

An Empirical Analysis of the Relationship between RMB Exchange Rate and Sino-US Trade Imbalance

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Abstract. With the development of Sino-U.S. trade, the trade friction has also intensified. Due to the continuous expansion of China's trade surplus, the United States believes that the serious undervaluation of the RMB is the main reason. The paper constructs an empirical analysis model, selects quarterly data from the first quarter of 2010 to the fourth quarter of 2017, and empirically analyzes the real exchange rate and the Sino-U.S. trade using methods found that there is a long-term equilibrium relationship between the trade surplus and real exchange rate. Finally, this article proposes policy suggestions on how to ease the trade imbalance between China and the United States.

1. Introduction

In recent years, China's economy has developed rapidly and has become the most powerful economy in the world. Especially after China's accession to the WTO, China's foreign trade has achieved remarkable growth. China's trade surplus with the United States has reached 1.87 trillion yuan in the year. The huge trade surplus has attracted the attention of scholars, business, politics and the public. Obviously, this has no advantages for both China and the United States. It can be seen that under the current background of Sino-US trade imbalance, the quantitative analysis of the impact of the RMB exchange rate on Sino-US trade imbalance is of great significance for exploring the real causes of the problem, resolving the RMB exchange rate dispute and improving Sino-US economic and trade relations.

2. Theoretical mechanism

Changes in exchange rates cause relative price changes in traded goods. According to the traditional theory of trade balance, the real exchange rate declines, the appreciation of the local currency can increase the relative price of domestic products in the international market. On the one hand weaken the international competitiveness of domestic exports, while the prices of foreign products are relatively low. Compared with domestic products, foreign products are more popular, and they can play a role in expanding imports and restricting exports to a country's foreign trade.

3. Empirical analysis

3.1 Analysis of the changes in the RMB exchange rate and the status quo of Sino-US trade

Table 1. 2000 One 2017 RMB exchange rate changes and Sino-US trade status unit: 100 million US dollars

Years	Exports	Imports	Trade surplus
2000	521.00	223.70	297.30
2001	542.80	262.00	280.80
2002	699.50	272.30	427.20
2003	924.70	338.60	586.10
2004	1249.50	446.80	802.70
2005	1629.00	487.30	1141.70
2006	2034.70	592.10	1442.60
2007	2327.00	693.80	1633.20
2008	2523.00	814.40	1708.60
2009	2208.20	774.40	1433.80
2010	2833.00	1020.40	1812.60
2011	3244.50	1221.54	2022.96
2012	3194.00	1192.00	2002.00
2013	3684.00	1526.00	2158.00
2014	3960.00	1590.00	2370.00
2015	4092.10	1478.10	2614.00
2016	3656.10	1278.20	2377.90
2017	4263.94	1516.29	2747.65

It can be seen from the listed data that although the renminbi has achieved a certain appreciation, the imbalance between China and the US trade balance has not improved. This situation fully demonstrates that the appreciation of the renminbi cannot effectively reduce the Sino-US trade deficit in the short term, and the RMB exchange rate is not the main reason for the trade imbalance between China and the United States. That is to say, the appreciation of the renminbi is difficult to play a role in adjusting the trade imbalance between China and the United States.

3.2 Variable selection

This paper uses quarterly data from the first quarter of 2000 to the fourth quarter of 2017, using EViews econometric software for testing. The trade balance between China and the United States is a function of RER, GDP, and FGDP, namely:

$$Y=f(RER, GDP, FGDP) \quad (1)$$

Among them, Y represents China's trade balance with the United States. That is, the trade balance between China and the United States can be expressed as a function of the real exchange rate of the Renminbi against the US dollar, China's total income, and the total income of the United States. To reduce the effects of heteroscedasticity, take the logarithm of the function:

$$\ln Y=a_0+a_1\ln RER+a_2 \ln GDP+a_3 \ln FGDP+u \quad (2)$$

According to the traditional theory of trade balance, the rise of the real exchange rate means the depreciation of the RMB. Depreciation will increase exports and reduce imports, so the symbol of a_1 is expected to be positive. The rise in China's real income level will boost the total import volume and have a negative impact on the trade balance. Therefore, the symbol of a_2 is expected to be negative: the rise of the actual income level in the US will promote the increase of China's total export volume and positively affect the trade balance. Effect, so the sign of a_3 is expected to be positive.

