



Study on the influence of RMB exchange rate change on the long-term and long-term effects of China's import and export trade

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Abstract: since the Asian financial crisis in 2002, the RMB has appeared in the public view again. At the same time, the change of RMB exchange rate has become a hot topic for scholars to discuss and study. Through the analysis of the basic literature, it is found that most scholars focus on the impact of RMB exchange rate changes on a certain industry. As a result, this paper selects the nominal exchange rate of RMB, the real exchange rate of RMB, the total import and export trade of China and the total import and export demand of China as the research variables to explore the short-term and long-term effects of RMB exchange rate changes on China's commodity import and export trade.

Key words: RMB exchange rate change, ADF test, Granger causality test, empirical analysis

I. BACKGROUND TO THE STUDY

Exchange rate refers to the proportional relationship between domestic currency and other national currencies, which is the link between countries and countries. At the same time, the exchange rate also has the function of price conversion, which is manifested in international finance and international trade. In addition, because the expression of exchange rate is the ratio between two currencies, it also plays a very important role in regulating a country's international economic balance. It is a financial lever to regulate trade and economic exchanges between countries. Therefore, under the background that China advocates "strengthening trade exchanges with foreign countries and strengthening economic exchanges and cooperation ", the change of RMB exchange rate is particularly important for China and its trading partners. It can be said that it is closely related to its own interests.

In addition, exchange rate stability and balance of payments have always been an important goal of macroeconomic regulation and control, which also provides a factual basis for the study of this paper. At the same time, as far as China is concerned, foreign trade has always occupied a considerable position in China's balance of payments, so the change of RMB exchange rate has naturally become the focus of discussion. This first occurred after the Asian financial crisis in 2002, when some countries and research institutions thought that the value of the yuan had been seriously undervalued and called for a repositioning of the yuan. From this point, we can also see that RMB exchange rate changes will have an important impact on international trade. Since then, since July 21, 2005, China has implemented a market-based basket of currency adjustment and management of floating exchange rate system. At the same time, under the condition that China's capital account has not been convertible, the main source of the capital financial account month is foreign direct investment, and when China's capital account is convertible, the RMB can be adjusted and converted. China began large-scale import and export trade activities. Therefore, it is very important to study the import and export service trade of Chinese goods under the condition of RMB exchange rate fluctuation.

II. Literature review

Against the background of the imminent collapse of the Bretton Woods system in the 1970s, the exchange rate system of all countries, including China, began to change to a more flexible floating exchange rate system. Therefore,

the impact of exchange rate changes on trade has once become a hot topic in academic discussion, and has achieved more fruitful results.

Wang Min (2009) studied the influence of RMB exchange rate change on the total FDI inflow into China by using the FDI effect analysis of RMB exchange rate change, cointegration test and VAR model. At the same time, the long-term and short-term effects of RMB century effective exchange rate on regional trade mode structure were concluded by analyzing commodity structure, trade mode structure and trade mode structure; Finally, using panel data and elastic definition method, the elasticity of import and export demand of China's five trading partners (the United States, Japan, the European Union, South Korea and ASEAN) is measured, and the equations are established. The empirical conclusions obtained by the least square well explain the contradictions in the image of RMB exchange rate changes on import and export trade.

And Zhou Kunshu and Fang Yu (2017), through the study of trade between China and ASEAN, selected the most studied object of trade between China and Philippines, analyzed the impact of RMB exchange rate changes, and concluded that there is a long-term equilibrium relationship between RMB exchange rate, import and export.

In addition, Guo Yu (2019) made a corresponding conclusion on the positive and negative effects of the two angles by studying the effects of RMB appreciation and RMB depreciation. To explain the impact of RMB exchange rate changes on import and export trade is not all positive, there is still a certain degree of negative impact, and to minimize the impact, can do is to innovate and practice.

Similarly, Pang Yewei (2020) pointed out in his literature that the largest demand country for RMB appreciation so far is the United States. Whether it is Sino-US trade or Sino-US trade friction in previous years, the imbalance of trade development and the RMB exchange rate have become one of the most important reasons for the dispute between the two countries. So, in order to ease the embarrassment of the difficulties in the US market, the United States has always wanted to encourage China to let China's RMB appreciate, also because the United States is China's long-term partner and the beneficiary of the largest return on RMB appreciation.

Finally, Lu Bing, Wang Yaqi, Hong Shengjie (2020) based on the perspective of arbitrage to give the study of RMB exchange rate changes on false trade. It is also pointed out in the literature that forward exchange rate appreciation has a significant impact on promoting the increase of product exports, and is more obvious to products with high value to weight ratio.

Combined with the above literature and the existing currency related policies and strategies in China, it is found that most scholars choose the positive change of RMB exchange rate. The negative effect was studied. Therefore, this paper selects the short-term and long-term influence of RMB exchange rate change to further study and analyze the RMB exchange rate change.

