A Study on the Impact of some Factors on Holdings of Foreign Exchange Reserve in China

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Abstract

Foreign exchange reserves are important indicators of ability to repay foreign debt and for currency defense. This paper adopts annual time series from 1983 to 2016 to analyze the impact of trade balance, foreign direct investment, external debt and foreign exchange rate on the holdings of foreign exchange reserve. Taking the special situation of China into consideration, the analysis is divided into three periods. The empirical analysis results show that the factors that impact the holdings of foreign exchange reserve are different in different period. More specifically, in the first period, the factors that affect the holdings of foreign exchange reserve most are the foreign direct investment and the trade balance. In the second period, the factors that affect the holdings of foreign exchange reserve most are the foreign direct investment and the external debt. In the third period, the factors that affect the holdings of foreign exchange reserve most are trade balance and exchange rate. On the basis of empirical analysis, some measures should be taken so as to keep a good holdings of foreign exchange reserve in China.

Keywords: Foreign Exchange Reserve, Trade Balance, Foreign Direct Investment, External Debt, Foreign Exchange Rate

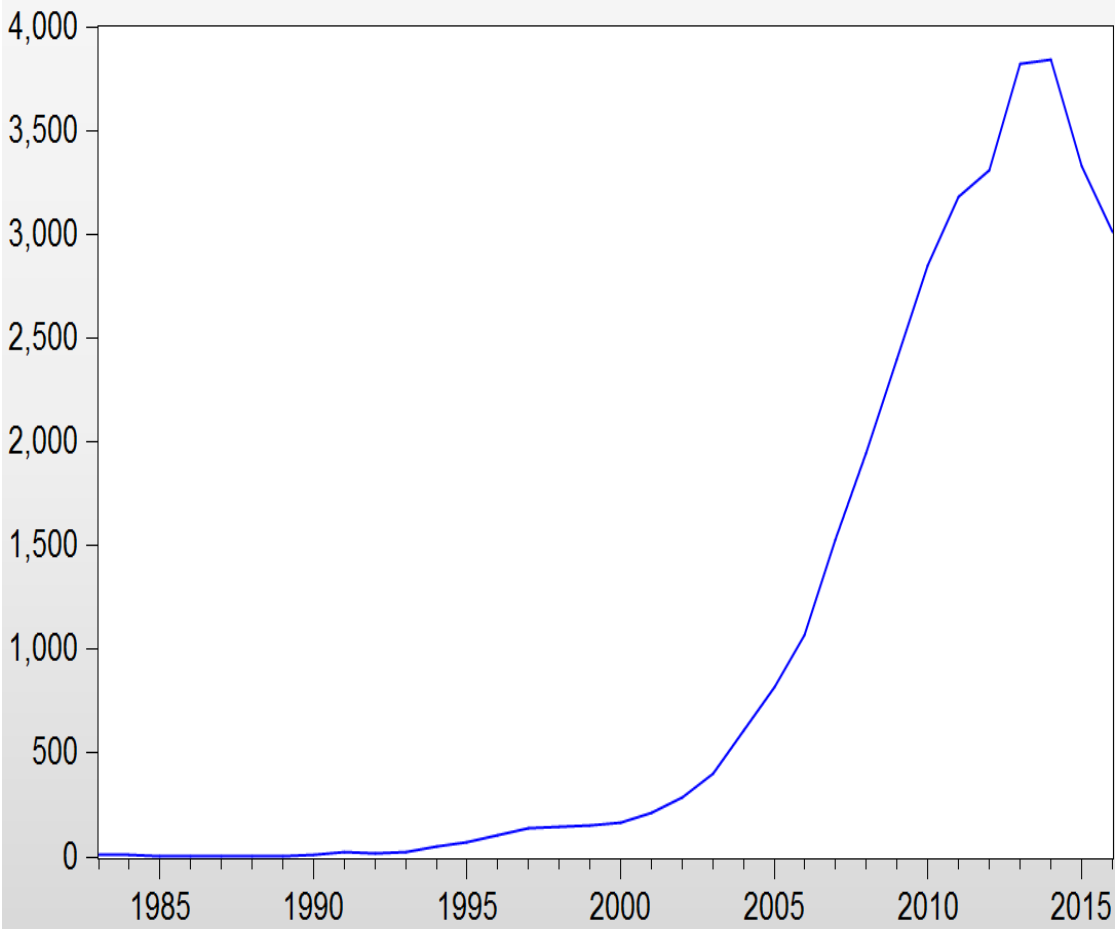
JEL Classifications: A1, C1, F1

1 Introduction

In a strict sense, foreign-exchange reserves should only include foreign banknotes, foreign bank deposits, foreign treasury bills, and short and long-term foreign government securities. However, the term in popular usage also adds gold reserves, special drawing rights, and International Monetary Fund reserve positions. This broader figure is more readily available, but it is more accurately termed official international reserves or international reserves. Foreign exchange reserves are called reserve assets in the balance of payments and are located in the capital account. Hence, they are usually an important part of the international investment position of a country. The reserves are labeled as reserve assets under assets by functional category. In terms of financial assets classifications, the reserve assets can be classified as Gold bullion, Unallocated gold accounts, Special drawing rights, currency, Reserve position in the IMF, interbank position, other transferable deposits, other deposits, debt securities, loans, equity, investment fund shares and financial derivatives, such as forward contracts and options. There is no counterpart for reserve assets in liabilities of the International Investment Position. Usually, when the monetary authority of a country has some kind of liability, this will be included in other categories, such as Other Investments. In the Central Bank's Balance Sheet, foreign exchange reserves are assets, along with domestic credit.

Nowadays, foreign exchange reserve has been the focus of the world. Foreign exchange reserve also has become a means for every country to balance the stabilization of exchange rate and adjust the development of economy. China is a biggest developing country and the foreign exchange reserve is also an important indicator to measure China's economy. The holdings of foreign exchange reserve in China show in table 1.

