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### RESEARCH OF COUPLING EFFECTS BETWEEN THE OFFSHORE RMB EXCHANGE RATE AND ONSHORE EXCHANGE RATE

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#### Abstract

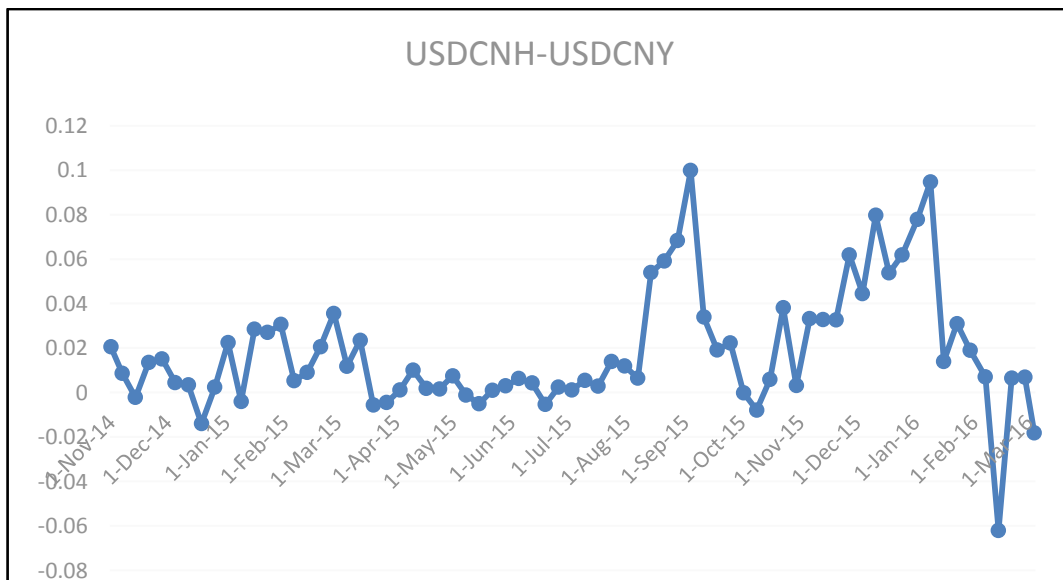
On August 11, 2015, the People's Bank of China (PBOC) decided to start the reform of the RMB central parity mechanism. To reinforced the decisive role of the market in the RMB exchange rate formation mechanism, and also enhanced the marketization and benchmark. Meanwhile, after the announcement of the exchange rate reform, both the offshore and onshore RMB markets experienced sharp fluctuations, and it obviously impact the macroeconomic and capital market. This paper is based on the "information flow" point of view, Researcher used Granger Causality Test, The VAR Model and Impulses Response Function to test the relationship between Chinese Yuan (CNY) marketing rate and Chinese Hong Kong (CNH) marketing rate. Result improved that CNH caused CNY, also had a positive influence on CNY. Furthermore, the offshore market was more important than onshore market. Researcher also explained that The Pricing Right of RMB transfer to offshore market from onshore market.

## 1. INTRODUCTION

On August 11, 2015, Bank of China declared the further improvement of the middle rate offer for RMB exchange US dollar price mechanism, Reformation can make the market mechanism play a decisive role in the exchange rate system, and enhance the marketization and benchmark. This reformation is an extremely important policy advance after the exchange rate reform in 2005, to establish the managed floating exchange rate system based on the market of supply and demand, with the approval of the State Council, China began to put this announcement into effect. After this reformation, RMB do not kept eyes on US dollar, but made the RMB exchange rate system more flexible. Although the Reformation went through a lot, huge differences between CNY and CNH have been exist. First, CNH market price determined by supply and demand market, price without any restrictions, but CNY market price was managed, the price fluctuation range is limited to 2%. Secondly, the participants of CNY are central banks; domestic banks, large state-owned enterprises, foreign banks, but the CNH are traders, overseas financial institutions, hedge funds, overseas residents. At last, the financial instrument of CNY market are spot, forwards, swaps and options, the CNH market are spot, forward, swap, no deliverable swap, interest rate swap, no deliverable interest rate swaps and currency options. With the offshore RMB market developed, trading on the offshore market have been more active, offshore and onshore market always have a difference between

