

# Research on the Impact of RMB Exchange Rate Fluctuation on Domestic Bond Market

Jian Kang<sup>a,\*</sup>

Nanjing University of Science and Technology, Jiangsu 210094, China

<sup>a</sup>517155061@qq.com

\*Corresponding author

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**Abstract:** The "811 Foreign Exchange Reform" further improved the RMB exchange rate mid-price quotation mechanism, and the linkage between the foreign exchange market and the domestic bond market was significantly enhanced. Based on the data of the RMB exchange rate and the bond market after the "811 Foreign Exchange Reform", this article explored the impact of RMB exchange rate fluctuations on the domestic bond market. This article first theoretically deduced the mechanism and path of the impact of RMB exchange rate fluctuations on the domestic bond market, mainly from the macro and micro perspectives. The VAR model was then used as a tool for empirical analysis of the article. The results show that the devaluation of the RMB will increase the bond market in the short term, and the magnitude is not obvious, but in the long run, the negative effect will continue.

## 1. Introduction

The RMB exchange rate system has been continuously reformed, and the RMB exchange rate has gradually moved towards marketization. It is expected to increase the flexibility of the RMB exchange rate and increase participation in the foreign exchange market. In recent years, the RMB exchange rate has been hit by international events such as the Sino-US trade war, which has an important impact on the stability of the domestic financial environment and economic development. The "811 Foreign Exchange Reform" in 2015 improved the mid-price quotation mechanism, clarified the source of market maker quotations, and determined the mid-price by supply and demand. Immediately, the RMB exchange rate depreciated rapidly, releasing the exchange rate risks accumulated in the previous period, correcting the distorted exchange rate level, and avoiding the possibility of further depreciation of the RMB exchange rate and thus causing a large-scale outflow of domestic funds. The RMB was also officially included in the Special Drawing Rights of the IMF in October of the next year, which is of great significance to the internationalization of the RMB.

The marketization of the RMB exchange rate can take advantage of the market price mechanism to efficiently complete the allocation of social resources. Moreover, the marketization of the RMB exchange rate has also played a significant role in advancing domestic economic structural adjustment and accelerating the transformation of economic growth. At the same time, the adjustment of the foreign exchange system has also made the volatility of the RMB exchange rate continue to expand, weakening the stability of the domestic capital market. For the government, the stability of the bond market is an important manifestation of the stability of the domestic financial market. It is important to incorporate the impact of the fluctuation of the RMB exchange rate on the domestic bond market into the long-term policy of the country's economic development. For investors, the fluctuation of the RMB exchange rate is an important factor in making investment decisions, and it is essential when analyzing the bond market trend. Therefore, this article will make a theoretical analysis of the transmission mechanism and impact of the RMB exchange rate fluctuations on the domestic bond market, and then draw empirical conclusions based on actual data.

## 2. Literature Review

Liao Shiguang (2012) believed that current account surpluses and inflows of foreign capital would increase the supply of foreign currency assets and cause the local currency exchange rate to appreciate. After the sale of foreign currency assets to the government, the supply of local currencies increases, forcing interest rates to fall. RMB appreciation and expected effects further increase the supply of RMB, and provide sufficient funds for domestic institutional investors to trade in the bond market, and play a positive role in promoting the development of the domestic bond market. At the same time, foreign investors also increase their investment funds, and international speculative “hot money” accelerates into the country, injecting liquidity into the domestic bond market. The results show that changes in the RMB exchange rate will significantly affect the development of the domestic bond market, and the appreciation of the RMB will play a positive role in promoting the development of the bond market. Liu Yanlei (2017) pointed out that both the expected depreciation of the exchange rate and the actual depreciation of the exchange rate will significantly push down the trend of the domestic bond market. First, the devaluation of the RMB causes domestic capital to flow out, which has a direct negative impact on the bond market. Second, the devaluation of the RMB improves the domestic economic fundamentals and the inflation rate increases, but the impact is not enough to offset the negative impact.

Guo Kai and Zhang Xiaomei (2014) pointed out that the NDF price has a guiding effect on the domestic stock market trend. The one-month term of RMB appreciation expectation can push up the domestic stock market trend, and the three-month term of RMB appreciation expectation will push down the domestic stock market trend. Wu Lihua and Fu Guangmin (2014) used the TVP-VAR model to study the relationship between the RMB exchange rate, short-term capital flows, and the stock market, and found that the three are closely linked and constantly change over time. The RMB exchange rate has increasingly affected the stock market and the degree of influence also change over time.