3.3 ADF unit root test

Table 2. ADF unit root test result

variable	Difference number	Inspection form	ADF statistics	1%	5%	10%	P	results
LnY	0	(C, 0, 4)	-2.4326	-3.5316	-2.9055	-2.5903	0.1369	unstable
$\Delta \ln Y$	1	(C, 0, 3)	-3.9260	-3.5316	-2.9055	-2.5903	0.0032	stable
ln RER	0	(C, 0, 1)	-1.0503	-3.5270	-2.9036	-2.5892	0.7307	unstable
$\Delta \ln RER$	1	(C, 0, 3)	-4.4465	-3.5270	-2.9036	-2.5892	0.0006	stable
lnGDP	0	(C, 0, 5)	0.0107	-3.5332	-2.9062	-2.5906	0.9558	unstable
$\Delta \ln GDP$	1	(C, 0, 0)	-3.1792	-3.5332	-2.9062	-2.5906	0.0257	stable
ln FGDP	0	(C, 0, 1)	-0.4625	-3.5270	-2.9036	-2.5892	0.8915	unstable
$\Delta \ln FGDP$	1	(C, 0, 0)	-5.3775	-3.5270	-2.9036	-2.5892	0.0000	stable

According to the above table, the ADF statistics of LnY, ln RER, lnGDP, and ln FGDP are all significantly higher than the corresponding ones. The threshold of McKinnone with a sex level of 10% is large, indicating that the sequence is non-stationary and there is a unit root; after the first-order difference, the ADF statistic of the Sino-US trade surplus LnY, the real exchange rate of the renminbi against the US dollar ln RER, and the US GDP ln The ADF statistic of FGDP is smaller than the corresponding threshold of 1% of McKinsey, indicating that the three sequences are stable after the first-order difference, and there is no unit root. Therefore, the Sino-US trade surplus and the quarterly sequence of the real exchange rate of the RMB and the US GDP are both first-order and single-order sequences, namely I(1). The ADF statistic of the first-order difference of lnGDP is smaller than the corresponding threshold of 5% of the McKinsey, so this sequence is also first-order stationary. The first-order difference ADF test values of the above table control variables are all less than the 5% threshold value, which proves that all variables are the same-order single-sequence sequence, indicating that each variable sequence satisfies the precondition of the cointegration test.

3.4 Model estimation equation

To further quantify the relationship between China's total exports to the United States, the real exchange rate of the RMB against the US dollar, and the logarithmic sequence of GDP between China and the United States, we conduct regression analysis based on the model, and the regression results are as follows:

$$\begin{aligned} \ln Y = & -33.5136 + 1.0720 \ln RER + 0.33 \ln GDP + 2.8695 \ln FGDP \\ & (-4.4225) \quad (1.0765) \quad (1.0469) \quad (3.0751) \\ R^2 = & 0.8809 \quad F = 167.8571 \end{aligned} \quad (3)$$

Through the cointegration analysis of the quarterly data from 2000 to 2017, the cointegration equation is obtained. From the results of the cointegration equation, it can be seen that in the long run, the real exchange rate has a positive impact on the bilateral trade balance between China and the United States, and the trade balance. The real exchange rate elasticity is 1.072. For every 1% decrease in the real exchange rate of RMB against the US dollar, that is, 1% of the appreciation of the RMB, the

trade surplus will decrease evenly or the deficit will increase by 1.072%, and the t-statistic will be 1.076. Not very significant, indicating that the impact of real exchange rate changes on trade balances is not very large. US GDP has the most obvious impact on Sino-US trade balance. For every 1% increase in US real GDP, the trade surplus will increase by an average of 2.87%. There is a positive change in China's real GDP and trade balance. For every 1% increase in China's real GDP, the trade surplus will grow by an average of 0.33%. In summary, among the various factors affecting the Sino-US trade balance, US GDP has the greatest impact, while China's real GDP and the real exchange rate of the RMB against the US dollar are much less than the impact of US GDP. Therefore, the exchange rate policy is not the main means for China to adjust the external economic imbalance. At the same time, it is clarified from another angle that the US use of the Sino-US trade surplus as a reason for putting pressure on the appreciation of the renminbi cannot be said.

4. Conclusion

For China, it should actively adopt a basket of macroeconomic policies and accelerate institutional transformation. While paying attention to solving the inflation problem, it should effectively slow down the rapid growth of the trade surplus including the United States and alleviate the pressure of RMB appreciation. Under this strategy, China should pay attention to solving the RMB exchange rate issue, actively and preferentially adjust the economic structure and promote industrial upgrading, transform the pressure of RMB appreciation into new development opportunities and development momentum, and strive to form a goal of independent innovation. The new international comparison of competitive advantages.

Effective measures should be taken to alleviate the situation of sustained trade growth in the trade surplus and foreign exchange reserves. In addition to implementing a series of macroeconomic policy adjustments and accelerating institutional transformation, other targeted measures should be taken to increase the regulation of trade imbalances. Effectively reduce the growth of trade surplus and foreign exchange reserves.

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