RMB Internationalization in the Context of Exchange Rate and Capital Account Control

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Abstract: We explain the logic of RMB offshore market development and how RMB offshore market development affect onshore market. The key driver of RMB offshore market development is arbitrage. Under the strategy of gradual appreciation of RMB by the Chinese authority, room for arbitrage in RMB offshore market is not narrowed even if scale of arbitrage increased. Our regression result indicates short-term capital inflow increased by 9-10 billion USD per month since the establishment of RMB offshore market.

Key words: Internationalization of RMB, Offshore market, Arbitrage

Introduction

After the global financial crisis in 2008, it was commonly accepted by the global society that there are defects exist in the current international monetary system, and a reform is needed. Among this, RMB entering the SDR and to

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develop RMB to be a new international reserve currency got wide concern by the global society. Some internationally known scholars highly expect RMB to be internationalized, and advocate to form a international monetary pattern that made up with USD, euro and RMB, thus to offset the insufficient of international reserve currency supply, and consequently overcome the defects in the international monetary system that USD dominates (Emmanuel, Gourinchas, and Rey, 2011; Taylor, 2011)².

China government has taken a series of measures for the international monetary system reform and RMB internationalization: People's Bank of China Governor Zhou Xiaochuan (2009a) published articles after the financial crisis to support developing SDR to be a super-sovereign currency, and it gave rise to widely attentions and discussions; Bringing RMB into SDR was added to conference agenda of G20; China started to use RMB as denominated currency when signing currency swap agreement with other countries. China allowed some countries to buy China's government bond as foreign exchange asset of their central banks. China start to accept the use of RMB as trade settlement currency, and propelled the development of offshore RMB market in cooperation with regulators in Hong Kong, allowed to use RMB to conduct foreign direct investments.

² There are two representative viewpoints about the reform of international reserve currency system. One of them is proposed by Zhou Xiaochuan that using super-sovereign currency rather than USD specifically enlarge the effect and influence of SDR. The other is international reserve currency diversification which mentioned here, this viewpoint believes: the prominent problem that international reserve system facing currently is the contradiction between the limited supply of reserve currency and rapidly growing demand, and the diversification of reserve currency system will abate this contradiction. The later one was much supported by the academic field.
Among the policies which promote RMB internationalization, trade settlement in RMB and Hong Kong RMB offshore market involved most interests, and also most concerned. When Hong Kong offshore RMB market was found in August 2010, cross-border RMB trade settlement amount rapidly approached the magnitude of 100 billion Yuan. The scale of RMB deposits in Hong Kong rose from 55.9 billion Yuan in July 2009, to 627.3 billion Yuan in November 2011. RMB-denominated bonds issued more than 100 billion Yuan, much outnumbered the amount of 36 billion Yuan in 2010. The number of Hong Kong’s licensed banks which managing RMB deposits has increased from 40 to 132. The number of RMB clearing platform participant banks has reached 166 till June 2011.

The development of RMB trade settlement and Hong Kong RMB offshore market were widely concerned, related institutions also organized several thematic researches. But up till now, the existing researches lack systematic elaboration about RMB offshore and onshore arbitrage, most researches still remain in qualitative analysis. The purpose of this article is to further clarify two facts: the first one, clarify the basic logic and facts of the arbitrage between RMB offshore and onshore markets based on interviewing, investigating and surveying major market participants and regulators; the second one, analyzing

3 Data source: Hong Kong Monetary Authority
the effect of short-term capital flow cause by the liberalization of RMB trade settlement policies and development of Hong Kong RMB offshore market, with the help of econometrics models.

Based on the two works above mentioned, we found: RMB trade settlement and develop RMB offshore market before liberalized RMB exchange rate regime will bring a large number of riskless arbitrage opportunities, the development of RMB market will be dominated by arbitrage under the subsidy from monetary authority, and it will form a notable impact to onshore RMB market. In this situation, not only the initial purpose of prompting the RMB internationalization is hard to realize, but also brought financial lost to monetary authority, created more difficulties in operating the monetary policies. Prompting RMB internationalization should firstly thoroughly establish the market oriented RMB exchange rate regime, and the order of reform should not be reversed.

This article is made up with six sections: Section 1 briefly reviews related literatures; section 2 discusses the trading logic of RMB offshore market; section 3 discusses the trading logic of RMB onshore market; section 4 quantify the scale of China’s short-term capital flows cause by the liberalization of RMB trade settlement policies and development of Hong Kong RMB offshore market; section 5 discusses the policy implications.
1. Literature review

Around the financial crisis in 2008, researches of RMB internationalization vastly emerged, and achieved much progress. The initial focal point was general researches such as the cost and benefit of currency internationalization, and historical experience of currency internationalization. With the liberalization of RMB trade settlement policies and the rapid growth of RMB offshore market in Hong Kong, the focal point transferred to the development of RMB offshore market and the reciprocal effects between offshore and onshore markets. Due to the space limitation, the following text mainly reviews literatures which are closely related to this article, and no longer involves literatures which are important but not closely related to this paper, such as researches on the international experience of currency internationalization, and prompting RMB internationalization from perspectives of developing foreign direct investment, international monetary system reform and official currency swap agreement.

1.1 Why to develop Hong Kong RMB offshore market

Paola (2010) argued that it is unprecedented that countries prompt the development of the offshore market. The major incentive of offshore markets development is to escape the regulation of onshore market, developing RMB
offshore market is not an exception. The development of RMB offshore market will certainly challenge domestic regulation policies, so why should China develop RMB offshore market in Hong Kong? Following are several explanations.

Developing RMB offshore market contributes to prompting RMB internationalization. Scholars from the “research group of RMB internationalization”(2011) of BoYuan foundation considered RMB internationalization is a trend, and developing RMB offshore market in Hong Kong complies with this trend. Among those researches, He Dong and McCauley summarized three functions of offshore markets: favoring trade, separating currency risks and country risks, excessive returns. Based on these reasons, foreign investors usually tend to utilize offshore markets to increase the position of some kind of currency. Therefore, developing RMB offshore market will improve the attraction of RMB to foreign investors, thus it will prompt RMB internationalization. He Dong and McCauley also indicated, even in the condition of capital controls, it’s still possible to develop RMB offshore market on the condition that offshore financial institutions keep their clearing account in domestic banks, and be able to withdraw freely.

