

Exchange Rate Changes, Monetary Policy and Sino-US Trade Imbalance

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ABSTRACT: *Since the beginning of 2019, the world political and economic situation has become more complicated. On the one hand, the United States has repeatedly provoked trade disputes with China and other countries, leading to the unilateral trade protectionism in the world to rise. On the other hand, the United States has continuously “retreated”, making the international political situation continue to be turbulent and the external environment is not optimistic. Therefore, in view of the current exchange rate and the trade imbalance between China and the United States, this paper explores whether the exchange rate is the main cause of the Sino-US trade deficit, and introduces monetary policy factors and empirical analysis. The results show that the exchange rate is not the main cause of the trade imbalance between China and the United States, and the variance decomposition result is less than 1%. The monetary policy has certain influence on the Sino-US trade balance, and the interest rate impact is greater than the money supply, which is also the monetary policy of China. The tool provides a basis for the shift from quantitative to price. It is recommended to speed up the reform of exchange rate marketization, improve the money supply channels and mechanisms, enhance the independence of monetary policy and promote the reform of interest rate marketization, and guide the capital market to better serve the real economy.*

Keywords: *exchange rate; monetary policy; trade balance*

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I. INTRODUCTION

On August 1, 2019, US President Trump said that he would impose a 10% tariff on the remaining \$300 billion of Chinese goods, and at the same time set off an uproar in the international economic society. Although the Sino-US trade negotiations have been carried out for 12 rounds, the US government has made a rebound and the negotiations have yet to make substantial progress. Trade disputes between the two largest economies in the world have intensified, which undoubtedly cast a shadow over the world economic outlook. On the one hand, the United States has repeatedly unilaterally announced the imposition of tariffs on China and other countries in order to reduce the trade deficit and disregard the rules of the World Economic and Trade Organization. It has been unanimously condemned by the international community. On the other hand, since Trump took office, he has been labelling China as a “currency manipulator” and believes that China has stimulated exports through exchange rate depreciation. At the same time, the US Treasury officially listed China as a “currency manipulator” on August 5. However, the IMF’s China’s annual fourth-term consultation report pointed out that the RMB exchange rate is basically in line with the economic fundamentals, denying China’s conclusion that it is a “currency manipulator”. As shown in Figure 1, since China initiated the exchange rate reform, China’s exchange rate has risen and fallen, two-way floating, determined by market supply and demand, so the US move is obviously unreasonable. However, some issues still deserve our deep thought: Is the exchange rate really the decisive factor affecting Sino-US trade? What are the reasons for the Sino-US trade deficit? As we all know, monetary policy as an important means for the government to control the national economy, its implementation has a great impact on China’s macro economy. Moreover, import and export have always been an important part of China’s rapid economic growth, so monetary policy may affect China’s trade balance to a large extent, and the exchange rate as one of the monetary policy transmission paths, there is a close relationship between the two. Therefore, this paper will introduce the monetary policy factors while discussing the relationship between exchange rate and Sino-US trade balance, and analyze the trade imbalance between China and the United States.

