

The Effect of RMB Exchange Rate Volatility on Import and Export Trade in China

Wanhui Jiang

School of Public Administration, Southwest Jiaotong University P. R. China

E-mail: onlyjwhui@163.com

DOI Link: <http://dx.doi.org/10.6007/IJARBSS/v4-i1/572>

Published Date: 11 January 2014

Abstract

The exchange rate volatility always plays a key role in import and export trade. This paper investigates the effect of nominal RMB exchange rate volatility on economic growth in China from 1981 to 2012. Through the ADF stationary test, the co-integration test, and the associated econometric model and the empirical analysis, the paper concludes that in the long run, exchange rate change has a positive impact on import and export trade. Therefore, it is necessary to take relevant policies and measures to adjust the RMB exchange rate at a reasonable level to avoid the RMB sharp appreciation in the short-term to promote a rational and efficient development for China's foreign trade.

Keywords: RMB exchange rate ; Exchange rate volatility ; Export trade ; Import trade

1. Introduction

The issue of the Renminbi revaluation has always been a focus at home and abroad for many years. After many times reform in the RMB exchange rate, China has started a managed floating exchange rate system since 1994. In the early days, the RMB always in a depreciated situation, but since 2005 the RMB has been showing an appreciation trend. Especially after the outbreak of the global financial crisis in 2008, the RMB has been facing a constantly appreciation pressure, and this makes an important impact on China's trade and economy (Xiaoyan Pai, 2008).

According to economic theory, the appreciation of a country's currency will be beneficial to its import, but have a bad influence on the export, which will affect a country's foreign trade (Yulu Chen, 2008). However, different country has different economic conditions, so the appreciation of currency may have different effects on a country's import and export trade. Since Chinese economic reform and opening up, through the changes in China's real economy development, the value of RMB has experienced a progress from devaluation to appreciation, but China's foreign trade has always been showing a favorable balance, and in most cases the surplus continues to grow. This phenomenon has aroused scholar's widespread attention at home and abroad.

Changjun Yue and Ping Hua (2002), through studying China's 1990-1998 annual economic data for all provinces, concluded that the RMB appreciation caused a reduction on export trade volume, besides that there is an increasing trend on price elasticity towards China's export products. Xiangqian Lu and Guoqiang Dai (2005) using the year of 1994-2003 RMB real exchange rate and China's import and export data, and through VAR model and other empirical tests, analyzed the relationship between real exchange rates and China's foreign trade. The tests proved that the RMB real exchange rate fluctuation had a significant influence on China's export, and Marshall-Lerner condition was satisfied in China, and exchange rate fluctuations exists J-curve effect on China's import and export trade. Weixian Wei (1997) using co-integration approach to analyze the year 1978-1996 export trade and real exchange rate date, concluded that since 1978 there has existed long-run equilibrium and causation relations among exports and real exchange rate and long-term export growth mainly depended on the rising of exchange rate.

Chou (2000) studied the relations between the export volume of different trade department and the exchange rate in China and also the relations between it's total export volume and the exchange rate according to the data from 1981 to 1996, and indicated that there existed a negative long-run equilibrium relation between exports and exchange rate. Marquez and Schindler (2006) studied relations between real exchange rate and foreign trade volume based on the monthly dados from 1992 to 2004, and established the model of the relationship between exchange rate and import and export. Through analysis of the model, they found that the rise in RMB exchange rate would bring different degree reduce of imports and exports.

In addition, some scholars concluded that there are no significant relations between exchange rate and foreign trade. Rose and Yellen (1989) studied thirty developing countries' data including China and found that about 28 countries does not exist significant relationship between real exchange rate and foreign trade through empirical research. Cerra and Saxena (2002) using the quarterly data of China from 1985 to 2001 and through empirical studies, proved that exports were not sensitive to exchange rate fluctuations, which means there is no significant relationship between exchange rate and foreign trade.

Obviously, the relations between RMB exchange rate and China's foreign trade is complex, and until today the scholars at home and abroad haven't reached same conclusion on this problem (see Yang Cao and Jianwu Li, 2006; Fuyou Lee and Min Sun, 2013; Caiyun Zhou and Taisong Cao, 2008; Jianguo Xie and Ligao Chen, 2002, etc). On the basis of the relevant researches at home and abroad, this paper analyzes the RMB exchange rate volatility and China's foreign trade situation. Through the theoretical and empirical analysis, this paper investigates the effect of nominal RMB exchange rate changes on import and export trade in China from 1981 to 2012. At the same time, it combines China's economic development status to discuss the effect of RMB exchange rate change on China's overall economic development to put forward some valuable political suggestions, too.