Another important reason for supporting the development of RMB offshore
market in Hong Kong is the controllable risks, as it can be treated as a trial for the liberalization of capital accounts of China. It's different with general offshore markets that every step of the development of RMB offshore market in Hong Kong was under close cooperation of inland and Hong Kong monetary authorities, inland monetary authority can keep control of the development of RMB services in Hong Kong. In the environment that inland still remain capital controls, the development of RMB offshore market in Hong Kong can be seen as a trial of relaxation of capital controls. Li Daokui (2008) thought that since the domestic financial system is not mature, China is not ready for capital account liberalization; hence he proposed a dual-track suggestion to prompt RMB internationalization, that is, gradually open domestic financial system to the outside world, as well as establish RMB offshore market in Hong Kong.

In practice, after the establishment of RMB offshore market, foreign investors obtained legal and convenient channels to hold RMB-denominated assets. RMB products such as RMB deposits and RMB-denominated bonds doubled its growth, these development in short-term at least can be seen as a boost of RMB internationalization process. Zhang Bin (2011b) argued, in the context of optimizing China’s foreign investment position, that the two main problems in China’s foreign investment position are external assets excess external liabilities significantly, and external return of assets is far less than the return of external assets. Prompting RMB internationalization through developing RMB
offshore market will lead to further increase of external assets and RMB liabilities. When RMB is appreciating against US dollar, and real yield rate of China’s foreign assets is being seriously challenged, the status of China’s international investment position will become worse, and bring welfare lost to the country. Consequently, he argued RMB exchange rate liberalization reform and foreign exchange reserve management reform are more urgent, and they should be taken before the development of RMB offshore market and liberalization related to capital inflows.

Forcing the domestic financial system reform by developing RMB offshore market will is another important view point that supports the development of RMB offshore market. He Dong and Ma Jun (2011), Zhang Ming (2011), Wang Xin (2011) argued, in the situation that domestic financial reform facing obstacles, RMB internationalization, especially the development of offshore market, will force domestic financial market to reform. Huang Haizhou (2010) thought the importance of prompting RMB internationalization is comparable with rural contract responsibility system reform in China’s agriculture sector and China’s access into WTO. But there are dissenting opinions. Researches by Yu Yongding(2011) argued, the development of RMB offshore market brought arbitrage between offshore and onshore market, and this formed new pressures to domestic macroeconomic management, but it’s not sure that whether the pressures can transfer into driving forces of domestic financial
system reform. Zhang Bin (2011a) argued, the major obstacle of China’s interest rate liberalization is the reluctance of increasing debt burden of local governments and big enterprises, at same time worries about domestic big financial institutions; the major obstacle of domestic exchange rate liberalization is the worries about export and employment, as well as the lack of matching systems of domestic demand oriented economic development pattern. Reform of interest rate and exchange rate, which are the most important reforms in financial field, cannot be forced to success by developing RMB offshore market. In combination of Japan’s historical lessons in developing offshore market, Murase (2010) argued that the prevailing development model of RMB onshore and offshore will created new rent-seeking spaces and corresponding interest group, thus may slow down the steps of domestic financial system reform.

In a word, there is on consensus about why China should develop RMB offshore market. So far, we still lack a relatively complete and cohesive framework to answer this question.

1.2 Why RMB offshore market in Hong Kong develops rapidly

Wang Qing (2011) pointed out, due to the following features of RMB deposit in Hong Kong, RMB deposit increase caused by RMB internationalization policies should be seen as hot money: (1) the major holders of those offshore
RMB deposit are enterprises rather than residents; (2) the motivation of holding those offshore RMB deposit is the expectation of RMB appreciate, the consideration of interest rate gap between domestic market and international market. (3) RMB in Hong Kong is waiting for opportunities to return to inland. But He Dong⁴ argued, it is for the reason that 60% of RMB deposits in Hong Kong are holding by enterprises, and these enterprises are cross-border settlement participants, thus demonstrated most RMB trade settlements have real trade background as supports, and cannot be totally seen as hot money.

Garber (2011) analyzed the supply and demand factors of RMB-denominated deposit changes, revealed the arbitrage mechanism between onshore market and offshore market, and he believes the expectation of RMB appreciation is the dominant factor that drives the development of RMB market in Hong Kong. RMB deposit market in Hong Kong for instance, Garber believes the trading logic is: the expectation of RMB appreciation → the speculative demand for RMB in the CNH market rises → the exchange rate spread between CNH and CNY market increases → inland importers make more RMB settlements in Hong Kong → the supply of RMB deposit in Hong Kong increases → the exchange rate spread between CNH and CNY market diminish. If the spread of CNH and CNY reversed, then the balance mechanism stated above will also

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⁴ From the speech of He Dong in the round-table meeting of RMB Internationalization held in The Hong Kong Monetary Authority in May 23, 2011
be reversed, RMB deposits in Hong Kong will reduce\(^5\). Garber argued, because of the existing of long-term appreciation expectation of RMB exchange rate and the existing of exchange rate spread between onshore and offshore market, RMB FDI and RMB trading settlements and such behaviors is driven by speculative factors.

Except for Garber (2011)’s explanation of the CNH market development, Yu Yongding (2012) added the interest rate arbitrage should also be considered. He investigated the trading behaviors in Hong Kong in the view of interest rate parity, and explained the phenomenon that foreign exchange reserve of domestic financial institution dropped and the surplus of …turned into deficit during October 2011 and December 2012.

Some market participants also examined the logic of RMB offshore market development in Hong Kong, so here we don’t elaborate them one by one because of the space limit. In general, most researcher agree with RMB appreciation expectation as the core support of the development of RMB market in Hong Kong, and the existence of a large number of interest rate and exchange rate arbitrage.

