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The Impact of Exchange Rate Shocks on Prices of China - ASEAN Free Trade Area

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***Abstract*—This paper mainly discusses the correlation between exchange rate and price, which is conducive to the study of economic and trade development between China and ASEAN Free Trade Area. The research method is mainly using VAR model with related data of exchange rate and price, researching and analyzing the connection between price level and RMB exchange rate changes. And on this basis, selected relevant data of China's import and export trade in ASEAN Free Trade Area, selected RMB exchange rate, oil prices and other factors, empirically analyzed the impact of China's current RMB exchange rate on commodity prices. At present, the price level and exchange rate volatility are in a relatively stable period, and the trend of price changes and the exchange rate remain basically the same. In the short term, changes in the exchange rate of the RMB have a significant impact on China-ASEAN bilateral trade. In particular, China's import trade from the ASEAN countries is more sensitive to the appreciation of the RMB than the export trade. In the long run, the impact of exchange rate changes on the China-ASEAN Free Trade Area is relatively weak.**

Keywords: exchange rate shocks, RMB exchange rate, China-ASEAN Free Trade Area, VAR model

I. INTRODUCTION

Since the 1990s, all countries in the world have accelerated economic globalization and regional economic cooperation by continuously developing trade liberalization and regional economic integration. Countries around the world have established different economic and trade preferential policies to seek greater economic development opportunities. Lu (2012) [3] states that with the signing of the "China-ASEAN Comprehensive Economic Cooperation Framework Agreement" in 2002, the development of bilateral trade between China and ASEAN has proceeded in an orderly manner. In July 2005, China began to issue a managed floating exchange rate system based on market supply and demand, with reference to a basket of currencies for adjustment. At the same time, the Philippians, Singapore, Thailand, India, Indonesia, and other ASEAN countries have published a floating exchange rate system, and the exchange rate of countries has increased (Liu, 2015) [5]. Having stronger cooperation among regions can play a decisive role in promoting economic development. Paul, Maurice and Marc (2016) [6] believe that the exchange rate is a very important economic variable for the economic life of a country and ordinary people. Han (2014) [2] states that large fluctuations in the exchange rate will have a huge impact. Devaluation will lead to national inflation, and appreciation will bring deflation in the country. This article will probe the correlation between exchange rate and price, which is conducive to the study of economic and trade development between China and ASEAN Free Trade Area, exploring and analyzing the connection between price level and RMB exchange rate changes.

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II. LITERATURE REVIEW

A. The Effect of Exchange Rate Fluctuation on the Price of China and ASEAN Free Trade Area

Zhao (2005) [10] believes that exchange rate changes, in addition to affecting the relative foreign commodities price, it will also affect the normal price level in the country and thus affect the trade balance. First of all, the devaluation of currency means that the price of domestic commodities has fallen. The price of imported goods expressed in local currency has risen. These two aspects work together could lead to domestic prices increased. Second, if currency depreciation improves trade balances in a short period of time, the export demand of currency devaluation countries will increase, and the total demand will increase. Wang Yaoxi and Wang Xuehong (2008) [7] argue that that in the case of full employment within the country, imports are less than exports, which means that the country's total income exceeds the supply of domestic products and services.

B. The Impact of RMB Exchange Rate Fluctuation on Chinese Price

Chen (2011) [1] analyzed the mechanism of the impact of RMB exchange rate fluctuations on China's price level. When the RMB exchange rate is declining, it will first cause the prices of imported goods and export commodities to rise, which will eventually lead to the increase of domestic general price levels. Liu (2012) [4] uses empirical analysis software to analyze the transmission mechanism and leverage of China's exchange rate to commodity prices under the conditions of the

Southeast Asian financial crisis, and analyzes the exchange rate transmission mechanism and leverage in the process of the Southeast Asian financial crisis' role of its outbreak and spread. Zhang (2017) [9] selected monthly data on the economic changes in nominal terms such as RMB nominal effective exchange rate, import price index, GDP, export price index, and CPI from January 1995 to October 2005 to study the effects of China's exchange rate changes on the prices of imported commodities and the general domestic price level. Zheng (2016) [8] said that in China, the fluctuation of the RMB exchange rate affects the economic variables such as import price and production cost, and ultimately affects the consumer price index, and the industrial product price index is equivalent to the price level.