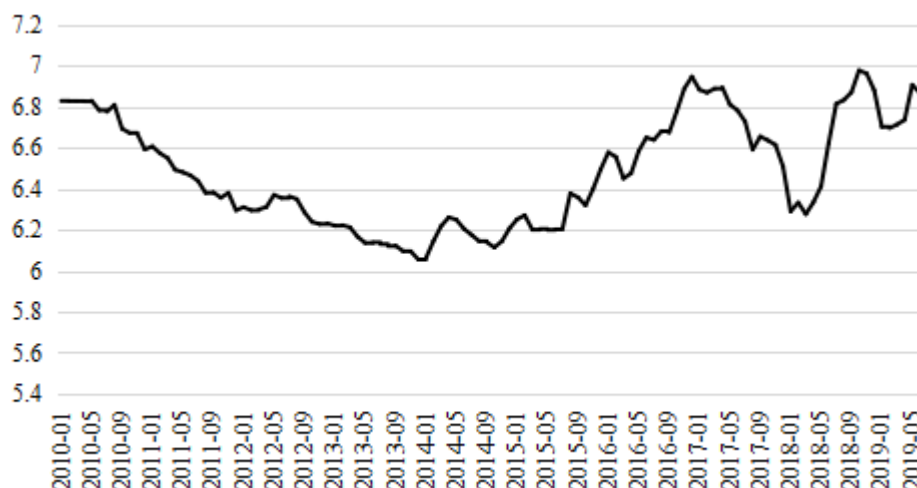


Figure 1 Trends in the RMB exchange rate since 2010

II. LITERATURE REVIEW

There has been no shortage of researchers on whether the exchange rate will affect China's trade balance. However, the relevant literature still disagrees on this issue. Some researchers believe that the exchange rate will affect China's trade balance: Lu and Dai (2005) based on 1994-2003 data, using cointegration vector autoregressive analysis method And the autoregressive distribution lag model empirically tests China's exchange rate and import and export relationship. As a result, the surface exchange rate changes have a significant impact on China's import and export, and the Marshall Lerner condition is established. At the same time, the exchange rate changes have a J-curve effect on the import and export. Cao (2008) used the data after the exchange rate reform in 2005, and measured the exchange rate changes through the bilateral external real exchange rate. The empirical analysis of the impact of the real exchange rate of the RMB on the import and export of China and the United States revealed that they had significant effects. However, another part of the researchers believe that the exchange rate has little to do with China's trade balance: Xie and Chen(2002) found that the RMB depreciation has no significant impact on China's trade balance through co-integration research and shock decomposition. Ye et al (2006) respectively compared the trade balance between China, the United States, and China and the exchange rate. The results show that changing the RMB exchange rate does not improve the trade balance between China and the United States and China and Japan.

The classical theory of western economics has different views on the study of the transmission mechanism of monetary policy. However, there are four main points in the summary: interest rate channels, credit channels, non-monetary asset price channels, and exchange rate channels. Zhao and Gao (2004) empirically tested the relationship between monetary policy instruments and macroeconomic variables based on cointegration theory and vector autoregressive model. The results show that interest rate instruments have a significant effect on China's net exports. Wang (2009) found through empirical tests that credit channels play a major role in the transmission path of China's monetary policy. Gao (2011) analyzed from the perspective of asset price channels and found that changes in money supply did not drive asset price changes well, thus reducing the effectiveness of monetary policy asset price channel transmission, and proposed to improve China's capital market organization structure and market system.

It can be seen from the above literature that most of the existing literature only studies the relationship between exchange rate changes and trade balance or the single channel of monetary policy on trade balance, and does not change exchange rate, monetary policy and Sino-US trade. The imbalance problem is combined. This article closely follows the current hot issue. On the one hand, it explores whether the exchange rate is the main cause of Sino-US trade imbalance. On the other hand, it studies the impact of monetary policy on Sino-US trade balance, and attempts to explain the Sino-US trade imbalance from this perspective.

III. INFLUENCE MECHANISM

The exchange rate is the exchange rate between the two countries' currencies. According to the traditional international financial theory, the depreciation of a country's exchange rate makes the country's export products lower in relative prices and has more advantages, which is conducive to the country's exports; on the contrary, the opposite. However, if a country wants to increase exports through exchange rate depreciation, it must meet an important condition, that is, the "Marshall Lena condition", which is an important part of the current Western exchange rate theory: when the sum of the price elasticity of import and export

demand is greater than one The depreciation of the local currency leads to an increase in the current account balance; on the contrary, when the sum of the price elasticity of import and export demand is less than 1, the depreciation of the local currency leads to a decrease in the current account balance. The mathematical representations are as follows: B is the domestic trade balance calculated in foreign currency, X is the domestic export value in local currency, M is the domestic import value in foreign currency, and E is the exchange rate (under the indirect price method).