**1.3 Impact of offshore market development on the onshore market**

\(^5\) From October to December 2011, the market exchange rate spread of CNH and CNY reversed, RMB deposits in Hong Kong reduced.
RMB trade settlement and the development of RMB offshore market enlarged the scale of foreign exchange reserve. Most time since the liberalization of RMB trade settlement policy and the building of CNH market, RMB settlements by importers are much more than exporters. This will lead to decrease of net foreign exchange demands in the onshore foreign exchange market. Under existing RMB exchange regime, monetary authority has to purchase all the oversupply of foreign exchanges for maintaining current exchange rate, which lead to the increase of foreign exchange reserve accumulation. The controversial question is: due to the different data sources and assumptions, the increased scale of foreign exchange reserve in the above channel is much divided. Besides, some viewpoints believe foreign investors utilize RMB trade settlement and CNH market to replace the former method that obtains RMB assets through other channels, therefore the liberalization of RMB trade settlement policies and CNH market should not be blamed for the increase of foreign exchange reserve. So far, there is no empirical research that could answer this question well.

The monetary authority takes the pressure of issuing money when they purchasing more foreign exchanges, and suffers financial losses. As stated above, due to the liberalization of RMB trade settlement and the development of CNH market, the monetary authority was forced to buy in more foreign exchange and at same time issue more RMB. If offshore RMB does not flow
back to inland, there is no further pressure for the monetary in term of keeping stable base growth. However, the mechanism stated above formed a potential lose for monetary policy. Zhang Bin (2011a) stressed financial losses of monetary authority, the measure of monetary authority that exchange foreign exchange assets for RMB liabilities will cause financial losses under existing RMB exchange rate regime.

Capital restriction is still valid, but the liberalization of RMB trade settlement and RMB offshore market in Hong Kong relaxed capital restriction in fact. MaCauley (2011), Ito (2011)‘s research demonstrates that capital flowing is not thoroughly free between offshore market in Hong Kong and the onshore market. This manifests actually part of regulation in capital account is still valid. Yu Yongding (2011) believes, although capital restriction is not invalid, the liberalization of RMB trade settlement and the development of RMB offshore market in Hong Kong opened a door for capital flows, and even further stimulated short-term capital flows, the related policies actually relaxed the policy of capital control. Murase (2010) named this arrangement in China currently as dual exchange rates, he argued with the RMB appreciation expectation, the essence of onshore and offshore exchange rates spread is Tobin-tax, which is: the cost of oversea capital transferring to domestic. However this Tobin-tax is only aiming at oversea capital flow into domestic and it is a compensation for domestic RMB outflow. Thus, this policy arrangement
implied redistribution of welfare.

The reviews stated above are not sufficient to cover important researches recently, but roughly reflect the current situation of research. We saw that there are generally controversies about prompting RMB internationalization through liberalization of RMB trade settlement and development of RMB offshore market. Resolving these controversies need further clarification of facts, and more proper research framework. In this paper, we are trying to further clarify the facts, and then analyze the co-movement of the two markets. We think this could do some help to make consensus and policy implications.

2. The development and trading logic of RMB offshore market in Hong Kong

2.1 The major participants and trading pattern: August 2010- August 2011

The major participants includes: (1) import and export trade enterprises of inland and Hong Kong; (2) foreign financial institutions who are engaged in RMB services; (3) hedge funds; (4) general investors, such as residents of Hong Kong or people who stays in Hong Kong for long-term thus are able to open RMB accounts at Hong Kong. Here we analyze the market trading logic in the background of the unilateral appreciation expectation of RMB from August 2010 to August 2011; after September 2011, the RMB appreciation

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6The author thank Professor Yu Yongding and Mr. Kevin Fung for their help of the analysis for this part of content
expectation reversed and we will discuss it in next part. Since general investors are not active, the effect of their activities in the market is of limited significance, so we won’t analyze it separately.

(1) The main purpose of using RMB as settlement currency is to seek the exchange rate spread between CNH and CNY market. Since the establishment of CNH market, in most time RMB in CNH is more expensive than it is in CNY, importers could obtain the exchange rate spread from the two markets by using RMB settlement. For example, RMB/USD quote in CNY market in 6.5, and RMB/USD quote in CNH market is 6.4, import enterprises buy USD in CNH market to make the payment could save their costs. Garber (2011) argues the exchange rate spread is actually a compensation that monetary authority gives corresponding merchants. It is because the existing of this exchange rate spread, that supporting merchants choose to make RMB settlement in Hong Kong rather than in onshore market. Though the RMB settlements by merchants have real trade background, Garber argue that due to the major incentive of this transaction is to seek exchange rate spread, so the reality is to make RMB settlement transaction for the need of speculation.

Through observing the co-movement of the exchange rate spread between CNH and CNY market and the ratio of paying\(^7\) and receiving\(^8\) money which

\(^7\) Mainly corresponding to import payments
\(^8\) Mainly corresponding to export receipts
use RMB in the trade settlement, we found further evidences on the judgment stated above. When the CNH-CNY exchange rate spread becomes larger, foreign trade enterprises will gain more by using RMB rather than USD to make import trade settlements, using RMB to make export trade settlement will cause losses, the ratio of paying and receiving money of RMB trade settlement should be larger. As shown in Figure 1, with trade settlement as the main body, RMB paying/receiving ratio (dark line), and CNH-CNY exchange rate spread (light line) are highly negative correlated, correlation coefficient is as high as -0.87. This demonstrated RMB cross-border settlement behaviors are largely based on the motivation of arbitraging the exchange rate spread of CNH-CNY.

**Figure 1**

RMB cross-border paying/receiving ratio and CNH-CNY exchange rate spread: highly negative correlated.

