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The Influencing Factors of RMB Exchange Rate in the Background of Anti-globalization

—An Empirical Evidence Based on VAR Model

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Abstract: Affected by the epidemic and geopolitics, global economic growth has slowed down, trade protectionism has begun to emerge, and anti-globalization sentiment has begun to sprout. With the pace of the Federal Reserve's interest rate hike, the global exchange rate, especially the RMB exchange rate, is gradually under pressure, which has a great impact on the economy and financial sector of the whole country. The research topic of this paper is the influencing factors of the RMB exchange rate in the background of anti-globalization, and the empirical analysis of the VAR model based on Stata software. The study found that rising domestic interest rates, a rising balance between import and export trade and rising uncertainty about US economic policy will lead to the appreciation of the RMB, while the growth of money supply will lead to the depreciation of RMB. It is worth noting that the RMB exchange rate is less affected by the uncertain economic policy factors in the United States, which shows that under the current anti-globalization and international game background, China still has a relatively independent control of the foreign exchange market.

Keywords: Anti-globalization, RMB exchange rate, VAR model, impulse response analysis.

1. Introduction

Since the outbreak of the financial crisis in 2008, global economic system and economic pattern have undergone major changes. Due to the epidemic and geopolitics, the global economic growth has slowed down, trade protectionism has begun to appear, and the anti-globalization trend has begun to sprout [1]. At present, China, as one of the most important major powers in the world, is playing a fierce international game with Europe, America and other countries. With the pace of the Federal Reserve's interest rate hike, the global exchange rate, especially the RMB exchange rate, is gradually under pressure, which has a great impact on the economy and financial sector of the whole country [2]. As a result of the price comparison between the two currencies, the RMB exchange rate is also an important means to allocate domestic and international resources. Therefore, studying the influencing factors of the RMB exchange rate against the background of anti-globalization is an important means to maintain the stable growth of China's foreign exchange market [3].

The research topic of this paper is the influencing factors of RMB exchange rate fluctuation in the background of anti-globalization, and the empirical analysis of a VAR model based on Stata software.

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Relying on the latest data of China's foreign exchange market so far, this paper analyzes the key factors affecting the RMB exchange rate (such as domestic interest rates, trade payments, money supply, and the US economic policy uncertainty), focuses on analyzing the influence of American policy on the foreign exchange market in China to help the steady development of the foreign exchange market in China, power in inverse globalization, and the ability of the federal reserve to raise interest rates to find a better solution for international game.

2. Empirical analysis of the influencing factors of the RMB exchange rate

2.1. Variable selection and data sources

In order to analyze the factors affecting the RMB exchange rate, this paper selects four variables: the domestic interest rate, trade balance, money supply and the uncertainty of American economic policy. Among them, (1) the central parity rate of RMB (ERMB) is used to express the RMB exchange rate, and the data comes from the State Administration of Foreign Exchange. (2) The seven-day weighted average interest rate (7 WAIR) is used to express the domestic interest rate level, and the data comes from the People's Bank of China [4]. (3) Use import and export trade balance (BIE) to express trade balance, data from the National Bureau of Statistics. (4) Money and quasi-money (M2) represent the money supply, and the data comes from the People's Bank of China. (5) The US Monthly EPU Index (AEPU) is used to express the uncertainty of the US economic policy, and the data comes from public data (www.PolicyUncertainty.com) released by Scott Baker [5].

To ensure the credibility of the study, the data of the last ten years were selected for this analysis. The empirical study interval of this paper is the latest monthly data from January 2014 to April 2024, and the data is reprocessed twice on the basis of the original data collection.

The empirical software used in this article is Stata 16.0.

2.2. Theoretical analysis and research hypothesis

2.2.1. Domestic interest rates

As shown in Figure 1 below, from 2014 to 2024, domestic interest rates showed an overall downward trend, which is closely related to the changes in China's economic environment and monetary policy.