$$B = EX - M \quad (1)$$

$$\frac{\partial B}{\partial E} = X + \frac{E \partial X}{\partial E} - \frac{\partial M}{\partial E} = X \left(1 + \frac{E}{X} \times \frac{\partial X}{\partial E} - \frac{\partial M}{\partial E} \times \frac{E}{M} \times \frac{M}{EX} \right) \quad (2)$$

the price elasticity of export demand is E_x , and the price elasticity of import demand is E_y

$$E_x = - \left(\frac{E}{X} \times \frac{\partial X}{\partial E} \right)$$

$$E_M = \frac{\partial M}{\partial E} \times \frac{E}{M}$$

Assume that trade is initially balanced, So

$$\frac{\partial B}{\partial E} = X \left(1 - E_x - E_M * \frac{M}{EX} \right) = X (1 - E_x - E_M)$$

If $E_x + E_M > 1$, $\frac{\partial B}{\partial E} < 0$, At this time, the depreciation of the local currency can improve the trade balance.

The implementation of monetary policy is through the use of monetary policy tools (three major monetary policy instruments: statutory reserve ratio, open market business and discount policy), affecting intermediary indicators (interest rate, money supply, etc.) to achieve the ultimate goal (price stability, Full employment, economic growth, balance of payments, and financial stability, etc. From an academic perspective, monetary policy tools can be divided into quantity and price. The quantitative monetary policy tools mainly focus on the regulation of the money supply, while the price type focuses on the adjustment of the interest rate or exchange rate. Two different types of monetary policy instruments are transmitted to the Chinese economy through various channels. As shown in the following figure, monetary policy mainly affects China's trade balance through four channels: interest rate channels, credit channels, non-monetary asset price channels, and exchange rate channels. The increase in money supply through these four channels leads to a drop in interest rates. Increased credit, rising asset prices, and falling exchange rates have led to an increase in investment, which in turn has affected trade balances.

IV. METHOD INTRODUCTION

This article uses China's exports to the United States minus imports, that is, net exports B. Exchange rate: From the existing literature, many researchers usually use the latter as the research variable between the nominal exchange rate and the real exchange rate. Compared with the nominal exchange rate, the actual exchange rate considers the impact of price changes on the nominal exchange rate. The inflation factor is excluded from the exchange rate. Therefore, this paper will also use the real exchange rate of the renminbi as the research variable of the exchange rate. This article mainly discusses Sino-US trade issues. Therefore, the nominal exchange rate of RMB against the US dollar and the CPI index of China and the United States are used to calculate the real exchange rate of RMB. In terms of monetary policy, the representative M2 represents the money supply and the interbank lending rate R respectively represent the quantitative and price monetary policy factors, and eliminates seasonal factors by using the X12 method.

The traditional unstructured VAR model does not reflect the correlation between the variables in the current period, but is completely hidden in the error term. Because it cannot be observed, it is often ignored as random interference. The structural VAR model (SVAR) contains the current relationship between variables, which solves this problem well.

For the K-order P-order SVAR model, $k(k-1)/2$ constraints are required. Therefore, the four variables selected in this paper need at least 6 constraints to make the model meet the recognition conditions. According

to economic theory. Apply some constraints: the real exchange rate, M2 and interest rate have no effect on the current net exports,; net exports and interest rates have no effect on the current exchange rate; net exports, exchange rates and interest rates for the current period M2 No impact; net exports and exchange rates have no effect on the current interest rate,. After applying the above constraints:

$$A = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & c_{(1)} & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & c_{(2)} & 1 \end{pmatrix}, B = \begin{pmatrix} c_{(3)} & 0 & 0 & 0 \\ 0 & c_{(4)} & 0 & 0 \\ 0 & 0 & c_{(5)} & 0 \\ 0 & 0 & 0 & c_{(6)} \end{pmatrix}$$

The estimated results are shown in Table 1:

Table 1 Matrix Coefficient Estimation Results

parameter	parameter	Std. Error	z-Statistic	Prob.
C(1)	-7.03E-05	0.1541	-0.000456	0.9996
C(2)	33.97350	9.9341	-3.4199	0.0006
C(3)	0.214569	0.0143	14.9666	0.0000
C(4)	0.009237	0.000617	14.9666	0.0000
C(5)	0.005664	0.000378	14.9666	0.0000
C(6)	0.5955	0.03979	14.9666	0.0000

V. EMPIRICAL ANALYSIS

(1) Unit root test

As shown in Table 2, each original sequence is a non-stationary sequence. After the first-order difference, each sequence rejects the assumption of a unit root at the 5% level, indicating that the first-order difference is a stationary sequence.

