Data mining: Application of EGARCH dynamic model on the volatility of high-frequency exchange rate data

Yang-Chao Wang, Jui-Jung Tsai* and Xingyu Chen

1Newhuadu Business School, Minjiang University, Fuzhou, China
2Straits Institute, Minjiang University, Fuzhou, China
3Department of Statistics and Applied Probability, UC Santa Barbara, Santa Barbara, CA, USA

*Corresponding author and e-mail: Jui-Jung Tsai, juitsai@ntu.edu.tw

Abstract. Dynamic model has always been the focus of data science research. The results of dynamic models with different physical backgrounds vary greatly. Considering the time-varying characteristics and heteroskedasticity of long time exchange rate series, the GARCH (Generalized Autoregressive Conditional Heteroskedasticity) model can be used to depict the pattern of variance fluctuation and clustering over time, and the research on variance can be extended to time-varying conditional variance. In this paper, the EGARCH (Exponential GARCH) model is further adopted to analyze the high-frequency exchange rate data from 2005 to 2017, which can reduce the parameter restrictions of the GARCH model, and at the same time, the characteristics of the exponential ensure the non-negative nature of the estimated variance, so as to predict the volatility more accurately. Moreover, the different effects of positive and negative random shocks on volatility can be analyzed to fully describe the data asymmetry. Finally, we use the clustering algorithm of the EGARCH model for data mining, evaluating the influence of endogenous variables and exogenous events on the RMB exchange rate.

1. Introduction

From 1994 to July 2005, the RMB exchange rate was completely pegged to USD with the nominal USD/CNY exchange rate fixed at 8.28. In other words, the RMB exchange rate had no flexibility whatsoever during this period. After the 2005 reform, the RMB exchange rate fluctuated much more dramatically than in the previous 10 years and the USD/CNY exchange rate rapidly depreciated to 6.41 in December of 2005 (Han and Shen, 2016). However, the 2005 reform was viewed as a change from one kind of peg to another kind of peg (Yip, 2016). From July 2005 to March 2008, though the RMB exchange rate referred to a basket of currencies, the USD still dominated that basket of currencies. The weight of the currencies in the basket is determined by the trade volume between China and these currencies’ countries but the USD’s effective weight remained much higher than its theoretical weight (Mele, 2010; Oksanen, 2012). The RMB exchange rate appeared to be more flexible because the floating band of RMB and USD widened during this process (Sun, 2010).

The RMB may appreciate against the USD if the RMB exchange rate is permitted to fluctuate more flexibly. Thus, the Chinese government keeps a tight grasp on the RMB exchange rate to control capital inflows and outflows and maintain a favorable exchange rate to help promote China’s exports and manufacturing (Hu et al., 2016). A substantial appreciation will reduce China’s exports, trade surplus,
and GDP growth (Yip, 2016). Therefore, after the 2008 financial crisis, to ensure the stability of China’s economic situation, the RMB exchange rate was completely re-pegged to USD from mid-2008 to mid-2010. The re-peg ensured that the USD/CNY exchange rate was stationary during this period. However, the Chinese government had to sacrifice much to maintain this stability. In addition, it is not possible for a country to maintain financial openness, a fixed exchange rate regime, and monetary policy autonomy at the same time (Klein and Shambaugh, 2015). Hence, the Chinese government has gradually loosened the RMB exchange rate, indicating that it may consider more flexible use of its monetary policy and deepening of financial reform.

The peg to the USD forced the Chinese government to think about the implementation of RMB internationalization, but first it had to restart exchange rate reform and reduce the RMB’s dependence on the USD. Because of the Chinese government’s reflection on its past monetary policies, exchange rate policies, and sacrifices, the Chinese government learned from the experience of other countries and promoted RMB internationalization. The RMB internationalization gradually developed and achieved preliminary results during 2010–2018. On October 1, 2016, the RMB was officially added in the SDR currency basket as the fifth worldwide vital currency (Wang et al., 2017).