III. Empirical Study on the Impact of RMB Exchange Rate Changes on China's Import and Export Trade

Generally speaking, there are two ways to work with the price of exchange rate: direct pricing method and indirect pricing method, while Chinese enterprises currently adopt direct pricing method. Therefore, according to the direct pricing method, in theory, the change of foreign exchange rate and the value of our currency changes in reverse, that is, the decline of foreign exchange rate, the depreciation of foreign currency and the appreciation of local currency. This leads to a large increase in domestic demand for foreign goods, leading to a decrease in exports and an increase in imports. Vice versa. From this, we can get the influence of RMB exchange rate change on China's import and export trade. The following model will be established to verify the above theoretical analysis to improve the reliability and accuracy.

(i) Data selection and variable determination

As described above, This paper decides to select the relevant data of RMB exchange rate changes between China and the United States. To facilitate research, This paper selects the data of RMB exchange rate against US dollar from

2000 to 2019, Among them, The most important is the period from 2005 to the present. Since July 2005, China began to fundamentally adjust the RMB exchange rate system to a more flexible floating exchange rate system. Thereafter, The yuan is no longer tied to a single dollar, RMB exchange rate formation mechanism is more flexible and flexible. The fundamental thing is, After 2005, The RMB exchange rate curve against the dollar has a large downward trend. Meanwhile, At 1900 hours on 21 July 2005, The exchange rate of the dollar against the renminbi has been adjusted, \$1=\$8.11. Overall, The Chinese exchange rate against the United States dollar (direct pricing method) announced after 2005 is shown in the following figure:

The exchange rate of RMB against the US dollar in the past 20 years

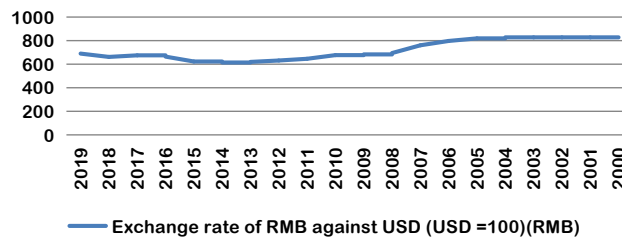


Figure 1 Breakdown of RMB to US dollar exchange rate in recent 20 years

To study the influence of RMB exchange rate on China's import and export trade, we can not simply select the data of exchange rate change. It is also necessary to select the relevant data of China's import and export trade volume and national income in recent years, and provide convenience for the establishment of the later model. Specific data are as follows:



Figure 2 2000-2019 China's total commodity import and export trade line chart

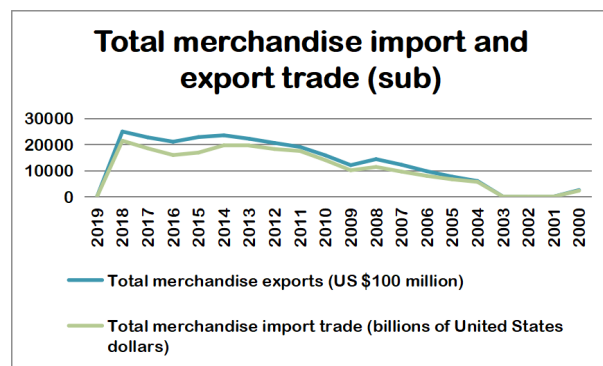


Figure 3 2000-2019 China's total commodity import and export trade line chart

As a result, according to the above chart, this paper selects the RMB exchange rate against the US dollar (USD =100)(RMB), the total export of China and its partners, and the total import of China and its partners as variables. The data are selected for 20 years from 2000 to 2019, as shown above. At the same time, all the data in the figure are from the China National Statistics website, which provides a guarantee for the reliability of the data.

In this article, Selecting r_1 to express the exchange rate of RMB against the US dollar (USD =100)(RMB), ex the total exports of China and its partners, and im the total imports of China and its partners, X for import demand, Y income from importing countries, P_1 is the price of imported goods; P_2 domestic commodity prices, M for export demand, Y_0 income from trading countries; SP_1 , is the price of our exports SP_2 . per cent of export commodity prices of trading countries Meanwhile, To facilitate research, We introduce the notion of nominal and real effective exchange rates, Among them, A nominal effective exchange rate for the renminbi is expressed in NEER(direct pricing method), A real effective exchange rate for the renminbi is expressed in REER, Then China's effective exchange rate can be expressed as:

$$NEER = E_{\$/d} \times \prod_{i=2}^m (E_{\$/fi})^{wi}$$

$$REER = S_{\$/d} \times \prod_{i=2}^m (S_{\$/fi})^w$$

(ii) Model building and data reprocessing

According to the selection of the above data, the establishment of variables and the preprocessing of the data and variables, we can establish the following functional relationship model:

For the study of import and export trade under the change of RMB exchange rate, the model that can show its internal relation is the function relation most intuitively. In this paper, the function model is established by selecting import total, import demand, export total, export demand, related series price and seat correlation variable of effective exchange rate in China. At the same time, in order to facilitate the study, the corresponding hypothesis is made here: $P_1=SP_2=SP, P_2=SP_1=P$, can be obtained:

Import demand function: $X=X(Y, P_1, P_2, NEER)$

Export demand function: $M=M(Y_0, SP_1, SP_2, NEER)$

Since the above contents have given the real effective exchange rate function, the above function relation can be simplified:

Import demand function: $X=X(Y, REER)$

Export demand function: $M=M(Y_0, REER)$

At the same time, in order to eliminate the effect of heteroscedasticity, the logarithmic treatment of the two sides of the above functional relationship, as well as the exchange rate of RMB against the dollar, the total import trade of China to its partners and the total export trade, will obtain the following relevant data:

$$\begin{aligned} \ln(X) &= a_0 + a_1 \ln(Y) + a_2 \ln(REER) + \varepsilon_1 \\ \ln(M) &= b_0 + b_1 \ln(Y_0) + b_2 \ln(REER) + \varepsilon_1 \end{aligned}$$

$\ln r_1$ means the RMB to the dollar exchange rate variable;

$\ln ex$ indicate the export variables between China and its partners;

$\ln im$ said the import variables of China and its partners.

At the same time, $d\ln h_1$ 、 $d\ln ex$ 、 $d\ln im$ represent the first order difference variables of the corresponding variables respectively.

(iii) Empirical results analysis

1. stationarity test

According to the selection of the above data and the establishment of the functional relationship model, we know that the test of stationarity is divided into two parts, namely, the export demand function of import and export and the test of the relative variables of the total import and export and the change of RMB exchange rate.

(1) Function model test

$\ln(X)$, $\ln(\ln)$, $\ln(Y_0)$ and $\ln(\text{REER})$ are tested at 5% level, The five empirical values all exceed the critical value, which indicates that the time series is not very stable, but after passing the first order difference test, the test value is less than the critical value at the level of 5%, so the corresponding cointegration analysis can be carried out.

(2) Test of three relational variables

Through the observation, analysis and study of the data of Fig .1, Fig .2 and Fig .3, we know that it belongs to the time series data. When analyzing the data, the test method mainly adopts the DF test and the ADF test method. Because the DF test method has great limitations on the time series test, this paper still uses the ADF test method to test, and the test results are as follows:

Table 1 ADF Findings

Variable name	Type of inspection (C,T,d)	ADF statistics	Critical value		P value	Conclusion
			1%	5%		
Inex	(C,0,1)	-1.573	-2.54	-1.737	0.0643	Not smooth
Inim	(C,0,1)	-1.493	-2.54	-1.737	0.0734	Not smooth
Inhl	(0,0,1)	-2.267	-3.749	-3.002	0.1846	Not smooth
dInex	(C,0,1)	-3.136	-2.554	-1.733	0.0028	Stable
dInim	(C,0,1)	-2.124	-2.554	-1.733	0.0238	Stable
dInhl	(0,0,1)	-12.475	-3.749	-3.002	0.000	Stable

Note: C,T,d is a ADF type of test, where C denotes intercept term, none is 0; T denotes time trend term, none is 0; d denotes lag order.

The above test results show that the three variables can not reject the original hypothesis that the sequence has unit root at the level of 1% and 5% significance, so the three variables are nonstationary sequences under this condition. However, the first order difference sequence can reject its original hypothesis at 5% significance level, so the first order difference sequence of the three variables is a stationary time series at 5% significance level. It can be seen that there may be a certain cointegration relationship between the three variables.

At this point, the stationary test of the two parts is over, and we conclude that there is a certain cointegration relationship between the functional relationship model and the three variables, so we study it accordingly.

2. cointegration analysis

Through the above study, we know that the total import volume of China and the total export volume of China exist in the above nonstationary sequence, so we only need to carry out cointegration analysis on the above two, as follows:

(1) Estimates of total imports:

$$\ln(X) = \ln(\text{im}) = 7.432 + 0.273 \ln(Y) - 0.474 \ln(\text{REER}) + \varepsilon$$

According to the ADF results, the test results are as follows: the critical value of -5.675 is less than 1% significance level -3.711, which indicates that the residual sequence tends to be stable when the confidence interval is 99. At the same time, it can also be explained that the real exchange rate of RMB has a long-term impact on China's total imports.

In addition, the exchange rate elasticity of China's total imports with its partners is -0.474, which indicates that the real exchange rate of RMB is 0.01(appreciation 0.01), the total import volume of China's partners will increase by 0.00474, and the domestic income elasticity of imports is 0.273, indicating that for every 0.01 increase in national income, the total import volume of China's partners will increase by 0.00273.