Table 2 Unit Root Test Table

Variable	ADF	Prob.	Critical value		Conclusion
			1%	5%	
LNB	-1.8414	0.6772	-4.05051	-3.4545	Unstable
LNE	-2.2513	0.4566	-4.04204	-3.4504	Unstable
LNM2	-0.8996	0.9517	-4.04128	-3.4501	Unstable
R	-0.8925	0.3154	-4.04128	-3.4501	Unstable
DLNB	-8.9912	0.0000	-4.05145	-3.4549	Stable
DLNE	-7.7867	0.0000	-4.04204	-3.4504	Stable
DLNM2	-12.7037	0.0000	-4.04204	-3.4504	Stable
DR	-9.9175	0.0000	-4.0428	-3.4508	Stable

(2) Granger causality test

According to the Granger causality test results in the following table, both the M2 money supply and the interest rate have passed the Granger causality test. Only the exchange rate has not passed the test, indicating that the exchange rate change is not the main reason that affects the Sino-US trade balance problem.

Table 3 Granger Causality Test table

Causal relationship	F-Statistic	Prob.	Conclusion
LNE does not Granger Cause for LNB	2.3354	0.0606	Accept
LNB does not Granger Cause for LNE	0.2400	0.9152	Accept
LNM2 does not Granger Cause for LNB	4.8802	0.0012	Refuse
LNB does not Granger Cause for LNM2	0.6667	0.6166	Accept
R does not Granger Cause for LNB	3.05543	0.0202	Refuse
LNB does not Granger Cause for R	1.1013	0.3602	Accept

3) Cointegration test of the SVAR model

Before the cointegration test, according to the smaller criteria of AIC and SC, we determined that the optimal lag order is the 1st order, and then the number of cointegration relations is determined by Johansen cointegration test. The specific results are as follows:

Table 4 Johansen Cointegration Test table

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.
None	0.2694	82.5276	47.8561	0.0000
At most 1	0.1954	47.5659	29.7971	0.0002
At most 2	0.1444	23.01484	15.4947	0.0031
At most 3	0.04832	5.5472	3.8415	0.0185

It can be seen from Table 3 that there are four variables rejecting the assumption that there is no cointegration relationship at the 5% significance level, indicating that there is a long-term cointegration relationship among the above four variables.

(4) Stationarity test of the SVAR model

It can be seen from the unit root distribution map that the reciprocal of all unit roots falls within the unit circle. Therefore, the model established is stable.