2. RMB exchange rate change and import-and-export trade

According to the scholars' research at home and abroad, we can conclude that exchange rate decline will reduce foreign trade volume. A country's real exchange rate decline may cause currency appreciation, and relatively speaking the domestic price of product will increase in the international market, which will cause a fall demand for domestic products and damage to the export trade. At the same time, the domestic market price of foreign products will relatively lower, which may stimulate the demand for foreign goods, then

leading to the rise of imports. However, some scholars with different opinion believe that exchange rate decline will have expansionary effect. In addition, other scholars suggest that the exchange rate decline will have different economic effects for the developed and the developing countries. In short, different countries have different economic environment and trade situation, and exchange rate fluctuation may cause different impacts on real economy. Therefore, it is necessary to analyze the situation on the basis of reality.

The volatility of exchange rates may influence a country's trade balance. According to the Marshall-Lerner condition, when the elasticity of a country's import and export goods meets the condition, a country's currency devaluation will increase its exports and reduce imports, thereby helping to improve the country's trade balance. At the same time, exchange rate also affects a country's overall economic situation through influencing its capital inflows and official reserves (Cooper Riehard, 1971).

Changes in exchange rates will first affect a country's foreign trade through the price and other multiple function, finally making an impact on the price of non-trade goods in the country. Currency devaluation, for example, will boost exports and reduce imports, and result in a rising price for imported goods at home, thus indirectly stimulating domestic prices. At the same time, the price of imported raw materials and equipments will rise to lead a rise in prices for other relevant commodities. And those rises will continue to influence other goods' price such as the substitutes. Therefore, the rising of all this series price will gradually be extended to all goods. In addition, exchange rate movements will impact on a country's national income and employment levels, too (Xiangsheng Dou, 2007).

In a word, exchange rate changes will influence international economy and a country's foreign trade. The exchange rate fluctuation of major industrial countries in the world can have a significant impact on international economy and also other countries' trade balance, which may increase trade friction between different countries and affect countries normal economy and trade development. At the same time, the exchange rate changes will affect the stability of international finance and the development of international economy (Zouheir Abida, 2011)

3. A descriptive analysis of RMB exchange rate and foreign trade

3.1. The volatility of RMB nominal exchange rate

With the development of economy, The Chinese government has loosen its controls on exchange rate, while China's exchange rate regime has gone through several significant transformation stages. Because the United States is the world's largest economic power, apart from the EU, the US is China's second largest trading partner. Although China has changed its currency system from pegging the US dollar to pegging a basket of currencies, China still uses the US dollar on the payment in international economy trade. Therefore, this paper uses available economic dates from 1981 to 2012 coming from the China Statistical Yearbook in 2012 to analyze the changes of RMB-US dollar exchange rate.

As shown in Figure 1. the average RMB exchange rate is always fluctuating. During the period of 1981-1994, the dual exchange rate system was applied in China, and at this stage the RMB exchange rate was increased from 170.5 to 861.87 point. In 1985, the government abolished the RMB internal settlement price and thereby appeared a sharp depreciation of RMB. In 1986, 1989 and 1990, China carried out three times adjustment for RMB exchange rate system, and in those years the rate was reduced.

Between 1994 and 2005, the RMB exchange rate showed a steady trend, the exchange rate of RMB per \$100 maintained at 830-840 point ratios. In 1994, China implemented the

managed floating exchange rate system which was mainly determined by market supply and demand. As a result of this reform, as shown in Figure 1, in 1994 the exchange rate suddenly rose to 861.87 points, which caused high RMB Yuan devaluation. Since then, RMB exchange rate has remained at a relatively stable level. Even in 1997 after the outbreak of East Asia's financial crisis, RMB Yuan showed a long-term equilibrium rate.

Since 2005, China has reformed the pegging system and implemented new system based on market supply and demand, that is, with reference to a basket of currencies, a managed floating exchange rate system. The exchange rate of RMB per \$100 has showed a downward trend, and the ratio were lower than 700 point besides 2008.