The literature on the fluctuation of the RMB exchange rate for the domestic bond market tends to use a multiple linear regression model as the basis for empirical analysis. However, this model needs to strictly distinguish between the explanatory variables and the explained variables, and it cannot consider the influence of time series data. Therefore, after comparing the methods of other scholars studying the stock market, this article will base on the data of the RMB exchange rate and the bond market after the "811 Foreign Exchange Reform", and choose the VAR model as an empirical analysis tool, and finally give conclusions and recommendations.

## 3. Theoretical Analysis

The impact of RMB exchange rate fluctuations on the domestic bond market trend can be explored from macro and micro perspectives. The macro level mainly refers to exchange rate fluctuations that affect domestic foreign exchange reserves and money supply through the capital account, while the micro level refers to exchange rate fluctuations that are transmitted to domestic merchandise trade through current accounts or affect bond issuance. These two approaches are the main mechanisms by which exchange rate fluctuations affect the domestic bond market.

### 3.1 Macro-analysis of the impact of exchange rates on the bond market

The fluctuation of the RMB exchange rate will affect the stability of the domestic financial system. On the one hand, in order to reduce the negative effects caused by exchange rate fluctuations, the central bank usually buys or sells foreign exchange directly, and uses domestic foreign exchange reserves to absorb exchange rate fluctuations and smooth the effect on economic development out. The central bank's intervention in the operation of the foreign exchange market will inevitably affect the domestic money supply and cause changes in domestic interest rates, which will then be transmitted to the bond market. In order not to affect the changes in domestic interest rates, the central bank also reversely operates in the bond market to achieve the purpose of flattening exchange

rate fluctuations without affecting interest rates. However, buying and selling directly in the bond market will also affect trends in the bond market. On the other hand, international “hot money” is extremely sensitive to the exchange rate. Changes in the exchange rate of the RMB will directly change the flow of the funds and thus be transmitted to the domestic bond market.

### 3.2 Micro-analysis of the impact of exchange rate on the bond market

Changes in the exchange rate will be reflected in the import and export prices of raw materials or products. The devaluation of the RMB will raise the prices of imported raw materials by domestic companies. The cost of the company will affect the company's capital turnover, thus the company's capital will be affected, which will then be transmitted to the domestic bond market. The appreciation of the RMB will raise the export price of products and affect profits of enterprises, and then the effect will be transmitted to the domestic bond market. At the same time, for companies with foreign currency debts, fluctuations in the exchange rate of the RMB will change their financing options at home and abroad, thereby reducing or increasing their holdings of local currency debts and affecting the supply of the domestic bond market. Similarly, for investors, changes in the exchange rate will affect investors' judgments on the company's ability to pay debts, and then affect the domestic bond market.

## 4. Empirical Analysis

This paper uses the vector autoregressive (VAR) model as an empirical analysis tool and uses the exchange rate and bond market data after the "811 Foreign Exchange Reform" to avoid the impact of exchange rate system reform on the relationship between variables. A total of 156 weekly data were selected from September 2015 to August 2018. Let the benchmark price of the USD / CNY exchange rate of the Bank of China represent the exchange rate variable and record it as *ex*; take the China Bond Total Index to represent the bond market trend and record it as *bond*. The original data was sourced from the Resset database.

### 4.1 Unit Root Test

In view of the fact that the benchmark price of the USD / CNY exchange rate of the Bank of China and the China Bond Total Index are time series data, the stability of the data largely determines the accuracy of the empirical analysis. The unit root test is particularly useful for testing the stability of time series data. Use Eviews software to perform unit root test-ADF test on the weekly data. The test results are shown in Table 1. The results show that the original sequence of *ex* and *bond* is non-stationary, but the first-order differences of *ex* and *bond* are stationary.

In Table 1,  $\Delta$  represents the first-order difference operator. The test type (C, T, L) respectively represents the constant term, time trend and lag term in the ADF test. The value of 0 indicates none.

Table.1. Unit Root Test

Variable	(C, T, L)	ADF test statistic	1% level test critical value	5 level test critical value	Conclusion
<i>ex</i>	(C, 0, 0)	-1.613713	-3.473096	-2.880211	Unstable
$\Delta ex$	(C, 0, 0)	-7.356431	-3.473096	-2.880211	Stable
<i>bond</i>	(C, 0, 0)	-1.009634	-3.473096	-2.880211	Unstable
$\Delta bond$	(C, 0, 0)	-8.091790	-3.473096	-2.880211	Stable

### 4.2 Cointegration Test

The original sequence of the variables *ex* and *bond* is not stable. If there is a stable linear combination that makes the combination no longer have a random trend, then *ex* and *bond* are co-integrated and can show a common trend. The cointegration test is used the Engle-Granger two-step method. First we calculate the residual term  $e_t$ , and then perform a unit root test on  $e_t$ .