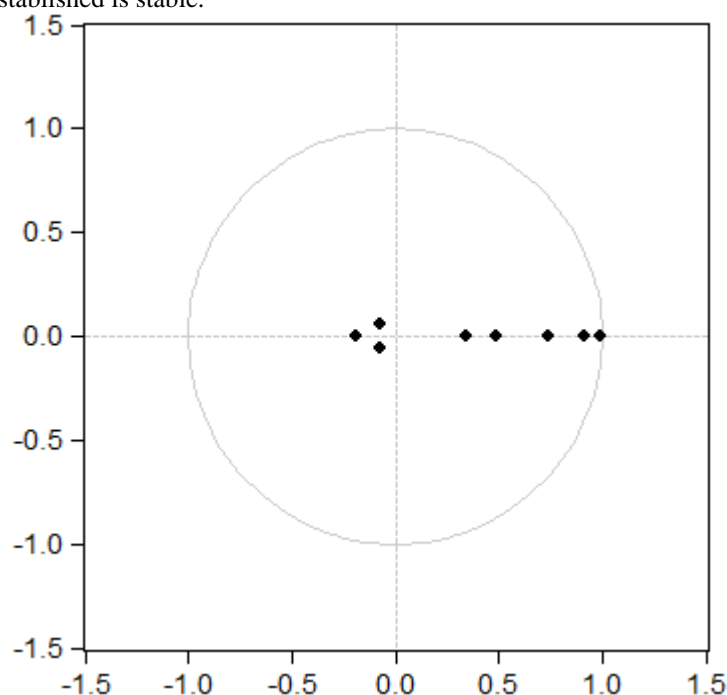


Figure 2 AR root map

(5) Impulse response and variance decomposition of the SVAR model

It can be seen from the impulse response result of Fig. 4 that when the LNE is subjected to a positive impact of one unit, the LNB gradually rises, and after reaching the highest point in the third phase, it begins to fall back, and the influence of the eighth phase tends to be stable. Explain that the depreciation of the RMB exchange rate will increase China's trade balance with the United States, that is, the surplus for the United States will increase, but the duration of action will not be long, and the long-term impact will tend to zero. It can be seen that the relationship between Sino-US trade balance and exchange rate is in line with the traditional international financial theory analysis; when LNM2 is positively impacted by a unit, LNB falls back after reaching the maximum in the second period, and tends to be stable after the 14th period. Explain that the implementation of monetary policy can effectively stimulate China's trade with the United States and expand China's net exports, and the long-term effect is obvious; when LNR is positively impacted by a unit, LNB will experience negative fluctuations in a short period of time, and will fall back after reaching the maximum in the third period. After 12 periods, it tends to be stable. According to the traditional financial theory, interest rates rise, funds are pulled away, and investment is reduced, which will inhibit production and exports to a certain extent, so the trade balance here is reduced. It can be seen from the table of variance decomposition table of Table 4 that the impact of the first phase of Sino-US trade balance on its own has reached 100%, indicating that Sino-US trade balance is greatly affected by its own factors, and its changes will be affected by expected factors and its own inertia. . After the 10th period, the impact of the impact of each variable gradually stabilized. It can be seen that the exchange rate can explain the lowest proportion of all variables, less than 1%, further indicating that the exchange rate is not the main reason for Sino-US trade issues, and therefore the United States. It is unreasonable for the government to try to impose a “currency manipulative state” on China, thus putting pressure on China. The M2 money supply has explained the change in trade balances by 1.8% after 20 periods,

indicating that the money supply is pegged. The quantitative monetary policy has a weaker influence on the control of trade balance; and the impact of interest rates on net exports is up to 3.37%, indicating that the price-type monetary policy with pegged interest rates has a certain impact on Sino-US trade balances. It provides a basis for the shift of monetary policy tools from quantitative to price.