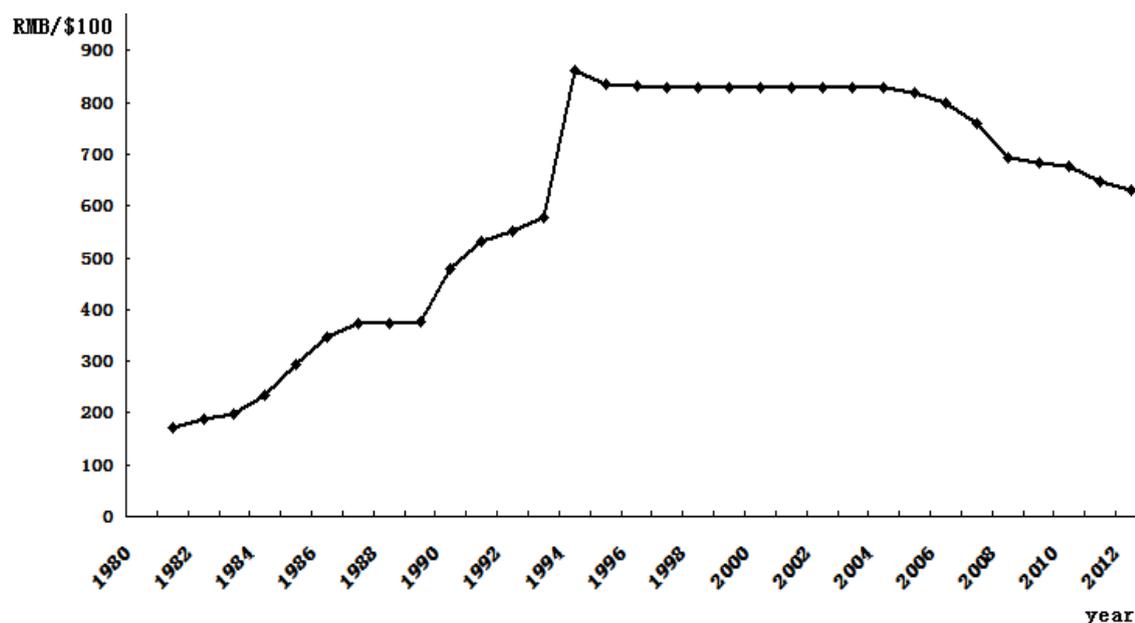


Fig. 1 the average exchange rate of RMB to US dollar from 1981 to 2012

3.2 Changes in import and export volume

A country's economic status is determined by both the domestic and the foreign economic condition, the volume of import and export trade is an important indicator to measure a country's foreign economy. Through analyzing China's import, export and others, China's overall foreign economic situation can be known.

According to specific import and export volume, the following figure 2 can be made, and it is an objective description of China's foreign trade states. As shown in Figure 2, China's foreign trade volume has been growing rapidly and steadily more than 20 years since 1981. Especially since 2000, China's foreign trade volume has showed a dramatic growth.

In 1981, China's trade just amounted to \$44.03 billion and the exports and imports were only \$22.01 billion and \$22.02 billion respectively, but by 2012 all of them increased to \$38676.6 billion, \$20498.3 billion and \$18178.3 billion respectively. That is to say, each year had a significantly increase. Further more, between 1981 and 2001, China's foreign trade volume showed a steady rise. After China joined the WTO in 2001, the foreign trade volume climbed rapidly, and in 2004 China's trade volume reached \$11545.5 billion. Due to the global financial crisis in 2008, both exports and imports reduced sharply. However, since 2009 the foreign trade volume has presented a fast rising trend again, and China's economy is growing

rapidly. With the development of China's foreign trade economy, China has become the world's biggest exporter since 2010.