Therefore, according to the above research, we can conclude that China's national income and the real exchange rate of RMB have a significant impact on China's total imports.

(2) Estimate total exports:

$$\ln(M) = \ln(ex) = 3.582 + 2.732\ln(Y0) + 0.694\ln(REER) + \varepsilon$$

According to the results of ADF study, the test results are $-4.911 < 1\%$ critical value -4.667 , which indicates that the residual sequence tends to be stable when the confidence interval is 99. At the same time, it can also be explained that the real RMB exchange rate has a long-term impact on China's total exports.

In addition, the exchange rate elasticity of China's total exports with its partners is 0.694, which indicates that the real exchange rate of RMB will decrease by 0.01 (appreciation 0.01), the total export volume of China's partners will increase by 0.00694, and the domestic income elasticity of exports is 2.732, which indicates that the total export volume of China's partners will increase by 0.02732.

Therefore, according to the above research, we can conclude that the national income of the United States and the real exchange rate of RMB have a significant impact on the total import of China.

3. Granger Causality Analysis

Based on the above stationary test and cointegration analysis of the selected data and variables, we can conclude that there is a long-term dynamic equilibrium and short-term change between the change of RMB exchange rate and the total import and export of China and its partners. However, it is not reliable for the inevitable causality between variables, so it needs further analysis and discussion through Granger causality test.

The results are as follows:

Table 2 Granger Findings

Original hypothesis	F statistics	P of probability	Late <unk>	Conclusion
Inhl does not Granger -cause Inex	0.48	0.4477	1	Acceptance
Inhl does not Granger -cause Inex	10.03	0.0000	2	Refusal
Inhl does not Granger -cause Inim	0.57	0.4769	3	Acceptance
Inhl does not Granger -cause Inim	6.59	0.0000	4	Refusal
Inex does not Granger -cause Inim	0.41	0.5065	1	Acceptance
Inex does not Granger -cause Inim	0.19	0.7626	2	Acceptance
Inim does not Granger -cause Inex	2.53	0.0894	1	Acceptance
Inim does not Granger -cause Inex	1.62	0.1246	2	Acceptance

Note 1. The lag period is the optimal value after screening. The significant level is 5 and the original hypothesis is true.

According to the above Granger causality test, we can know that at the significant level of 5%, the Granger reason for export is that the exchange rate is in the second order lag period, while the Granger reason for import is that the exchange rate is in the fourth order lag period. However, no matter how many stages lag, import and export do not constitute a Granger causality.

Moreover, the causality test of $\ln(X)$, $\ln(M)$ and $\ln(REER)$ can draw Granger corresponding conclusions.

Therefore, through the above contents, we can make a preliminary judgment: in the short term, the influence of RMB exchange rate change on export trade is greater than that on import trade, and for import, the long-term exchange rate change has a greater impact on it.

4. Conclusion Analysis

Through the empirical analysis of the impact of RMB exchange rate changes on import and export trade, we can draw the following conclusions:

First of all, the different degree of change of RMB real exchange rate will have different effects on import and export trade. Because there is a positive relationship between the change of RMB real exchange rate and the amount of goods in and out of China, the appreciation of RMB will increase imports and restrain exports.

Secondly, China's overall import and export trading system and Marshall-Lerner conditions are basically similar, with certain flexibility. Therefore, when the real exchange rate of RMB in China decreases, that is, the appreciation

of RMB, it will increase imports and reduce exports, thus having a certain impact on the income and expenditure of China's import and export trade.

IV. Policy recommendations

According to the above research, we know that the impact of RMB exchange rate changes on China's commodity import and export trade is divided into long-term development impact and short-term impact. On the one hand, in the short term, the depreciation of the RMB will promote the export trade between China and its partners to a greater extent, but in the long run, because the public demand for foreign goods is small and saturated. For the long term, the impact will gradually weaken and eventually stabilize. On the other hand, the impact of RMB depreciation on import trade is relatively small. Although it will promote in the short term and continue to maintain in the long run, the degree of promotion is limited because of the small elasticity of some foreign commodities.

Therefore, in view of the above discussion, the following suggestions are given for the current situation of import and export trade in China:

1. the above results, the impact of RMB exchange rate changes on import and export trade volume is also related to the types of commodities traded and the elasticity of commodities to exchange rate changes. On the basis of the trade mode of labor-intensive commodities in China, we should seize the opportunity to eliminate high-energy products with small added value, study and develop some new products with high-tech industries as the main ones, and realize industrial upgrading.

2. in addition, because the change of exchange rate has a certain delay effect, it is necessary to refer to the delay effect in the adjustment of exchange rate, so as to avoid the frequent change of exchange rate, so as not to show the positive effect before.

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