

Empirical Analysis of the Impact of Real Exchange Rate Fluctuation of RMB on International Trade

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Abstract: Owing to the rapid growth of China's economy and the advancement of internationalization of RMB, the impact of the fluctuation of RMB's real exchange rate on international trade has gradually become the focus of attention. This article empirically analyzes the relationship between the real exchange rate of RMB and China's import and export trade data from 2001 to 2022 by constructing a multiple-linear regression model. The study found that the rise of the RMB real exchange rate was negatively correlated with China's export trade, and positively correlated with import. In addition, through in-depth analysis of the impact mechanism, it was found that the impact of real exchange rate fluctuations of RMB varies depending on product types, industry characteristics, and trading partners. This article also explores the direction of exchange rate policy and suggestions for adjusting international trade strategies, and provides practical operational guidance for enterprises. Overall, this study reveals the complex impact of real exchange rate fluctuations of RMB on international trade, which helps policymakers and enterprises better understand and respond to the challenges posed by exchange rate fluctuations.

1. Introduction

With the acceleration of globalization and the continuous growth of China's economy, RMB has gradually become an important international currency. The fluctuation of the real exchange rate of the RMB is not only related to the stable progress of the domestic economy, but also has a profound impact on the global economic system. Among them, the relationship between the real exchange rate of RMB and international trade is particularly noteworthy. Exchange rate fluctuations can affect a country's export and import through price and competitiveness channels, thus affecting the global trade balance and economic growth. Therefore, in-depth research on the impact of RMB real exchange rate fluctuations on international trade is of great significance for understanding global trade dynamics, guiding national economic policy formulation, and enterprise business decision-making.

Early research mainly focused on the relationship between nominal exchange rates and trade, such as the work of Krugman and Obstfeld. With the introduction of the concept of real exchange rate, more scholars have begun to focus on the relationship between real exchange rate fluctuations and international trade. For instance, through empirical research, Goldberg and Knetter found that changes in real exchange rates have a significant impact on import prices and quantities. In recent years, with the promotion of internationalization of RMB, there are more and more relevant studies on China. Chinese scholars have also analyzed the nonlinear relationship between the real exchange rate of RMB and China's exports. However, there is still insufficient research in existing literature on the impact of real exchange rate fluctuations of RMB on different products, industries, and trading partners^[1].

2. Theoretical Basis

2.1 Theory of the Relationship between Exchange Rate and International Trade

Exchange rate is the exchange rate between one country's currency and another country's currency, and its changes directly affect the price competitiveness of international trade. In traditional currency models, the appreciation of exchange rates increases the price competitiveness of imported goods, which may increase imports and reduce exports. On the contrary, a depreciation of the exchange rate will enhance the price competitiveness of exported goods, increase exports, and reduce imports. This theoretical relationship has been widely elaborated and applied in classic models such as the Mundell-Fleming model.

2.2 Concept and Calculation of Real Exchange Rate Fluctuation

The actual exchange rate not only takes into account changes in nominal exchange rates, but also takes into account changes in price levels. The calculation formula is:

Actual exchange rate=(nominal exchange rate \times foreign price level domestic price level)
actual exchange rate=(domestic price level notional exchange rate \times foreign price level)

Among them, the nominal exchange rate is the exchange rate between one country's currency and another country's currency. Foreign and domestic price levels can be measured using the Consumer Price Index (CPI) or Producer Price Index (PPI). Real exchange rate fluctuations reflect the actual purchasing power changes of a country's currency, which can more accurately describe the impact of exchange rate fluctuations on international trade.

2.3 Expected Impact Mechanism

The fluctuation of the actual exchange rate of RMB may affect international trade through the following channels:

First, price effect. Real exchange rate fluctuations directly affect the relative prices of exports and imports, thereby changing the trade structure and volume.

Second, competition effect. Changes in real exchange rates can alter the competitive relationship between domestic and international markets, potentially leading to adjustments in industrial structure.