exchange rate. Meanwhile, compare with offshore market, onshore market lack of liquidity, deficiency of time on trading, all those defect lead to the RMB pricing right transfer to the offshore market. China have a problem on middle price of RMB exchange rate deviated from market exchanged rate, that affect the benchmark and authority. China bank announced that after August 11 2015, before the daily opening quotation on inter-bank foreign exchange market, market maker must consult the inter-bank foreign exchange market rate and consider the middle price quotation in China foreign exchange trading center, for which are provide form situation of supply and demand market and major international currencies change. The new quotation system could effectively correct the deviation between the RMB and the market, and the supply and demand of market can be better. Meanwhile, RMB exchange rate will enter to Bi-directional volatility mechanism, and connect closely with international exchange rate market, this new system will lay the foundation for the adaptation of international trading mechanism, RMB free exchange and the internationalization of RMB.

According to [Kaen and Hachey \(1983\)](#), [Hartman \(1984\)](#) and [Swanson and Hansen \(1988\)](#), they studied the relationship between onshore and offshore market. They found that Domestic interest rates to guide the offshore interest rates in the United States, put forward the "domestic priority", refers to the domestic market relatively more enjoy the local information advantage, the direction of the information transfer from domestic to overseas market. [Frenkel et al. \(2003\)](#) examined the exchange rate on Japanese market, Studies have shown that the offshore market due to its large volume and high degree of freedom of the market, become the yen exchange rate pricing center. The writer also thinks the offshore market pricing center and information advantage depends on the market size of the market and the degree of trade liberalization. [Ding and Pu \(2012\)](#) researched between onshore and offshore market price discovery by using VAR Model. The results show that does not exist between offshore and onshore at sight to d/market price discovery mechanism, but the CNY between spot market and the market price guide.



**Figure 1: Differential in rates between CNH and CNY**

Source: Wind database

The figure reflects the difference between the weekly closing price of the onshore and offshore exchange rates from November 1, 2014 to March 4, 2016. The exchange rate difference between CNH and CNY still exist. after august 11, 2015 revaluation, the difference of rate fluctuation become more intense. According to the report of RMB internationalization which was published from China bank in June 2015 released that Hong Kong, Singapore, London and other major

offshore market average daily trading volume has more than 230 billion on foreign exchange, compare with domestic market, it's more than four times. Large offshore trading volume affects the pricing of onshore RMB. In addition to the situation of China in recent years have been changed, like the GDP growth rate continuous decline, the stock market "crash", commercial bank failure rate increased year by year. Under this background, International capital predators short RMB in the offshore market, even said "short China". Those comments cased the offshore and onshore market volatility.

## 2. THEORETICAL ANALYSIS

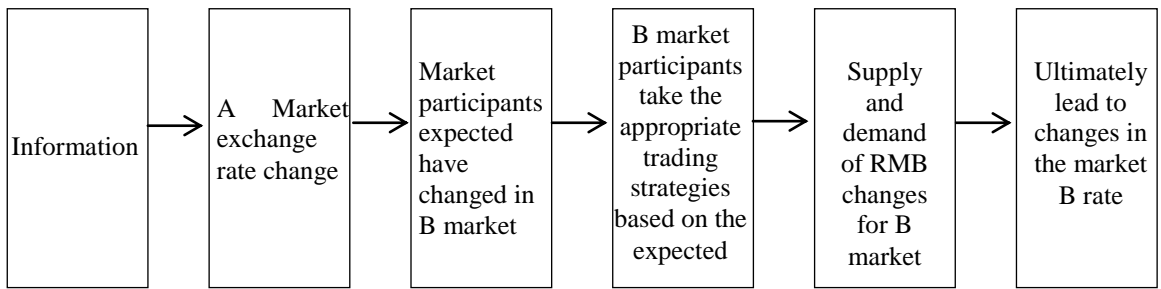
Zhang and Yang (2005) researched the relationship between domestic and overseas RMB exchange rate. The result showed that the forward rate and RMB price deviation between theories; its main reason is that our country to carry on the control the capital and is influenced by market expectations. But, outside the RMB NDF (offshore non-deliverable forwards market) by short-term exchange rate, the influence of random factors is smaller. That also shows the offshore RMB NDF market is more rational than domestic currency markets. Chunxiang and Hong (2008) Study the hedging and arbitrage behavior in the RMB market, the study found that after the revaluation, the extent of the market affected by the overseas market information in strengthening, the domestic market have weakened local information advantage. Xiaofeng & Hua (2008) Examined the information flow between the RMB spot foreign exchange market, the overseas futures market and the overseas NDF market, found that the spot market transmission market information to the overseas derivative market, and NDF market is the center of the market price information, the price guide force is stronger than the spot market and futures market.

