

The impact of RMB exchange rate fluctuations on trade development under the RCEP framework

Yuhao Feng

School of Jinqiu International Product Launch, Jinan, Shandong, 250000, China

ABSTRACT

This study explores the impact of RMB exchange rate fluctuations on trade development under the RCEP framework, analyzes the mechanism of exchange rate fluctuations on trade balance, spatial spillover effects, and new characteristics of regional trade, and provides theoretical basis and practical suggestions for optimizing exchange rate policies and promoting regional economic integration.

KEYWORDS

RCEP; Renminbi exchange rate; Trade development

1 Introduction

The Regional Comprehensive Economic Partnership (RCEP) was signed on November 15, 2020 and officially came into effect in 2022, becoming the world's largest free trade agreement, covering the ten ASEAN countries as well as China, Japan, South Korea, Australia, and New Zealand. RCEP covers nearly half of the world's population and accounts for about one-third of the gross domestic product, demonstrating enormous market potential. In 2023, China's total import and export volume to the other 14 RCEP member countries reached 12.6 trillion yuan, an increase of 5.3% compared to 2021, highlighting the importance of studying the economic and trade relations between China and RCEP countries. At the same time, since the market-oriented reform of the RMB exchange rate in 2005, exchange rate fluctuations have had a profound impact on China's economic and trade relations with RCEP countries, increasing uncertainty.

2 Literature review and current status

2.1 Literature review

The traditional view holds that exchange rates affect trade through price transmission mechanisms, but there are differences in empirical conclusions. Wei Junjie (2024) found a negative correlation between short-term exchange rates and imports and exports based on Chinese data, but in the long run, it is dominated by income levels, revealing policy lag. Pham et al. (2023) found in their study of the five ASEAN countries that there is asymmetric transmission of exchange rate shocks under inflation targeting, with oil prices as the core variable, confirming the country differences in short-term effects. However, Barkoulas and Baum (2002) pointed out that exchange rate fluctuations have limited impact on trade flows and suggested exploring other factors. Recent research has emphasized that intermediate goods trade under the global value chain is less sensitive to exchange rates, indicating that production networks have the ability to hedge risks.

Research has confirmed that exchange rate fluctuations have cross-border transmission. Liu Yang (2024) found that there is a significant neighbor effect in the European region, reflecting the synergy of economic policies. Olamide et al. (2022) revealed through the GARCH model that exchange rate instability in SADC countries generates negative multiplier effects through the "inflation growth" channel, verifying the applicability of menu cost theory in developing countries and highlighting the vicious cycle between currency depreciation and inflation expectations. Chen Qian (2024) found that exchange rate fluctuations generate a "butterfly effect" through the industrial chain, while Yang Jiahui (2024) emphasized the need to achieve trade balance through multidimensional strategies such as optimizing industrial structure, highlighting the importance of policy coordination.

Regional economic integration promotes the enhancement of industrial complementarity. According to Chen et al. (2023) based on commodity segmentation data, the trade dependence within the RCEP region showed industry heterogeneity from 2001 to 2018: the dependence of technology intensive products outside the region reached 68.5%, and the proportion of labor-intensive products within the region significantly increased, forming a "dual circulation" feature. The "triangular trade network" of China, Japan, and South Korea in the field of electronic products accounts for 42% of regional trade volume, highlighting the asymmetric influence of major powers. The RCEP trade presents three major characteristics: the continuous strengthening of growth momentum in high-tech industries within the region, the refinement of industrial division of labor promoting the improvement of intra industry trade, and the unified rules

reducing the impact of exchange rate fluctuations.

2.2 China's trade status with RCEP partner countries

In 2022, China's total imports from RCEP countries reached 950.286 billion US dollars, an increase of 130% compared to 2008, with a compound annual growth rate (CAGR) of 6.7%. Except for a brief pullback in 2015-2016 due to global commodity price declines and economic cycles, all other years have maintained positive growth. The export value jumped from 329.138 billion US dollars in 2008 to 990.838 billion US dollars in 2022, an increase of 201%, with a CAGR of 8.1%. Among them, in 2013, it exceeded the threshold of 500 billion US dollars, in 2020, during the COVID-19 epidemic, it rose by 11.2% against the trend, and in 2022, the export volume reached a new record high.

The proportion of trade showed a V-shaped fluctuation, with a slight decrease from 29.95% to 28.34% from 2010 to 2013. From 2014 to 2020, an upward trend was initiated, reaching a peak of 31.71% in 2020. From 2021 to 2022, it fell back to 30.12% due to disruptions in the supply chain caused by the epidemic.