Figure 1. Foreign exchange reserve in China



Unit: billion dollar

Figure 1 show the change of China's foreign exchange reserve in China. It easy can be observed that the holdings of China's foreign exchange reserve grow like an exponential increase from 1983 to 2016. From 1983 to 1993, the holdings of foreign exchange reserve in China keep in a very low level. From 1993 to 2000, the holdings of foreign exchange reserve in China increase more rapidly. However, since in 2001 China becomes a member of World Trade Organization, the holdings of foreign exchange reserve have experienced a dramatic change. Especially, in 2006, the holdings of China's foreign exchange reserve surpass that of Japan and become the largest holdings of foreign exchange reserve in the world. After 2014, there is a little decrease in the holdings of China's foreign exchange reserve. One of the most important reasons is that a part of foreign exchange reserve is used to balance the appreciation of RMB. The purpose of this paper is to find out the impact of trade balance, foreign direct investment, external debt and foreign exchange rate on the holdings of foreign exchange reserve in China.

To this end, the rest of this paper is organized as follows: Part 2 reviews empirical studies which are explored by the previous researches about this topic. Part 3 discusses the theoretical framework. Part 4 presents the empirical analysis results. And part 5 provides some conclusions.

2 Literature Review

There is a large number of scholars who attempt to find out factors that affect the holdings of foreign exchange reserve through different kinds of ways. Most of their results, Of course, are different.

Fukuda and Kon (2010) explore the possible long-run impacts of this trend on macroeconomic variables in developing countries. They analyze a simple open economy model where increased foreign exchange reserves reduce the costs of liquidity risk. Given the amount of foreign exchange reserves, utility-maximizing representative agents decide consumption, capital stock, and labor input, as well as the amounts of liquid and illiquid external debt. The equilibrium values of these variables depend on the amount of foreign exchange reserves.

A rise in foreign exchange reserves increases both liquid and total debt, while shortening debt maturity. To the extent that interest rates of foreign exchange reserves are low, an increase in foreign reserves also leads to a permanent decline in consumption. However, when the tradable sector is capital intensive, the increase may enhance investment and economic growth. They provide empirical support for our theoretical analysis using panel data from the Penn World Table. The cross-country evidence shows that an increase in foreign exchange reserves raises external debt outstanding and shortens debt maturity. The results also imply that increased foreign exchange reserves may lead to a decline in consumption, but can also enhance investment and economic growth. The positive impact on economic growth, however, disappears when we control the impact through investment.