Junyang & Xiaoyan (2009) after the exchange rate system reform in 2005, the RMB spot exchange rate has an impact on the offshore RMB non-deliverable forward exchange rate. Domestic foreign exchange market began to show the local advantage.

Min and Shusong (2010) researched shows that the spot market information affects the overseas NDF market volatility, but because the development of the domestic market lag and system constraints, overseas NDF market is in the market price information center. Ruijun & Hao (2012) analyzed the impact of the offshore RMB market in Hong Kong on the domestic financial market. Jing (2012) examined the interaction between CNY market spot rates, CNH market spot rates and NDF forward rates, The research showed that the three markets are related to each other, and the information transmission is quick. After 2007, the volatility of CNY spot exchange rate and CNH spot exchange rate has obvious influence, which shows that the influence of RMB internationalization is strengthening.

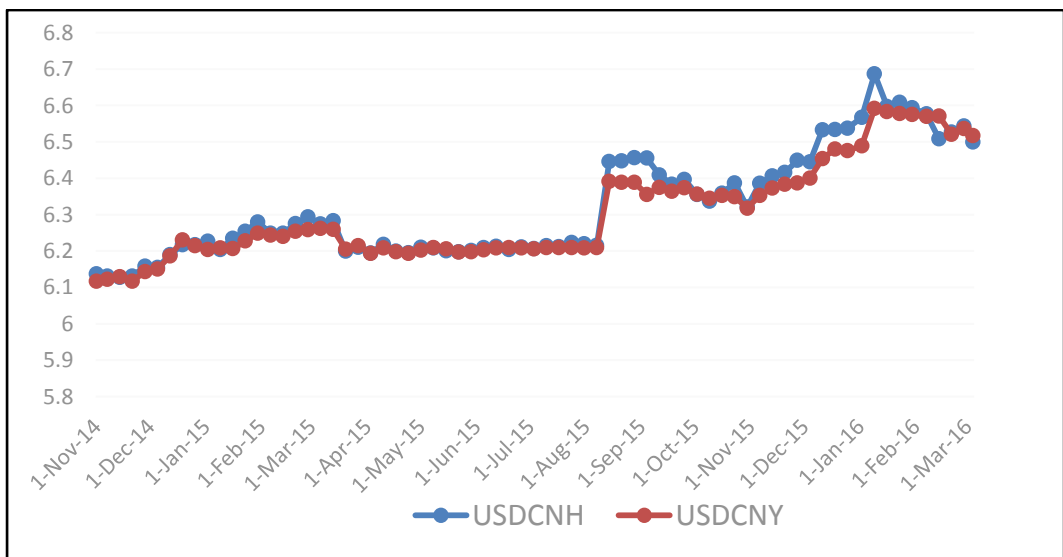
Although the CNH market and CNY market trading system, the size of the market, have a great difference in such aspects as financial instruments, but is not a complete split between the two markets. On the contrary, the two markets in terms of price has obvious characteristic of conduction and interactive. There are many relevant theories about different price on the market, for example, Interest rate parity theory, and foreign exchange supply and demand equilibrium theory, the foreign exchange market validity theory, etc. But these theories have strict premise, like the free flow of capital, transaction cost is zero, investors risk neutral, etc., those theory Have great difference with the actual situation in our country. In comparison, based on the point of information flow to explain, and interactive relationship of onshore and offshore market is more effective in China.

