

A Study on the Impact of the Fed's Quantitative Easing Policy on the RMB Exchange Rate

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ABSTRACT

In the context of global economic integration, the United States, as a major world economic power, the adjustment and change of its monetary policy is of great significance to the fluctuation of the RMB exchange rate. By studying the characteristics of the Fed's QE (quantitative easing) monetary policy, this paper analyses its impact on international capital flows and trade markets, and describes how these impacts are transmitted to China's currency market, causing fluctuations in the RMB exchange rate.

KEYWORDS

Federal Reserve; Quantitative easing (QE); RMB exchange rate; Purchasing power parity (PPP); Capital flows

1. INTRODUCTION

After entering the twenty-first century, the international financial market has shown an unstable situation, which has successively produced the financial and economic crisis, the COVID-19 epidemic and other events affecting the global economy. Against this backdrop, the Federal Reserve has implemented quantitative easing on several occasions in response to the negative impact these events have had on the US. As the world's largest economy, the adjustment and implementation of U.S. monetary policy not only affects its own economic growth and inflation levels, but also has a far-reaching impact on China's economy through the transmission of the international economic and financial markets [1].

Some scholars on the Fed's QE policy on China's economic impact of in-depth study, the study found that the Fed's QE policy on China's macroeconomic impact is concentrated in the exchange rate of the RMB, so that China's holdings of forex accounted for by the depreciation of U.S. bonds, the pressure of the RMB appreciation is huge, thus reducing China's trade and exports, so that China's economy has been struck by a certain degree of blow [2]. (Feng Xiaochu, 2014)

In terms of PPP, Miao Lu (2010) argues that the US-China PPP better explains the long-term stable equilibrium relationship between the RMB exchange rate and the US-China CPI. Therefore, the US-China PPP can be used as a reference and evaluation of the RMB exchange rate, but the determinants of the exchange rate do not only depend on the PPP theory [3].

In terms of capital flows, Zheng Jiandong (2020) argues that when the U.S. implements expansionary monetary policy, the widening of the U.S.-China interest rate spread can promote cross-border capital inflows into China, which in turn leads to the movement of the U.S.-China interest rate spread, which

has a long-run effect on China's cross-border capital flows, and that there is no sign of such an effect weakening [4].

In terms of import and export trade, Li Zilei and Zhang Yun (2013) argue that the Fed's long-term QE policy will cause China's price level to rise by increasing international commodity prices [5]. Mo Jie (2023) shows that the direct impact of the U.S. quantitative easing monetary policy on U.S.-China trade is smaller than the indirect impact. The appreciation of RMB will have a negative effect on China's exports and a positive effect on imports [6].

In terms of policy recommendations, Zhang Ming (2008) argues that under the impetus of trade surpluses, interest rate differentials and capital inflows caused by the Fed's QE policy, the RMB is under tremendous pressure to appreciate against the U.S. dollar, and in order to curb the further appreciation of the RMB against the U.S. dollar, China's central bank has to resort to weakening the independence of its monetary policy or strengthening its control over capital inflows [7].

From the point of view of existing research, scholars analyzed the impact of QE monetary policy on China's economy through the purchasing power parity, international capital flows and import and export trade at three levels, deeply analyzed how the Fed's QE policy through a variety of ways to influence the dynamics of the exchange rate of the RMB, and put forward a number of policy recommendations and coping strategies for weakening the impact of the Fed's QE policy. These research results have laid a theoretical foundation for the research of this paper, which provides certain guidance and reference for the research based on the above research.

2. OVERVIEW OF THE FED'S QE POLICY

Quantitative easing, as an unconventional monetary policy, is usually complemented by interest rate cuts. After implementing a policy of zero and near-zero interest rates, the central bank injects a large amount of liquid funds into the market through a series of interventions, such as purchasing assets, repurchasing medium- and long-term bonds, such as treasury bills, and increasing the supply of base money [8], in order to encourage spending and borrowing, that is, by printing more cash (U.S. dollar overissuance).

2.1. Time Course of Quantitative Easing by the Federal Reserve

The Fed's interest rate cut - quantitative easing cycle is mainly focused on the economic and financial crisis and the COVID-19 epidemic period, is the Federal Reserve in order to enhance the vitality of the country's economy, to reverse the economic decline of the strategy implemented. The specific implementation phase is November 2008 - October 2014, March 2020 - March 2022, including QE1, QE2, QE3, QE3+ and QE2020.