Data Source: original data of CNH and CNY are from Bloomberg, CNH-CNY equals -0.06 represents RMB price of USD in CNH market is 0.06 Yuan lower than the RMB price in CNY market;
(2) **Financial institutions engaged in the offshore RMB businesses are aiming at obtaining RMB spot and forward exchange rate spread.** In the background of RMB appreciation expectation, the typical mode that financial institutions engaged in RMB business in offshore market is short USD and long RMB in the spot market, and short RMB with long USD in the forward market. For instance, financial institution borrow 100 million USD in spot market, with a 1 year interest rate of 0.8%, at same time exchange them to RMB\(^9\) at the exchange rate of 1:6.4 in CNH market. The profit that this transaction bring to financial institution is\( (1\text{ year RMB spot and forward exchange rate spread} + 1 \text{ year RMB interest income} – 1 \text{ year USD interest cost}) \): in the example above\( (10 \text{ million RMB} / 1,562,500 \text{ USD} + 6.4 \text{ million RMB} / 1,000,000 \text{ USD} – 5.12 \text{ million RMB} / 800,000 \text{ USD} = 11.28 \text{ million RMB} / 1,762,500 \text{ USD}) \).

This profit of financial institutions come from two aspects, one is the spot and forward exchange rate spread of RMB, and the other one is the interest rate spread of RMB and USD. If increasing financial institutions made the same transactions, it will definitely raise the spot RMB price and lower forward RMB

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\(^9\) Financial institution can exchange lent USD to RMB relies on the existence of CNH market, and this is a condition they have since August 2010.
price, the room for making arbitrage will disappear. In CNH market, the trade stated above could make profit for a long time, the key is: since RMB trade settlement existing, RMB from inland could flow in Hong Kong without limit, offshore financial institution buying RMB won’t obviously pull up spot RMB price; although financial institutions selling forward RMB will bring down forward RMB price, once the forward price of RMB is lower than the generally expected future RMB exchange rate in the market, it will still attract a large number of investors to buy forward RMB. Therefore, the following three elements jointly make the arbitrage sustainable: the first one, RMB trade settlement provide RMB to Hong Kong; the second, the development of CNH market enables financial institutions to buy RMB; thirdly, inland foreign market intervention make the market keeping an unilateral appreciation expectation, financial market could sell RMB in a price that higher than spot exchange rate.

(3) Hedge funds use high leverage, to speculate for RMB appreciation in the future. Hedge funds are major participants in RMB non deliverable forward market (NDF), they can use 10 times or more leverage, buy/sell forward RMB (Kevin Fung, 2011). Forward RMB price (RMB NDF forwards price) has an implied RMB forward price, however this price cannot well represent the general RMB appreciation expectation of the market. Since 2008, the NDF implied RMB price was much lower than the general expected RMB appreciation of the market. Say market generally expected that RMB will
appreciate 5% in 1 year, but the appreciation implied by NDF was 2.5% in 1 year (as shown in figure 2). What is the reason?

Figure 2

1-year RMB appreciation calculated by NDF price and market generally expected 1-year RMB appreciation expectation

Data declaration: Estimation of NDF market appreciation expectation, spot exchange rate minus 1-year RMB NDF exchange rate, divided by spot exchange rate. Consensus appreciation investigation, spot exchange rate minus market generally expected 1-year RMB forward exchange rate (Consensus Forecast), divided by spot exchange rate. Data source: Bloomberg, Consensus Economics, quoted from McCauley (2011)

The reason is as we stated above, financial institutions are selling forward RMB, though the forward RMB price is quite low, financial institutions can still obtain dual profits of interest rate spread and exchange rate spread. And the
lower forward RMB price attracted hedge funds, if market consensus expects RMB appreciation much higher than NDF implied RMB appreciation, it will be a great profit-making opportunity for hedge funds, with the function of leverage, hedge funds make profit considerably\textsuperscript{10}.

3-month RMB NDF market for instance, depending on the actual CNY RMB spot exchange rate in the maturity date, we found: hedge funds can profit from NDF market, and the profit room increased since the second half year of 2010. As shown in Figure 3: (1) in most time, buying forward RMB is profitable, since June 2005, each time the expected return without leverage is 0.2271%, consider the 10 times leverage, and 3-months annualized return, the return per year can reach 9.084%. (2) Besides, we can see from the trend line of Figure 3, the profit space of buying forward RMB has two turning points. The first turning point happened after the exchange rate reform of July 2005, transferred from lost to profit; the second turning point happened in the second half year of 2010, especially since the establishment of CNH market, the profit space rose substantially.

\textbf{Figure 3}

\textit{Hedge funds can profit in RMB NDF market, and the profit margin rose again}

\textsuperscript{10} Certainy, considering the interest cost, the result above is needed to be adjusted. However, during this process, the interest rate of USD is going down in long-term, and then trends to be stable. Thus the conclusion stated above will not be affected, even will be reinforced.
Data Declaration: Used (1) RMB NDF 3-months forward quotes, to calculate with (2) 3-months later corresponding CNY spot exchange rate quotes. Thus we obtained a percent result of profit of RMB NDF forward buyers which are hedge funds. Note that the profit of this transaction is the situation without leverage, and does not contain interest cost. Besides, the red line in the figure is the cubic polynomial trend line of the yield curve, so it has two turning points.

Table 1

The major participants of RMB offshore market in Hong Kong and the their profit sources

<table>
<thead>
<tr>
<th>Profit Source</th>
<th>Trade Enterprises at Inland and Hong Kong</th>
<th>Banks</th>
<th>Hedge Funds</th>
</tr>
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<tbody>
<tr>
<td>The exchange rate spread of CNH and CNY</td>
<td>The spread of CNH spot exchange rate and NDF forward exchange rate</td>
<td>RMB NDF appreciation expectation lower than the actual RMB appreciation</td>
<td>The interest rate spread of China and US</td>
</tr>
</tbody>
</table>
Overall, in the RMB offshore market in Hong Kong, foreign trade enterprises, financial institutions and other investors formed a complicated interdependent trading chain, each take a part of profit. As shown in Figure 1, foreign enterprises provide RMB to Hong Kong through import trade settlement, and obtain the price spread between CNH and CNY. The exchange rate spread between CNH and CNY relies on the RMB demands created from arbitrage transactions of financial institutions. Financial institutions long RMB in spot market, and short RMB in forward market with a price higher than spot RMB exchange rate. They obtain the price spread between spot and forward market and interest rate spread between RMB and USD. Financial institutions and hedge funds shared the benefits of RMB appreciation expectation, among this, financial institutions obtained the exchange rate spread of RMB spot and forward exchange rate, hedge funds obtained the expected return from the gap between the NDF implied RMB exchange rate and market consensus RMB exchange rate. Hedge funds bore certain risks, but due to its leverage operation, the expected return is also high.

