

Research on the Impact of Quantitative Easing Monetary Policy in the United States on Sino-US Trade: Empirical Analysis based on SVAR Model

Jie Mo

School of Economics and Finance, Shanghai International Studies University, Shanghai
201620, China

*Josephhhh@163.com

Abstract

Under the epidemic, the quantitative easing monetary policy of the United States has shown the characteristics of larger scale, faster speed, and direct access to entities, and has had a severe impact on Sino-US trade through channels such as exchange rates and international commodity prices. The article uses the SVAR model to empirically measure the impact of quantitative easing monetary policy on Sino-US trade, exploring the path effects of exchange rates, interest rates, international commodity prices, and foreign direct investment. Research has found that on the one hand, the direct impact of quantitative easing monetary policy on Sino-US trade is less than the indirect impact; On the other hand, exchange rates, international commodity prices, and foreign direct investment are the main factors that explain the fluctuations in Sino-US import and export trade. Finally, policy recommendations were put forward on how to address the spillover effects of monetary policy.

Keywords

Quantitative Easing Monetary Policy in the United States; Sino-US Trade; SVAR Model.

1. Introduction and Literature Review

In order to cope with the economic downturn caused by the COVID-19, on March 23, 2020, the United States adopted the "unlimited" quantitative easing monetary policy, announced the unlimited purchase of US treasury bond, and the interest rate was lowered to 0-0.25%, which had a huge impact on the global economy. In the context of the global value chain, trade relations between countries are becoming increasingly close, and China US trade plays an important role in it. In recent years, the Biden government's crackdown on restrictions, epidemic impact and the Russia-Ukraine conflict have brought more challenges and uncertainties to China US trade. Scholars at home and abroad have conducted in-depth research on the economic effects of monetary policy, and found that adjustments to one country's monetary policy can have spillover effects on other countries' trade (Li Zenglai and Liang Dongli, 2011; Cheng&Zhang, 2012). In terms of the cross-border transmission path of monetary policy, academia generally believes that US monetary policy can have an impact on other countries through channels such as trade, exchange rates, interest rates, capital markets, and foreign exchange reserves. In terms of trade channels, Chen Lei and Hou Peng (2011) pointed out that the ultra quantitative easing of the US dollar will push up the prices of international commodities, increase the cost of trade imports, and thus cause imported inflation. In terms of exchange rate channels, monetary policy will have a more significant impact on enterprises' exports, which is mainly reflected in two aspects: on the one hand, based on the "one price law", under the market conditions of perfect competition, there is a positive correlation between the change of exchange rate and the change of commodity prices (Sun et al., 2018); On the other

hand, there is a reverse relationship between exchange rates and trade expenditures, which ultimately affects the domestic economy by affecting trade expenditures (Dedola et al., 2017). In terms of interest rate channels, Kim and Roubini (2000) pointed out that interest rate channels play the most important role [3]. In terms of capital market channels, Liu Kegou and Zhai Chenxi (2011) found that the adoption of quantitative easing monetary policy by the Federal Reserve will directly lead to the rise of asset prices, which will then lead to price foam in other countries and regions, and ultimately produce spillover effects [7]. From the perspective of existing research, scholars have paid more attention to monetary policy, which has demonstrated the existence of cross-border spillover effects of U.S. monetary policy. However, they pay less attention to the excessive easing monetary policy caused by the COVID-19 epidemic, and lack of verification of transmission mechanism. This article selects the "unlimited" quantitative easing monetary policy of the United States as the research object, which not only helps to clarify the mechanism of action between quantitative easing monetary policy and Sino-US trade, but also provides corresponding policy recommendations for China to effectively respond to the spillover effects of monetary policy.

2. Theoretical Mechanism and Research Hypothesis

2.1. Exchange Rate Channel

From the perspective of the impact of monetary policy on the exchange rate of China and the United States, in an open economy with a floating exchange rate system, the United States will put a large number of dollars on the market, which will lead to the continuous appreciation of the RMB. The reasons are: (1) The foreign exchange dollar market has a balance of payments deficit due to the depression of the United States financial market, which leads to the appreciation of foreign exchange and the depreciation of the U.S. dollar; (2) The expected 'self enhancement' will stimulate the market to purchase a large amount of RMB, prompting more arbitrage capital inflows, and thus leading to the continuous appreciation of the RMB. From the impact of the RMB exchange rate on China's import and export trade, it can be seen that the appreciation of the RMB will have a significant inhibitory effect on China's export trade (Yan Yingen and Li Anqi, 2022). An increase in a country's currency exchange rate will lead to a decrease in the competitiveness of its own goods in the market, which is not conducive to the further expansion of its export product scale; In addition, the influx of a large amount of hot money into the Chinese market will also stimulate consumption and the expansion of China's import scale. Based on the above analysis, this article proposes the following hypothesis.