According to the flow of information, when some new information about the effects of asset price, and then the market will react to the information, make the asset prices can adjust to the equilibrium price. In different markets, the price discovery efficiency is not the same. In offshore and onshore market, if there is a market exchange rate's response to information often ahead of the other market, so the market in RMB has more advantage on the price discovery function, the assets of the other market prices will be influenced by the dominant market.



**Figure 2: Flow rate mechanism**

Conclusion on Dominate the market and other market conduction can be sum up as follow: When the impact of the information to influence dominated the market price, other market participants from the dominant market price fluctuations in the price change of information, thus the participants of the market is expected to change, the expected transformation will generate the corresponding investment strategy, the RMB will affect the market supply and demand, eventually cause the change of the price. This process is called "information flow" or "contagion effect" between the markets. Measure market information flow between the main index of measuring the market pricing power transmission "mean spillover effect"; and measure the market price volatility transmission between the "volatility spillover effects".



**Figure 3: Exchange on CNH and CNY**

**Note:** Weekly closing price  
**Source:** Wind database

The chart reflects the consistent trend of the RMB onshore and offshore exchange rates from November 1, 2014 to March 4, 2016, during this period the RMB was in a depreciation trend both in the onshore and offshore markets. But in the CNH market price fluctuation is more severe than CNY markets, throughout the cycle, the devaluation of the channel in the CNH market depreciation rate more than CNY market, CNH market showed significant spillover effects, according to the "information flow" point of view, the CNH market showed the dominant position in the pricing.

### 3. EMPIRICAL ANALYSIS

In exchange for CNH and CNY linkage between the empirical analyses, selected from March 2014 to March 2016 the daily exchange rate data, which is a daily central parity CNY, CNH is Hong Kong's RMB market daily closing price. The data comes from the East wealth through choice data, done in eviews7.0.

**Table 1: Descriptive statistics**

	Average	Median	Variance	Kurtosis	Skewness	J-B value
CNH	6.322	6.254	0.145	0.699	2.252	14.664
CNY	6.301	6.235	0.132	0.767	2.423	15.656

**Source:** Authors' own calculations

During the inspection period CNH mean, the values are higher than CNY, show CNH market spot exchange rate of RMB higher than the CNY market. CNH market variance higher than CNY market, that CNH market volatility is greater than the CNY market; according to kurtosis, skewness and J-B value CNH and CNY are not normally distributed.

#### 3.1. ADF test

To prevent the erroneous regression in the regression of time series due to the instability, the first time series stationary test. If the ADF is less than the threshold, the result indicates stationary series. If the original sequence is not smooth then be the difference, and then test again. If the sequence exist stable equilibrium relationship between the same orders, the sequence is. ADF test results are follows:

**Table 2: ADF test results**

	ADF vaule	Inspection type	5% threshold	Smoothness
CNH	-1.252	I	-2.882	Not smooth
CNY	-0.892	I	-2.882	Not smooth
$\Delta$ CNH	-11.693	I	-2.882	smooth
$\Delta$ CNY	-13.678	I	-2.882	smooth

**Note:** The test is divided into type containing the intercept and trend items, respectively, I and T represent; represents the first difference

**Source:** Authors' caculation

The results showed that the original data is not through the stationary test, but after the first difference, have passed the stability test at the 5% significance level, CNH and CNY order one, that is of the same order smoothly, that may exist between them long-run equilibrium relationship.

#### 3.2. Lag order to determine

According to FPE, AIC, SC and HQ criteria to determine the optimal lag order model.

**Table 3: Lag order to determine**

Lag	LogL	LR	FPE	AIC	SC	HQ
0	380.599	NA	1.11e-05	-5.736	-5.693	-5.719
1	644.321	515.457	2.16e-07	-9.672	-9.541*	-9.618
2	652.434	15.612	2.03e-07*	-9.734*	-9.515	-9.645*
3	653.995	2.955	2.11e-07	-9.697	-9.392	-9.573
4	656.076	3.879	2.17e-07	-9.668	-9.275	-9.508

**Note:** \* To determine the optimal lag order number

**Source:** Authors' caculation

According to table 3, the optimal lag in FPE, AIC and HQ criteria model of order 2 order. In the SC Guidelines optimal lag order is an order. Optimal lag order to prevail under multiple criteria to determine that the optimal lag order of the model is of second order.