It is no doubt that the RMB exchange market’s volatility will increase with the increasing elastic exchange rate reform. However, China will sacrifice more if it do not change. Gervais et al. (2016) find that countries carrying out fixed or intermediate exchange rate systems will experience more real exchange rate depreciation and exports reduction during the crisis because fixed exchange rate system is vulnerable to external shocks and intermediate exchange rate system needs the consistency of exchange rate and monetary policy (Willett, 2003). In addition, the China’s exchange rate system has to be consistent with the process of RMB international, financial development, and China’s increasing global position and influence. China should not give up the reform because of the volatility. It should keep reforming in accordance with its development status and the ability to handle risks.

The Chinese exchange rate system reform began before the RMB internationalization and at present plays an important role in the process of RMB internalization, both of which exert a remarkable influence on the RMB exchange rate. Accordingly, this study investigates how a series of measures related to China’s exchange rate reform and RMB internationalization impact the evolution of the RMB exchange rate using the EGARCH model in the context of China’s transitional economy.

In this study, we choose the USD/CNY exchange rate to investigate the influence of China’s exchange rate reform and RMB internationalization on the evolution of RMB exchange rate according to the following reasons. First, the USD/CNY is very important in China’s exchange rate system which attracts the most attention from the government and investors. Due to the China’s relevant reform and strategies, it will be more elastic and generate greater influence in the future. Second, emerging countries grow to become an important role in the world especially after the 2008 worldwide financial crisis. China is the biggest emerging country in the world and then it is crucial to investigate its currency during its process of structural transition and new reforms. Finally, the domestic policies we choose to study the USD/CNY exchange rate also contain the cooperation among the RMB and other foreign currencies. That is, we also indirectly take other currencies into consideration.

2. Data and model
Descriptive statistics for the log-returns of the USD/CNY exchange rate from 2005 to April 2017 are reported in Table 1. The negative mean and median appear because the USD/CNY exchange rate depreciated in the most time of the period. The exchange rate returns are positively skewed as we see from its positive skewness. The positively large kurtosis means the changes of the exchange rate returns are quite centralized because the USD/CNY exchange rate is intervened by the People’s Bank of China (PBC). The Jarque-Bera statistic shows that the distributional assumption for their innovations is not a normal distribution and should be described by other distributions. Finally, the Augmented Dickey-Fuller test statistic shows that the series is stationary, suggesting the use of log-returns of the USD/CNY exchange rate for modelling is reasonable.
Table 1. Statistical characteristics of exchange rate returns.

| Statistics   | Mean  | Skewness | Median | Kurtosis | Jarque-Bera | p-value for JB | p-value for ADF |
|--------------|-------|----------|--------|----------|-------------|----------------|-----------------|
| USD/CNY      | –0.0057 | 1.1049 | –0.0029 | 28.8923 | 80,078.5 | <0.0001 | 0.0001 |

This study selects policies about China’s exchange rate reform and RMB internationalization for empirical research to investigate how domestic factors influence volatility of the USD/CNY exchange rate. First, we choose the current important strategies and policies rather than traditional factors because the direction lack relevant studies. Second, the China’s exchange rate reform attracts more and more attention and the exchange rate becomes more and more market-oriented. It is a great policy timeline and then we follow it to study currency market volatility changes in the different stages. The detailed list of measures related to China’s exchange rate system reform and RMB internationalization is tabulated in Table 2.

Table 2. RMB exchange rate reform policies.