According to the interest rate parity formula, if RMB interest rate is higher than USD interest rate, forward RMB should depreciate to eliminate the arbitrage.

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11 Comparing with Figure 1 can we find that, since the second half year of 2009, especially since August 2010, this kind of profit mode of hedge funds could start to profit in subjective expectation
room. The reality is that though the enlargement of financial institution’s arbitrage transactions will push forward forward RMB depreciation, but onshore foreign exchange market supply-demand fundamental and onshore monetary authority’s intervention operations have more effects on the RMB forward exchange rate. Market believes in forward RMB appreciation rather than depreciation, the passion of buying forward RMB does not decrease. Chinese monetary authority’s interventions in foreign exchange market and the RMB unilateral appreciation is the starting point of continued arbitrage stated above.

2.2 Major participants and their profit mode : Since September 2011 up to now
The world is like a chess game. After September 2011, due to the influence of international financial market turbulence, RMB appreciation expectation in offshore market reversed, RMB in offshore market was cheaper than RMB price in onshore market. From the analysis above, the spot and forward offshore RMB price is the result of the joint transactions of foreign trade enterprises, financial institutions and hedge funds. So after September 2011, the analysis of offshore RMB spot price and forward RMB price should also be in this frame, the difference is the conditions of arbitrages are changed. In order to save space, we describe the changes after September 2011 in a very brief way:
The RMB appreciation expectation decrease → The net demand of forward RMB from hedge funds decrease → Financial institutions sell forward RMB in a depreciated forward price, at same time USD interest rate increase → Financial institutions decrease net spot RMB position and their demand to RMB → RMB in CNH market depreciate → Import RMB trade settlement decrease, export RMB trade settlement increase, RMB in Hong Kong flow out.

3. The development and trade logic of onshore foreign exchange market

3.1 Major participants and trade model: before August 2010

According to "Interbank Spot Foreign Exchange Market Membership List" issued by China foreign Exchange Trade System, the direct participants in onshore foreign exchange market are of four categories: (1) People’s Bank of China; (2) domestic financial institutions, including commercial banks and policy banks etc, more than 170 institutions in total, are 62% of the Interbank Spot foreign Exchange Market Membership List; (3) giant state companies and branches of foreign financial institutions at China, The ten giant state companies among those including China Ocean Shipping ( Group ) Company, China National Oils, Foodstuffs and Cereals Corporation, China National Petroleum Corporation, Sinopec, are 4% of the interbank spot foreign exchange market members, close to 100 China branches of foreign financial institutions includes Citibank, JPMorgan Chase, HSBC, Standard Chartered
bank, Bank of Tokyo Mitsubishi UFJ, Mizuho Bank, Sumitomo Mitsui Bank, Société Générale, BNP Paribas, Deutsche Bank, Barclays Bank etc., are 34% of the spot foreign exchange market members. The institutions stated above are foreign exchange market members who can directly make transaction in the market. Foreign exchange transactions by most foreign trade enterprises are conducted by banks. As for those major participants of onshore foreign exchange market, we analyze their trade behavior as following:

(1) People’s Bank of China buy foreign exchanges in foreign exchange market, in order to maintain the target exchange rate, thus caused the unilateral RMB appreciation expectation. In July 21, 2005, China People’s Bank announced the RMB exchange rate reform plan. After that, RMB entered into a gradual appreciation channel; during the financial crisis RMB kept a steady relation with USD once again; after the crisis RMB return to the gradual appreciation channel again. China People’s Bank is always the net buyer in foreign exchange market, and the price setter of RMB exchange rate in the market. RMB’s gradual appreciation is far less sufficient to make the supply and demand side of the market return to balance, so only through unilaterally purchase foreign exchanges in a large number can People’s Bank of China maintain the RMB’s gradual appreciation. The heavily intervention of People’s Bank of China in foreign exchange market caused the rapid growth of foreign exchange reservation, from January 2005 to August 2010, China People’s
Bank’s net buying in the foreign exchange market is 29.5 billion dollar on average for each month, China’s foreign exchange reserve increased from 800 billion USD to 3 trillion USD from 2005 to 2011.

(2) In general, companies who are making foreign trade or foreign investment sell foreign exchange in foreign exchange market through the sale and purchase of foreign exchange by domestic banks for guests. Export, import and direct investment businesses and so on of foreign trade and foreign capital enterprises formed foreign exchange demand and supply in foreign exchange market through sale and purchase of foreign exchange by commercial banks for guests. In the pattern of continuous trade surplus and direct investment surplus, the total demand foreign trade and foreign capital enterprises is less than foreign exchange supply, and formed a net selling of foreign exchange in foreign exchange market. From January 2005 to August 2010, the net selling of foreign trade and foreign capital enterprises each month on average is 29.9 billion USD.

**Figure 4**

The net spread of sale and purchase of foreign exchange by banks for guests /net export and RMB appreciation expectation: highly correlated
Declaration: we eliminated the months of net settlement of exchange under the condition of trade deficit and the abnormal values

The foreign exchange purchase and sell by enterprises do not only depend on import and export, but also obviously affected by RMB appreciation expectation. When the RMB appreciation expectation rising, export enterprises utilize earlier settlement of exchange, import enterprises utilize delay foreign exchange purchasing, and some enterprises utilize delay remitting profit back to home or increase liabilities, foreign exchange loan and such methods expand USD liabilities and RMB assets, to obtain the profit of RMB appreciation. Zhang Ming, Xu Yisheng (2008) and such researches in China about hot money agrees concordantly, in the background of RMB appreciation expectation, foreign trade or foreign capital enterprises increase their RMB position through many channels, and decrease the USD position, thus obtain the profit from RMB appreciation, domestic RMB priced asset prices rise and
the interest rate spread between RMB and USD. In figure 4, the sale and purchase behaviors of foreign exchange of enterprises are obviously positive correlated with RMB appreciation expectation. The monthly data since 2008 shown, the correlation of the amount of sale and purchase of foreign exchange of banks’ guests and RMB exchange rate appreciation in the same term is 0.64. When the RMB appreciation expectation is strong, export enterprises are willing to do more settlement of exchange, import enterprises delay foreign exchange purchasing (or use foreign exchange loan instead of foreign exchange purchasing), import and export enterprises’ sale and purchase of foreign exchange net value increases. Once the RMB appreciation expectation reversed, export enterprises’ willing of settlement of foreign exchange decreases, yet import enterprises purchase foreign exchange faster, net value of sale and purchase of foreign exchange decreases.