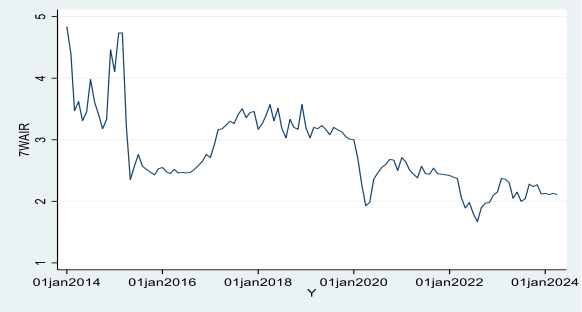

Figure 1: Trend of the RMB exchange rate against the US dollar

According to the interest rate parity theory, the existence of domestic and foreign interest rate spreads will increase cross-border capital flows, thus bringing about exchange rate changes. The intermediary of the interest rate transmission to the exchange rate is mainly the international capital flow. When the domestic interest rate is higher than abroad, keen investors will find arbitrage opportunities, cross-border capital flows, foreign capital poured into domestic, the spot foreign exchange market showed the demand for foreign currency, and the rising demand for domestic currency, namely the domestic currency appreciation and foreign currency devaluation. However,

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when the domestic interest rate is lower than that of foreign countries, profit-driven capital makes a large amount of international hot money pour out of the country to earn the spread income. The low domestic interest rate and the rise of commodity prices promote the prosperity of the value of the real economy, and the amount of local currency decreases, which then leads to the decline of the external value of local currency [6].

Combined with theoretical analysis, this paper believes that the decline of domestic interest rate will bring depreciation pressure to RMB, while the rise of interest rate will make RMB appreciate. In this paper, the middle rate adopts the direct price method, so **Hypothesis 1** is that the domestic interest rate is negatively correlated with the RMB exchange rate level.

2.2.2. Balance of trade

As shown in Figure 2 below, this paper uses the import and export trade balance (BIE) to express the trade balance. As can be seen from the figure, China has been in the trade surplus for a long time, that is, the balance of import and export trade fluctuates within a regular range.

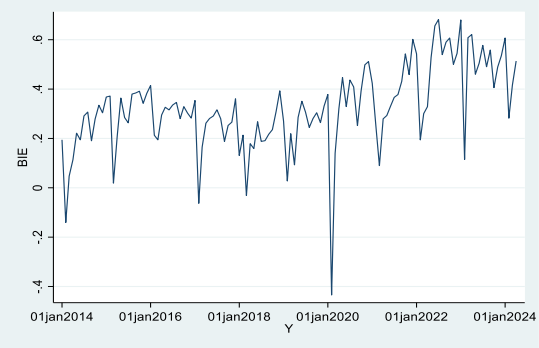

Figure 2: Trade balance trend chart

The balance of trade is the most important item of the current account under the balance of payments, which can represent the changes in the import and export trade of goods in a country. Import and export trade will cause capital flows, and the trade surplus will also increase China's foreign exchange reserves. Trade balances mainly affect the exchange rate from capital flow and foreign exchange reserves. First, capital flow, when exports increase and trade balance increases, a large amount of foreign exchange flows into the country through the current account, capital and financial account, which directly leads to the increase of the foreign value of the domestic currency; second, foreign exchange reserves, foreign exchange reserves show the confidence of the monetary authorities to stabilize the exchange rate; when exports increase trade and balance increases, the scale of foreign exchange reserves increases and the market confidence in the domestic currency is enhanced, thus forming a strong appreciation expectation [7].

As a result, rising trade balances will make the yuan appreciate. Therefore, **Hypothesis 2**: The trade balance is negatively correlated with the central parity level of RMB exchange rate.

2.2.3. Money supply

As shown in Figure 3 below, the money supply increased significantly from 2014 to 2024.