III. DATA DESCRIPTION

The relevant data of the China-ASEAN Free Trade Area selected in this paper, total import and export volume, export volume, and import volume, all of these data come from the statistics database of China Economic Net and the website of the Ministry of Commerce of the People's Republic of China from 1998 to 2016.

The data related to exchange rate and price in this paper selected from January 2006 to December 2016. In data selection, according to the availability of data, the selection of relevant variables and data sources are as follows：

The price index is replaced by the consumer price index, the retail price index, and the producer price index. The data comes from the website of the National Bureau of Statistics of China.

The RMB exchange rate selects the RMB nominal effective exchange rate index published by the Bank for International Settlements. And all data from BIS.

Money supply chooses M2. Data from China National Bureau of Statistics website.

The RMB deposit interest rate selects the interest rate of people's current deposits. The data comes from the People's Bank of China website.

China's GDP is replaced with monthly industrial increase data. The data comes from the website of the National Bureau of Statistics of China.

International market crude oil prices. The data comes from the U.S. Energy Agency.

The prosperity of the real estate market. The data comes from Hexun website.

IV. EMPIRICAL ANALYSIS OF THE RELATIONSHIP BETWEEN EXCHANGE RATE FLUCTUATION AND PRICE LEVEL

A. Cointegration test

After the unit root test determines that the sequence is in a first-order monotonic state, the original sequence needs to be cointegrated to determine if there is a long-term equilibrium relationship. And using the Johansen test, the test results obtained are shown in Table 1-2, Table 1-3 and Table 1-4.

TABLE 1-2. LNCPI COINTEGRATION TEST RESULTS

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.310873	165.4706	125.6154	0.0000
At most 1 *	0.286870	118.1847	95.75366	0.0006
At most 2 *	0.215247	75.24706	69.81889	0.0173
At most 3	0.162212	44.46398	47.85613	0.1006
At most 4	0.096142	21.98629	29.79707	0.2992
At most 5	0.039449	9.148772	15.49471	0.3518
At most 6 *	0.031289	4.037234	3.841466	0.0445

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.310873	47.28583	46.23142	0.0384
At most 1 *	0.286870	42.93768	40.07757	0.0232
At most 2	0.215247	30.78309	33.87687	0.1120
At most 3	0.162212	22.47769	27.58434	0.1969
At most 4	0.096142	12.83752	21.13162	0.4673
At most 5	0.039449	5.111538	14.26460	0.7277
At most 6 *	0.031289	4.037234	3.841466	0.0445

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

TABLE 1-3. LNCPI COINTEGRATION TEST RESULTS

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.318575	167.0299	125.6154	0.0000
At most 1 *	0.279535	118.3166	95.75366	0.0006
At most 2 *	0.214489	76.67856	69.81889	0.0128
At most 3	0.164709	46.01811	47.85613	0.0737
At most 4	0.099057	23.16121	29.79707	0.2382
At most 5	0.041844	9.913424	15.49471	0.2874
At most 6 *	0.034698	4.484874	3.841466	0.0342

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.318575	48.71326	46.23142	0.0266
At most 1 *	0.279535	41.63804	40.07757	0.0331
At most 2	0.214489	30.66045	33.87687	0.1154
At most 3	0.164709	22.85689	27.58434	0.1797
At most 4	0.099057	13.24779	21.13162	0.4297
At most 5	0.041844	5.428550	14.26460	0.6871
At most 6 *	0.034698	4.484874	3.841466	0.0342

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

TABLE 1-4. LNCPI COINTEGRATION TEST RESULTS

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.356124	198.6763	125.6154	0.0000
At most 1 *	0.311607	142.7647	95.75366	0.0000
At most 2 *	0.255673	95.34342	69.81889	0.0001
At most 3 *	0.176404	57.84356	47.85613	0.0044
At most 4 *	0.139496	33.19598	29.79707	0.0195
At most 5	0.075670	14.11591	15.49471	0.0798
At most 6 *	0.031941	4.122714	3.841466	0.0423