After the RCEP came into effect, policy dividends became apparent. In the first year of its implementation in 2022, tariff reductions within the region covered over 90% of goods, and the utilization rate of rules of origin increased by 18 percentage points year-on-year. Trade resilience has been enhanced. During the epidemic, China's trade share with RCEP countries increased to 32.4% in 2020 (global export share 26.4%), and 30.8% in 2021 (global import share 26.9%). Emerging fields have emerged, and the average annual growth rate of digital trade imports and exports has reached 25%. The proportion of cross-border e-commerce has increased from 8.7% in 2018 to 19.2% in 2022.

Strategic value highlighted, market position stable: RCEP member countries continue to maintain China's largest trading partner status, industrial chain security: for every 1 percentage point increase in the proportion of intra regional trade, the risk index of supply chain interruption decreases by 0.8, and the internationalization of the RMB: the proportion of RMB settlement reached 34.6% in 2022, an increase of 12.7 percentage points from 2018.

Table 1 Total Import and Export Trade Volume and Proportion between China and RCEP Countries from 2008 to 2022 (in billions of US dollars)

Year	Import	Export	Proportion (%)	Year	Import	Export	Proportion (%)
2008	4190.68	3291.38	29.23	2016	5789.88	5210.21	29.81
2009	3291.38	2806.19	29.99	2017	6836.98	5660.04	30.84
2010	5346.21	3579.55	29.95	2018	7715.81	6279.13	30.29
2011	6379.54	4389.11	29.58	2019	7615.21	6676.96	31.21
2012	6328.08	4851.74	28.89	2020	7794.92	6982.69	31.71
2013	6520.85	5270.23	28.34	2021	9940.07	8731.45	30.91
2014	6684.06	5656.54	28.70	2022	9502.86	9908.38	29.89
2015	5919.77	5594.19	29.15				

2.2.1 Materials and methods

(1) Variable selection and data selection

Select the annual panel data of RCEP member countries (China, Japan, South Korea, Australia, New Zealand, and ten ASEAN countries) from 2015 to 2024. Data source: RMB exchange rate data from the People's Bank of China, trade data from UN Comtrade, the World Bank, etc., macroeconomic data from the World Bank, IMF, etc.

(2) Selection of variables

· Dependent variable (dependent variable):

Trade Development Level (TRADE): RCEP and the total import and export volume between countries/regions within the region and China.

· Independent variable (explanatory variable)

Renminbi Exchange Rate Fluctuations (NEER): Reflecting the exchange rate fluctuations of the Renminbi against a basket of currencies.

· Control variables

GDP growth rate: reflects the economic growth of countries/regions within the RCEP region.

Inflation rate: reflects changes in the price levels of countries/regions within the RCEP region.

Foreign Direct Investment (FDI): Reflect the situation of attracting foreign investment to countries/regions within the RCEP region.

(3) Model construction

$$\text{Trade_it} = \alpha + \beta_1 * \text{ExchangeRate_it} + \beta_2 * \text{ControlVariables_it} + \epsilon_it$$

Trade_it represents the trade development level indicator of the i-th country/region in the t-th period.

ExchangeRate_it represents the RMB exchange rate fluctuation indicator for the i-th country/region in the t-th period.

ControlVariables_it represents the controlled variable for the i-th country/region in the t-th period.

ϵ_it represents the random error term.

(4) Descriptive statistics

Using SPSS for regression analysis and descriptive statistical analysis of the objective function, the statistical results show that there is a significant gap in trade development levels and different trade situations and policies among countries in the nine years from 2015 to 2023, which will affect trade activity data. The GDP growth rate reflects changes in the economic cycle, with a decline during economic downturns and an increase during periods of prosperity. The inflation rate reflects the supply-demand relationship, which affects the inflation rate. FDI data fluctuates greatly due to differences in investment environments, policies, regulations, and market sizes among countries. The exchange rate policy of a country affects the fluctuation of the Renminbi exchange rate (NEER), and international capital flows will have an impact on the exchange rate.

Table 2 Descriptive statistics

	N	minimum value	maximum value	average value	standard deviation
trade	117	2	2839680	170642.47	602663.370
GDPth	135	-12.0164	9.6908	3.310568	3.6236976
inflation	135	-17.6127	24.4217	2.771320	5.0540938
FDI	135	-42.9391	3440.7498	316.335012	579.8919374
neer	133	.1400	9324.5000	804.025882	1920.6939521

(5) Empirical results

ADF inspection

This article uses SPSS software and ADF method to perform unit root test on the sample data to examine the stationarity of the data. The test results are shown in Table 3.