(3) In net, domestic financial institutions buy foreign exchange in foreign exchange market. Beside sale and purchase of foreign exchange by banks for their guests, domestic financial institutions have foreign exchange deposits and loans, forward foreign exchange trade, etc., they sale and purchase foreign exchange for themselves in foreign exchange market. Domestic financial institutions are the net buyer of foreign exchange in foreign exchange market. From January 2005 to August 2010, domestic financial institutions’ net buying of foreign exchange each month on average was 2.1 billion USD.
The foreign exchange businesses of domestic financial institutions are mainly guest-driven, so they do not have big net position. In the background of RMB appreciation expectation, many guests hope to get USD loan from commercial banks, and then obtain the profit from the appreciation of RMB to USD. This means commercial banks are in the situation of spot foreign exchange short position, and forward foreign exchange long position. Commercial banks take the countermeasure to avoiding risks is to sell forward long position in spot market, thus increased net supply in spot foreign exchange market, commercial banks’ spot position becomes short position (though it’s balance in comprehensive position). In order to avoid the speculation of RMB appreciation, regulate institutions enhanced regulations to foreign exchange businesses of commercial banks, on one side increased requirement of the ratio of foreign exchange deposit and loan, restricting foreign exchange loan; on the other side increased the requirement to spot foreign exchange position of commercial banks, rather than only emphasizing comprehensive foreign exchange position as past.

(4) In net, giant state enterprises and branches of foreign financial institutions in China sell foreign exchange in the foreign exchange market. Giant state enterprises and China branches of foreign financial institutions have big differences in the extent of businesses, the former’s major works are foreign
trade and outward foreign direct investment and such entity economic activities, and involves some related financial transactions; the latter is mainly financial transactions. Unfortunately, limited by the current published data, the two are in one category, so we can only put them together in this article. Giant state enterprises and China branches of foreign financial institutions are net sellers in foreign exchange market. From January 2005 to August 2010, giant state enterprises and China branches of foreign financial institutions net sell foreign exchange 1.7 billion USD each month on average in foreign exchange market.

**Giant state enterprises and China branches of foreign financial institutions** have large amount of oversea branch institutions or are oversea institutions’ branches, they formed a large number of spot or forward foreign exchange cash flow during their operation. We didn’t find appropriate research object of those two kinds of institutions, so it’s hard to generalize their behavioral logic in selling and buying foreign exchange. However from the data of foreign exchange market transactions, these two kinds of institutions are quite active, the fluctuations are great, with a property of short-term capital flowing, and have decisive effect to short-term foreign exchange market fluctuation.

**Figure 5**

The supply and demand of various institutions in foreign exchange market: January 2005-December 201
Data source: based on People’s Bank of China, China foreign Exchange Trade System, CEIC data base, calculated by author.

(5) On the whole, foreign exchange net supply brought by foreign trade and foreign capital enterprises has decisive effect to middle-term and long-term foreign exchange market supply-demand relations, and giant state enterprises and China branches of foreign financial institutions, domestic financial institutions have decisive effect to short-term foreign exchange market changes. Comparing with thousands of foreign trade and foreign capital enterprises, there are only more than 10 giant state enterprises, the number of financial institutions from foreign and domestic all together are not much more than 100, but the latter have more significant effect to short-term foreign
exchange market supply-demand. In figure 5 is showing the average and standard deviation of various trading subjects, the coefficient of dispersion of giant state enterprises and China branches of foreign financial institutions, domestic financial institutions and foreign trade and foreign capital enterprises are 9.03, 5.08 and 0.45, even in absolute value, the standard deviation of foreign exchange trading volume of giant state companies and China branches of foreign financial institutions exceeded foreign trade and foreign capital enterprises, the standard deviation of foreign exchange trading volume of domestic financial institutions is close to foreign trade and foreign capital enterprises. Though the trading volume of Giant state enterprises and China branches of foreign financial institutions and domestic financial institutions is not large in middle and long term, but the fluctuation in short term is severe, and have decisive effect to foreign exchange market fluctuation in short-term.

3.2 Major participants and trading mode: Since September 2010 up to now
The liberalization of RMB trade settlement policy and the establishment of CNH market provided new arbitrage opportunities to part of onshore market traders, and also opened a convenience door for short-term cross-border capital flowing, it will obviously affect the supply and demand of onshore foreign exchange market. In the background of RMB unilateral appreciation before September 2011, using RMB to do import trade settlement can obtain the exchange price spread between onshore and offshore market, import RMB
trade settlement rose rapidly, export RMB trade settlement is less, export RMB settlement are averagely no more than 20% of total RMB trade settlement. A large number of import RMB trade settlements reduced the foreign exchange demand in onshore market, and increased onshore foreign exchange net supply. This part of foreign exchange net supply increased in onshore market is corresponding to RMB demand in offshore market, which is the RMB demand of foreign investors. This actually provided an opportunity of holding RMB assets for foreign investors. As Yu Yongding (2011) indicated, RMB internationalization in fact relaxed capital controls.

The sudden reversing of the supply-demand relation in onshore foreign exchange market after September 2011 once again proved the significant effect of RMB exchange rate change expectation to onshore foreign exchange market. Comparing with September, the following changes emerged in the foreign exchange market in October 2011: (1) foreign exchange net supply shrunk sharply. Foreign trade enterprises’ net selling of foreign exchange in September 2011 was 165.8 billion Yuan\(^\text{12}\), and decreased to 20.2 billion Yuan\(^\text{13}\) in October, 145.6 billion Yuan less than in September. (2) Giant state enterprises and China branches of foreign financial institutions converted from net supplier to net demander. These institutions owned 45.1 billion Yuan

\(^{12}\) Funds outstanding for foreign exchange of Central bank were described as historical RMB equivalent. Therefore, here we also used RMB-denomination to illustrate the demand and supply of other participants in Foreign exchange market.