On global scale, central banks' holdings of foreign reserves have escalated sharply in recent years. World international reserves holdings have risen significantly from US$1.2 trillion in 1995 to nearly US$10.0 trillion in June 2011. Dominant among these reserves are concentrated in the hands of few countries. Ten major holders of foreign reserves are mostly from Asia. Oil exporting countries in Africa and the Middle East are not left out in this trend. Nigeria's foreign reserves rose from US$5.5 billion in 1999 to US$62.40 billion in July 2008, making Nigeria the twenty-fourth largest reserves holder in the world. This pace of reserves accumulation is occurring without regard to its diminishing marginal benefits and rising marginal costs. Irefin and Yaaba (2011) use an Autoregressive Distributed Lag approach to run a slightly modified econometrics 'Buffer Stock Model' of Frenkel and Jovanovic (1981) to estimate the determinants of foreign reserves in Nigeria with focus on income, monetary policy rate, imports and exchange rate. The results debunk the existence of buffer stock model for reserves accumulation and provide strong evidence in support of income as the major determinant of reserves holdings in Nigeria. Chaudhry, Akhtar, Mahmood and Faridi (2011) provide the empirical evidence regarding the relationships between foreign exchange reserves and inflation, focusing on Pakistan's experience since 1960. They use the Auto Regressive Distributive Lag Model proposed by Pesaran et al. (2001) in order to investigate the order of cointegration between inflation and foreign exchange reserves through bound testing approach, and also use the OLS estimation to determine the long run relationship. Through this econometric technique, they trace out the nature of relationship and speed of adjustment in the concerned variable due to fluctuations in the level of foreign exchange reserves. Empirical results indicate that the rise in foreign exchange reserves leads to lower the rate of inflation in Pakistan during the study period. Rizvi, Naqvi, Ramzan and Rizavi (2011) analyze the economy of Pakistan during the period of 2001-2006 with reference to the probable use of reserves accumulation as a monetary tool and find convincing evidences that reserves are being accumulated excessively in that period and impacted successfully in stimulating GDP's, Exports' and Imports' growth; stabilizing exchange rate; and reducing debt burdens and deficits. However, it is not evident that this strategy is designed and implemented intentionally by the monetary authorities following in the footsteps of other economies of the region. It rather seems to be a spontaneous policy or a fluke generated as an aftermath of 9/11 attacks that actually led to the strong capital inflows in the country by way of remittances and net foreign factor income.

Gokhale and Raju (2013) use a time series data of the variables between 1980 and 2010. The present study tries to establish a causal relationship between exchange rate and foreign exchange reserves in the Indian context. Emphasis has been laid on understanding the impact of foreign exchange reserves on the exchange rate. India has accumulated unprecedented foreign exchange reserves and synchronously has been experiencing a large depreciation in its Rupee vies avis US dollar. This trend prompts us to undertake this study to establish some association between the two trends. Our analysis uses Unit Root test, Johansson Co-integration test and Vector Auto Regression and concludes that there is no long and short term association between exchange rate and foreign exchange reserves in the Indian context. Alam and Rahim (2013) perform a study about foreign exchange reserves of Bangladesh. The main purpose of this study is to the influence of exchange rates on foreign exchange reserves to the Bangladesh context. Both the primary and secondary data has been used in this study. The primary data has been collected through a structured questionnaire from 50 respondents. The secondary data, namely Bangladesh foreign exchange reserves (FER), Bangladesh current account balance (CAB), Bangladesh capital and financial account balance (CFAB), and BDT/USD exchange rates (ER). This study covers yearly data from July 01, 1996 to June 30, 2005 and quarterly data from July 01, 2005 to June 30, 2012. Findings of this study shows that out of the selected 16 factors affecting foreign exchange reserves, exchange rates occupy the first position, weighted average score (WAS) being 4.56. Foreign exchange reserves (FER) and current account balance (CAB) have increased by 502.9087% and 1451.218%, whereas capital and financial account (CFAB) has decreased by -649.024% on June 30, 2012 compared to June 30, 1997.