**3.3. Granger causality test**

**Table 4: Granger causality test**

Null Hypothesis:	Obs	F-Statistic	Prob.
CNY does not Granger Cause CNH	138	0.116	0.890
CNH does not Granger Cause CNY		5.695	0.004

Source: Authors' own calculations

At 5% confidence level, accepting the null hypothesis "CNY CNH not Granger cause" reject the null hypothesis "CNY CNH not Granger cause." That CNH is the Granger caused CNY, and CNY is not caused CNH.

**3.4. VAR model estimation results**

Granger causality test shows the effect of exchange rates CNY and CNH's market. 2 the lag order 2 shows that in the information transfer process before impact 2 CNH exchange rate will CNY exchange rate. And the situation prior to the current exchange rate 2 CNY and CNY exchange rates will also be made on the basis of corresponding changes. Because it contains lags between variables, this paper uses vector auto regression VAR model VAR. The result as follow:

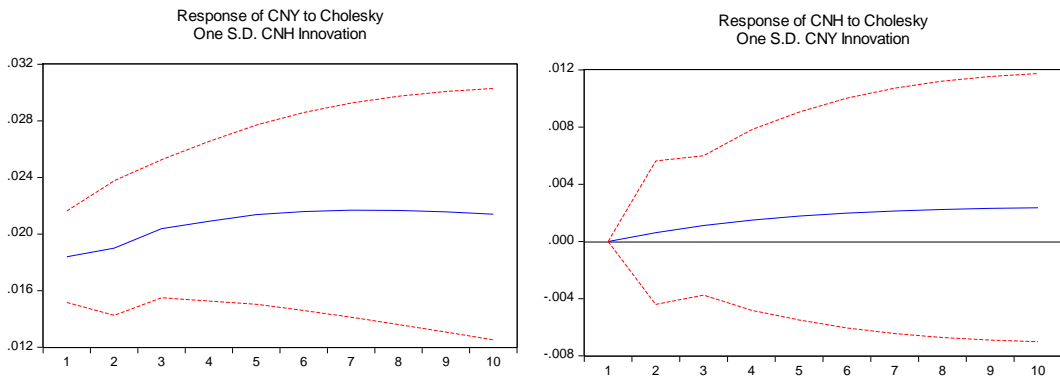
**Table 5: VAR model results**

	CNH	CNY
	0.949	0.339
CNH(-1)	(0.141) [ 6.735]	(0.107) [ 3.183]
	-0.029	-0.139
CNH(-2)	(0.145) [-0.199]	(0.110) [-1.269]
	0.044	0.471
CNY(-1)	(0.181) [ 0.244]	(0.137) [ 3.442]
	0.018	0.303
CNY(-2)	(0.171) [ 0.105]	(0.129) [ 2.340]
	0.110	0.163
C	(0.140) [ 0.787]	(0.106) [ 1.544]

Source: Authors' own calculations

As can be seen from the estimated results of VAR model, there is a linkage between CNH and CNY each other, and the impact of different lag also differences. CNH (-1) is positively correlated with the CNY, but CNH (-2) and CNY are negatively correlated. From CNH (-1) impact on the CNY is a strong point of view on the effective coefficient; and because CNH (-2) in the course of the flow of information on CNY has been CNH (-1), CNY (-1) and other ways of conduction times, so CNH (-2) on the CNY, has been weakened. CNH and CNY (-1), and CNY (-2) is positively correlated, the reason is that the studied time period show a continued depreciation of the RMB trend, CNY is consistent with the CNY (-1)and CNY (-2) fluctuation direction.

### 3.5. Impulse response effect of CNH and CNY



**Figure 4: Impulse response effect of CNH and CNY**

**Source:** Authors' own calculations

CNH market is impact of a unit; from the first trading day of the CNH market cased positive effect. Also CNY market units, the first trading day CNH market also played a positive role. But from the point of view of the impact of the reaction rate, the impact on the market CNY CNH market is much larger than the impact of the magnitude of the impact on the market impact of CNY and CNH's. Show that although the impact of CNH and CNY market each other, but the impact on CNH to more than CNY and CNY impact on CNH's, CNH market is information superiority and dominate the market.