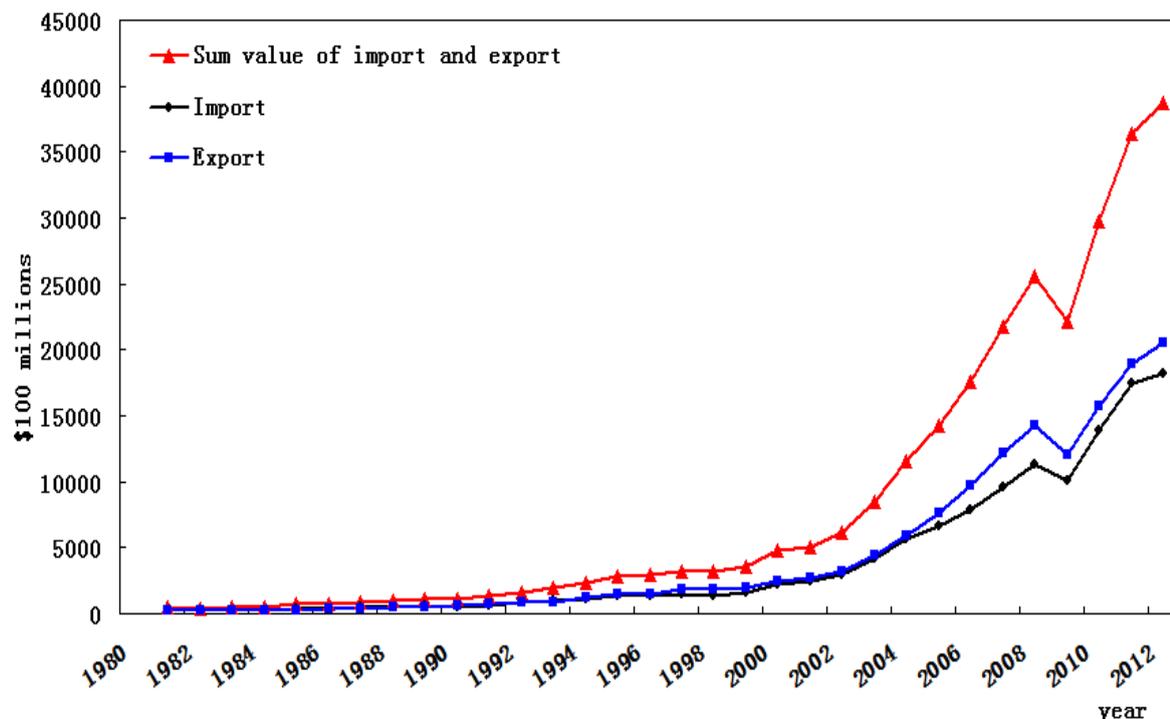


Fig.2 China's import and export quantity from 1981 to 2012

4. Empirical Analysis

4.1 Variables and data

This paper mainly to analyze the impact of exchange rate changes on the trade amount of export and import. For the sake of simplicity, to let E_t denote the nominal exchange rate of RMB, X_t denote the exports, and M_t denote the imports. All sample data including the nominal exchange rate, the imports and the exports are from 1981 to 2012.

Due to various regular or irregular factors, there often appears a variety of fluctuations among time series data. In order to get a better regression sequence for exchange rate and trade data, we first conduct a logarithmic processing for all variables and then do the unit root test.

4.2 Unit root tests

This paper selects the dates about China's exchange rate, exports and imports from 1981 to 2012. To avoid non-stationary problem in time series, here we use the unit root test firstly, and the test results are shown in Table 1.

As shown in Table 1, those three time series for the exports (X_t), the imports (M_t) and the exchange rate (E_t) are all first difference stationary in the 1% level, showing that they are first-order integration series. Again, we use co-integration test to see whether there exists a cointegration relationship between those series in the long term.

4.3 Cointegration test and equation estimation

Supposing two equations as the following:

$$\ln X_t = a_1 + a_2 \ln E_t + u_t \quad (1)$$

$$\ln M_t = b_1 + b_2 \ln E_t + v_t \quad (2)$$

Where, X_t denotes the exports, M_t denotes the imports, E_t denotes the RMB exchange rate, u_t and V_t denotes the equation residuals of (1) and (2), respectively.

Because exports (X_t), imports (M_t) and exchange rate (E_t) are all first order integration series, we can use the Engle-Granger test to see whether there exists co-integration relation between X_t , E_t and M_t , and then to make the regression for equation (1) and (2), respectively. we use unit root test to check the two equation's residuals, and the ADF test results are shown in Table 2.