The influence of other factors held constant, as ER changes by 285.6894 units due to one unit change in FER, on average in the same direction which represents that ER has positive effect on the FER and this relationship is statistically significant. 62.1526 percent of the variation in FER is explained by ER. The outcomes of Breusch-Godfrey test (LM test), ARCH test, and the Normality test are that there is a serial correlation among residuals, the variance of residuals is not constant, and the residuals are not normally distributed. Chen (2013) makes an empirical study of the impact of foreign exchange reserves on currency mismatch. The results of the study show that foreign exchange reserves have a significant and persistent effect on currency mismatch. Finally, based on the findings of the study and the current situation of China's foreign exchange reserves, this paper proposes some countermeasures.

Zhou (2014) finds that China's foreign exchange reserves growth will promote consumer price index increase. So that, the excessive foreign exchange reserves is the reason to CPI increase, also he finds that the contribution degree of foreign exchange reserves to CPI is more that 20%,that means the influence of foreign exchange reserves is obvious. Chowdhury, Uddin and Islam (2014) undertake an econometric analysis of the determinants of foreign exchange reserves. Yearly time series data have been used to figure out that type of relevant variables that are very much momentous for the determinants of foreign exchange reserves. They attempt to identify the key determinants of foreign exchange reserves in Bangladesh using Augmented Dicky Fuller (ADF) unit root test to examine the stationarity, Engle Granger residual based co-integration approach to show the cointegrating relationship among variables, and diagnostic tests for better modeling. The empirical results confirm that there exists a strong relationship among foreign exchange reserves, exchange rate, remittance, home interest rate, broad money, UPI of export and import, and per capita GDP. The coefficients are found to change smoothly, as a function of seven threshold variables- out of nine candidates where six variables are statistically significant. Drawing inferences from these findings, it can be suggested that exchange rate, a strong remittance related policies, quality items of exports, and sustainable GDP can keep a substantial and feasible roles to make up a healthy amount of foreign exchange reserves for the host country like Bangladesh.

China is both a major trading partner of the United States and the largest official holder of U.S. assets in the world. The value of Chinese foreign exchange reserves peak at just over $4 trillion in June 2014, but has since declined to $3.19 trillion as of August 2016. This very large decline is in foreign exchange reserves is unprecedented and some analysts have speculated that continued sales of these (mostly U.S.) assets might significantly impact the U.S. and global economies.Neely (2017) tries to explain the reasons for this large decline in official assets, what China's policy choices are, and how these choices could affect the U.S. economy. The fluctuations in Nigeria's foreign exchange reserves and the increase in both import and export trade make it imperative to determine how trade has influenced the country's foreign reserves. Nteegah and Okpoi (2017) utilize data on foreign reserves, oil imports, non-oil imports, oil export, non-oil exports and exchange rate in Nigeria during the period 1980–2015 and analyzing it using the cointegration and Vector Error Correction Model, the findings revealed that foreign trade has serious implications for Nigeria's foreign reserves. This is evidenced from the causality test results which revealed that oil import, non-oil imports, oil exports, non-oil exports and exchange rate propelled foreign reserves. Also the Vector Error Correction result indicates that oil and non-oil export are positively and correctly signed hence have positive implication on foreign reserves while oil and non-oil imports were negatively signed implying that they retarded foreign reserves in Nigeria. Specifically, oil export, non-oil imports and exchange rate were significant at 5 percent. This implies that they impacted significantly on foreign exchange reserves in Nigeria during the period covered by the study. Based on these findings, we suggest the need to diversify the country's export base and eliminate frivolous imports as possible measures of improving foreign reserves in Nigeria. KashIf (2017) investigates the impact of economic growth on Brazilian international reserves holdings in the context of Error Correction Mechanism using data over the 1980-2014 period. The results reveal that economic growth is highly significant. From the estimation of our model, he argues that economic growth and international reserves have positive long run relationship. Error correction estimates validated our model for error correction term is negative and statistically significant. Besides, our model suggested that economic growth has short run relationship too. The speed of adjustment is more than 40% which indicated that error correction term corrects previous year disequilibrium at the rate of 40.4%. Onwuka and Igweze (2014) examine the effect of foreign reserve and external debt on USD/Naira exchange rate. Our models have consistently shown that external reserve and foreign debt have significant contributions to the USD/Naira exchange rate. A direct relationship exists between USD/Naira exchange rate and external reserve and foreign debt respectively.