| No. | Date       | Policy Measure                                                                                                                                 |
|-----|------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | 2005/07/21 | The People’s Bank of China (PBC) announced to abolish the monetary policy of pegging the US dollar and begin to implement a floating exchange rate system based on market supply and demand with reference to the currency basket. |
| 2   | 2005/08/09 | The PBC expanded the forward foreign exchange and opened RMB and foreign currency swap for designated foreign exchange banks. The PBC authorized the China Foreign Exchange Trading System & National Interbank Funding Center (CFETS) to announce the central parity rate of the RMB against the US dollar, euro, Japanese yen, and Hong Kong dollar at 9:15 am of each work day as the interbank foreign exchange rate (including the OTC method and the matching method) and the middle price of the exchange rate. |
| 3   | 2006/01/04 | The PBC decided to expand the floating rate of the RMB-dollar trading price in the interbank foreign exchange market from 0.3% to 0.5%. |
| 4   | 2007/05/21 | The PBC and the Hong Kong Monetary Authority agreed to expand the settlement of the RMB in Hong Kong, and officially launching offshore RMB transactions. |
| 5   | 2007/07/01 | The first batch of RMB-denominated bonds were offered for sale in Hong Kong. |
| 6   | 2008/07/01 | As an emergency measure to stabilize the Chinese economy, the exchange rate of RMB to the US dollar was fixed at 6.83 to 1. |
| 7   | 2009/04/08 | Pilot RMB settlement spots were announced for cross-border trade in Shanghai and four cities in Guangdong. |
| 8   | 2009/07/01 | China launched a pilot project in designated cities allowing companies to settle import and export trade in RMB, and designated Hong Kong as a pilot city for RMB settlement outside the mainland. |
| 9   | 2010/06/19 | The PBC announced that it will restart the exchange rate system that has been frozen since the financial crisis, further promote the reform of the RMB exchange rate formation mechanism and enhance the flexibility of the RMB exchange rate. |
| 10  | 2010/07/19 | The PBC and the Hong Kong Monetary Authority agreed to expand the settlement of the RMB in Hong Kong, and officially launching offshore RMB transactions. |
| 11  | 2010/08/19 | The Chinese interbank foreign exchange market launched the RMB-Malaysian currency (ringgit) exchange, and the Malaysian ringgit became China’s first non-US currency for exchange. |
Table 2. Cont.

| No. | Date       | Policy Measure                                                                                                                                                                                                 |
|-----|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 12  | 2010/10/01 | A pilot project was launched to allow designated exporters to retain part of their foreign currency income abroad.                                                                                               |
| 13  | 2010/11/22 | The domestic interbank market opened a RMB exchange against the Russian ruble.                                                                                                                               |
| 14  | 2010/12/15 | Moscow listed the RMB against the ruble, and Russia became the first country in which the RMB was listed abroad.                                                                                                 |
| 15  | 2011/01/12 | Bank of China opens RMB transactions to US consumers.                                                                                                                                                         |
| 16  | 2011/01/14 | The PBC allows approved domestic enterprises to use RMB for direct overseas investment.                                                                                                                     |
| 17  | 2011/04/01 | Officially launching the RMB for foreign exchange options trading, providing enterprises and banks with more exchange rate hedging tools.                                                                     |
| 18  | 2011/04/26 | The cross-border trade RMB settlement pilot project was extended to the whole country within the year, and then the pilot project of cross-border RMB business under the capital project was launched. |
| 19  | 2011/05/07 | 82 Russian banks set up RMB exchange accounts. The floating range between the RMB-to-US dollar trading price and the central parity rate in the interbank foreign exchange market is expanded from 5% to 1%. |
| 20  | 2012/04/16 | The floating range which the designated foreign exchange banks provide to their customers is expanded from 1% to 2%.                                                                                           |
| 21  | 2012/05/29 | Authorized by the PBC, CFETS announced the improvement of the RMB-to-Japanese yen trading method in the interbank foreign exchange market and the development of direct exchange of the RMB against the Japanese yen.        |
| 22  | 2013/04/09 | The CFETS announced the improvement of the RMB-to-Australian trading method in the interbank foreign exchange market and the direct trading of RMB to the Australian dollar based on market principles. |
| 23  | 2014/03/17 | The floating range between the RMB-to-US dollar trading price and the central parity rate in the interbank foreign exchange market is expanded from 1% to 2%.                                          |
| 24  | 2014/03/19 | The floating range which the designated foreign exchange banks provide to their customers is expanded from 2% to 3%.                                                                                           |
| 25  | 2014/06/18 | Bank of China completes first direct transaction of the RMB to the New Zealand dollar.                                                                                                                      |
| 26  | 2014/07/02 | Cancellation of the management in bank-to-customer dollar listing trade spread.                                                                                                                               |
| 27  | 2014/09/29 | China’s interbank foreign exchange market conducts direct exchange of the RMB against the euro.                                                                                                               |
| 28  | 2015/06/27 | The PBC stated that it will further promote the marketization of interest rates, the reform of the RMB exchange rate formation mechanism, and dredge the transmission channels of monetary policy. |
| 29  | 2015/08/11 | The 811 exchange rate reform.                                                                                                                                                                               |
| 30  | 2015/12/11 | The CFETS officially released the CFETS RMB exchange rate index.                                                                                                                                              |
| 31  | 2016/02/01 | The central parity rate formation mechanism turned to the “transparent” rule of “pre-closing price + night trading currency fluctuations.”                                                                     |
| 32  | 2016/10/01 | The RMB is officially included in the SDR (Special Drawing Rights). According to the CFETS currency basket selection rules, CFETS currency baskets added 11 types of 2016 listed RMB to foreign exchange currency, and the number of CFETS basket currencies changed from 13 to 24. The new basket currencies include the South African rand, Korean won, United Arab Emirates dirham, Saudi riyal, Hungarian forint, Polish zloty, Danish krone, Swedish krona, Norwegian krone, Turkish lira, and Mexican peso. The weight of the basket currency is calculated by the trade weight method based on the re-export trade factor. The current period adjustment is based on 2015 annual data. |
We use the Exponential Generalized Autoregressive Conditional Heteroscedastic (EGARCH) model to identify how policy measures impact dynamic return volatility. Let $r_t$ represent the log-returns of the USD/CNY exchange rate. The model’s specification is as follows.