\(^{13}\) The trade surplus was 17 billion USD in the same term, higher than the average from January to September which was 12 billion USD.
foreign exchange net supply in September 2011, and these institutions suddenly converted to net demander in October, the foreign exchange net buying is 81.5 billion Yuan, the foreign exchange net demand increased 126.6 billion Yuan comparing with that in September. (3) Domestic financial institutions’ net buying increased. The net buying in September 2011 was 7.9 billion Yuan, and 64.5 billion Yuan in October, increased 56.6 billion Yuan comparing with in September. In September, the three kinds of institutions stated above formed 239.4 billion Yuan net supply, and reverse to 89.3 billion Yuan in October. (4) To maintain the foreign exchange rate target, the centre bank was net buying in foreign exchange market in September, and net selling foreign exchange in October, foreign exchange reservation decreasing rarely appeared since then. The driven cause of the rapid adjustment of foreign currency of various enterprises and financial institutions is the RMB appreciation expectation in offshore market suddenly reversed to RMB depreciation expectation after September 2011. Not only all the arbitrage based on RMB appreciation was hard to continue, but appeared the currency mismatch in the balance sheet left by arbitrage transactions in the past, a big shift of foreign exchange position of enterprises and financial institutions was unavoidable.

4. Will RMB trade settlement and the development of offshore RMB market increase short-term capital flow
In this part, we use econometric model to further prove the effect of RMB settlement policy liberalization and offshore RMB market development to short-term capital flow after August 2010. As stated above, the long-term unilateral intervention of monetary authority to foreign exchange market caused RMB unilateral appreciation expectation, led to the arbitrage transaction behaviors in onshore market based on RMB appreciation expectation. After August 2010, RMB trade settlement policy liberalization and offshore RMB market development provided new opportunities of RMB appreciation expectation arbitrage to foreign investors, and formed a new arbitrage transaction link composed by foreign trade or foreign capital enterprises, offshore financial institutions and hedge funds. The following econometric model more accurately and normatively recognized the quantitative effect of RMB settlement policy liberalization and offshore RMB market development to short-term capital flow.

4.1 Data source declaration and data features
In the econometric model of short-term capital flow, we mainly use variables such as short-term capital flow scale, RMB appreciation expectation, interest rate spread of RMB and USD, dummy variables which are used to describe the liberalization of RMB trade settlement policy and the development of offshore RMB market, variables describe financial crisis. The data sample period is from July 2005 to October 2011.
Short-term capital flow (ShortC) is defined as the increased amount of current foreign exchange assets of monetary authority minus current balance of trade, and then minus current balance of direct investment, this is a definition of short-term capital flow scale which is commonly adopted among many empirical researches about hot money and capital flight. According to this definition, we bring such items into short-term capital flow scale as profit in international balance sheet, current transfers, securities investment, other investments, errors and omissions.

RMB appreciation expectation are calculated using the data of RMB one-year forward exchange rate Consensus forecast, the data comes from Consensus Economics Company’s market survey to important financial institutions of the world. In past researches, RMB appreciation expectation was commonly represented by NDF market price converted RMB forward exchange rate. However according to the our analysis above, NDF market price converted RMB forward exchange rate is the outcome of transactions, it will be effected by several non-exchange-rate elements such as RMB trade settlement policy or whether the USD liquidity is tight. As some market participants (Mackel et al.2011) indicated, NDF market price converted RMB forwards exchange rate can no longer be the unbiased estimation of future RMB appreciation. Besides, in econometric equation we controlled variables such as RMB trade settlement, financial crisis equivalent variable, and China-U.S. interest rate spread.
equivalent variable, these variables have obvious endogenous relationship with NDF market price converted RMB forward exchange rate. Endogenous relationship can be effectively overcome by using the data from the market survey of RMB forward exchange rate Consensus forecast to replace NDF market price converted RMB forward exchange rate.

The RMB and USD interest rate spread obtained by using RMB interbank market one-year RMB interest rate minus USD bond one-year interest rate. RMB trade settlement policy liberalization and offshore RMB market development are described by dummy variables, it’s 0 from July 2005 to July 2010, 1 from August 2010 to October 2011. There are two alternatives for variables what describe financial crisis. One of them is three-month Ted interest rate spread what measure risks of financial market, that is, the interest rate of three-month LBIOR and three-month US bond; The another one is Segmentation time definition, defining from May 2007 to March 2009, from May to July 2010, August to October 2011 as 1, reflecting the financial market crisis, other time as 0.

Firstly we use model related variables to do the unit root test, two unit root tests ADF(Augmented Dickey- Fuller Unit Root Test ) and PP ( Phillips-Perron Unit Root Test ) are used. The result shows that short-term capital flow (ShortC) can pass the two tests in 5% significance level without unit root. RMB
one-year forward exchange rate Consensus forecast (RMB_E), interest rate spread of RMB and USD (ISPREA), Ted interest rate spread equivalent variable and other variables all exist unit roots, but all of them can pass tests in 5% significance level without unit roots after first-order difference.

4.2 Model estimate and result

Here we use monthly date, generally the transactions of that month are mainly effected by information change of that month, and information in the past month has relatively small effects, the dynamic relation between variables is not significant. In addition, the explained variable in the model is short-term capital flow, explaining variables are RMB appreciation expectation, interest rate spread of RMB and USD, dummy variables of RMB trade settlement policy liberalization and offshore RMB market development, and variable to describe financial crisis, it’s a one-way causality between explaining variables and explained variables. We tried to compare models such as vector auto-regression, error correction and least square method, and then we found that vector auto-regression which is good at catching the dynamic relation between variables has no advantage comparing to error correction model and least square method. Here we chose the estimation method of least square. Following are results of some alternative models.