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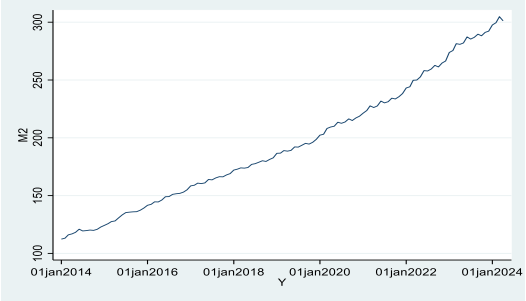

Figure 3: Money supply chart

The money supply is the main factor that determines the value and purchasing power of money. According to the purchasing power parity theory, the change in the money supply will be mediated by inflation and cause the fluctuation of exchange rate. When loose monetary policy is implemented in China, the monetary balance will increase, and the residents will increase their consumption and investment expenditure, resulting in the rise of domestic commodity prices and leading to inflation. The massive import of relatively cheap foreign goods increases the demand for foreign exchange and increases local currency depreciation. Moreover, when the money supply increases rapidly in a short time and the price level cannot be adjusted quickly due to viscosity, this change will be reflected in the financial market as the rapid decline of the domestic interest rate, which affects the massive outflow of international capital, thus leading to the substantial depreciation of local currency [8]. Therefore, the increased money supply will devalue the currency and increase the exchange rate. Therefore, **Hypothesis 3:** the money supply is positively correlated with the central parity level of the RMB exchange rate.

2.2.4. US economic policy uncertainty

As shown in Figure 4 below, from 2014 to 2024, monetary policy uncertainty in the US peaked around 2020 and 2021, which was closely related to the global epidemic and the international game.

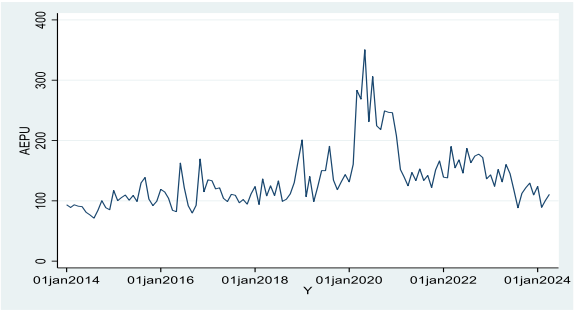

Figure 4: Uncertainty index in US economic policy

When the economic policy uncertainty index in the United States rises, it indicates that the accuracy of investors' predictions of future macroeconomic fundamental factors decreases, thus increasing the risk, and thus affecting exchange rate fluctuations. Because currency market investors may be risk-averse. Suppose the investment subject of the foreign exchange market risk aversion is very sensitive to the fluctuation of the risk index, the US economic policy uncertainty index tends to indicate the future investment environment to the good trend, which will make this part of the investors increase the relative demand for dollar assets, and reduce the relative demand for RMB assets, making the devaluation [9].

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Therefore, the uncertainty of US economic policy will affect the trend of RMB appreciation and depreciation of the exchange rate, and the rise of the uncertainty of US economic policy will lead to the appreciation of RMB. Therefore, **Hypothesis 4:** US economic policy uncertainty is negatively related to the central parity level of the RMB exchange rate.

2.2.5. The RMB exchange rate

As shown in Figure 5 below, the central parity rate of RMB against US dollar shows an overall upward trend, which indicates that RMB has been in a depreciation trend in the past decade. Among them, the RMB also has a long trend of appreciation around 2017 and 2021. This may be closely related to China's successful fight against the epidemic and other macroeconomic achievements.

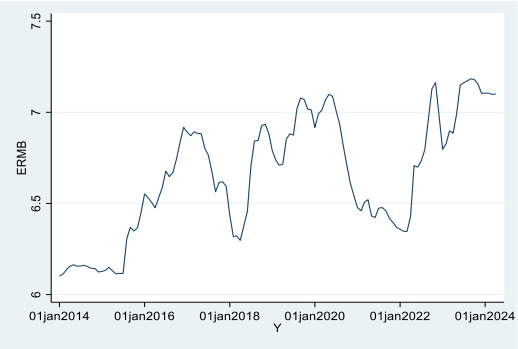

Figure 5: Trend of the RMB exchange rate against the US dollar

2.3. Empirical analysis

2.3.1. Data stability test

Since the VAR model is established to ensure the stability of the time series, this paper first conducts a stationary test of the relevant data. The unit root test is a common method to test the stationarity of the time series, usually for the ADF test [10]. As shown in Table 1 below, this paper adopts logarithmic treatment and differential differentiation for the unstable time series, and the sequences after the first order difference are stationary sequences, so the next analysis can be conducted.