$$r_t = 100 \times \ln \left( \frac{U_t}{C_{t-1}} \right);$$

(1)

$$r_t = x_t' \beta + \tau \sqrt{\sigma_t^2} + \epsilon_t;$$

(2)

$$\epsilon_t = \sqrt{\sigma_t^2} \times \nu_t; \quad \nu_t \sim \text{IID}(0, 1);$$

(3)

$$\ln(\sigma_t^2) = c + \sum \alpha_i \ln(\sigma_{t-i}^2) + \sum \beta_j \frac{\epsilon_{t-j}}{\sigma_{t-j}} + \sum \gamma_j \frac{\epsilon_{t-j}}{\sigma_{t-j}} + \sum_k \delta_k D_k;$$

(4)

$$D_k = \begin{cases} 1 & \text{during the implementation period;} \\ 0 & \text{the other period.} \end{cases}$$

(5)

where $\sigma_t^2 = \text{var}(\epsilon_t | \theta_{t-1})$ represents time-varying return volatility, and $\theta_{t-1}$ is all the information during and before period $t-1$. $\alpha_i$, $\beta_j$, and $\gamma_j$ specify the GARCH, ARCH, and leverage effects of the model, respectively. $\delta_k$ captures the policy impact where $D_k$ is an indicator variable, indicating the implementation period of the specific policy measure (Tsai et al., 2015; Wang et al., 2019; Wang et al., 2021).

3. Empirical results

This study considers the 2005 China’s exchange rate reform as the starting point of our investigation. On July 21, 2005, the PBC claimed an announcement about the exchange rate mechanism reform, representing the realization of managed floating rate system and the beginning of lengthy and circumspect market-oriented reform of the Chinese exchange rate system. From then, the RMB middle price is not solely pegged to the USD but refers to a basket of 11 different currencies. The interbank range of fluctuation between the RMB and the USD is 0.3% while others are 3.0%. It is more likely to be a trial and to accumulate experience before the further and deeper reform that the USD still plays the most significant role in the RMB middle price formation mechanism. At this point of time, the Chinese government did not realized the importance of RMB internationalization and had no awareness and strength to promote this process until 2007. Since then, the PBC continually widened the interbank range of fluctuation between the RMB and the USD. May 21, 2007, it widened from 0.3% to 0.5% and April 16, 2012, it widened to 1.0%. Next, March 17, 2014, it further widened to 2% and retail range of fluctuation between the RMB and the USD widened from 2% to 3% at the same time. The PBC planned to reform more and accumulate more experience with interventions. In general, the Chinese market-oriented reform of exchange rate system was firstly enforced in 2005. Although the managed floating exchange rate system did make the USD/CNY exchange rate continually depreciate in the first several years, it fluctuated less frequently and less dramatically compared with other main currencies. The exchange rate between the RMB and the USD started to fluctuate more dramatically than before with the gradual development of RMB internationalization.