Table 1. Overview of the Fed's successive QE policies

Event	Time Period	Reason	Initiatives
QE1	November 2008- April 2010	Sub-prime Mortgage Crisis	The Fed purchased \$1.25 trillion in MBS, \$175 billion in agency bonds and \$300 billion in medium- and long-term U.S. Treasuries for a total of \$1.725 trillion.
QE2	November 2010- June 2011	Debt Crisis in Greece	The Fed purchased \$600 billion in medium- and long-term U.S. Treasuries.
QE3	September 2012- October 2014	Escalation of The Debt Crisis in Europe	The Fed is purchasing \$40 billion a month in MBS and continues its OT of selling short-term Treasuries and buying medium- and long-term Treasuries.
QE3+	December 2012- October 2014	U.S. Fiscal Cliff Issues	The Fed is replacing OT with an additional \$45 billion of Treasury purchases per month on top of QE3, bringing the amount of monthly easing to \$85 billion.
Event	Time Period	Reason	Initiatives
QE2020	March 2020 - March 2022	COVID-19 Epidemic	The Fed purchased an unlimited number of medium- and long-term U.S. Treasuries and MBS, expanding the amount of easing to an unlimited amount.
QT2022	March 2022 -		The Fed began raising interest rates, signaling the end of QE2020.

Data Source: Federal Reserve Website

2.2. The Fed's Quantitative Easing Implementation Cycle

The Fed's QE policy usually loosens the monetary base in two ways, i.e., by changing the price of money (lowering interest rates) or by changing the quantity of money (printing more U.S. currency). Its policy implementation cycle is roughly divided into four stages: zero interest rate policy, supplementary liquidity, direct release of liquidity, and guiding market long-term interest rates down.

Take QE1 as an example. Starting from August 2007, the Federal Reserve made 10 consecutive interest rate cuts, and the U.S. federal funds rate (mainly the overnight lending rate) dropped to the ultra-low interest rate range of 0%-0.25%. In 2007-2008, the Federal Reserve acquired a large number of non-performing assets and launched a series of credit instruments to inject a large amount of money (supplemental liquidity) into commercial banks and non-bank financial institutions, preventing serious liquidity shortages in domestic and foreign financial markets. In 2008 - 2009, the Federal Reserve acquired a large number of MBS issued by Fannie Mae, Freddie Mac, and the Federal Home Loan Bank. At this stage, the Federal Reserve directly injected capital for troubled enterprises, acting as an intermediary to actively release liquidity to the market. 2009, with the stabilization of the U.S. economy and financial markets, the Federal Reserve gradually through open market operations from commercial banks and other financial institutions to purchase long-term treasury bonds, in an attempt to guide the market to reduce long-term interest rates to encourage lending and investment activities, so as to achieve the purpose of stimulating economic growth and controlling the level of inflation.

3. HOW THE FED'S QE POLICY AFFECTS THE RMB EXCHANGE RATE

3.1. Overall Trend in the Exchange Rate of RMB

Since quantitative easing by the Federal Reserve requires the injection of large amounts of dollars into the market, it usually leads to a depreciation of the dollar. As the U.S. dollar depreciates, US bonds held by other countries in their forex account will also depreciate. China, as one of the major creditors of the United States, the implementation of the Fed's QE policy will often lead to the RMB to face enormous appreciation pressure, and thus forced to appreciate [9].

From November 2008 - April 2010 (during QE1), when the Fed implemented quantitative easing for the first time, the RMB to U.S. dollar exchange rate rose slightly by 0.14%. From November 2010 - June 2011 (during QE2), the RMB rose about 3.25% against the U.S. dollar. From September 2012 - October 2014 (during QE3 and QE3+), the RMB grew about 3.05% against the U.S. dollar. However, with the end of QE3+, the RMB entered another period of depreciation. It wasn't until March 2020, when the Fed FOMC meeting announced a re-entry into the rate-cutting-quantitative easing cycle, that the RMB ushered in an appreciation binge. By the end of QE2020 in March 2022, the RMB has been lowered from 7.0119 to 6.3457 against the U.S. dollar, with the RMB appreciating by about 10.50%.

