

Comparative Study on the RMB Exchange Rate Formation Mechanism before and after “the 8.11 RMB Exchange Rate Reform”

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Keywords: Exchange rate formation mechanism; Exchange rate reform; TARCH model; Closing price

Abstract. This paper analyzes the data of the central parity rate and opening, closing prices of RMB against US dollar, then establishes the TARCH model of the central bank how to intervent the RMB exchange rate fluctuation base on the fluctuation characteristics of RMB exchange rate. Through the empirical analysis of the fluctuation of RMB exchange rate, concludes that the "leverage effect" is caused by the fluctuation of RMB exchange rate in two stages. Meanwhile analyzes the linkage between the central bank and the fluctuation of RMB exchange rate, which obtains the empirical results of the TARCH model on the fluctuation of before and after the RMB exchange rate reform. Finally, conclude the real RMB exchange rate formation mechanism by comparing the estimated results of TARCH model and try to put forward the policy recommendations for the reform of the RMB exchange rate formation mechanism.

Introduction

RMB exchange rate formation mechanism is part of the exchange rate mechanism, which refers to the process of producing an equilibrium price of exchange rate base on the situation that the various factors affect and interact each other. On August 11, 2015, the central bank made a major decision to adjust the quotation mechanism of the RMB central parity rate against the US dollar, requiring market makers refer to the closing rates of the previous day's interbank foreign exchange market when quoting to the China foreign exchange trading center. At this point, the RMB exchange rate formation mechanism has changed the managed floating exchange rate system that has been applied since July 21, 2005 and promulgated and implemented by the people's bank of China with reference to a basket of currencies base on the market supply. By making market makers make quotations based on the previous day's closing prices, the quotation can be closer to the real price level of the market, so as to reduce the error between the central parity of the exchange rate and the market price.

The RMB exchange rate formation mechanism has been developing towards marketization, since the exchange rate formation mechanism reformed from 2015. From the single dollar peg to a basket of currency system, and then to the current system that refers the previous day's closing rate of interbank foreign exchange market, both are moving forward in the path of exchange rate marketization [1]. The RMB exchange rate has undergone several changes after three years from 2015. On December 11, 2015, China foreign exchange trading center published the RMB exchange rate index, namely, it published six weights in a basket of currencies, which are US dollar, euro, Japanese yen, Hong Kong dollar, British pound, and Australian dollar, so that the RMB basket of currencies is no longer a black box, to make it public. In February 2016, the central bank clarified the fixing mechanism of the RMB central parity rate against the US dollar based on the “previous day's closing price + the exchange rate change of a basket of currencies” [2]. On December 29, 2016, China foreign exchange trading center adjusted the currency basket again, adding 11 currencies and reducing the weight of US dollar to 22%. On February 2017, the central bank shortened the calculation time for the exchange rate of a basket of currencies from 24 hours to 15 hours, making the central parity of the RMB exchange rate closer to the market. However, with the development of time, due to the large fluctuations in the exchange rate, on May 26, 2017, the

central bank introduced counter-cyclical factors into the calculation of the central parity rate of the RMB exchange rate, which played a regulating role when the exchange rate deviated from the equilibrium level. From the double anchoring of “previous day's closing price + changes in the exchange rate of a basket of currencies” in 2016 to the triple anchoring of “previous day's closing price + changes in the exchange rate of a basket of currencies + counter-cyclical factors” [3].

Literature Review

After August 11, 2015, the exchange rate of RMB against US dollar shall refer to the closing rate of the previous day's interbank foreign exchange market. Such exchange rate formation mechanism means that the central bank will give more exchange rate to the market and reduces the intervention in the foreign exchange market. However, whether the exchange rate fluctuation is really given to the market still need us to explore the effectiveness of foreign exchange intervention. Mainly from the following three perspectives to analyze, base on the study of domestic and foreign scholar.