### 4. CONCLUSION

In the test of the stability of the model time series CNH, CNY at the 5% significance level is not smooth, but CNH and CNY through the first difference through the stationary test. In the lag order of the model determined in accordance with FPE, AIC and HQ criteria to determine the optimal lag order is the second order. Granger causality test results show that CNH is the Granger caused CNY, and CNY is not caused CNH. VAR model results show that the CNY market is affected by CNH (-1) and CNH (-2), and CNY and CNH (-1) is positively correlated with CNH (-2) negatively correlated, and CNH (-1) to CNY strong and effective, smaller CNH (-2) on the CNY. From the pulse response effect, the impact of CNY CNH impact is far greater than the impact of CNY impact on CNH. Through the above empirical results, the following conclusions can be obtained: CNH and CNH market exchange rate on the market significantly "spillover effect"; CNH and CNY in two markets CNH market is the dominant market, with high information advantage and price discovery, pricing has increased from RMB market is transferred to the territory of the CNH market.

### 5. POLICY RECOMMENDATIONS

#### 5.1. Exchange rate formation mechanism to accelerate market-oriented reforms

With the RMB offshore market development and maturity, as the leading market CNH market has become the center of RMB pricing, the impact of fluctuations in the offshore market for the onshore market, more and more significant. Although domestic RMB market after several rounds of reform, and gradually form a market supply and demand with reference to a basket of currencies, managed floating exchange rate system. But with the market-oriented exchange rate market is still a large gap, which is expected to cause adverse exchange rate distortions and market. Coupled with overly restrictive onshore RMB market volatility is likely to cause the range of offshore RMB exchange rate arbitrage, prompting the massive flow of hot money, thereby affecting the transmission of monetary policy and asset prices stable. Accelerate the reform of exchange rate formation

mechanism of the market, expanding the market exchange rate floating range of inter-bank RMB pegged to a basket of currencies forming mechanism, so as to comprehensively reflect the weighted average exchange rate of each trading countries avoid pegged to the dollar and lead passive appreciation or depreciation. To achieve the basic unity of onshore and offshore RMB exchange rate.

### 5.2. Maintain the stability of the offshore RMB market

In view of the offshore RMB market has become the dominant market, maintain the RMB exchange rate is to maintain a stable center of gravity offshore RMB market exchange rate. In the offshore market, the central bank is no longer a means of administrative intervention to maintain exchange rate stability, but only as a market participant to influence the CNH market. The intervention of central bank on offshore RMB exchange rates is many. First, the central bank to intervene directly through correspondent banks, paying out dollars to buy the currency to prevent excessive depreciation of the RMB exchange rate, or to buy dollars and sell yuan to prevent excessive appreciation of the yuan. This means to alleviate the same degree of appreciation or depreciation pressure, you may need to purchase or invest more reserves to intervene in the offshore market. Second, On the agency to close the supply of offshore RMB, limiting short body mass by inter-bank market lending RMB short selling channels. For example, foreign-invested banks to suspend its offshore RMB business to participate in the line cross-border RMB business purchase and sale, Window guidance to domestic banks to suspend offshore bank accounts to RMB cross-border financing. Maintenance of offshore RMB market stability requires in practice, constantly sum up experience and lessons, innovative ways and means to strengthen the different financial instruments to improve management efficiency and stable offshore markets.

### 5.3. To strengthen the transparency of exchange rate policy, improve the credibility of the central bank in the RMB market

The effectiveness of central bank policy is closely related to the central bank's policy of transparency and credibility. First, fuzzy policy is easy to mislead the market. Different interpretations of each foreign exchange market participant's fuzzy policy will exacerbate market volatility, more transparent policies are conducive to a better understanding of the market to the exchange rate of the central bank's attitude and the bottom line; help stabilize the market irrational behavior. Second, if the central bank helps to enhance the credibility of the good effects of monetary policy. Its release policy signal market players to be fully understood and widely accepted, monetary policy transmission mechanism more smoothly. At the same time, the credibility of good help maintain financial stability. Faced with a structural imbalance in the financial markets, the central bank can serve as a window guidance and moral persuasion role in guiding financial institutions and the public to adjust economic activities to achieve the policy objectives of maintaining market stability.

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