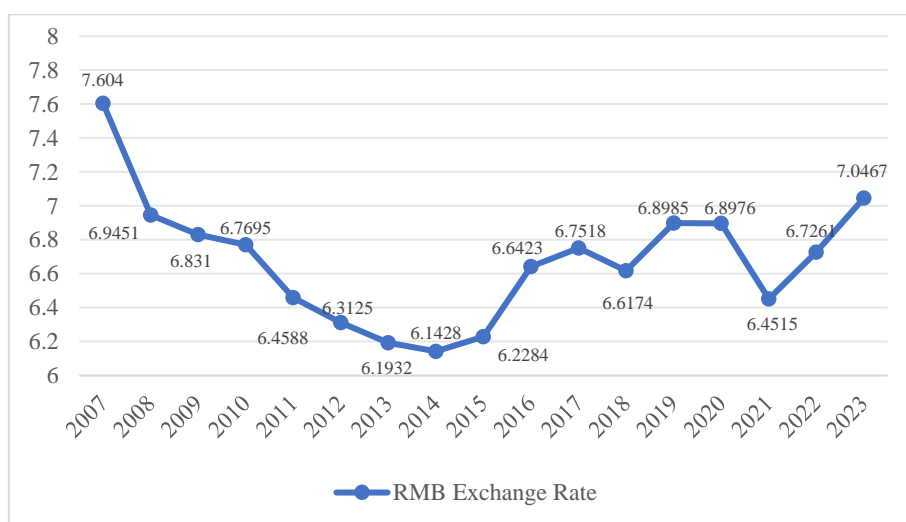


Figure 1. Annual average exchange rate of the RMB against the US dollar

Data Source: China Currency Network; People's Bank of China official website

Beyond Fed's monetary policy, the RMB exchange rate is affected by multiple factors, including the domestic economic situation, international financial markets, and investor confidence in the RMB. For example, in April 2012, the RMB entered a cycle of continuous depreciation due to China's slowing economic growth and declining exports. However, with the implementation of QE3 in September 2012, the RMB to U.S. dollar exchange rate dropped from 6.3459 to 6.3021 from September 27, 2012 to October 18, 2012, and the RMB increased by about 0.70% in just 22 days. It can be seen that compared with other influencing factors; the Fed's monetary policy is undoubtedly the main reason for the fluctuation of the RMB exchange rate.

3.2. Relative Purchasing Power Parity Between China and the United States

Based on purchasing power parity theory (PPP), the market exchange rate will usually naturally converge to the theoretical exchange rate of PPP under certain conditions, that is, the trend of the exchange rate of the two currencies will follow the trend of the price level of the two countries [10]. This paper chooses to use CPI as a price indicator to measure the PPP between China and the United States.

Table 2. Theoretical rate of change in the exchange rate of the RMB

Year	CPI in China	Growth Rate	CPI in US	Growth rate	RPPP Theoretical Rate of Change in Exchange Rates	Official RMB exchange rate
2000	100%	Inflation Rate	100%	Inflation Rate	$\Delta e = \Delta p - \Delta p^*$	8.2784
2004	105%	3.90%	109.70%	2.68%	1.22%	8.2768
2005	106.90%	1.80%	113.40%	3.39%	-1.59%	8.1917
2006	108.50%	1.50%	117.10%	3.23%	-1.73%	7.9718
2007	113.70%	4.80%	120.40%	2.85%	1.95%	7.604
2008	120.40%	5.90%	125%	3.84%	2.06%	6.9451
2009	119.60%	-0.70%	124.60%	-0.36%	-0.34%	6.831
2010	123.50%	3.30%	126.67%	1.64%	1.66%	6.7695
2011	130.17%	5.40%	130.72%	3.16%	2.24%	6.4588
2012	133.50%	2.60%	133.38%	2.07%	0.53%	6.3125
2013	137.33%	2.60%	135.28%	1.46%	1.14%	6.1932
2014	139.93%	2%	137.56%	1.62%	0.38%	6.1428
2015	141.90%	1.40%	137.69%	0.12%	1.28%	6.2284
2016	144.74%	2%	139.46%	1.26%	0.74%	6.6423
2017	147.09%	1.60%	142.38%	2.13%	-0.53%	6.7518
2018	150.18%	2.10%	145.92%	2.44%	-0.34%	6.6174
2019	154.50%	2.90%	148.46%	1.81%	1.09%	6.8985
2020	158.20%	2.50%	150.36%	1.23%	1.27%	6.8976
2021	159.81%	0.90%	157.45%	4.70%	-3.80%	6.4515
2022	162.90%	2%	170%	8%	-6%	6.7261

Data Source: China Statistical Yearbook

This table calculates the CPI growth rate and the theoretical rate of change of the RPPP exchange rate for the U.S. and China for the period 2004-2022, using the U.S. and China CPIs for 2004-2022 as the data source (with 2000 as the base period).