It is therefore recommended that Contributions to foreign reserve should be diversified to other major currencies of the world so as to reduce the exchange rate demand on the United State Dollar, Foreign borrowing should be reduced as low as possible so as to reduce the demand on foreign exchange. Borrowing from other non- USD dominated economies may diversify foreign exchange demand.

3 Theoretical Framework

According to the economic theory, holding amount of foreign exchange reserve is often affected by two aspects that are the demand of foreign exchange reserve and the supply of foreign exchange reserve. Then, more details of the two aspects will be given, which can affect the foreign exchange reserve.

3.1 In terms of demand

There are four approaches that can affect holding amount of foreign exchange reserve. More specific, they are the import, the payment for external debt, the profit outflow of foreign direct investment and the foreign exchange regime. The four approaches will be demonstrated one by on.

3.1.1 Import

Import is one of the most significant factors that affect the scale of foreign exchange reserve, especially in the aspect of demand for transaction. Nowadays, as the economy globalizes, the import transactions have become more frequent, which will result in more demand of foreign exchange reserve. For a country, the greater trade openness indicates the strong dependence on the international economic environment, and it also indicates the greater amount of import. Therefore more foreign exchange reserve will be needed to satisfy the demand of import. Conversely, if a country will small trade openness to the world, it will also import less than the country with greater trade openness. Of course, the need of foreign exchange reserve will also become smaller. In summary, it can be concluded that the amount of import has a positive relation with the amount of foreign exchange reserve.

3.1.2 Payment for external debt

External debt is an important way for a county to make up for the shortage of capital. In some degree, it can help borrower's economy develop more rapidly. Furthermore, it is also beneficial for the borrower to conduct international cooperation. However, the borrower also needs to pay the debt when the deadline is coming. So the borrower should holding more foreign exchange reserve so as to make a payment. Usually, the borrower will expand its export and decrease its import. This can can create more foreign exchange reserve. But it can result in a negative shock to the domestic market in terms of imbalance of the foreign exchange reserve, which will lead to deterioration of international current account. In order to avoid debt crisis, the borrower should hold enough foreign exchange reserve so as to pay the debt in time. Obviously, large external debt will generate large holdings of foreign exchange reserve.

3.1.3 Profit outflow of foreign direct investment

Generally speaking, the foreign exchange reserve has become a major approach for developed countries to export the capital and it also a useful way for developing countries to take good use of the foreign. The foreign direct investment can bring a lot of returns for developed countries and while there is no pressure for the developing countries to pay the external debt. Although the foreign direct investment is not the external debt, the purpose of foreign direct investment can earn the higher profits than that of the domestic investment. If the earnings of the foreign investment can not be remitted smoothly, its enthusiasm of the investors will be stricken. So, the recipient nations will remit a large number of earnings every year. The remittance of the earnings indicates a decrease in the supply of the foreign exchange reserve in the foreign exchange market.

3.1.4 Exchange rate regime

At present, the floating exchange rate has been used by most countries in the world. To a certain extent, a country's exchange rate policy and its willing to intervene in currency market will affect on its international reserve, especially, the demand of foreign exchange reserve. When a country is faced with the wide fluctuations in the foreign exchange rate, the foreign exchange reserve which is held by the central bank can be used to stabilize the foreign exchange rate's fluctuation. Generally, the preventive demand is the main driving factor for a country which implements the pegged exchange rate to hold the foreign exchange reserve. The exchange rate regime also affects the demand of foreign exchange reserve. For example, if a country implements a flexible exchange rate or relaxes intervention in the foreign exchange rate, its demand of foreign exchange reserve will be decreased.