Hypothesis 1: The quantitative easing monetary policy of the United States will lead to the appreciation of the RMB and worsen the conditions for China's foreign trade.

2.2. Interest Rate Channel

On the one hand, the US market interest rate remains below 0.25%, higher than other countries' market interest rates, further highlighting the profit seeking nature of capital. On the one hand, in the short term, there will be a large-scale influx of foreign capital in China's currency market, leading to a significant increase in domestic investment willingness, leading to inflation in China. On the other hand, the ultra-low interest rates in the US domestic market will also have an impact on corporate investment and household consumption.

Hypothesis 2: US quantitative easing monetary policy will stimulate a sustained decline in US market interest rates, adding further uncertainty to foreign trade.

2.3. International Commodity Price Channels

Investors out of a risk aversion mentality, anticipate a depreciation of the US dollar, which will lead to a large number of risk averse individuals selling the US dollar and buying commodities, driving up international commodity prices. Domestic consumers tend to prefer lower priced

domestic consumer goods, and rising domestic prices lead to domestic inflation. In addition, there is a negative correlation between international commodity prices and the overall conditions of China's foreign trade. The increase in demand for commodities in China will also lead to an increase in commodity prices.

Hypothesis 3: The US quantitative easing monetary policy will lead to high international commodity prices and worsen the conditions for China's foreign trade.

2.4. Foreign Direct Investment Channels

The impact of quantitative easing monetary policy in the United States on FDI has a dual nature. On the one hand, the decline in the US dollar exchange rate under quantitative easing monetary policy has increased the cost of FDI and hindered US investment in China. On the other hand, as one of the main investment destinations for private investment in the United States, China may attract more foreign direct investment from the United States to China. From the perspective of the impact of FDI on trade, it can be seen that China's export trade is highly dependent on foreign investment. Foreign direct investment is imported into China's domestic market through forms such as export-oriented foreign investment.

3. Analytical Framework and Empirical Analysis

3.1. Model Building

This article uses the Structural Vector Autoregressive Model (SVAR Model) to analyze the dynamic impact of quantitative easing monetary policy in the United States on Sino-US trade. The functional model constructed is shown in equation (1). Among them, MB represents the US broad money supply, FR represents the US federal funds interest rate, CRB represents the international commodity price index, EXC represents the exchange rate of RMB against the US dollar, FDI represents foreign direct investment, EXP and IMP represent China's total exports to the United States and China's total imports from the United States respectively, and p is the selected lag order.

$$A_0 \begin{bmatrix} MB_t \\ FR_t \\ CRB_t \\ EXC_t \\ FDI_t \\ EXP_t \\ IMP_t \end{bmatrix} = A_1 \begin{bmatrix} MB_{t-1} \\ FR_{t-1} \\ CRB_{t-1} \\ EXC_{t-1} \\ FDI_{t-1} \\ EXP_{t-1} \\ IMP_{t-1} \end{bmatrix} + A_2 \begin{bmatrix} MB_{t-2} \\ FR_{t-2} \\ CRB_{t-2} \\ EXC_{t-2} \\ FDI_{t-2} \\ EXP_{t-2} \\ IMP_{t-2} \end{bmatrix} + \dots + A_p \begin{bmatrix} MB_{t-p} \\ FR_{t-p} \\ CRB_{t-p} \\ EXC_{t-p} \\ FDI_{t-p} \\ EXP_{t-p} \\ IMP_{t-p} \end{bmatrix} \quad (1)$$

The data research period is from March 2020 to November 2021. The US federal fund interest rate FR and the international commodity price index CRB are from the IMF, the exchange rate EXC is from the People's Bank of China, foreign direct investment FDI is from the World Bank database, and the import and export volume of Sino-US trade is from the China Statistical Yearbook.

3.2. The Impact of Monetary Policy on Intermediate Economic Variables

Logarithmic processing and unit root test were performed on the variables, and the variables remained stable at a significance level of 5%. The results of AR feature root test show that the feature roots of the model feature equation all fall within the unit circle, indicating that the model has stability. Under the positive impact of one unit of broad money supply in the United States, the changes of international commodity prices, exchange rates, foreign direct investment and interest rates are as follows: (1) At first, the exchange rate of RMB against the