Relative PPP considers the rate of change in the exchange rate to be equal to the difference between the rates of change in the price levels (inflation) of the two countries, i.e. $\Delta e = \Delta p - \Delta p^*$. In 2004-2019, the value of Δe is basically greater than 0, which means that China's prices are rising faster than the U.S.'s in general, and the real purchasing power of the RMB is weakening, and the RMB to U.S. dollar exchange rate should be trending upward. However, as can be seen from the table, the RMB was almost always in a state of appreciation from 2004-2014. The main reason for its deviation from the RPPP theoretical exchange rate, besides China's accession to the WTO in 2001, is due to the Fed's successive rounds of quantitative easing in 2007.

Quantitative easing, as an unconventional monetary policy conducted as a last resort when conventional monetary policy has failed, usually triggers market concerns about the future performance of the economy of the country where it is implemented. The four rounds of quantitative easing implemented by the Federal Reserve from 2007-2014 led to a decline in investor confidence in the U.S. dollar. This change in psychological expectations prompted the dollar to depreciate at a rate that exceeded the decline in real purchasing power, forcing the RMB to bear the upward pressure from the over-expected depreciation of the dollar. In late 2014, the RMB immediately began to rise against the dollar following the end of the Federal Reserve's QE3+, and the RMB entered a five-year depreciation cycle. The RMB is now in the midst of a five-year depreciation cycle, and the Fed is now in the midst of a five-year depreciation cycle.

Similarly, in 2022, the US inflation rate is much larger than the Chinese inflation rate, and the real purchasing power of the RMB is in an upward trend, but the value of the RMB has declined. This is because the Fed ended QE2020 in March 2022 and sustained interest rate hikes leading to a rebound in investor confidence in the US dollar market, which in turn influenced the movement of the RMB to the U.S. dollar exchange rate, causing it to deviate from its relative purchasing power parity.

3.3. The Impact of the Fed's QE Policy on International Capital Flows

The interest rate differentials between the world's major economies and the United States are an important factor driving international capital flows. Prior to the implementation of quantitative easing, the Federal Reserve usually starts with a zero-interest-rate policy, which causes a large amount of capital to flow to other economies, especially emerging markets and developing countries, in search of opportunities for higher returns. In recent years, as China's economic growth rate is higher than that of the United States, and the interest rates in the United States during the period of quantitative easing were much lower than those in China, this has made more investors inclined to invest in China, which has led to a large inflow of capital into the Chinese market [11], which has in turn contributed to the appreciation of the RMB.

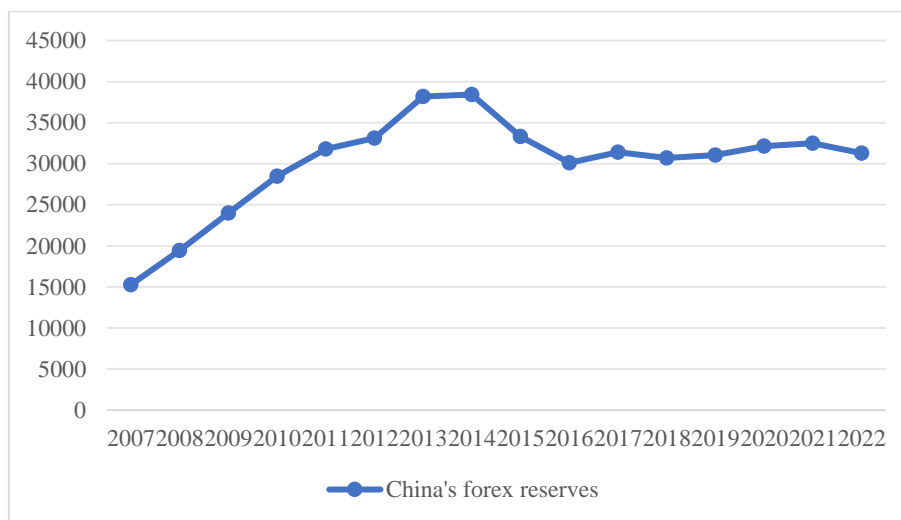


Figure 2. China's forex reserves

Data Source: China Business Yearbook

Forex reserves are the sum of foreign currencies and assets held by a country to support the value of its currency. As can be seen from Fig. 4, China's forex reserves continued to grow from September 2007, when the United States made an emergency interest rate cut, to 2014, when the Fed's QE ended. Generally speaking, the continuous growth of forex reserves indicates a large inflow of capital into China. This is because capital inflows increase the demand for the RMB in the forex market, which increases the value of the RMB and prompts the Chinese government to buy more foreign currencies to maintain exchange rate stability.