Otherwise, if a country attempts to implement a strong intervention policy to control its domestic exchange rate or to stabilize its currency market, more foreign exchange reserve will be needed to adjust above which has been analyzed.

3.2 In terms of supply

From the balance of international payment, the fluctuation of a country's foreign exchange reserve is equal to the sum of current account balance and capital balance. In terms of supply, the resources of foreign exchange reserve are the profit of export, the inflow of external debt and the foreign direct investment.

3.2.1 Profit of export

The most stable and sustainable source of foreign exchange reserve is the increase in the amount of export. Therefore, a country should strengthen its domestic products' competitiveness to promote an increase in its export. Because the favorable balance of external debt and foreign investment will finally return to the borrowing countries and investors. But these all need to use the current account surplus to pay off. So, trying a country's best to export is most important channel to supply the foreign exchange reserve.

3.2.2 Inflow of external debt

A large part of a country's external debts inflow though the remittance. If these foreign exchange reserves are immediately used to introduce the goods and the technology from the developed countries, its effect on domestic economy just like the goods import. The inflow of external debt can promote the domestic economy and society development, which can result in an increase in the earnings of foreign exchange reserve. An increase in the earnings of foreign exchange reserve can lead to an increase in a country's external credit and the ability of debt payment. If the external debt is not used right now, the foreign exchange reserve will be increased. Therefore, if the rate of utilization of external debt is higher, the increase effect on foreign exchange reserve will be smaller. Conversely, Therefore, the inflow of external debt will pose a direct or indirect effect on economic development and foreign exchange reserve.

3.2.3 Foreign direct investment

The foreign direct investment can not generate the debt and debt payment, it can affect the foreign exchange reserve by the indirect channels. Commonly, an increase in the direct investment demonstrates the capital receipts and an increase in the import. In the balance of international payment, if the net current account is greater than the capital receipts, it indicates that the foreign direct investment boosts competitiveness of the domestic export. Owing to the export growth, the ability of supply of the foreign exchange reserve can be strengthened; if the net current account is smaller than the capital receipts, it indicates that this foreign exchange only uses the foreign direct investment which is treated as a way to enter the domestic market. Of course, it is harmful to the foreign exchange reserve growth. Meanwhile, the foreign direct investment improve the enterprise's international competitiveness, and it also can promote the domestic national economy and adjust the industrial structure, which has a further impact on a country's balance of payments and foreign exchange reserve.

4 Empirical Analysis

In this paper, the purpose is to study the impact of trade balance, foreign direct investment, external debt and foreign exchange rate on holdings of foreign exchange reserve in China. Taking real situation of China's foreign exchange reserve into consideration, the regression analysis will be divided into three periods. More specific, the first period is from 1983 to 1993. The second period is from 1994 to 2005. The third period is from 2006 to 2016.

4.1 Data descriptive

In this paper, there are five variables (trade balance, foreign direct investment, external debt, foreign exchange reserve and foreign exchange rate) used from 1983 to 2016 to conduct an empirical analysis. these data-sets are sourced from the National Bureau of Statistic of the People's Republic of China. In order to get rid of heteroscedasticity, all variables are taken the logarithms. the details of these variables are shown in table 1.

Table 1. Variables

Variable	Definition	Function	Source
$\log BT$	Trade balance	Trade balance can be seen as combination effect of export and import on foreign exchange reserve. The larger the trade balance is, the bigger the foreign exchange reserve will be fluctuated (explanatory variable)	National Bureau of Statistic of the People's Republic of China
$\log FDI$	Foreign direct investment	Remitting earnings of foreign direct investment can generate the demand of foreign exchange reserve (explanatory variable)	National Bureau of Statistic of the People's Republic of China
$\log ED$	External debt	External debt has a direct and indirect effect on the foreign exchange reserve (explanatory variable)	National Bureau of Statistic of the People's Republic of China
$\log ER$	Exchange rate	Foreign exchange reserve can stabilize the fluctuation of exchange rate. (explanatory variable)	National Bureau of Statistic of the People's Republic of China
$\log FER$	Foreign exchange reserve	Explained variable	National Bureau of Statistic of the People's Republic of China

4.2 Regression analysis

This paper takes use of Eviews to conduct an empirical analysis. The ordinary least square will be applied to analyze the impact of trade balance, foreign direct investment, external debt and foreign exchange rate on holding amount of foreign exchange reserve in China.