Table 1: Stability test

Variable	ADF-value	p-value	Critical value (1%)	Critical value (5%)	Critical value (10%)	Stationarity
LNM2	-0.883	0.7937	-3.502	-2.888	-2.578	No
DLNM2	-14.010	0.0000	-3.503	-2.889	-2.579	Yes
LNWAIR	-2.820	0.0555	-3.502	-2.888	-2.578	Yes
DLNWAIR	-9.832	0.0000	-3.503	-2.889	-2.579	Yes
LNBIE	-7.980	0.0000	-3.505	-2.889	-2.579	Yes
DLNBIE	-16.177	0.0000	-3.506	-2.889	-2.579	Yes
LNAEPU	-3.977	0.0015	-3.502	-2.888	-2.578	Yes
DLNAEPU	-15.448	0.0000	-3.503	-2.889	-2.579	Yes
LNERMB	-1.487	0.5399	-3.502	-2.888	-2.578	No
DLNERMB	-6.798	0.0000	-3.503	-2.889	-2.579	Yes

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The ADF test method is observation statistics, if it is smaller than the critical value of the 5% significant level, it proves that there is no unit root in the time series, which means that the time series is stable. From Table 1, the test results indicate that LNBIE and LNAEPU are stable at the 1% significance level and LNWAIR is stable at the 10% significance level. While LNM 2 and LNERMB are unstable. However, all the variables in the table are stable at the level of 1% after the first order difference, so the first order difference data modeling is selected in this paper.

2.3.2. Determination of the lag order

Secondly, in order to reduce the estimation error and improve the prediction accuracy, the lag order of the model is determined by the method of information criterion. It can be seen from Table 2 that the optimal lag order of the model under the LR, FPE and AIC criteria is order 4; therefore, after comprehensive consideration, the optimal lag order of the model is order 4.

Table 2: Determination of optimal lag order

c	LogL	LR	FPE	AIC	HQIC	SBIC
0	683.629		7.60E-13	-13.7097	-13.6567	13.5786*
1	722.929	78.598	5.70E-13	-13.9986	-13.6804*	13.2122
2	754.885	63.912	5.00E-13	-14.1391	-13.5558	12.6973
3	780.504	51.238	5.00E-13	-14.1516	-13.3031	12.0545
4	817.151	73.295*	4.0e-13*	-14.3869*	-13.2733	11.6345

2.3.3. Co-integration inspection

In this study, Johansen verified whether there is a long-term stable proportional relationship between various variables through the Johansen co-integration test. Given that the Johansen co-integration test is sensitive to lag order, the optimal lag order was determined according to AIC. The co-integration test method is applicable to non-stationary sequences [11]. According to the ADF test above, LNERMB, LNM 2, LNWAIR, LNBIE and LNAEPU are all first-order integrations. Therefore, Johansen co-integration test method is used in this paper to judge whether there is a long-term stable proportional relationship between variables. Table 3 below is the test results obtained from Stata16.0.

Table 3: Cointegration test results of LNSF2 and LNER2

Maximum rank	Parms	LL	Eigenvalue	Trace statistic	5% critical value
0	30	-600.45613	.	106.7969	68.52
1	39	-572.79951	0.36453	51.4837	47.21
2	46	-561.61264	0.16756	29.1099*	29.68
3	51	-553.31531	0.12718	12.5153	15.41
4	54	-549.03644	0.06774	3.9576	3.76
5	55	-547.05767	0.03192		

If the trace statistic is greater than the 5% significance level, this means that the time series has a co-integration relationship. If so, it means that the time series has no cointegration relationship. From the above test results, we can see that at the 5% level, there is a co-integration relationship between the time series of the five economic variables, that is, there is a long-term stable equilibrium relationship.