Table 3 shows how policy measures impact dynamic market volatility. From July 21, 2005 to June 2008, the USD/CNY exchange rate kept depreciating with few evident fluctuations. The 2005 exchange rate system reform abolished Chinese government’s single-peg-to-USD monetary policy and implemented the managed floating exchange rate system ($\delta_1$). However, this reform was aimed at preparing for future reform and the nature of new exchange rate system was not much different from the abolished system. The PBC still cautiously intervened to maintain a smooth USD/CNY exchange rate. As a result, the reform did not theoretically increase the volatility. Then, the PBC promoted a more marketable RMB middle price mechanism ($\delta_3$) and issued RMB bonds in Hong Kong ($\delta_5$) to attract more RMB investors and stimulate the RMB market’s vitality. The increasing transactions increased its volatility. They also caused the CNY to appreciate because they increased market demand for the CNY.
Table 3. The effects of China’s exchange rate reform and RMB internationalization.

| Date       | Effect  | Date       | Effect  | Date       | Effect  |
|------------|---------|------------|---------|------------|---------|
| $\delta_1$: 2005/7/21 | -2.1921*** (0.4245) | $\delta_{12}$: 2010/10/1 | 0.4432 (0.4851) | $\delta_{23}$: 2014/3/17 | 0.5182 (7.4273) |
| $\delta_2$: 2005/8/9 | 0.0523 (0.6111) | $\delta_{13}$: 2010/11/22 | -0.3605 (0.5180) | $\delta_{24}$: 2014/3/19 | 0.1064 (7.4697) |
| $\delta_3$: 2006/1/4 | 0.7960*** (0.1823) | $\delta_{14}$: 2012/10/15 | 0.4590 (0.5995) | $\delta_{25}$: 2014/6/18 | -0.1822 (0.6750) |
| $\delta_4$: 2007/5/21 | 0.1543 (0.3055) | $\delta_{15}$: 2011/1/12 | 0.0190 (2.3813) | $\delta_{26}$: 2014/7/2 | -0.4423 (0.6850) |
| $\delta_5$: 2007/7/1 | 0.5497** (0.3113) | $\delta_{16}$: 2011/1/14 | -1.1937 (2.3705) | $\delta_{27}$: 2014/9/29 | 0.1937 (0.2444) |
| $\delta_6$: 2008/7/1 | -2.4744*** (0.4009) | $\delta_{17}$: 2011/4/1 | -0.1094 (0.4920) | $\delta_{28}$: 2015/6/27 | -3.0904*** (0.3321) |
| $\delta_7$: 2009/4/8 | -1.2342*** (0.2496) | $\delta_{18}$: 2011/4/26 | 0.2990 (0.9845) | $\delta_{29}$: 2015/8/11 | 3.5349*** (0.3554) |
| $\delta_8$: 2009/7/1 | -1.2353*** (0.2416) | $\delta_{19}$: 2011/5/7 | 0.0707 (0.8982) | $\delta_{30}$: 2015/12/11 | -0.4946** (0.3012) |
| $\delta_9$: 2010/6/19 | 0.0043† (0.0040) | $\delta_{20}$: 2012/4/16 | -0.2893 (0.4460) | $\delta_{31}$: 2016/2/1 | 0.6440*** (0.2694) |
| $\delta_{10}$: 2010/7/19 | -1.0792** (0.4860) | $\delta_{21}$: 2012/5/29 | 0.0415 (0.3246) | $\delta_{32}$: 2016/10/1 | 0.3162† (0.2534) |
| $\delta_{11}$: 2010/8/19 | 1.4701*** (0.4804) | $\delta_{22}$: 2013/4/9 | -0.2191* (0.1430) | $\delta_{33}$: 2017/1/1 | -0.2330 (0.2928) |

From July 2008 to June 18, 2010, the USD/CNY exchange rate stayed approximately stable because of RMB’s transient re-peg to the USD. Influenced by the 2008 worldwide financial crisis, the PBC rigidly re-pegged the RMB to the USD ($\delta_6$) so that the USD/CNY exchange rate was almost equal to ¥6.83/$, which stopped the CNY’s appreciation and completely eliminated the market’s volatility. Moreover, the Chinese government developed the RMB cross-border trade settlement pilot scheme ($\delta_7$, $\delta_8$), which helped raise RMB holders’ and users’ confidence in RMB and reduce the frequency of their transactions in the RMB market. These RMB internationalization measures also decreased the market volatility.