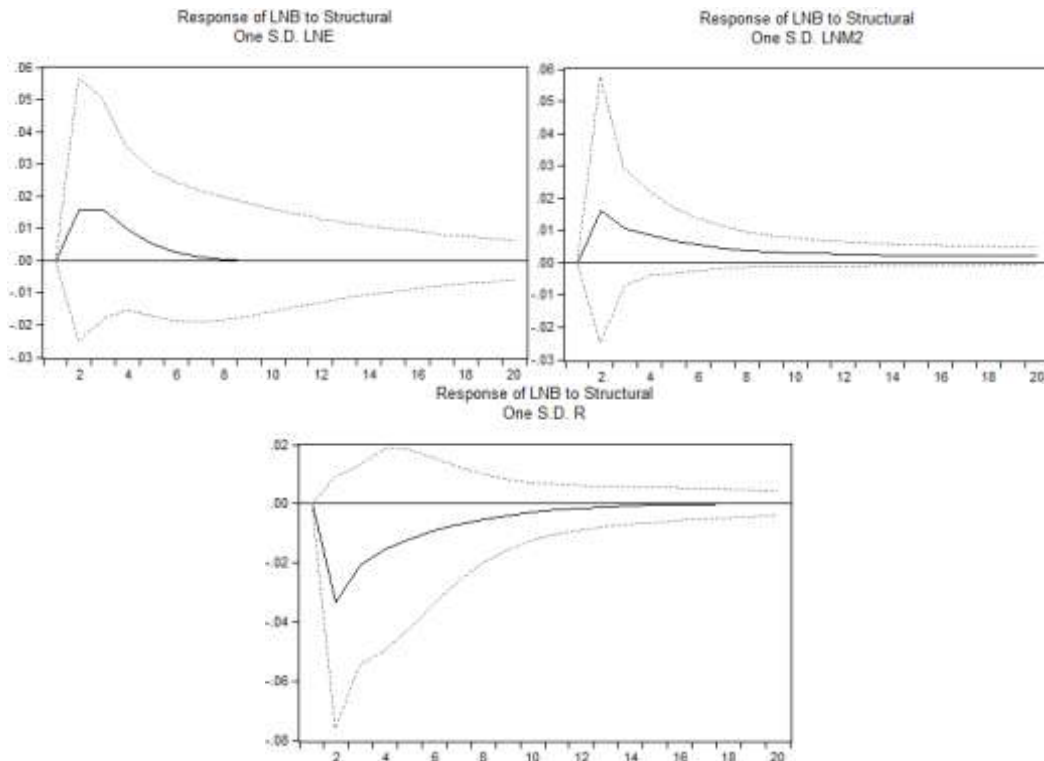


Figure 3 Structural impact of changes in LNB on LNE,LNM2 and R

Table 5 Variance decomposition of LNE

Period	LNB	LNE	LNM2	R
1	100.0000	0.0000	0.0000	0.0000
2	97.2072	0.4260	0.9519	1.9149
4	95.4639	0.9500	1.2225	2.8635
6	94.9529	0.9976	1.4387	3.2107
8	94.7829	0.9979	1.6940	3.3251
10	94.7170	0.9972	1.7267	3.3592
12	94.6852	0.9968	1.7497	3.3683
14	94.6552	0.9966	1.7681	3.3701
16	94.6495	0.9964	1.7839	3.3701
18	94.6358	0.9963	1.8150	3.3697
20	94.6231	0.9962	1.8115	3.3692

VI. CONCLUSION

From the above empirical analysis, we draw the following conclusions: First, through the Granger causality test, it is found that the exchange rate is not the Granger cause of the change in Sino-US trade balance; secondly, through the impulse response analysis, it is found that the depreciation of exchange rate can promote China's trade balance with the United States in the short term. The result is in line with the traditional international financial theory analysis, but the long-term effect is weakened. The increase in the money supply has a positive impact on the Sino-US trade balance, and the long-term effect is obvious. The rise in interest rates

will have a significant negative effect on Sino-US trade balance. Third, through the decomposition of variance, it is found that the exchange rate has the weakest impact on Sino-US trade balance, less than 1%, further indicating that the exchange rate is not the main cause of Sino-US trade imbalance. The implementation of monetary policy has a certain impact on Sino-US trade balance, and the interest rate impact is greater than the money supply, which also provides a basis for China's monetary policy tools to change from quantity to price. Therefore, the impact of the exchange rate on Sino-US trade is limited and is not the main factor of the Sino-US imbalance trade. What's more, the implementation of monetary policy has a certain degree of influence on Sino-US trade.

According to the conclusions, this paper gives the following suggestions: In the context of global economic growth entering the era of "new mediocrity" and the Chinese economy entering the era of "new normal", especially in the context of the trade friction with the United States, We should be cautious. First of all, in the trade negotiations with the United States, We should try our best to avoid the terrible situation like Japan whose exchange rate fell sharply after signing "The Square Agreement" with the United States. At the same time, the decision-making organs should continue to adhere to the policy orientation of market-oriented reforms when formulating exchange rate policies, and constantly improve the mechanism for the formation of the RMB exchange rate. Improve the transparency of exchange rate policy and keep the balance of the RMB exchange rate reasonable. The second is to further improve the money supply channels and mechanisms, enhance the independence of monetary policy, and at the same time improve monetary policy tools, focus on guiding public expectations, and improve the role and effectiveness of monetary policy. Finally, continue to improve the credit system construction of commercial banks, accelerate the reform of interest rate marketization, and guide the capital market to better serve the real economy.

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