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2.3.4. Parameter stability test

In addition, a parameter stability test needs to be carried out so that the subsequent pulse response and variance decomposition have practical effects. The common method is AR root, that is, to observe whether the inverse of the absolute value of the characteristic equation root of the VAR model is in the unit circle, and then follow the subsequent analysis. As can be seen from Figure 1, all the unit roots are included by the unit circle, which also means that the parameters have passed the stability test.

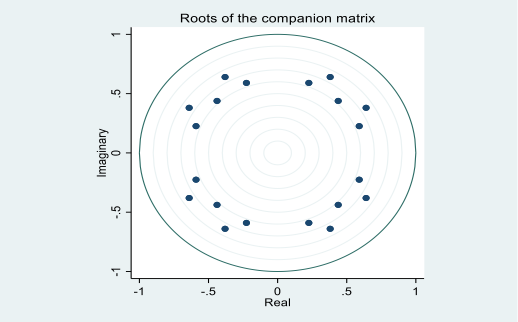

Figure 6: The unit circle

2.3.5. Impulse response analysis

In the VAR model, the empirical results of impulse response mainly focus on the judgment of positive and negative direction, which belongs to qualitative judgment, mainly the amplitude and time relationship of the influence of one variable on another variable. If the selected time series is stable, the variable can return to a stable state after the previous period [12].

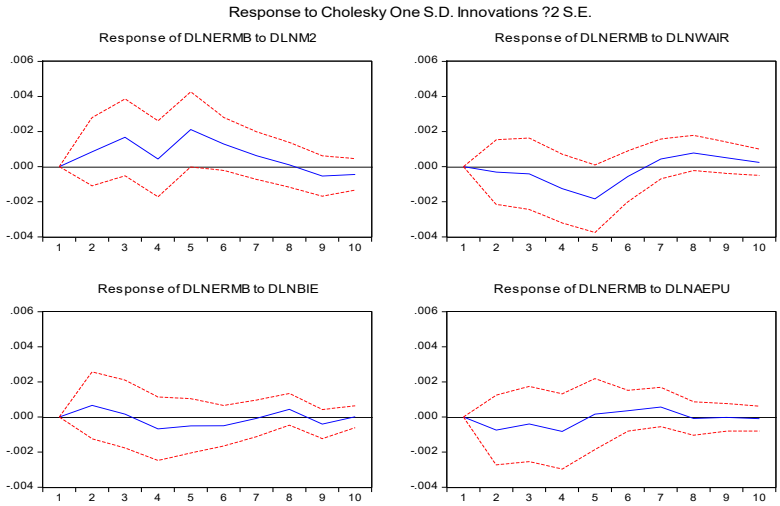

Figure 7: Impulse response result

As shown in Figure 7, when the RMB exchange rate receives an impulse from the money supply, it immediately produces a positive response, and the response gradually increases and peaks in the sixth phase, and then the positive response gradually weakens and stabilizes. This confirms **Hypothesis 3** presented in this paper. In other words, the increase in money supply will bring about an increase in the central parity rate of the RMB, that is, the depreciation of the RMB.

Then, when the RMB exchange rate is hit by domestic interest rates, it immediately produces a negative response, and the response peaks in the fifth phase and gradually stabilizes. This confirms

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the hypothesis of this paper: that is, when the domestic interest rate increases, the RMB central parity rate will fall, that is, the RMB appreciation.

In addition, when the RMB exchange rate is impacted by the trade balance, it immediately produces a positive response, and the response strength peaks in the second phase, then gradually turns to a negative response and stabilizes. This confirms the **Hypothesis 2** of this paper. In other words, when the trade balance increases, the central parity rate of RMB tends to decline, that is, the appreciation of the RMB.

Finally, when the RMB exchange rate is impacted by the index of economic policy uncertainty from the United States, it immediately produces a positive response, and this response strength reaches a peak in the fourth period, and then gradually turns to a positive response and tends to stabilize. This confirms the **Hypothesis 4** of this paper. In other words, when the uncertainty of the US economic policy rises, the central parity rate of the RMB tends to decline, that is, the appreciation of the RMB.