Table 1 the ADF test of import, export and exchange rate series

Variables	Test Type	ADF Value	Critical value	Test Outcome
M_t	(c, 0, l)	0.5327	-2.6192	Non-stationary
ΔM_t	(c, 0, l)	-5.3397*	-3.6702	Stationary
X_t	(c, 0, l)	0.8018	-2.6192	Non-stationary
ΔX_t	(c, 0, l)	-5.2525*	-3.6702	Stationary
E_t	(0, 0, l)	1.9980	-1.6104	Non-stationary
ΔE_t	(0, 0, l)	-3.6139*	-2.6443	Stationary

Note: In the (c, t, l), c, t and l presents the concept, trend and lag term, respectively. *, ** and *** presents the test is statistically significant on the 10%, 5% and 1% level, respectively.

Table 2 the ADF test of U_t and V_t series

Residuals	ADF Value	1% level	5%	10%
u_t	-3.8178	-3.6701 *	-2.9640	-2.6210
v_t	-2.9382	-2.6569 *	-1.9544	-1.6093

Note: *, ** and *** presents the test is statistically significant on the 10%, 5% and 1% level, respectively.

Table 2 shows that u_t series is statistically significant on the 1% level, v_t is also statistically significant on the 1% level, so there exists cointegration relationship between $\ln X_t$ and $\ln E_t$ and between $\ln M_t$ and $\ln E_t$, which means there have long-term stable relationship between exchange rate, imports and exports. Therefore, we can build the following equations:

$$\ln X_t = \underset{(-2.8024)}{-6.347412} + \underset{(6.1218)}{2.189590} \ln E_t \tag{3}$$

$$R^2 = 0.5554, DW = 0.0641, F = 37.48$$

$$\ln M_t = \underset{(-2.4657)}{-5.374627} + \underset{(5.8864)}{2.026217} \ln E_t \tag{4}$$

$$R^2 = 0.5360, DW = 0.0773, F = 34.65$$

From equation (3), we see that there exists a positive long-run linear equilibrium relation among China's exports and exchange rate. When the exchange rate rises, so does the exports; when the rate declines, exports decreased correspondingly. As we can see from equation (4), there exists a positive long-run linear equilibrium relation among China's imports and exchange rate. However, the result of the formula is opposite to the theoretical prediction. In fact, although the exchange rate plays an important role, many factors can cause changes in China's import trade. Because the processing trade occupies a large part of China's export and

the raw materials and intermediate goods of this kind of trade mostly depend on import, the result of growing exports will certainly bring about the growth of imports.

In addition, the development of China's economy and the increasing demand in the domestic market will drive the growth of imports trade, too. Due to these factors, so since 2005, China's imports have been increasing fast with the RMB's appreciation. Therefore, other factors except exchange rate have greater impact on imports. This is the main reason that caused a positive long-run linear equilibrium relation among imports and exchange rate.

5. Conclusions and associated policy suggestions

Through the above analysis, this paper shows that the RMB nominal exchange rate fluctuation is the main factor that affects China's imports and exports. In the long run, the rise of RMB exchange rate which means devaluation of RMB will have a positive effect on the foreign trade, and will also makes a significant growth on domestic import and export volume. Therefore, we must take effective policies to adjust the relationship between RMB exchange rate fluctuations and foreign trade.

5.1 The coordination reform of exchange rate and interest rate liberalization

According to the interest parity theory, there exists solid relationship between the interest rate and the exchange rate, the interest-rate spread of two countries is approximately equal to the difference between the forward exchange rate and the spot exchange rate. The changes in interest rates may indirectly affect the exchange rate level through influencing the current-account and international capital flows. On the contrary, exchange rate fluctuation may indirectly affect interest rates level through influencing domestic price and short-term capital-flow, thus there is a close link between the two.

A managed floating exchange rate system has been taken through China's exchange rate reform. In this case, if China still uses centralized management towards interest rate, it will inhibit the exchange rate's adjusting effect of economy and have a bad effect on China's participation in international economic cooperation. In this background, China should gradually realize the market-oriented reform of interest rate to promote the coordination between interest rate and exchange rate system, and to take full advantage of the positive effect of interest rate. At the same time, the foreign exchange markets are a part of financial market system, thus China should continue to improve financial system to make the foreign exchange market more effectively (Zongxin Zhang, 2006).

