DIF	0.5658	0.8492	accept
50	13	DJPYCNY → DIF	0.51346	0.8932	accept
49	14	DJPYCNY → DIF	0.55373	0.8697	accept
48	15	DJPYCNY → DIF	0.73272	0.7249	accept

With the results of the Granger test in "Table IX", when the lag length is 2, the exchange rate of the euro against RMB is the Granger cause of the change in the Shanghai and Shenzhen 300 stock index futures. Therefore, we conclude that the change in the exchange rate of the euro against the RMB has a significant impact on Shanghai and Shenzhen 300 stock index futures after two periods.

6) Impulse response function: In order to better show the dynamic relationship between the exchange rate factor and Shanghai and Shenzhen 300 stock index futures price index, and clearly observe the impact of exchange rate factors on Shanghai and Shenzhen 300 stock index futures price index, we draw the impulse response function graph of each variable.

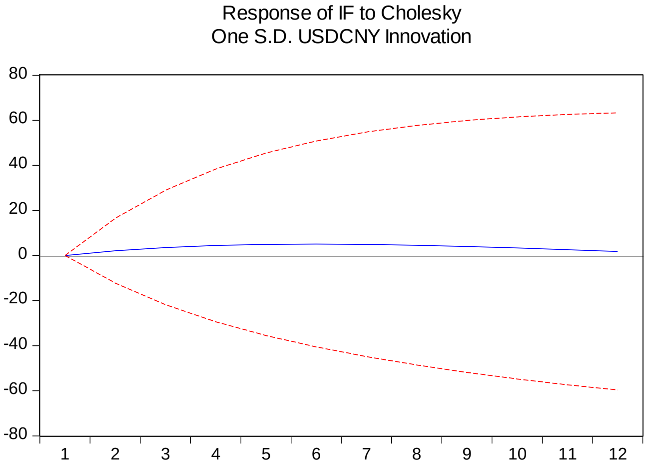

Fig. 6. Response function of Shanghai and Shenzhen 300 stock index futures price index caused by the impact of US dollar/RMB exchange rate.

As shown in "Fig. 6", the horizontal axis represents the number of months of exchange rate impact on the stock index futures price index, and the vertical axis represents the degree of response of Shanghai and Shenzhen 300 stock index futures price index. In the figure, there is a response curve of the stock index futures price index on the impact of each variable, and the dotted line is twice the standard error of the impulse response trend. It can be seen from "Fig. 6" that after the impact of the US dollar against 1 unit of the RMB, the impact on Shanghai and Shenzhen 300 stock index futures price index is positive. And the range is gradually weakened after the eighth period. In general, the impact of the US dollar against the RMB exchange rate on Shanghai and Shenzhen 300 stock index futures price index is positive.

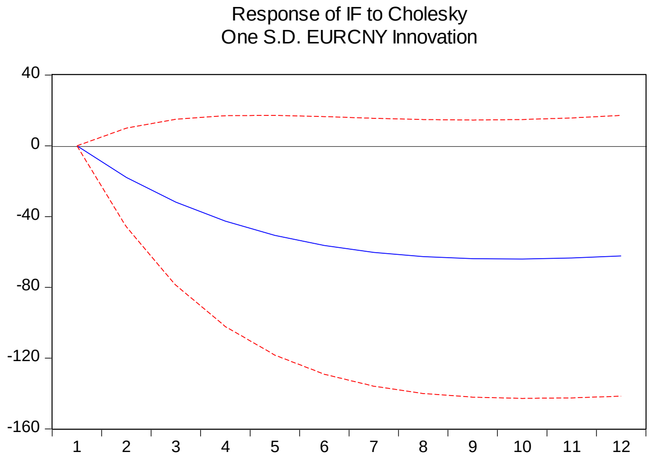

Fig. 7. Response function of Shanghai and Shenzhen 300 stock index futures price index caused by the impact of the euro against the RMB exchange rate.

As shown in "Fig. 7", with the impact on Euro-RMB exchange rate, the impact on Shanghai and Shenzhen 300 stock index futures price index is negative. As the number of periods increases, the negative impact gradually increases. Until the beginning of the seventh period, negative impact has been weakened. In general, the impact of the Euro-RMB exchange rate on Shanghai and Shenzhen 300 stock index futures price index is negative.

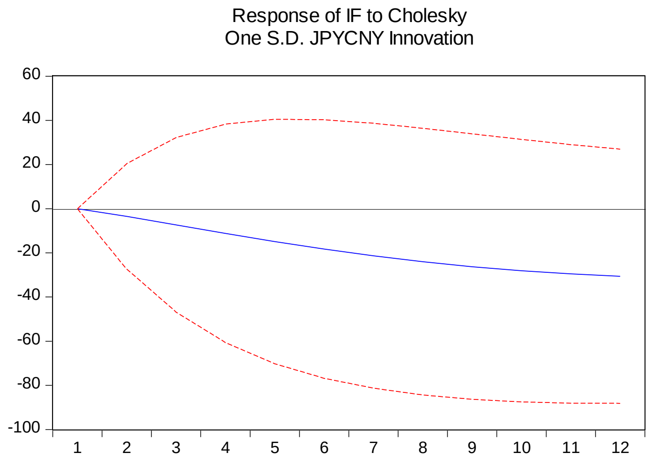

Fig. 8. Response function of the Shanghai and Shenzhen 300 stock index futures price index caused by the impact of Japanese yen-RMB exchange rate.