4.2.1 Period from 1983 to 1993

Table 2. Estimation of period from 1983 to 1993

Variable	Coefficient	Std. Error	t-Statistic	Prob.
$\log BT$	0.044	0.045	0.972	0.036
$\log FDI$	0.219	1.304	0.168	0.047
$\log ED$	0.784	1.582	0.496	0.638
$\log ER$	0.218	0.334	0.653	0.538
C	0.020	2.498	0.008	0.994
$R^2 = 0.964$		$Adjusted - R^2 = 0.981$		$D.W.$ =1.356

Table 2 indicates that the external debt and exchange rate do not get through the significant test under 5% level. Therefore, both of them will be removed from this model. Then, the rest of variables will be used to conduct an estimated regression again. The estimated results will be shown in table 3.

Table 3. Re-estimation of period from 1983 to 1993

Variable	Coefficient	Std. Error	t-Statistic	Prob.
$\log FDI$	0.236	0.021	3.054	0.000
$\log BT$	0.067	0.022	11.310	0.014
$R^2 = 0.957$		$Adjusted - R^2 = 0.941$		$D.W. = 1.967$

Table 3 indicates that both the foreign direct investment and the trade balance get through the significant test under 5% level. $Adjusted - R^2 = 0.941$means that this model has a strong ability of the both variables to foreign exchange reserve. $D.W. = 1.967$ means that there is no correlation among them.

The specific estimated equation gives:

$$FER = 0.236 \log FDI + 0.067 \log BT \qquad (1)$$

Equation (1) shows that the foreign exchange reserve is mainly affected by trade balance and foreign direct investment from 1983 to 1993. 1% increase in the foreign exchange investment can result in 0.236% increase in the foreign exchange reserve. 1% increase in the trade balance can lead to 0.067% increase in the foreign exchange reserve. This is in keeping with the theoretical framework. Since 1978, the reform and opening-up policy has been implemented in China. The opening up of China has well promoted the export trade. Because of this, the foreign exchange reserve in China increased largely at that period. Of course, the trade balance is also a positive factor that affects the foreign exchange reserve.

4.2.2 Period from 1994 to 2005

Table 4. Estimation of period from 1994 to 2005

Variable	Coefficient	Std. Error	t-Statistic	Prob.
$\log BT$	0.058	0.111	0.517	0.621
$\log FDI$	1.552	0.479	3.241	0.014
$\log ED$	2.078	0.141	14.689	0.000
$\log ER$	3.905	5.711	0.684	0.516
C	-20.821	17.583	-1.184	0.275
$R^2 = 0.986$		$Adjusted - R^2 = 0.981$		$D..W. = 1.356$

Table 4 indicates that the trade balance and exchange rate do not get through the significant test under 5% level. Therefore, both of them will be removed from this model. Then, the rest of variables will be used to conduct an estimated regression again. The estimated results will be shown in table 5.

Table 5. Re-estimation of period from 1994 to 2005

Variable	Coefficient	Std. Error	t-Statistic	Prob.
$\log FDI$	0.573	0.089	6.420	0.000
$\log ED$	2.262	0.191	11.844	0.000
$R^2 = 0.940$		$Adjusted - R^2 = 0.934$		$D.W. = 1.673$

Table 5 indicates that both the foreign direct investment and the external debt get through the significant test under 5% level. $Adjusted - R^2 = 0.934$ means that this model has a strong ability of the both variables to foreign exchange reserve. $D.W. = 1.673$ means that there is no correlation among them.