However, if the Fed's monetary policy shifts from easing to tightening, it will begin a series of tightening tactics such as raising interest rates and scaling back bond purchases, causing the price of U.S. Treasuries to fall and yields to rise. Investors in pursuit of higher yields, they will choose to transfer assets from other treasury yields lower than the U.S. treasury yields of the economy to the US [12]. With the narrowing of the interest rate differential between China and the US, capital may flow out of China and back to the US. This change in capital flows may have implications for China's financial markets and economic stability [13].

3.4. The Impact of the Fed's QE Policy on China's Import and Export Trade

As the world's most important reserve currency and international trade valuation currency, the U.S. dollar's exchange rate fluctuations will directly affect the global economic liquidity and commodity prices. Therefore, in addition to the Fed's QE policy will lead to the appreciation of the RMB, it will also leverage international capital flows and China's supply and demand changes in the feedback effect of the price level, thus affecting China's import and export trade [14].

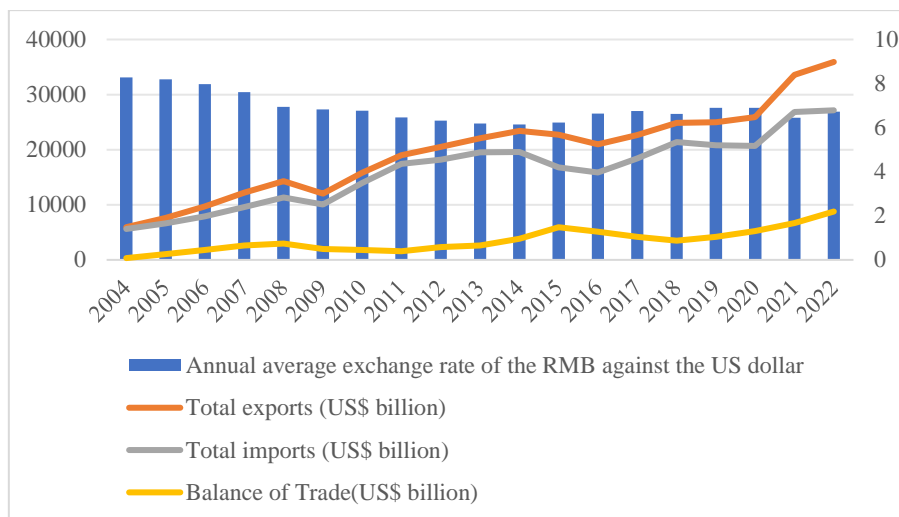


Figure 3. China trade situation

Source: General Administration of Customs of China, Business Data Center of the Ministry of Commerce of China.

The depreciation of the U.S. dollar leads to higher international commodity prices, and the cost to Chinese firms of purchasing dollars to pay for imported goods increases, requiring them to pay a higher value of currency for the same amount of goods. As a result, domestic enterprises and consumers will gradually reduce their demand for imports and instead expand their demand for goods in the domestic market. Demand in the domestic market exceeds supply, leading to a sustained rise in domestic prices and a gradual increase in the cost of production for enterprises, which will have a negative impact on China's trade and exports.

However, as can be seen from Fig. 3, China's total exports are increasing after the Fed restarts QE policy in 2020. In addition to the factor of the world's high dependence on the Chinese economy [15], this may also be due to the fact that the Fed's QE policy has led to an increase in the supply of U.S. dollars in the market and a significant drop in the cost of capital. A large number of investors have turned their attention from the U.S. market to the equally vast Chinese market in search of higher rates of return. The large amount of foreign capital made it easier for Chinese exporters to access the capital they needed to keep expanding their production scale, thus increasing Chinese trade exports. In addition, as the trade surplus widened, the rising demand for currency further contributed to the appreciation of the RMB.

4. HOW CHINA RESPONDS TO THE NEXT ROUND OF FED'S QE POLICY

4.1. Forex Policy

As shown in Fig. 4, since China's economic growth has long depended on exports, the degree of foreign trade dependence is currently still in a high state, which makes China's economy highly correlated with its major trading partners, such as the United States and the European Union, and foreign economic factors have a large impact on China's economy, which can easily lead to economic fluctuations.