Table 2

Collection of Regression Model Results
<table>
<thead>
<tr>
<th>Explaining Variables</th>
<th>Explained Variables</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change of RMB Appreciation Expectation (dRMB_E)</td>
<td>Short-term Capital Flow(ShortC)</td>
<td>72.1*</td>
<td>84**</td>
<td>103**</td>
<td>107.4**</td>
</tr>
<tr>
<td>Change of Interest Rate Spread Between China and US (dISPREAD)</td>
<td>41.9</td>
<td>22</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dummy Variables of RMB Trade Settlement and Development of Offshore RMB Market in Hong Kong (RTS)</td>
<td>91*</td>
<td>100*</td>
<td>109**</td>
<td>113.5**</td>
<td></td>
</tr>
<tr>
<td>Dummy Variable of Financial Crisis (Crisis)</td>
<td>-97.5**</td>
<td>-89.1*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change of TED Interest Rate (dTED)</td>
<td>0.4</td>
<td>0.49</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>constant term (C)</td>
<td>105***</td>
<td>102.8***</td>
<td>64.3***</td>
<td>65***</td>
<td></td>
</tr>
<tr>
<td>R²</td>
<td>0.21</td>
<td>0.19</td>
<td>0.16</td>
<td>0.15</td>
<td></td>
</tr>
<tr>
<td>D.W</td>
<td>1.90</td>
<td>1.89</td>
<td>1.87</td>
<td>1.87</td>
<td></td>
</tr>
</tbody>
</table>

**Notice:** *, **, *** represent passed the test in 10%, 5%, 1% significance level

The explained variable in the model is Short-term Capital Flow(ShortC), explaining variables including market consensus expected RMB one-year forward exchange rate change (dRMB_E), Change of Interest Rate Spread Between China and US (dISPREAD), Dummy Variables of RMB Trade Settlement and Development of Offshore RMB Market in Hong Kong (RTS),
Dummy Variable of Financial Crisis (Crisis), and another variable Change of Ted Interest Rate (dTED) what describing financial crisis. Market consensus expected RMB one-year forward exchange rate change (dRMB_E) and Dummy Variables of RMB Trade Settlement and Development of Offshore RMB Market in Hong Kong (RTS) among the four models passed significance test and the signs are same with expected, Interest Rate Spread Between China and US did not pass significance test, Dummy Variable which uses time to describe Financial Crisis (Crisis) passed significance test and the sign is same with expected, the variable of Change of Ted Interest Rate (dTED) what is describing financial crisis did not pass significance test and the sign is not same with expected.

Comprehensively compare, the result of model 1 and model 2 are more ideal, the major difference between the two models is that the former one considered the effect of China-US interest spread factor, but the corresponding coefficient is not significant; yet the latter one did not. The fitting degree of model 1 is just slightly higher than model 2, in the two models, it's not big that difference of RMB one-year forward exchange rate change (dRMB_E) and RMB trade settlement policy liberalization and Development of Offshore RMB Market in Hong Kong (RTS), and both significant. The following conclusions can be drawn combining with the result of the estimation of the two models: (1) the change of RMB appreciation expectation is still the key element which lead to
short-term capital flow, a one-percent incremental of RMB appreciation expectation will result in 7-8 billion USD increase of capital flow on average each month; (2) the effect of China-U.S. interest rate spread to short-term capital in-flow is not significant; (3) the liberalization of RMB trade settlement policy and the development of RMB offshore market in Hong Kong effect short-term capital flow significantly, since the rapid development of RMB offshore market in August 2010, short-term would increase 9-10 billion USD each month for this reason.

5. Conclusion and Policy Meaning

The liberalization of RMB trade settlement policy and the development of RMB offshore market in Hong Kong created more convenient conditions for foreign investors holding RMB. Based on the analysis and empirical model test of the development of RMB offshore market in Hong Kong, all proved a large number of RMB flew out to overseas since the development of RMB offshore market in Hong Kong in August 2010, correspondingly more short-term capital and foreign capital flew in China. More RMB assets held by overseas investors can be seen as a progress of RMB internationalization, but whether China needs the accompanied short-term capital inflow?

If the monetary authority does not continually intervene in the inland foreign exchange market, overseas investors increasing RMB holding will bring
foreign capital inflow and RMB appreciation, but the scale flew in will be cut by itself because of the higher RMB price, and in this process the foreign exchange reservation will not increase, it won’t effect the operation of money supply of monetary authority. However the current situation is the monetary authority continues intervening in foreign exchange market, and put RMB in modest appreciation channel. In this background, overseas investors can increase RMB assets holding continuously by the help of RMB trade settlement liberalization and Hong Kong RMB offshore market development, the arbitrage space always exists. At same time, the monetary authority has no choice but continuously buys in increased foreign exchange supply in order to maintain the current foreign exchange trend, and thus supplies more base money. With the continuously realized modest appreciation of RMB, the monetary authority continuously suffer financial lost in the process of buying foreign exchange and supplying RMB, the compensated is merchants who arbitrage the price spread between offshore and onshore market, financial institutions who obtain interest rate spread, forward and spot foreign exchange rate spread at same time, and speculators who speculate RMB appreciation.

Under the double regulation of exchange rate and capital, the RMB internationalization process stated above is mostly a result of RMB appreciation expectation arbitrage under policy compensation. Monetary authority paid a large amount of financial cost for this, but the RMB
internationalization process supported by it is not firm. As we saw after
September 2011, once the overseas RMB appreciation expectation reversed
or international financial market emerges severe turbulence, a large number of
capitals will transfer from RMB assets to USD assets, RMB internationalization
will decline rapidly.

As Yu Yongding(2011) indicated, the liberalization of RMB trade settlement
policy and the development of RMB offshore market in Hong Kong can be
seen as the relax of capital item regulation and control. In a exchange rate
forming mechanism which can not yet reflect market supply and demand
fundamentals, the relax of capital regulation will only incur more speculative
capital impact, and threaten the stable of domestic macro economy. The fresh
lessons of Latin America and Southeast Asia crisis are needed to be learnt by
China.

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