Table 3 ADF stationarity test results

variable	Differential order	t	P	AIC	critical value		
					1%	5%	10%
trade	0	-2.897	0.046**	1322.861	-3.498	-2.891	-2.583
	1	-6.677	0.000***	1311.838	-3.5	-2.892	-2.583
	2	-14.625	0.000***	1319.595	-3.507	-2.895	-2.585

***, **, * represent significance levels of 1%, 5%, and 10%, respectively

According to the test results in Table 3, the level of trade development has a t-statistic of -2.897 and a p-value of 0.046, which is significant at the 5% significance level (p-value less than 0.05), rejecting the null hypothesis and indicating that the original sequence of the variable trade is stationary at the 5% significance level. When the difference order is 1, the t-statistic is -6.677 and the p-value is 0.000, which is extremely significant at the 1% significance level (p-value less than 0.01), rejecting the null hypothesis and indicating that the variable trade is stationary after first-order difference. Moreover, from the AIC value (1311.838), it is smaller than the AIC value when the difference order is 0, indicating that the model fitting effect is better after first-order difference.

Cointegration test :

This article uses Johansen's cointegration test, and at the 5% and 10% significance levels, there are at least 5 cointegration relationships between variables; At a significance level of 1%, there are at least three cointegration relationships between variables. This indicates a significant long-term equilibrium relationship between these time series variables.

Table 4 Cointegration test results

Null Hypothesis	Eigenvalue	Trace (the largest root)	10% critical value	5% critical value	1% critical value
No cointegration relationship	0.335	104.466	65.82	69.819	77.82
Up to 1 cointegration	0.263	64.966	44.493	47.855	54.681
Up to 2 cointegration	0.146	35.308	27.067	29.796	35.463
Up to 3 cointegration	0.116	20.037	13.429	15.494	19.935
Up to 4 cointegration	0.079	8.033	2.705	3.841	6.635

Benchmark Regression :

Column (1) of Table 5 shows univariate regression, while columns (2), (3), and (4) gradually add control variables. The coefficient size and significance level of the control variable, the RMB exchange rate, did not change significantly, indicating that the impact of RMB exchange rate fluctuations on trade import and export volume is relatively robust. The exchange rate of RMB is negatively correlated with the level of trade.

The formula for the model :

$$\text{Trade_it} = -105573.22 + 6.710 \cdot \text{Neer} + 7811.731 \cdot \text{GDPth} - 4082.858 \cdot \text{Inflation} + 753.057 \cdot \text{FDI}$$

The absolute values of the coefficient t-statistic of NEER are all less than 1.96, and the impact on the dependent variable is not significant at the 5% significance level. From a macroeconomic perspective, this may indicate that in the

Table 5 Benchmark regression results

	(1)	(2)	(3)	(4)
NEER	-32.502 (-1.201)	-44.792 (-0.151)	-43.984 (-1.606)	6.710 (0.712)
GDPth		31466.539 (2.179)	31431.409 (2.169)	7811.731 (0.817)
Inflation			-4180.606 (-0.415)	-4082.858 (-0.626)
FDI				753.057 (12.784)
Constant	193746.866 (3.291)	96540.819 (1.320)	107385.273 (1.378)	-105573.222* (-1.988)
R2	0.012	0.05	0.052	0.606

current economic environment, fluctuations in the nominal effective exchange rate have a relatively small impact on the economic indicators represented by the dependent variable. This may be due to the strong exchange rate elasticity of the economic system, which can buffer the impact of exchange rate fluctuations through other economic adjustment mechanisms such as domestic industrial structure adjustment, trade policies, etc;

The coefficient of GDPth is significantly positive, indicating that under the economic environment set by these two models, an increase in GDP growth rate will drive an increase in the dependent variable. From a macroeconomic perspective, GDP growth rate reflects the overall growth trend of a country or region's economy. When the economy grows rapidly, it will affect various economic sectors through a series of transmission mechanisms, thus having a positive impact on the dependent variable. For example, economic growth may lead to increased employment, higher household income, consumption and investment growth, which in turn affect the economic indicators represented by the dependent variable.