The specific estimated equation gives:

$$\log FER = 0.573 \log FDI + 2.262 \log ED \qquad (2)$$

Equation (2) indicates that the foreign direct investment and the external debt have a positive effect on the foreign exchange reserve. Specifically, 1% increase in the foreign exchange reserve will generate 0.573% in the foreign exchange reserve. 1% in the external debt will bring about 2.262% in the foreign exchange reserve. This is in accord with the theoretical framework. In this period, the factor that affect the foreign exchange reserve most is the external debt. There are three reasons that result in this result. The first is that the overseas financial institutions have conducted large number of business in China, which will lead to an increase in the short-run external debt. The second is that the amount of export and import increases largely, which will generate an increase in the short-run external debt related to the trade fiance. The third is that the interest margin between home & foreign currency and the appreciation of RMB will bring about that quantities of domestic institutions increase their external debt so as to the debt of RMB. The foreign exchange reserve still can promote the holdings of foreign exchange reserve. The major reason is still from the reform and opening-up policy.

4.2.3 Period from 2006 to 2016

Table 6. Estimation period from 2006 to 2016

Variable	Coefficient	Std. Error	t-Statistic	Prob.
$\log BT$	0.183	0.086	2.119	0.047
$\log FDI$	0.259	0.500	0.517	0.624
$\log ED$	0.060	0.113	0.533	0.614
$\log ER$	4.052	1.266	3.202	0.019
C	14.380	5.861	2.454	0.059
$R^2 = 0.976$		$Adjusted - R^2 = 0.960$		$D..W. = 1.177$

Table 6 indicates that the foreign direct investment and external debt do not get through the significant test under 5% level. Therefore, both of them will be removed from this model. Then, the rest of variables will be used to conduct an estimated regression again. The estimated results will be shown in table 7.

Table 7. Re-estimation period from 2006 to 2016

Variable	Coefficient	Std. Error	t-Statistic	Prob.
$\log BT$	0.144	0.057	2.526	0.036
$\log ER$	0.490	0.301	1.633	0.000
$R^2 = 0.973$		$Adjusted - R^2 = 0.967$		$D.W. = 1.780$

Table 5 indicates that both the trade balance and the exchange rate get through the significant test under 5% level. $Adjusted - R^2 = 0.967$ means that this model has a strong ability of the both variables to foreign exchange reserve. $D.W. = 1.780$ means that there is no correlation among them.

The specific estimated equation gives:

$$\log FER = 0.144 \log BT + 0.490 \log ER \quad (3)$$

Equation (3) indicates that in this period the trade balance and the exchange rate have a positive effect on the foreign exchange reserve. Concretely, 1% increase in the trade balance can result in 0.144% in the foreign exchange reserve. 1% increase in the exchange rate can lead to 0.490% in the foreign exchange rate. This is also consistent with the theoretical framework. The reason is that after 2005, the exchange rate regime has reformed and the managed floating exchange rate regime is carried out in China. In order to maintain the stabilization of exchange rate, more foreign exchange reserve needs to be held. As for the trade balance, the export trade increases rapidly because of excess capacity. Therefore, more foreign exchange reserve needs to be held to perform oversea transactions.

5 Conclusion

The aim of this study is to explore the impact of some factors (trade balance, foreign direct investment, external debt and foreign exchange rate) on holdings of foreign exchange reserve in China. The data-sets from 1983 to 2016 are applied to conduct empirical analyses which are divided into three periods. In the first period. the factors that affect the holdings of foreign exchange reserve most are the foreign direct investment and the trade balance. In the second period, the factors that affect the holdings of foreign exchange reserve most are the foreign direct investment and the external debt. In the third period, the factors that affect the holdings of foreign exchange reserve most are trade balance and exchange rate. According to the empirical analysis results, some measures should be taken.

For example, the industrial structure of export should be adjusted; The import of advanced technology and equipment should be encouraged. The circumstance of foreign direct investment should be improved; the industrial structure of foreign direct investment should be optimized. The growth rate of external debt should be controlled; External debt structure should properly be arranged. The exchange rate should be stabilized; A healthy exchange rate regime should be established.

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