5.2 The change in the expectation of RMB appreciation

This paper finds that in the long-run, the RMB exchange rate fluctuations have positive effects on related economic indicators. However, in recent years because of huge trade surplus and vast international reserve, China is facing great pressure from the U.S., the Japan and other European countries to upward revaluation of the RMB and in the short-term the sharp appreciation of the RMB will have an impact on China's economy. In recent years, expectations are growing stronger for the RMB appreciation, and the expectation is going to get worse. Under the pressure of RMB appreciation expectation, China must take measures to maintain a stable exchange rate, and continue to change the history of the RMB pegging to a single currency to make the RMB exchange rate fluctuations more autonomously. In addition, China needs to pay more attention to the world economic crisis and to avoid other countries to take measures to shift its economic problems to China for their own interests.

Taking into account of other economic factors and the international environment, China can gradually adjust the exchange rate and take a moderate appreciation of the RMB, and thereby adjust China's trade balance with other countries and ease foreign trade

contradictions. At the same time, the government should take measures to optimize the export structure and change the extensive export mode to achieve mutually beneficial trade with trading countries. Those actions may help to reduce the RMB appreciation pressure from the America and other countries and lower the expectation of RMB appreciation.

5.3 Gradually to open capital markets

The economic integratization development leads a higher mobility of international capital especially in China, and this is an important factor that caused the RMB exchange rate fluctuations. The rapid flows of capitals affect China's exchange rate and then indirectly affect money supply and the price level in China, and thereby have an impact on China's import and export trade. Therefore, China should gradually open the capital markets and put more efforts to crack down hot money inflows.

When there is a steady expectation of RMB appreciation, we can use institutional means to intensify the power to suppress and regulate the flow of hot money. Under the premise improving the management of the capital markets, in the short-term China need to open capital markets gradually, and try to maintain the stability of the RMB exchange rate level to guide the foreign capitals to start a orderly investment in China. In the long term, the government should strengthen the regulatory role of the markets in the economy and go ahead with reform and opening up, and the stability and development of the capital markets will reduce the bad effect of hot money on economy.

5.4 The acceleration of foreign exchange policy reform

5.4.1 The diversification of reserve structure

In China, the government holds the majority of foreign exchange, and the US dollar is the main form of China's foreign exchange reserves. This single holding ways will affect the independence of China's monetary policy, and may cause big reserve risks. Huge trade surplus and current-account surplus for mang years are the direct cause of RMB appreciation pressure. Accordingly, China should take measures to optimize the foreign exchange reserve structure (Magee and Grades, 2012).

China can push the reformation of foreign exchange system by using a diversification of foreign exchange reserves. Firstly, gold is relatively ideal investment due to its stability in value, and it helps to avoid the investment risk. Therefore, China may increase the proportion of gold in reserves, which will help to strength China's foreign exchange reserves. Secondly, China should reduce the proportion of the dollar in foreign exchange reserves and appropriately increase the holding proportion of other world currency, which may thereby enhance the capacity of negative impact of economic fluctuations. In addition, in the process of rapid economic growth and strengthens of comprehensive national strength, China should actively and steadily take effective polices and measures to promote the process of internationalization of the RMB, and this is an at-the-root solution to guarantee the security of China's foreign exchange and the autonomy of foreign exchange policy.

5.4.2 To increase holding proportion of individuals for foreign exchange

Firstly, to increase the non-government holding proportions of foreign exchange will help to improve the stock structure of foreign exchange. Secondly, the reform of foreign currency holding system will promote a multiple system. All of these can contribute to the diversification of foreign exchange holdings and investments and reduce the risks of China's foreign exchange reserves. In addition, China needs to establish a system to achieve it's structural adjustment of foreign exchange holding structure to increase the holding proportion by the non-government. China should continue to reform the exchange-rate regime and try to reduce the expectation of RMB appreciation, and may take measures by

encouraging enterprises and privates to use foreign exchange to do some rational investments, too (Xiangsheng Dou, 2010).

The government basically has achieved the marketization of foreign exchange transaction, while the monetary policies have still impacts on the exchange rate fluctuations. According to the economic practices of all countries in the world, when a country especially such as China is facing the complicated financial markets, it need to combine monetary policy with market intervention to improve the foreign exchange market operation mechanism.

5.4.3 To transform foreign exchange reserves into strategic resource reserves

From the real situation, China has high foreign exchange reserves and the government is eager to buy the treasuries from other countries especially the U.S.. Therefore, the relevant country's exchange rate policies or system reform will threaten the safety of China's reserves to a certain extent, which will result in the reduce of foreign exchange reserve value. In order to insure the value of reserves, China should change the single form of investment to build a strategic resources reserve system.