The coefficient t-statistic of inflation rate in models (3) and (4) has an absolute value less than 1.96, indicating no significant impact on the dependent variable. From a macroeconomic perspective, this may mean that fluctuations in inflation rates have little impact on the economic indicators represented by the dependent variable in the current economic operation. This may be because economic entities have certain expectations and adaptability to inflation, and can respond to changes in inflation by adjusting their own economic behavior; Or the transmission mechanism of inflation may have certain obstacles in the economic system, making it difficult for the impact of inflation to be effectively transmitted to the dependent variable.

In model (4), the coefficient of FDI is significantly positive, and the absolute value of the t-statistic is large. This indicates that foreign direct investment has a significant positive impact on the dependent variable. From a macroeconomic perspective, the inflow of FDI can bring resources such as capital, technology, and management experience, promote the development and upgrading of domestic industries, increase employment opportunities, improve production efficiency, and thus drive the growth of economic indicators represented by the dependent variable. For example, the entry of foreign-funded enterprises may drive the development of related industries, promote the formation of industrial clusters, and thus have positive spillover effects on the entire economy. Due to the significant positive impact of FDI in model (4), the government can formulate relevant policies to attract more foreign direct investment, such as improving the investment environment, providing preferential policies, etc., to promote economic growth and improve the economic indicators represented by the dependent variable.

Heteroscedasticity test

The existence of heteroscedasticity can have many adverse effects on regression analysis results, such as rendering parameter estimates ineffective, causing hypothesis testing to fail, and reducing model prediction accuracy. Therefore, it is crucial to test for the presence of heteroscedasticity when conducting regression analysis. The following is the method and analysis of heteroscedasticity test.

From these scatter plots, it can be seen that there is no significant sign of heteroscedasticity in the independent variables Neer, GDPth, Inflation, FDI, and standardized predicted values, indicating that the variance of residuals does not show a regular change with the value of the independent variables.

2.2.2 Conclusions and recommendations

(1) Conclusion

This article conducts a unit root test on the trade development indicators of RCEP countries. The variable trade shows that the original sequence is stationary at a significance level of 5%, and becomes more stationary at a significance level of 1% after first-order differencing. Moreover, the fitting effect of the first-order differencing model is better than that of