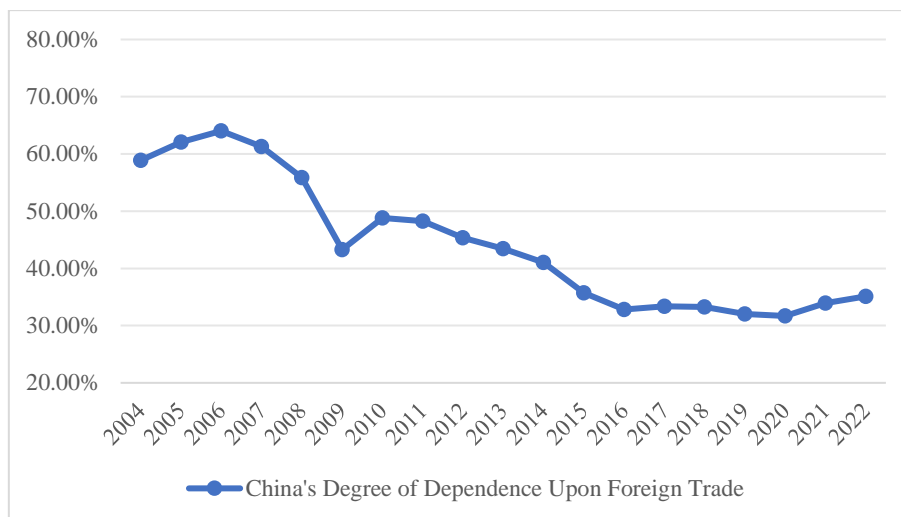


Figure 4. China's Degree of Dependence Upon Foreign Trade

Data source: EPSDATA

Under the Fed's QE policy, the depreciation of the U.S. dollar has put pressure on the RMB to appreciate. China's central bank often needs to consume a large amount of forex reserves to intervene in the forex market, buying U.S. dollars and selling RMB, in order to mitigate its impact on exporters and keep the stability of the forex market. This may put some pressure on China's forex reserves, which can be mitigated by the Chinese central bank by appropriately adjusting the structure of its forex reserves, increasing the proportion of non-dollar currencies or assets in its forex reserves, and reducing its dependence on the dollar. China can also strengthen monetary cooperation with its major trading partners in order to jointly respond to the challenges posed by the Fed's QE policy. For example, currency swap agreements could be signed with major trading partners to increase mutual currency liquidity to reduce the effect of exchange rate fluctuations.

In addition, while ensuring the liquidity and security of forex reserves, China can gradually promote reform of the forex market, increase the openness and transparency of the forex market, and enhance the forex market's ability to self-regulate. It should be noted that this measure requires China to implement a prudent monetary policy in order to maintain an appropriate level of money supply and interest rates to prevent the occurrence of financial risks during the reform process.

4.2. Capital Flow Management

The large inflows and outflows of cross-border capital flows may cause serious shocks to the economic and financial stability of emerging market countries, triggering currency crises and financial market turmoil [16]. As the largest emerging market and developing country, China's international capital inflows and outflows have gradually become an important factor affecting China's economic stability as the volume of international trade and the total amount of its economy continue to grow.

The continued growth of forex reserves during the Fed's quantitative easing period suggests large capital inflows into China. In order to maintain exchange rate stability. China usually carries out capital flow management, the most direct means is to raise the exchange rate floating range. The increase of the exchange rate floating range can release the pressure of RMB appreciation, correct the price of the RMB exchange rate, and fundamentally inhibit the inflow of international capital into China, so as to reduce the impact of international capital flows on China's macroeconomy.

In addition, increasing foreign currency holdings is also an effective means of controlling capital flows. The Chinese government can equalize the balance of payments and ease the pressure of RMB appreciation by increasing the amount of outward investment and purchasing large amounts of foreign

currencies. At the same time, the expansion of outward investment can also break up part of China's forex reserves and reduce exchange rate risks, thus increasing the independence of monetary policy.

5. CONCLUSION

In sum, the Fed's QE policy has had a significant and complex impact on the RMB exchange rate. During the period of quantitative easing, the significant increase in the global supply of U.S. dollars led to a relative depreciation of the U.S. dollar, which in turn generated appreciation pressure on the RMB exchange rate, resulting in greater exchange rate risk and market uncertainty for China's financial markets and import and export enterprises.

To this end, China should pay close attention to the Fed's policy changes and the dynamics of the international financial market, strengthen the research and innovation of forex policy, and take appropriate capital flow management measures to cope with the impact of the Fed's QE policy, in order to better adapt to the Fed's QE that may continue to occur in the future - the cycle of interest rate cuts.

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