The results are shown in Table 2. The original sequence of  $e_t$  is not stable, and the first-order difference is stable, which means the variables  $ex$  and  $bond$  is (2, 1) level cointegration.

Table.2. Cointegration Test

Variable	(C, T, L)	ADF test statistic	1% level test critical value	5 level test critical value	Conclusion
$e_t$	(C, 0, 0)	-1.003342	-3.473096	-2.880211	Unstable
$\Delta e_t$	(C, 0, 0)	-8.169010	-3.473096	-2.880211	Stable

### 4.3 Vector Error Correction Model Test

Now we can see that there is some relationship between  $ex$  and  $bond$  in the long-term equilibrium, but in the short term, it may still be unbalanced. This kind of relationship that exists during long-term equilibrium can only be maintained in the short-term process, that is, the error correction model can make the part that deviates from equilibrium in a certain period be corrected in the next period. The Eviews software was used to establish vector error correction models for the variables  $ex$  and  $bond$ . The error correction term can be expressed as Equation (1).

$$\text{CointEq1} = bond + 3.514558ex - 2439.801 \quad (1)$$

The vector error correction model is expressed as Equation (2). From the  $\text{CointEq}_{t-1}$  coefficient, we can see that the deviation of the bond market trend from its long-term equilibrium value in the short term will be revised by 0.1158% in the next period.

$$\Delta bond_t = -0.013258 - 0.001158\text{CointEq}_{t-1} + \begin{bmatrix} 0.356857 & -0.081427 \end{bmatrix} \begin{bmatrix} \Delta bond_{t-1} \\ \Delta bond_{t-2} \end{bmatrix} + \begin{bmatrix} 0.012357 & -0.006307 \end{bmatrix} \begin{bmatrix} \Delta ex_{t-1} \\ \Delta ex_{t-2} \end{bmatrix} \quad (2)$$

### 4.4 Granger Causal Relation Test

The Granger causal relation test examines whether the lag terms of a variable can be substituted into the equations of other variables. If a variable has a functional relationship with the lag terms of other variables, a Granger causal relation exists. In more detail, for two sets of variables, if changes in one set of variables can cause changes in the other set of variables, then the previous set of variables is the Granger cause of the latter set of variables; if the previous set of variables changes can not cause changes in the latter set of variables, then cannot be called Granger cause. In this paper, three kinds of lags are selected, and Granger causal relation tests are performed on  $ex$  and  $bond$  in turn. The results are shown in Table 3. The results show that  $ex$  is the Granger reason for  $bond$ , that is, the fluctuation of the RMB exchange rate has a significant effect on the trend of the domestic bond market.

Table.3. Granger Causal Relation Test

Null hypothesis	Lag term	F-Statistic	P-Value
$bond$ is not Granger cause for $ex$	2	1.89350	0.1541
$ex$ is not Granger cause for $bond$	2	4.59204	0.0116
$bond$ is not Granger cause for $ex$	3	1.77617	0.1543
$ex$ is not Granger cause for $bond$	3	3.29056	0.0224
$bond$ is not Granger cause for $ex$	4	0.87901	0.4782
$ex$ is not Granger cause for $bond$	4	2.99791	0.0206

### 4.5 VAR Stability Test

The determination of the number of lag term is also an important step in the VAR model. A larger number of lags can more fully reflect the dynamic characteristics of the model, but a larger number of lags will reduce the degree of freedom of the model. According to the Schwarz Criterion and the

Akaike Information Criterion, the optimal number of lag term for this model is calculated to be 2. This paper tests the validity of the model based on this. The characteristic root charts are shown in Figure 1 and Table 4. The results show that the unit circle contains all the characteristic roots of the model, and the modulus of the inverse of the characteristic roots is less than 1, that is, the results of the model are valid.

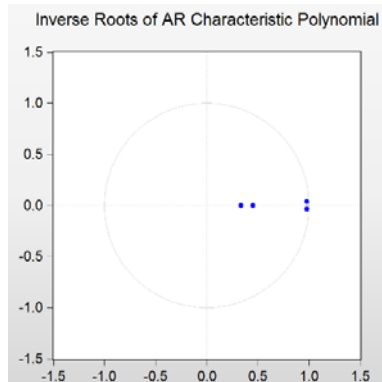


Figure 1. Figure of Characteristic Roots

Table.4. Table of Characteristic Roots

Characteristic roots	The modulus of the inverse of the characteristic roots
$0.980352 - 0.037055i$	0.981052
$0.980352 + 0.037055i$	0.981052
0.453225	0.453225
0.336721	0.336721

#### 4.6 Impulse Response Function

The impulse response function describes the dynamic changes of the system when the model is subjected to some kind of shock. The impulse response function is shown in Figure 2. The upper right corner shows the impact of ex on bond, that is, the impulse function chart of the RMB exchange rate change by one standard deviation on the domestic bond market trend. In the figure, the solid line indicates the trend of the bond after the impact, and the upper and lower dashed lines indicate twice the standard deviation of the trend. It can be seen that after the RMB exchange rate has a positive shock on the domestic bond market trend, the domestic bond market trend slowly rises, and then rises to the maximum in the third period, then decreases to zero in the fourth period, and then continues to decline. That is to say, the depreciation of the RMB exchange rate will slightly stimulate the domestic bond market in the short term, but in the long run, it will still have a long negative and continuous effect.