Ito and Edison et al. respectively used this model to test the effect of foreign exchange intervention of the Japanese central bank and Australian central bank. Ito agreed that the intervention of Japanese central bank is effective in changing the exchange rate. However Edison's study found that Australian intervention did not change the level of the exchange rate but smoothed out its volatility [4]. Wan Ajun, based on the special background of “8·11” exchange rate reform, deeply discussed the relationship between the ultimate goal of the central bank's monetary policy and exchange rate stability [5]. And he used the monthly data to analyze, concluded that the rise and fall of the RMB exchange rate, as well as the volatility of exchange rate, can hardly be influenced by the intervention of the People's bank of China. Therefore, his suggestion to Chinese central bank is to accelerate the pace of RMB exchange rate marketization and minimize the intervention. Daude used this method to study the effectiveness of exchange rate intervention in 18 emerging countries [6]. Deng Liqiao and Dong Liang obtained the intervention effect of total 23 countries and regions' central bank in the world through empirical analysis by using panel instrumental variable method. They believe that positive foreign exchange intervention has an effect on both nominal and real exchange rates to mitigate fluctuations and has an obvious effect on stabilizing exchange rates [7]. Obstfeld and Rogoff established a dynamic stochastic general equilibrium model of the open economy and solved the optimal conditions [8]. Wang Aijian and Deng Liqiao also used the NK-DSGE theoretical model, and introduced monetary policy, foreign exchange intervention and other factors into the model [9]. The research results showed that the volatility of exchange rate was affected by different intervention methods. In terms of exchange rate adjustment, intervention cost and response to shocks, the intervention rules are superior to other intervention [10].

The Model

Building model. Although the above five models can well describe the “aggregation” feature of the volatility of financial asset return, they cannot explain that the price drop caused by bad news is greater than the price rise caused by the same degree of good news, namely the so-called “leverage effect”. However, the “leverage effect” exactly exists in the fluctuation of RMB exchange rate. Therefore, this paper decides to adopt TARCH model.

Mean value equation of TARCH model:

$$y_t = \gamma x_t + \mu_t \quad (1)$$

According to the study, the change of the exchange rate midpoint price and the closing price were introduced into the mean equation, and the change of the opening price and the midpoint price of the exchange rate were used as explanatory variables. So the mean value equation changed to below:

$$e_t = \gamma_1 e_{t-1} + \gamma_2 e_m + \gamma_3 e_0 + \mu_t \quad (2)$$

In which, e_t is the change in the daily closing price over the previous day's closing price of the exchange rate of RMB against US dollars; e_{t-1} is the change in the previous day's closing price over the day before the previous day's closing price of the exchange rate of RMB against US dollars; e_m is the daily fluctuation of RMB exchange rate against the previous closing price, which represents the intervention of China's central bank in the foreign exchange market; e_0 is the daily fluctuation of the opening price of RMB exchange rate against the middle price, which represents the correction of market against the central bank's control of exchange rate.

Empirical Analysis.

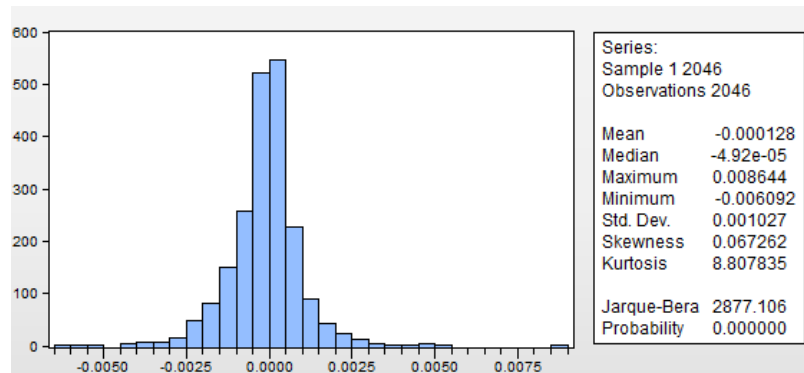


Figure. 1 Daily exchange rate closing price against the previous days' of RMB/US dollar

By observing the Fig. 1, the daily exchange rate closing price against the previous day's closing price of RMB against the US dollar, we could found that the exchange rate volatility sequence ET is asymmetrical, and its 'right tail' is longer than the 'left tail'. Meanwhile, the deviation valve of sequence ET, $S = 0.06726 > 0$, which indicated that the sequence ET is right-skewed. And the kurtosis valve $K = 8.807853$, which exceeds the peak valve 3 of the standard normal distribution, broadly reflecting that the distribution of ET sequence has the characteristic of 'sharp peak and thick tail'. The J-B statistic of sequence ET is very large, but its corresponding P value is very small, indicating that sequence ET does not obey the assumption of normal distribution, and the EM, EO is the same as ET. Therefore, before modeling, stationary test, correlation test and ARHCH effect test should be performed for ET, EM and E0 sequences respectively. TARCH model can only be used on the basis of meeting the requirements of sequence stability and conditional heteroscedasticity.