US dollar was negative to the equilibrium state, and then positive to the equilibrium state at a certain extent; (2) The impact of quantitative monetary policy in the United States has had an immediate effect of a decrease in the federal funds rate, which continued to decline in the first two periods and reached its lowest point of -0.3 in the eighth period. The implementation of quantitative easing monetary policy in the United States has a significant medium to long-term inhibitory effect on the US federal funds rate; (3) Foreign direct investment has maintained a certain degree of positive and balanced state from the 4th to the 8th period, which means that US dollar ultra quantitative easing will have a positive promoting effect on foreign direct investment in both the short and long term; (4) Under the positive impact of the US money supply, the international commodity price index began to rise and reached the maximum in the fourth period. Subsequently, it showed a downward trend and returned to an equilibrium level in the 6th period. Logarithmic processing and unit root test were performed on the variables, and the variables remained stable at a significance level of 5%. The results of AR feature root test show that the feature roots of the model feature equation all fall within the unit circle, indicating that the model has stability. Under the positive impact of one unit of broad money supply in the United States, the changes of international commodity prices, exchange rates, foreign direct investment and interest rates are as follows: (1) At first, the exchange rate of RMB against the US dollar was negative to the equilibrium state, and then positive to the equilibrium state at a certain extent; (2) The impact of quantitative monetary policy in the United States has had an immediate effect of a decrease in the federal funds rate, which continued to decline in the first two periods and reached its lowest point of -0.3 in the eighth period. The implementation of quantitative easing monetary policy in the United States has a significant medium to long-term inhibitory effect on the US federal funds rate; (3) Foreign direct investment has maintained a certain degree of positive and balanced state from the 4th to the 8th period, which means that US dollar ultra quantitative easing will have a positive promoting effect on foreign direct investment in both the short and long term; (4) Under the positive impact of the US money supply, the international commodity price index began to rise and reached the maximum in the fourth period. Subsequently, it showed a downward trend and returned to an equilibrium level in the 6th period.

3.3. The Impact of Various Channels on China's Import and Export

Under the impact of the positive disturbance of exchange rate, interest rate, foreign direct investment, international commodity prices and the supply of broad money in the United States, the changes of Sino-US import and export trade are as follows: (1) The change of RMB exchange rate has brought about the immediate effect of China's export reduction, which is reflected in the long-term positive promotion of imports. (2) When a positive impact of one unit of the US federal funds rate occurred, China's imports and exports did not immediately respond. (3) When foreign direct investment generates a positive impact of one unit, China's overall exports to the United States show a downward trend followed by an upward trend; The import reached its highest peak of 0.03 in the first phase, and then decreased to the minimum value of -0.03. (4) After a positive impact of one unit on international commodity prices, China's export scale to the United States shows a trend of first decreasing and then increasing, and reaches its maximum peak of 0.04 in the seventh period; It has a significant inhibitory effect on imports. (5) Under the positive impact of one unit of broad money supply in the United States, China's exports in the first four periods remained positive and balanced, reaching the maximum peak of 0.02 in the third period; China's imports gradually decreased from the second phase and returned to the horizontal position. Under the impact of the positive disturbance of exchange rate, interest rate, foreign direct investment, international commodity prices and the supply of broad money in the United States, the changes of Sino-US import and export trade are as follows: (1) The change of RMB exchange rate has brought about the immediate effect of China's export reduction, which is reflected in the long-term positive promotion of imports. (2) When a

positive impact of one unit of the US federal funds rate occurred, China's imports and exports did not immediately respond. (3) When foreign direct investment generates a positive impact of one unit, China's overall exports to the United States show a downward trend followed by an upward trend; The import reached its highest peak of 0.03 in the first phase, and then decreased to the minimum value of -0.03. (4) After a positive impact of one unit on international commodity prices, China's export scale to the United States shows a trend of first decreasing and then increasing, and reaches its maximum peak of 0.04 in the seventh period; It has a significant inhibitory effect on imports. (5) Under the positive impact of one unit of broad money supply in the United States, China's exports in the first four periods remained positive and balanced, reaching the maximum peak of 0.02 in the third period; China's imports gradually decreased from the second phase and returned to the horizontal position.

3.4. Variance Decomposition

On the basis of impulse response analysis, this article conducts variance decomposition on China's export trade, and the results are shown in Table 1. From the perspective of four channel paths: (1) Exchange rate channel (LNEXC). The impact of the exchange rate between China and the United States on China's export trade to the United States is mainly reflected in the short term, and the long-term impact is not significant, which is consistent with the results of the previous pulse response analysis. (2) Interest Rate Channel (LNFR). The US federal funds rate accounted for 0% in the first period and gradually increased to 2.022% over time, but the overall impact was limited. (3) Foreign Direct Investment Channel (LNFDI). The explanatory power of foreign direct investment on changes in China's export trade has gradually increased from 2% in the first phase to 12.157% in the tenth phase. As time goes by, the explanatory power of foreign direct investment on China's export trade to the United States continues to increase. (4) International Commodity Price Channel (LNCRB). The proportion of international commodity prices explaining China's export fluctuations is constantly increasing, and there is a clear long-term impact. (5) On the whole, the U.S. broad money supply (LNM2) accounted for less than 2% of China's export fluctuations in the first two periods. The direct impact of quantitative easing monetary policy is not prominent.