Trace test indicates 5 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.356124	55.91166	46.23142	0.0035
At most 1 *	0.311607	47.42127	40.07757	0.0063
At most 2 *	0.255673	37.49986	33.87687	0.0177
At most 3	0.176404	24.64758	27.58434	0.1137
At most 4	0.139496	19.08008	21.13162	0.0945
At most 5	0.075670	9.993193	14.26460	0.2124
At most 6 *	0.031941	4.122714	3.841466	0.0423

Max-eigenvalue test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

From the Table 1-2, the cointegration test is divided into two test methods, one is the Trace Test, and the other is the Maximum Eigenvalue Test. From the results of the two tests, it can be seen that under the significance level of 5%, there is a co-integration relationship between the results of the two test methods and the VAR model can be constructed. From the Table 1-3, there is a cointegration relationship between the results of the two test methods at the 5% significance level, that is, there is a long equilibrium relationship. And from Table 1-4, at the 5% level of significance, the results of the two test

methods also show a co-integration relationship, that is, there also is a long-term equilibrium relationship.

B. VAR model stationarity test

After lagging the VAR model, a VAR(4) model is constructed for all three models. The following needs to be tested for stationarity to determine whether the model is stable.

Figure 1-1 shows the position curves of the unit curve and the VAR model. It can be seen that all the feature roots in the model are within the unit circle, which does not exceed the characteristic root of the unit circle. This shows that the model is a stationary system that can perform pulse analysis and variance decomposition.

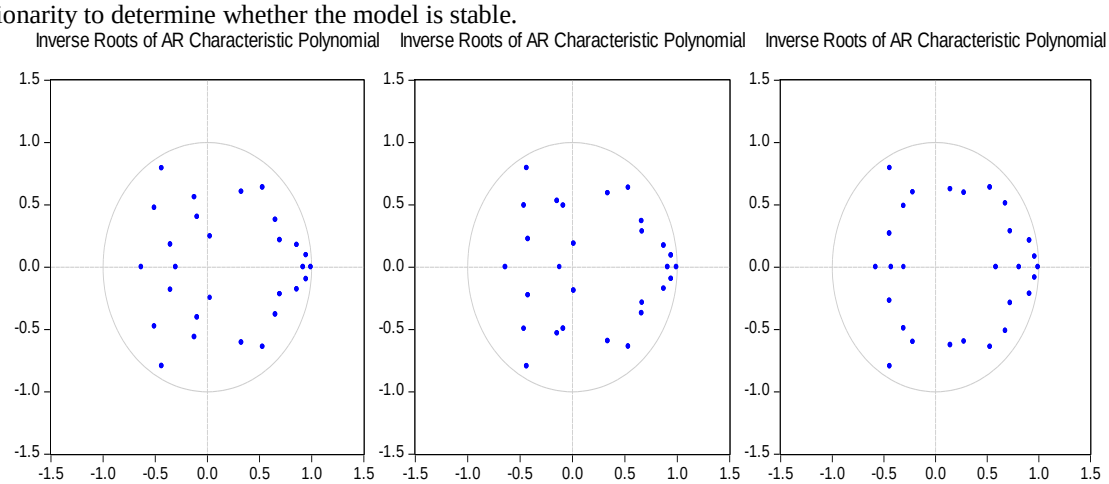

Figure 1-1. Root location diagram of three VAR models

C. Pulse response analysisAuthors and Affiliations

After judging the stationarity of the three VAR models, it is found that the three VAR models constructed are all in a stable state, and thus the impulse response analysis can be further performed. The results obtained are shown in Figure 1-2.