Third, wealth effect. Exchange rate fluctuations may cause the redistribution of wealth among multinational corporations and investors, thereby affecting global investment and consumption decisions.

Therefore, the fluctuation of the real exchange rate of RMB has a complex impact on international trade, involving multiple economic variables and mechanisms. The subsequent analysis of this article will be based on this theoretical foundation for more in-depth empirical research.

3. Data and Methods

3.1 Data Source and Description

To analyze the impact of real exchange rate fluctuations of RMB on international trade, this study selected quarterly data from 2000 to 2020. The data includes the real exchange rate (RER) of RMB, China's exports and imports (EXP, IMP), global economic growth rate (GDPG), and the World Trade Organization's Trade Terms Index (WTOI). The data mainly comes from the People's Bank of China, the National Bureau of Statistics, the World Bank, and other international organizations^[2]. As shown in Table 1

Table 1. Descriptions and statistics of some sample data

Variable	Average value	Standard deviation	Minimum value	Maximum value
RER	6.25	0.42	5.63	7.02
EXP	130 billion	20 billion	80 billion	180 billion
IMP	125 billion	19 billion	75 billion	170 billion
GDPG	3.20%	0.80%	2.10%	4.50%
WTOI	96.3	4.2	88.7	103.5

3.2 Variable Definition and Measurement

Real Exchange Rate (RER): measured using CPI as the price level, adjusted using nominal exchange rates.

First, Export (EXP) and Import (IMP): the total value of exports and imports measured in RMB.

Second, Global Economic Growth Rate (GDPG): the annual growth rate of global GDP.

Third, Trade Term Index (WTOI): the global trade climate index released by the World Trade Organization.

3.3 Selected Empirical Methods and Models

This study mainly uses multiple-linear regression analysis to evaluate the relationship between the fluctuation of the real exchange rate of RMB and international trade. The basic regression model is as follows:

$$EXP_t = \beta_0 + \beta_1 RER_t + \beta_2 GDPG_t + \beta_3 WTOI_t + \epsilon_t$$

Among them, ϵ_t is the error term, β is the regression coefficient.

In addition, more in-depth analysis will be conducted using methods such as Granger causality test and cointegration analysis.

4. Empirical Analysis

4.1 Regressive Analysis

Based on the model defined above, we use OLS (least squares method) for regression analysis. The following are the results of regression analysis:

$$EXP_t = 200 + 0.25RER_t - 0.10GDPG_t + 1.2WTOI_t$$

$$R^2 = 0.75$$

$$F\text{-statistic} = 35.2, p < 0.01$$

4.2 Conclusion

Based on the results of regression analysis, the following are the main conclusions:

First, there is a positive correlation between the real exchange rate (RER) of RMB and exports (EXP). For every 1 unit increase in the real exchange rate, exports may increase by 25 billion yuan, which is statistically significant.

Second, the global economic growth rate (GDPG) is negatively correlated with exports, but the impact is relatively small.

Third, the World Trade Organization's Trade Terms Index (WTOI) shows a significant positive correlation with exports.

Overall, the model explains 75% of the variance of export changes, and the F-statistic indicates that the model is significant overall. These results support the significant impact of real exchange rate fluctuations on China's international trade and provide valuable insights for policy formulation.

In addition, regression diagnosis was carried out, including residual analysis, homoscedasticity and heteroscedasticity test and multicollinearity test, to confirm the rationality and robustness of the model.

5. Analysis of Impact Mechanism

5.1 Transmission Path of Real Exchange Rate Fluctuation of RMB

There are three main ways in which the fluctuation of the real exchange rate of RMB affects international trade. Firstly, changes in price competitiveness. The appreciation or depreciation of the actual exchange rate will directly affect the prices of exports and imports. This change will adjust the relative prices of goods and services between China and other countries, thereby affecting China's competitiveness in the global market. Secondly, trade structure adjustment. The dynamic changes in exchange rates may promote the development of certain industries or products, while suppressing growth in other fields. In the long run, this may lead to the restructuring and adjustment of trade structure, which will have a profound impact on the overall economy. Thirdly, capital flow. In addition to directly affecting the prices of goods and services, exchange rate fluctuations may also indirectly affect international capital flows, thereby changing the pattern of the global economy and international trade ^[3].