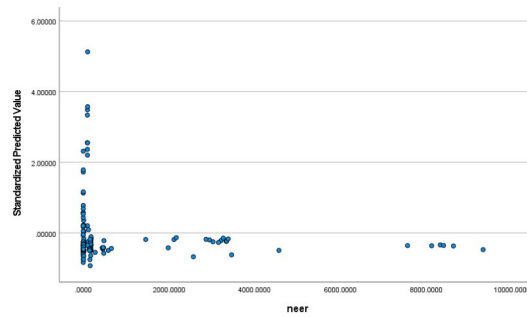


Figure 1 Scatter plot of neer and standardized predicted values

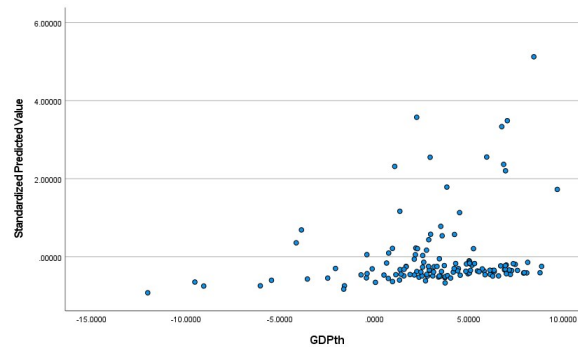


Figure 2 Scatter plot of GDPth and standardized predicted values

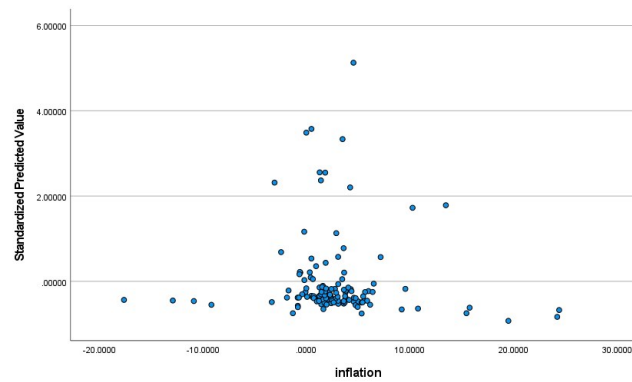


Figure 3 Scatter plot of inflation and standardized predicted values

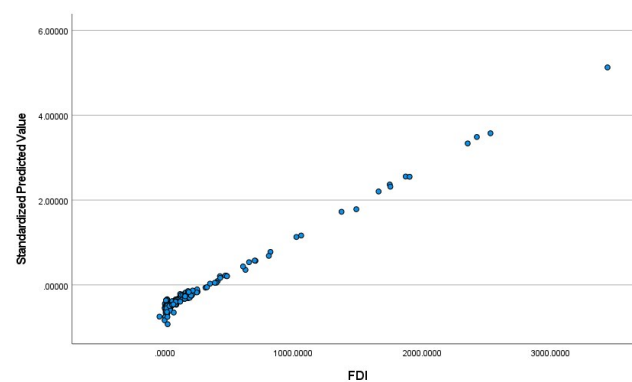


Figure 4 Scatter plot of FDI and standardized forecast values

the second-order differencing. This indicates that some economic variables need to undergo differential processing to meet stationarity requirements, laying the foundation for subsequent regression analysis and avoiding spurious regression problems. A cointegration test was conducted, and at the 5% and 10% significance levels, there were at least 5 cointegration relationships between variables; At a significance level of 1%, there are at least three cointegration relationships. This fully demonstrates the significant long-term equilibrium relationship between the economic variables studied, which means that in the long run, these variables influence and constrain each other, jointly driving the economic system towards an equilibrium state.

According to the benchmark regression results, NEER did not show a significant impact on the dependent variable in any of the four models. The economic system itself has strong regulatory capabilities. With the development of the economy and the optimization and upgrading of industrial structure, enterprises may enhance their competitiveness and reduce sensitivity to exchange rate fluctuations through technological innovation, product differentiation, and other means. At the same time, the government's trade policies can also buffer the impact of exchange rate fluctuations to a certain extent, such as stabilizing the international trade pattern through measures such as export subsidies and trade barrier adjustments. When GDP grows, the scale of enterprise production expands and the demand for labor increases, thereby driving an increase in employment levels. With the increase in residents' income and consumption capacity, it further stimulates domestic demand and promotes a virtuous cycle of the economy. At the same time, as corporate profits increase and investment willingness rises, new investment projects continue to emerge, promoting industrial upgrading and technological innovation, injecting new impetus into sustained economic growth. The inflation rate has no significant impact on the dependent variable in models (3) and (4), which reflects that economic entities have gradually formed rational expectations and adaptability to inflation in long-term economic practice. When facing inflation, consumers will adjust their consumption behavior according to expectations, reserve goods in advance or choose more cost-effective consumption methods. Enterprises will also adjust their production plans, pricing strategies, and wage levels based on inflation expectations to reduce cost pressures caused by inflation. In addition, the transmission mechanism of inflation may have certain obstacles in the macroeconomic system. The implementation effect of monetary policy may be constrained by factors such as imperfect financial markets, heterogeneity of corporate and resident behavior, which may result in changes in inflation not being timely and effectively transmitted to the economic indicators represented by the dependent variable. This requires us to conduct in-depth research on the transmission mechanism of inflation, strengthen the coordination and cooperation between monetary policy and other macroeconomic policies, and improve the effectiveness and accuracy of policies. The significant positive impact of FDI coefficient in model (4) fully demonstrates the important driving role of foreign direct investment in macroeconomic development. The inflow of FDI not only brings scarce funds to the domestic market, alleviates the financing constraints of enterprises, but also brings advanced technology and management experience. These advanced technologies and management concepts can promote technological innovation and management level improvement of domestic enterprises, and drive the optimization and upgrading of industrial structure. At the same time, the establishment of foreign-funded enterprises has created a large number of employment opportunities, increased residents' income levels, thereby driving consumption growth and promoting economic prosperity and development. This indicates that the government should actively create a favorable investment environment, increase investment attraction efforts, attract more FDI inflows, and fully play its role in promoting economic growth and structural adjustment.

(2) Suggestion

Based on the above conclusions, this article proposes the following suggestions:

Firstly, in terms of exchange rate policy, although the current fluctuations in the Renminbi exchange rate (NEER) do not have a significant impact on the studied economic indicators, the potential impact of exchange rate fluctuations cannot be ignored as the degree of economic openness deepens. The government should continue to pay attention to the dynamics of exchange rates, improve the exchange rate formation mechanism, enhance exchange rate flexibility, and enable exchange rates to more accurately reflect market supply and demand relationships. At the same time, strengthen guidance on exchange rate risk management for enterprises, encourage them to use financial derivatives such as forward foreign exchange settlement and sale, foreign exchange options, etc., reduce the risks brought by exchange rate fluctuations, enhance their ability to cope with exchange rate changes, and stabilize international trade and investment activities.