2.3.6. Analysis of variance decomposition

The pulse response function focuses on the influence trajectory of each variable on the exchange rate in the short term, focusing on qualitative research, and the influence contribution of each variable on the RMB exchange rate with quantitative research. In addition, after the VAR model obtains the results, the variables will produce some random error terms, and the results of the variance decomposition can explain this important information [13].

As can be seen from Table 4, the RMB exchange rate is influenced by its own influence and has the greatest influence. That is to say, the RMB exchange rate can explain its own changes and has a strong explanation. In addition, with the progress of time, although the interpretation of the RMB exchange rate itself is decreasing, the interpretation of the RMB exchange rate itself is still 86.17%. The interpretation of money supply was 7.06%, while the interpretation of domestic interest rates, US economic policy uncertainty and trade balance was 4.34%, 1.17%, and 1.24%, respectively.

Table 4: Variance decomposition analysis

Period	S.E.	DLNERMB	DLNM2	DLNWAIR	DLNBIE	DLNAEPU
1	0.010254	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.011450	98.62428	0.549541	0.072442	0.333340	0.420401
3	0.011612	96.33268	2.600984	0.194998	0.345023	0.526311
4	0.011739	94.31117	2.684195	1.325997	0.668802	1.009833
5	0.012080	89.06455	5.607074	3.550985	0.805411	0.971981
6	0.012202	87.69956	6.617035	3.688408	0.957518	1.037482
7	0.012244	87.17495	6.833493	3.789926	0.955098	1.246532
8	0.012279	86.71003	6.801071	4.168846	1.075590	1.244459
9	0.012311	86.31324	6.954093	4.315714	1.178640	1.238309
10	0.012328	86.17727	7.063275	4.343394	1.175517	1.240549

As shown in Figure 8 below, among the factors affecting the RMB exchange rate, the RMB exchange rate itself, followed by money supply, domestic interest rate, economic policy uncertainty in the United States and trade balance.

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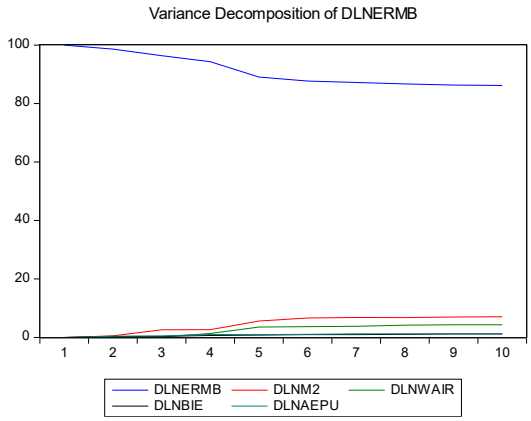

Figure 8: Variance decomposition of DLNERMB

3. Conclusion

This paper studies the main influencing factors of RMB exchange rate fluctuations under the background of inverse globalization. Based on the monthly data from January 2014 to April 2024, using the Stata16.0 software and building the VAR model, the main factors affecting the RMB exchange rate are the domestic interest rate, trade payments, money supply and the uncertainty of American economic policy.

According to the results of the empirical analysis, when the domestic interest rate level rises, it will cause the keen international capital to respond quickly, that is, quickly flow into our country from abroad to earn interest rate appreciation; When the trade balance of imports and exports increases, the supply of foreign currency in the foreign exchange market will increase, and the demand for foreign currency will decrease, thus making the RMB appreciate. When the money supply increases, the supply of local currency in the domestic foreign exchange market will be greater than the demand for local currency, resulting in the depreciation of RMB. When the uncertainty of US economic policy rises, risk averse people will reduce their demand for dollar assets and increase their holdings of RMB, and the RMB will appreciate accordingly.

It is worth noting that the RMB exchange rate is less affected by the uncertain economic policy factors in the United States, which shows that under the current anti-globalization and international game background, China still has a relatively independent control of the foreign exchange market.

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