China can use the available reserves to buy overseas strategic resources such as oil, industrial raw minerals and various non-renewable energy sources. This can not only help to reduce the huge foreign exchange reserves, but also effectively ease the problems of resources, environment and development in China's economy. At the same time, China should urge private enterprises to use the foreign exchange to increase their foreign direct investment (FDI). China's private enterprises occupy an important position in economic development, so the government should pay more attention to them to show their great vitality and increase their foreign investment. All those measures can greatly enhance and consolidate China's position in the world economy, and also help to promote the implementation of China's "going global" strategy (Xiangsheng Dou, 2010).

Corresponding Author

Wanhui Jiang, School of Public Administration, Southwest Jiaotong University, P. R. China.
E-mail: onlyjwhui@163.com. Address: School of Public Administration, Southwest Jiaotong University, Jinniu, Chengdu 610031, Sichuan, P. R. China.

References

1. Chou W. L., 2000. Exchange Rate Variability and China's Exports. *Journal of Comparative Economics*, 28, 61-79.
2. Coöper Riehard, 1971. *Currency Devaluation in Developing Countries*. New Haven: Yale University Press, pp. 132-147.
3. Valerie Cerra, Sweta Chaman Saxena, 2002. An Empirical Analysis of China's Export Behavior. *IMF Working Paper*, I ,WP/02, pp. 1-33.
4. Jaime Marquez, John W. Schindler, 2006. Exchange Rate Effects on China's Trade: An Interim Repor, the *International Finance Discussion Papers*, 86, pp. 11-59.
5. Yue C., Hua P., 2002. Does Comparative Advantage Explain Export Pattern in China?. *China Economic Review*, 13, 276-296.
6. Rose A., Yellen, 1989. Is there a J-curve. *Journal of Monetary Economies*, 1, 53-68.
7. Zouheir Abida, 2011. Real Exchange Rate Misalignment and Economic Growth: An Empirical Study for the Maghreb Countries. *International Journal of Economics and Finance*, 5, 129-137.
8. Yulu Chen, 2008. *International Finance*. Beijing: China Renmin University Press, pp. 29. (in

Chinese)

9. Yang Cao, Jianwu Li, 2006. RMB real exchange rate and the impact of volatility on export trade-based on the 1980-2004 years of empirical research. *World Economy Research*, 8, 56-59. (in Chinese)
10. Xiaoyan Bai, 2008. The history and logic of RMB exchange rate system reform process. *World Economic Research*, 12, 32-33. (in Chinese)
11. Xiangsheng Dou, 2007. *International Finance*. Beijing: Economic Science Press. (in Chinese)
12. Xiangsheng Dou, 2010. Researches on the Problem of the RMB Exchange Rate Stability in the Context of the Post-financial Crisis Era. *Pacific Journal*, 18, 53-59. (in Chinese)
13. Fuyou Li, Min Sun, 2013. An Empirical Study on the Effect of RMB Real Exchange Rate Change on Sino-Japan Trade from 2000 to 2011. *Contemporary Economy of Japan*, 2, 60-64. (in Chinese)
14. Xiangqian Lu, Guoqiang Dai, 2005. The Influence of Fluctuation of Real RMB Exchange Rate to Chinese Import and Export:1994—2003. *Economic Research*, 5, 31-39. (in Chinese)
15. Jie Ma, Can Zhang, 2012. DCC-GARCH-CVAR model and dynamic optimization the structure of China's foreign exchange reserves. *World Economy*, 7, 11-12. (in Chinese)
16. Weixian Wei, 1997. Analysis on relationship between China's exports and Effective exchange rate. *Statistical Research*, 5, 45-50. (in Chinese)
17. Jianguo Xie, Ligao Chen, 2002. RMB exchange rate and the rate balance:Cointegration research and Shock decomposition. *World Economy*, 9, 27-34. (in Chinese)
18. Zongxin Zhang, 2006. Cooperative effect analyze of interest rates and exchange rates reform under the condition of financial opening. *International Financial Research*, 9, 12-13. (in Chinese)
19. Yuncai Zhou, Taisong Cao, 2008. the impact of RMB exchange rate fluctuations on China's foreign Trade-Based on the empirical research of Johansen Cointegration and Error Correction Model. *Journal of Fujian Higher Specialty Institutions*, 6, 31-34. (in Chinese)