From June 19, 2010 to January 2014, the USD/CNY exchange rate depreciated with a few evident fluctuations. First, the PBC restarted the managed floating exchange rate system and increased its elasticity ($\delta_9$). The fewer interventions and greater flexibility increased the market’s long-term volatility. Second, the promotion of CNY/MYR transactions ($\delta_{11}$), China’s first non-USD inquiry currency, boosted the supply and demand of the MYR and intensified the volatility of the CNY/MYR exchange rate. As the MYR is in the RMB currency basket, it indirectly increased the USD/CNY exchange rate’s volatility. However, the official start of the offshore CNH market ($\delta_{10}$), having a relatively free-floating RMB exchange rate, was to meet offshore investor demand and share the CNY market pressure, thus decreasing the volatility of the USD/CNY exchange rate. During this period, numerous measures for RMB internationalization, such as the CNY/MYR, CNY/RUB, and CNY/JPY direct transactions ($\delta_{11}$, $\delta_{14}$, and $\delta_{21}$) and the open of RMB transactions to US consumers ($\delta_{15}$), increased the RMB demand and caused USD/CNY exchange rate to depreciate, and thus leading to higher volatility.
From February 2014 to April 2017, the USD/CNY exchange rate began to rise and to fluctuate more. For one thing, the PBC further boosted the process of interest rate liberalization ($\delta_{28}$), eliminating the spread and thus stabilizing the exchange rate. Moreover, the official issue of the CFETS RMB exchange rate index under which currencies in the CFETS currency basket are weighted by trade further decreased the influence of main currencies on the RMB exchange rate. For another, the 811 exchange rate reform ($\delta_{29}$), the new RMB middle price formation mechanism ($\delta_{31}$), and the RMB’s official inclusion in the SDR currency basket ($\delta_{32}$) together signalled a more flexible exchange rate system, fewer governmental interventions, and the continual deepening of RMB internationalization, all of which implied more volatility in the exchange market. The 811 exchange rate reform began the RMB’s depreciation although some measures for RMB internationalization caused the RMB to appreciate in the short run, leading to USD/CNY exchange rate appreciation with more fluctuations than before during this period.

![Figure 1. RMB exchange rate from June 2010 to January 2014.](image)

Furthermore, we have also examined effects of policies on the trend of the RMB exchange rate. To save space, we do not tabulate the results and we finally choose volatility of the USD/CNY exchange rate as our research core. In the three periods, from July 2005 to June 2008, from July 2008 to June 2010, and from February 2014 to April 2017, the untabulated results indicate the RMB exchange rate was intervened, re-pegged to the USD, and dominated by the effect of 811 exchange rate reform, respectively. In addition, from June 2010 to January 2014, a lot of measures on RMB internationalization, such as the CNY/MYR, CNY/RUB, CNY/JPY and CNY/AUD direct transaction, the open of RMB transaction to US consumers, the qualified domestic enterprises to directly invest abroad using RMB, and the promotion of RMB-to-foreign-exchange options, increased the RMB demand and caused USD/CNY exchange rate to depreciate. Figure 1 shows the general appreciation of RMB against foreign currencies, which reflects the rise in the value of RMB caused by the rise in the demand for RMB in the context of exchange rate reform and RMB internationalization strategy at this stage.

In summary, the internationalization of RMB has an impact on the exchange rate fluctuations of the RMB against the currencies of other countries. In addition, it will further open the market, reduce exchange restrictions and exchange rate risks, increase the difficulty of national macro-control, and reduce the stability of China’s domestic financial environment to a certain extent. The cooperation between China and countries along the Belt and Road and ASEAN countries is conducive to strengthening the trading frequency of RMB through cross-border trade, thereby establishing the trading position of RMB internationalization and enhancing China’s international influence. Since the central bank decided to further promote the reform of interest rate liberalization, the international pursuit of RMB-denominated Treasury bonds and other investment products has stepped up to a new level, and
the holding risks have also been greatly reduced, laying a foundation for RMB to move from the international investment function to the international reserve function.