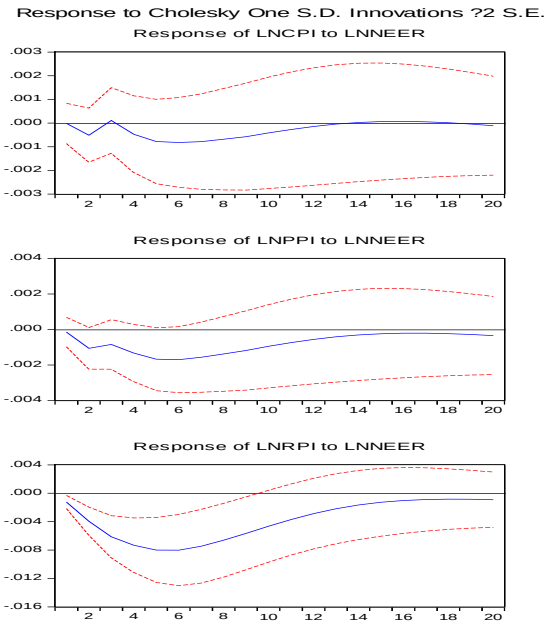

Figure 1-2. Pulse response graph of lncpi, lnppi and lnrpi to lnneer

The first plot in the figure shows the impulse response of lncpi to lnneer, the second plot shows the impulse response of lnppi to lnneer, and the third plot shows the impulse response of lnrpi to lnneer. From the first figure, it can be seen that in the beginning the lncpi impulse response to lnneer is negative, and the negative impulse response gradually decreases with the extension of time, it tends to 0 at the 12th, and then gradually tends to a steady state, it showing that the response is relatively stable. In the second picture, the lnppi impulse response to lnneer is negative, and as the time goes by, the negative response gradually decreases, and tends to be stable around the 14th phase. The third picture shows the impulse response of lnrpi to lnneer. It can be seen from the figure that the impulse response of lnrpi to lnneer is negative, and the negative response is larger than the former two, and the period of 16 tends to be stable, which means that the lag response period is longer.

In general, comparing the three responses, it can be seen that lnneer has the largest impulse response to lnrpi and the lag period is longer, while the lnneer impulse response to lncpi is relatively minimal and the lag period is relatively shorter.

D. Summary

From the above empirical analysis, it has been concluded that the RMB exchange rate will have a greater impact on domestic price levels in the medium and long term, but in the short term it will mainly cause a negative impact on China's price levels, which will be more than six months. At the same time, through statistical analysis, it is believed that the current domestic price level and exchange rate volatility are in a relatively stable period, and the development trend of price changes and exchange rates remain basically the same. From research and analysis of the reality of the impact of the exchange rate of the price level, take the relevant exchange rate adjustment and price adjustment policies to maintain price and exchange rate stability in China, it has a important significance.

V. CONCLUSION AND SUGGESTION

Firstly, through the use of data from 1998 to 2016, the impact of exchange rate fluctuations of the RMB on the China-ASEAN trade zone was studied in terms of total export volume, total import volume. Through analysis, it has been found that fluctuations in the exchange rate of the RMB will have a

greater impact on China-ASEAN trade in the short term and will have a greater impact on trade, but in the long run, the impact of exchange rate fluctuations on foreign trade will tend to be flat, and the appreciation of the RMB will easily cause greater fluctuations in the trade between China and ASEAN countries in the short term, with positive and negative effects alternating.

Secondly, further investigation reveals that the impact of exchange rate changes on China's imports from ASEAN is greater than that on export trade, which means that China's import trade is more sensitive to changes in exchange rates than export trade.

Thirdly, by adopting the data related to exchange rate and price from January 2006 to December 2016, the study found that there are four ways for the transfer of RMB nominal effective exchange rate to price, and there is only the first route: exchange rate changes affect domestic prices by affecting import prices in China, prices will cause a drop in the general price level in China when the exchange rate of RMB is appreciated. However, this transmission route has a low effect on price transmission. The other three transmission paths include: Changes in exchange rates affect China's domestic prices by affecting aggregate demand. Exchange rate movements affect China's domestic prices by affecting asset prices. Exchange rate movements affect Chinese domestic prices by affecting monetary policy. These three ways will lead to the rise of China's domestic price when the RMB appreciates, and bring inflationary pressure.

Based on the above conclusions, the suggestions given in this paper are: first, maintain the stability of the exchange rate under the background of RMB appreciation. The implementation of a managed floating exchange rate system is a rational choice for China in the long run. Second, enhance the flexibility of the RMB exchange rate. Combine the relevant factors such as RMB interest rate, economic growth rate, foreign exchange reserve adequacy and change trend to determine the range of exchange rate fluctuation.

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