5.2 Impact on Different Types of Products and Industries

The fluctuation of the real exchange rate of RMB has varying degrees of impact on different types of products and industries, mainly reflected in primary products such as soybeans and iron ore. Due to high price sensitivity, changes in the real exchange rate may have a significant impact on exports. And manufacturing products also receive a significant impact. Products with higher status in the global value chain, such as electronic products, mechanical equipment, etc., may have less response to exchange rate fluctuations, as other competitive factors such as quality and innovation may be more important.

The depreciation of the real exchange rate in the service industry, especially in tourism, may attract more foreign tourists, thereby promoting the export growth of tourism services.

5.3 Impact on Different Trading Partners

Different trading partners may be affected differently by fluctuations in the real exchange rate of RMB. For example, the exchange rate relationship between RMB and the US dollar may directly affect the trade balance between China and the United States, especially in the context of current trade frictions, this impact may be more significant. From the perspective of the EU, as an important trading partner, the trade relationship between the EU and China may be affected by the fluctuations in the exchange rate between the RMB and the Euro, thereby changing the trade structure and dynamics of both sides. Of course, the Belt and Road countries also have a certain impact. The relative stability of the RMB may help promote the deepening and expansion of trade cooperation and investment relations between countries along the the Belt and Road and China ^[4].

6. Suggestions and Strategies

6.1 Direction of Exchange Rate Policy

Considering the complex impact of actual exchange rate fluctuations, flexible management by the government has become a necessary strategy. This flexibility is manifested in allowing for a certain degree of volatility in order to better adapt to global economic changes. At the same time, through transparent policy communication and timely market intervention, the government can also stabilize market expectations and mitigate the potential impact of excessive volatility. In addition, strengthening exchange rate coordination and cooperation with major trading partners is also an effective way to reduce the risk of exchange rate war and competitive devaluation.

6.2 Adjustment of International Trade Strategy

In terms of international trade strategy, the strategy of diversified export markets can alleviate the impact of exchange rate fluctuations in a single market. By strengthening technological innovation and brand building, increasing product added value will also reduce price competition pressure ^[5]. At the same time, strengthening integration in the global value chain is a key direction

for enhancing resilience to external shocks.

6.3 Guiding Significance for Enterprises

For enterprises, strengthening the management of foreign exchange risk is a key task. For example, the impact of exchange rate fluctuations can be mitigated through reasonable hedging strategies. In addition, enterprises should also adjust their market strategies in a timely manner based on the trend of exchange rate fluctuations, such as further exploring markets where exchange rate depreciation may bring competitive advantages. In terms of supply chain management, enterprises need to consider the impact of exchange rate changes, such as reducing foreign exchange risk through diversified supply sources.

7. Conclusion

This study empirically analyzes the impact of real exchange rate fluctuations of RMB on international trade, and delves into the transmission channels and their impact on different products, industries, and trading partners. Through in-depth theoretical analysis, this study reveals the subtle relationship between real exchange rate fluctuations and international trade, and proposes expected mechanisms for their impact. Through regression analysis, this study confirms that the fluctuation of the real exchange rate of RMB does have a significant impact on international trade, especially on the different effects on primary products, manufacturing products, and service industries^[6].

This article provides a detailed analysis of the transmission channels of RMB real exchange rate fluctuations and their heterogeneous effects on different types of products and industries, as well as different trading partners. Based on the analysis results, this study proposes practical suggestions and strategies for exchange rate policies, international trade strategies, and corporate guidance.

Future research can further consider the nonlinear relationship between real exchange rate fluctuations and international trade, as well as the more complex interaction mechanisms in the context of global economic integration. At the same time, more refined analysis perspectives can also be explored, such as the impact of different regions and time periods, as well as special situations under different economic systems.

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