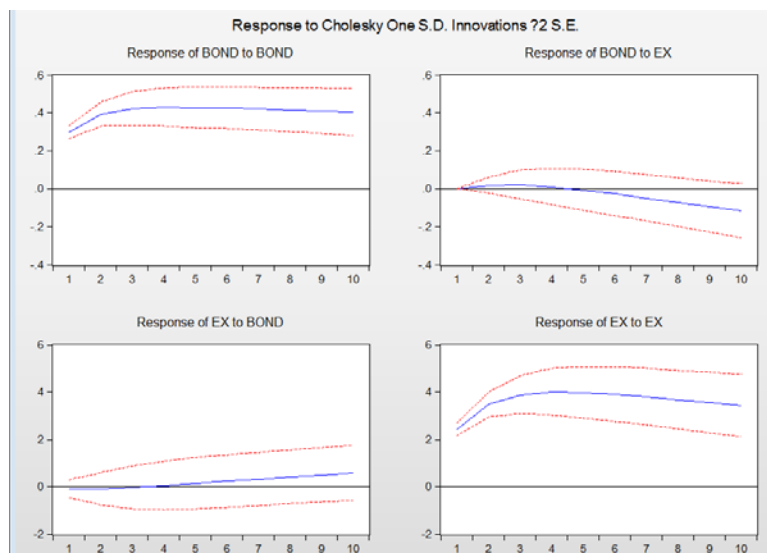


Figure 2. Impulse Response Function

#### 4.7 Variance Decomposition

Variance decomposition uses variance to measure the impact of each impact on the endogenous variable, thereby determining the effect of each impact on the system. Table 5 shows the results of variance analysis of *bond*. The results show that with the increase of the number of impact periods, the impact of *bond* on itself slowly decreases, by more than 90% in the 17th period; the impact of *ex* on the *bond* slowly increases, reaching more than 10% in the 17th period. The results show that the impact of the RMB exchange rate on the domestic bond market is long-term and cumulative, and the degree of impact has gradually deepened.

Table.5. Variance Decomposition

Period	S.E.	BOND	EX
1	0.298941	100.0000	0.000000
2	0.494928	99.88803	0.111971
3	0.651070	99.84352	0.156479
4	0.779861	99.87405	0.125953
5	0.889860	99.89686	0.103136
6	0.986628	99.83492	0.165081
7	1.073775	99.63923	0.360766
8	1.153690	99.28584	0.714162
9	1.228001	98.76785	1.232146
10	1.297849	98.08889	1.911106
11	1.364059	97.25865	2.741350
12	1.427235	96.29016	3.709839
13	1.487835	95.19815	4.801855
14	1.546204	93.99798	6.002025
15	1.602605	92.70502	7.294978
16	1.657241	91.33423	8.665766
17	1.710270	89.89987	10.10013
18	1.761809	88.41529	11.58471
19	1.811951	86.89291	13.10709

20	1.860763	85.34409	14.65591
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## 5. Conclusion

In summary, the fluctuation of the RMB exchange rate significantly affects the trend of the domestic bond market. From the perspective of the impulse response function, the devaluation of the RMB will slightly increase the bond market trend in the short term, but in the long term, it will still have a long negative continuous effect. From the perspective of variance decomposition, the impact of the RMB exchange rate on the domestic bond market is long-term and cumulative, and the degree of impact has gradually deepened.

For the government, a developed bond market is an important place for the central bank to implement monetary policy, and it can conduct monetary policy efficiently and quickly. There is still room for the development of the domestic bond market, providing a platform for the central bank to conduct open market operations and improving the effectiveness of monetary policy. As the RMB exchange rate moves towards marketization, it needs to be carried out in an orderly and steady manner to avoid excessive impact on the domestic bond market and weaken the transmission effect of the central bank's monetary policy. When the RMB exchange rate experiences large fluctuations, it is also necessary to take appropriate measures to ensure the stable operation of the domestic capital market. For investors, more attention needs to be paid to exchange rate risks. Especially when the RMB exchange rate fluctuates greatly, do a good job of adjusting asset allocation and managing financial risks in order to make better investment decisions.

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