4. Conclusions
Using the EGARCH model, this study investigates how China’s exchange rate reform and RMB internationalization impact the evolution of RMB exchange rate from 2005 to 2017. The exchange rate system reform began in 2005, a trial step characterized by government interventions. China had abolished the single-peg-to-USD policy prior to mid-2008. Influenced by the 2008 global financial crisis, the USD faced depreciation pressure. China re-pegged the RMB to USD and maintained the USD/CNY exchange rate at around 6.83 because a substantial appreciation of RMB against USD reduces China’s exports, trade surplus, and GDP growth. From 2010 to 2017, China restarted the exchange rate reform. In addition, the RMB internationalization process accelerated during this period. China adopted a managed floating exchange rate system, continuously increases exchange rate elasticity, and implemented a series of related policy measures. The new RMB middle price formation mechanism on August 11, 2015 and the RMB’s official inclusion in the SDR currency basket on October 1, 2016 signal more flexible exchange rate system, fewer governmental interventions, and the continual deepening of RMB internationalization, while they also induce more volatility in the exchange market.

For the long term, the Chinese government policies are too strong focused on the stability of the exchange rate between the RMB and the USD, which sacrifices monetary policy flexibility. Considering international pressure and domestic needs, the PBC rescinded the RMB’s single peg to the USD and began to implement a managed floating exchange rate in 2005. At present, the PBC has not completely given up its power to intervene in the USD/CNY exchange rate, though it has continually improved the Chinese exchange rate system and gradually relaxed exchange controls. With these improvements and deregulation policies, the USD/CNY exchange rate has become more volatile despite its downward or upward trend. However, the PBC still can intervene to influence USD/CNY exchange rate trends and even re-peg the CNY to USD. Meanwhile, it is becoming increasingly difficult for the PBC to intervene, while its interventions can also intensify the volatility.

As we can see from the 2018 annual meeting of the Boao Forum for Asia, China further promotes its reform and opening-up policy. China’s exchange rate reform and RMB internationalization are of significant tasks. As to the Chinese government, it faces more challenges than before as the reform enters into the deep water area. The Chinese government should actively boost the two tasks to meet the new requirements of Chinese financial and trade development. Meanwhile, it should develop and improve its regulation and supervision, cultivate its ability to handle the increasing financial risks during the process of the RMB internationalization. As to the market participants, it is a very valuable opportunity for both domestic and foreign investors. They should pay more attention to the RMB exchange market, have more confidence in the RMB, and prepare to handle currency risks in their investments.

Finally, we provide several suggestions. First, RMB internationalization inevitably triggers other countries’ concerns. Some countries, according to McNally and Gruin (2017), are concerned that China’s special monetary governance may change worldwide financial conditions. We think that Chinese government should adhere to win-win principle when boosting the RMB internationalization in the future. This is a crucial point that Chinese authorities need to consider before formulating a new series of policies. Second, as CNY exchange rate is still most affected by US policies, some researchers (such as Chey, 2013; Kurien and Geoxavier, 2013) think that the RMB cannot challenge the USD at the present. China still cannot completely realize its monetary policy independence in the short time. Therefore, China can consider promoting the RMB to be an Asian currency at first. If Chinese government can complete the negotiation of Asian free trade zone, it will be a milestone for the RMB internationalization. Furthermore, the Chinese government has not completely utilized Hong Kong’s advantages. Considering current policies on Hong Kong (such as the RQFII, Shanghai-Hong Kong Stock Connect, Shenzhen-Hong Kong Stock Connect, and Bond Connect), the Chinese government should further utilize Hong Kong’s financial strengths that designs and approves more RMB financial
instruments for the Hong Kong market, improves the RMB offshore market, and promotes more bilateral transactions of financial instruments between Mainland and Hong Kong markets.

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