As shown in "Fig. 8", with the impact of Japanese yen-RMB exchange rate, the impact on Shanghai and Shenzhen 300 stock index futures price index is negative. As the number of periods increases, the negative impact gradually increases. In general, the impact of Japanese yen-RMB on the stock index is negative.

IV. Conclusion

A. *Research Conclusion*

Based on the empirical results, this paper has the following conclusions:

Through the cointegration test, after China's "811 exchange rate reform", there is no long-term stable cointegration relationship between China's RMB exchange rate changes and stock index futures. According to the Granger causality test, the exchange rate of the US dollar, the euro, Japanese yen against the RMB is not the Granger reason for the price changes of the Shanghai and Shenzhen 300 stock index futures. However, the Granger results do not indicate that the dollar, the euro and the Japanese yen against the RMB do not cause stock index futures price changes to be effective in the economic sense. According to the results of the impulse response function analysis, we conclude that: (1) China's exchange rate fluctuations triggered the link between the Shanghai and Shenzhen 300 stock index futures prices. However, from the current point of view, its impact is still limited. (2) The impact of changes in the US dollar against the RMB exchange rate on the Shanghai and Shenzhen 300 stock index futures prices has a positive effect and a relatively short-lasting effect. The exchange rate movement between the euro and the RMB has negative impact on the Shanghai and Shenzhen 300 stock index futures prices. And the early response is strong. The Japanese yen-RMB exchange rate movement also has negative impact on the Shanghai and Shenzhen 300 stock index futures prices, and the more obvious the impact will be in the later period.

B. Countermeasures

The stability of a country's exchange rate is the mainstay of its national financial security and stability, and the pricing rules of foreign exchange are also the part of its financial innovation. With the development of financial derivative technology and the deepening of financial deepening, the links between various financial sub-markets are getting closer and closer. Therefore, we must pay more attention to the management of exchange rate market and stock index futures market. There are three suggestions:

It is to promote the exchange rate marketization of the RMB, to increase the flexibility of the exchange rate, and to give greater freedom to interest rates and markets. The "811" exchange rate reform is a "milestone" feat in the process of RMB exchange rate reform. It has ended the era of unilateral appreciation and opened an era of exchange rate market fluctuations. The US dollar against the RMB exchange rate plays an important role in signalling and is the most important bilateral exchange rate. From the empirical analysis of the impulse response function in this paper, it can be seen that the change of the US dollar against the RMB exchange rate will cause the stock index futures to "same direction" in a short period of time. The changes in the exchange rate of the euro and the Japanese yen against the RMB are "reverse" to the stock index futures, and have a long lasting effect. Second, it is to reform the expected governance mechanism of the RMB exchange rate. After the "8.11" exchange rate reform, the RMB exchange rate entered a one-and-a-half-year depreciation stage. Enterprises and residents competed to buy foreign exchange, and the bearish sentiment continued for a long time, resulting in an increase in exchange rate management costs. With the rapid development of the global economy, it is more necessary to adhere to expected management and prevent devaluation.

Third, the relationship between the stock index futures market and the stock market is inseparable. Chinese scholars have conducted a correlation analysis between the Shanghai and Shenzhen 300 stock price indices and the Shanghai Securities Composite Index. They have found that the two are highly correlated, and the correlation is close to 100%. Therefore, the impact of the exchange rate on the Shanghai and Shenzhen 300 stock index futures also reflects the impact of the exchange rate on the stock market blue chips. Therefore, it is necessary to constantly strive to improve the securities market mechanism and strengthen the standardization and construction among the various financial sub-markets.

REFERENCES

[1] Ba Shusong, Yan Min. The dynamic relationship between stock prices and exchange rates—based on empirical analysis of the Chinese market. Tianjin, Nankai Economic Research, No. 3, 2009, pp. 46-62.

[2] Wu Yi. Research on systemic risk of cross-market trading of Chinese stocks and stock index futures [D]. Tianjin University of Finance and Economics, 2016.

[3] Dong Liegang. Research on the linkage relationship between commodity futures price and exchange rate in China [D]. Diplomatic Academy, 2015.

[4] Yang Liu. An Empirical Analysis of the Impact of RMB Exchange Rate on China's Growth Enterprise Market Index[J]. Digital Design, 2017, 6(04): 158-163.

[5] Dong Xiaoliang. Analysis of the Impact of the Shanghai and Shenzhen 300 Index Futures on the Volatility of the Stock Market[J]. Market Forum, 2011, (02): 66-67.

[6] Wang Jiadong. An Empirical Analysis of the Impact of Interest Rate and Capital Flow on Stock Index Futures [D]. Jiangxi University of Finance and Economics, 2016.

[7] Xiong Zhengde,Wen Hui, Ling Yurong. Research on the Linkage between Agricultural Products Futures Market and Foreign Exchange Market Based on Time-frequency Analysis[J]. China Management Science, 2013, 21(S1): 255-263.

[8] Ajayi,R.A. and Mougoue,M.,"On the Dynamic Relation between Stock Price and Exchange Rates", The Journal of Fin-anical Research,No.19,PP193-207.1996

[9] Desislava Dimitrova,"The relationship between stock prices and exchange rates:Studied in multivariabl-e MoDel," Political Econom,No.14,August,2005.

[10] Hwang,J.k.,"The Relationship between Stock Prices and Exchange Rates:Evidence from Canada,"Inter-national Adva-nces in Economic Research,No.5,August,1999.