Table 1. Variance Decomposition Results of China's Export Trade

period	standard deviation	LNCRB	LNEXC	LNFDI	LNFR	LNM2	LNEXP	LNIMP
1	0.078	0.526	28.156	2.000	0.000	1.002	71.318	0.000
2	0.137	3.382	24.680	2.385	0.002	1.177	67.751	0.622
3	0.183	5.650	22.875	4.692	0.117	2.399	61.833	4.433
4	0.208	9.657	20.941	7.213	1.079	2.390	56.484	6.235
5	0.226	9.333	21.560	8.209	1.315	2.728	51.011	7.845
6	0.240	10.403	21.081	11.132	1.285	3.051	55.604	8.445
7	0.260	11.032	20.334	12.327	1.496	4.052	49.612	5.147
8	0.261	12.142	19.736	12.245	1.874	5.093	44.486	8.424
9	0.269	11.896	19.336	13.217	2.051	6.263	44.138	8.099
10	0.275	12.514	18.852	12.157	2.022	7.372	43.556	9.527

The results of the variance analysis of China's import trade are shown in Table 2. From the perspective of four transmission pathways: (1) Exchange rate channel (LNEXC). The exchange rate will have a long-term impact on the fluctuation of China's import trade and its effect is the most significant. The explanatory power of the exchange rate on China's import trade in the first period is only about 5%, and it increased to 27.145% in the tenth period. (2) Interest Rate

Channel (LNFR). The explanatory power of interest rates on fluctuations in China's import trade has always been relatively small, and has not had a significant impact on China's import trade. (3) Foreign Direct Investment Channel (LNFDI). There is a time lag in the positive effect of foreign direct investment on China's import trade. The explanatory power for the first period was 5.649%, and the subsequent fluctuation increased to 8.796%. (4) International Commodity Price Channel (LNCRB). The explanatory power of international commodity prices is about 12%, followed by small fluctuations around this value. (5) On the whole, the direct impact of the US broad money supply (LNM2) on China's import trade is not significant, and the explanation is weak.

Table 2. Variance Decomposition Results of China's Import Trade

period	standard deviation	LNCRB	LNEXC	LNFDI	LNFR	LNM2	LNEXP	LNIMP
1	0.078	12.953	5.709	5.649	0.329	1.000	16.892	57.468
2	0.137	9.722	21.973	6.434	0.433	1.029	16.215	44.194
3	0.183	10.421	30.902	7.544	0.452	0.934	17.420	32.327
4	0.208	12.599	30.089	8.399	0.875	0.865	18.313	28.860
5	0.226	12.517	29.827	9.227	0.905	0.880	18.069	28.575
6	0.240	12.524	29.712	9.221	0.912	0.922	18.118	28.592
7	0.260	12.420	29.447	9.642	0.954	0.914	18.262	28.360
8	0.261	12.239	28.802	9.476	1.078	0.944	19.895	27.566
9	0.269	12.401	28.001	9.154	1.196	0.970	21.546	26.733
10	0.275	12.418	27.145	8.796	1.237	0.995	23.645	25.765

4. Conclusion

This article uses the SVAR model to empirically measure the spillover effects and transmission paths of quantitative easing monetary policy in the United States. The results show that: (1) the direct impact of quantitative easing monetary policy in the United States on Sino US trade is less than the indirect impact. (2) Exchange rates, international commodity prices, and foreign direct investment are the main factors that explain the fluctuations in Sino-US trade. (3) The appreciation of the RMB exchange rate will have a negative impact on China's exports and a positive promoting effect on imports; The impact of interest rates is not significant; Foreign direct investment has a positive effect on improving foreign trade conditions, while the rise in international commodity prices has worsened trade conditions. Based on the above conclusions, this article proposes the following suggestions: (1) Maintain the independence of monetary policy, take the initiative, and firmly implement the dual cycle development strategy. (2) Pay close attention to the adjustment of US monetary policy and take targeted measures to address its spillover effects. (3) Establish a sound commodity management mechanism, improve commodity risk avoidance and management mechanisms, increase efforts to attract foreign direct investment, and promote industrial transformation and upgrading. (4) Accelerate the transformation of import and export trade, enhance the discourse power in international trade, and strive to have the power to price important products, formulate trade rules, and dominate trade activities in international trade.

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