Table 1 Mean value equation parameters of the TARCH model

	2013.08.11~ 2015.08.10	2015.08.11~ 2018.08.11
ET(-1)	0.041883	0.595613
Z-Statistic	(41.19991)	(10.49973)
EM	0.362449	0.174293
Z-Statistic	(7.541164)	(9.014771)
E0	0.281163	0.423448
Z-Statistic	(4.274840)	(7.811528)

As can be seen from Table 1, according to the fluctuation of RMB exchange rate from 2013 to 2015, estimating the overall sample data by using TARCH model. The estimated results of the model are as follows:

Mean valve equation:

$$e_t = 0.041883e_{t-1} + 0.362449e_m + 0.281163e_0 \quad (3)$$

It can be known from the estimation results of the mean valve equation, $\gamma_2 > 0$, $\gamma_3 > 0$, $\gamma_2 > 0$, because the central bank intervene the foreign exchange market, and contrary adjustment to the RMB exchange rate. That is to say if the RMB exchange rate appreciation, through the central bank's adjustment, will lead to the devaluation of the RMB. $\gamma_3 > 0$, because the market will spontaneously correct the central parity rate that central bank intervenes. That is, if the central bank intervenes in the appreciation of the RMB exchange rate, the RMB exchange rate will continue to appreciate after the correction of the market. Because $\gamma_2 > \gamma_3$, the impact of the central bank on the exchange rate is greater than that of market correction, which also indicates to some extent that the central bank has the ability to control the rise and fall of the exchange rate. $\gamma_1 > 0$, which indicates that the daily closing prices of the RMB/US dollar exchange rate has the same change trend to the previous day's closing prices, but $\gamma_1 = 0.041883$, the small valve indicates that the daily closing price of the RMB/US dollar exchange rate doesn't have a great influence on the previous day, and it may be that the opening price and the central price of the same day have a greater influence on it.

According to the fluctuation of RMB exchange rate from 2015 to 2018, estimating the overall sample data by using TARCh model. The estimated results of the model are as follows:

Mean valve equation:

$$e_t = 0.595613e_{t-1} + 0.174293e_m + 0.423448e_0 \quad (4)$$

Because $\gamma_2 < \gamma_3$, which indicates that the influence of market correction has increased the exchange rate, and it has been greater than the central bank's influence on the exchange rate. To some extent, this also indicates that the central bank has reduced its ability to adjust the exchange rate and left more exchange rate adjustment to the market. $\gamma_1 > 0$, which indicates that the daily closing prices of the RMB/US dollar exchange rate has the same change trend to the previous day's closing prices. And $\gamma_1 = 0.595613$, the bigger valve shows that the daily closing price of the RMB/US dollar exchange rate have a greater impact on the previous day.

Conclusions

The establishment of TARCh model that the central bank's intervention in the fluctuation of RMB exchange rate and the analysis of the test results, which shows that the two stages of the RMB exchange rate formation mechanism is different, and the central bank's control of the exchange rate is also different. Before the "8.11" exchange rate reform, China should theoretically adopt the "one basket" exchange rate formation mechanism, but after calculation, in fact, the "dollar peg" system is adopted, and the proportion of the central bank's adjustment is relatively large. After the "8.11" exchange rate reform, when market makers make quotations, they refer to the closing rate of the previous day's interbank foreign exchange market, and the central bank gives more adjustment of exchange rate to the market, instead of intervening in the foreign exchange market by influencing the central parity of the RMB exchange rate. Our country is the socialist market economy system, the market is the main body of economy. With the development of our country economy, a mature market will have a benign adjustment of the exchange rate, and then the central bank will play an auxiliary role in most situations to promote the formation of a healthy and sound foreign exchange market.

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