Secondly, in terms of promoting economic growth, based on the significant positive impact of GDPth on the dependent variable in some models, the government should steadfastly promote sustained and stable economic growth. Increase investment in technological innovation, encourage enterprises to carry out research and development activities, enhance independent innovation capabilities, cultivate emerging industries, promote industrial structure optimization and upgrading, in order to improve the quality and sustainability of economic growth. By formulating reasonable industrial policies, guiding the flow of resources towards high value-added and high-tech industries, promoting the transformation of traditional industries towards intelligence and greening, creating more high-quality employment opportunities, driving residents' income growth, further promoting consumption and investment, and forming a virtuous cycle of economic growth.

Thirdly, in terms of inflation management, although the current inflation rate does not have a significant impact on the dependent variable, stabilizing prices has always been one of the important goals of macroeconomic policies. The government should closely monitor the dynamics of inflation and strengthen the management of inflation expectations. By coordinating monetary and fiscal policies, we can maintain a reasonable increase in the money supply and avoid the risk of inflation caused by excessive currency issuance. At the same time, we will strengthen market supervision, crack

down on unfair practices such as price monopolies and hoarding, ensure stable market supply, maintain stable price operations, and create a favorable macro environment for economic development.

Fourthly, in terms of attracting foreign investment policies, given the significant positive impact of foreign direct investment (FDI) on economic indicators, the government should actively formulate and improve policies to attract foreign investment. Further optimize the business environment, simplify administrative approval processes, improve government service efficiency, and provide a fair, transparent, and predictable market environment for foreign-funded enterprises. Intensify the introduction of foreign investment in key areas and industries, attract foreign investment to high-tech industries, high-end manufacturing, modern service industries, and other fields through policy measures such as tax incentives and land supply priority, fully leverage the positive role of FDI in promoting technological innovation, industrial upgrading, employment growth, and other aspects, and promote high-quality economic development.

About the Author

Yuhao Feng, 13053897633@163.com.

References

- [1] Wan Shuting The impact of exchange rate fluctuations on China's export trade of forest products to Japan: an empirical analysis based on VAR model [J]. *Era Economy and Trade*, 2024, 21(8):91-96.
- [2] Liang Sanjin, Wang Qunfei Empirical analysis of the impact of RMB exchange rate fluctuations on the export trade structure of Zhejiang tea [J]. *Economic Research Guide*, 2025(1).
- [3] Liang Sanjin Empirical Analysis of the Impact of Renminbi Exchange Rate Changes on the Trade Structure of Agricultural Products in Jiangxi Province [D]. Jiangxi Agricultural University, 2013.
- [4] Liang Sanjin, Yu Lei, Fang Ling Empirical Analysis of the Impact of Renminbi Exchange Rate Changes on the Export Trade Structure of Major Agricultural Products in Anhui Province [J]. *Journal of Bengbu University*, 2018, 7(3):6.
- [5] Ma Huiying Research on the Impact of Renminbi Exchange Rate Changes on China's International Trade [J]. *Business Economics Research*, 2015(32):3.
- [6] Xiong Qikang Research on the Impact of Renminbi Exchange Rate Reform on China's Foreign Trade Import and Export Enterprises: An Analysis of the Future Trends of Renminbi Exchange Rate Changes [J]. *Financial Theory and Practice*, 2007(2):3.
- [7] Shu Wenjuan Analysis of the Impact of the Real Effective Exchange Rate of the Renminbi on China's Import and Export Trade [D]. Northwestern University, 2012.
- [8] Bu Chunlan Research on the Impact of Exchange Rate Fluctuations on China's Direct Investment in RCEP Countries [D]. Fujian Agriculture and Forestry University, 2022.
- [9] Hou Jie, Yang Jiahui The Impact of Renminbi Exchange Rate Fluctuations on Bilateral Trade between China and RCEP Countries: Based on Neighbor Effect and Center Effect [J]. *Era Economy and Trade*, 2024, 21(2):93-98.
- [10] Guo Chuan, Li Xiaohao Research on the Spillover Effect of RMB and RCEP Member Countries' Currency Exchange Rate Fluctuations [J]. *Price Theory and Practice*, 2022(4):124-128.
- [11] Zhao Nana Analysis of the Internationalization of the Renminbi and China's Foreign Trade Relations under the New Situation [J]. *Chinese Market*, 2024(17):45-48.