Capital Inflows and the Impossible Trinity in China

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Abstract: In this paper, we estimate China’s capital market openness in \textit{de facto} measure, and compare it with that in \textit{de jure} measure. Although in recent decade China’s capital market openness remained stable in \textit{de jure} measurement, it has increased substantially in \textit{de facto} sense. Large capital inflows have forced China into facing increasing dilemma of achieving monetary independence and exchange rate stability. We outline metrics for measuring the Impossible Trinity aspects: exchange rate stability, monetary independence, and capital market openness, taking into consideration of sterilization. China’s authorities have taken on open market operations and reserve requirement ratio as sterilization tools to retain some degree of monetary autonomy, but they are costly and unsustainable. We also test the linearity of the Impossible Trinity, and find that the weighted sum of the three trilemma variables adds up to a constant, indicating China meets the Trilemma. Thus, we suggest that exchange rate flexibility and appropriate capital controls should be taken in the future, considering further growing capital inflows and domestic inflationary pressures.

Keywords: capital inflows, capital market openness, the Impossible Trinity, Trilemma, sterilization

JEL classification: E22, F32, F36, F41

1. Introduction

Over the last 30 years, a rapid growth of cross-border capital flows has become a prominent feature in an increasingly globalized economy. In the meantime, however, these flows also experienced unprecedented volatility in recent years. International capital flows dropped significantly at the start of 2008 financial crisis, but rebounded quickly in less than a year. Emerging market economies witnessed more of the fluctuations of the capital flows than developed countries.

As one of the largest emerging market economies, China is experiencing growing capital inflows, which lead to a dilemma on making choices between monetary independence and exchange rate stability. On the one hand, Chinese authorities maintain exchange rate stability by accumulating foreign exchange reserves. During 2002-2010 China’s foreign exchange reserves amounted to $2.84 trillion from $280 billion, and the resulting additional Renminbi
supply increased from 2.3 trillion to 22.58 trillion, which mainly derived from net capital inflows (Prasad, Eswar and Wei, 2007). On the other hand, to keep monetary independence and avoid the negative impacts of international capital inflows and resulting excessive domestic liquidity problems, policymakers had to sterilize by raising the reserve requirement ratio and taking on open market operations. Hu (2011) in his study found that China still had certain autonomy of monetary supply, but in fact how to maintain the monetary supply in a sustainable level seems to be a tricky issue for Chinese policy makers. Since September 2003, the central bank has raised the reserve ratio requirements from 6% to 21.5% in 2011, and the total amount of central bank bills reached 4.2 trillion RMB in the 2010. According to China Business News, the financial cost of sterilization was more than 1 trillion RMB, and has been a heavy burden for People’s Bank of China. Faced with the continuous influx of international capital flows, Chinese policymakers find it increasingly acrobatic to maintain the value of the Renminbi on the one hand and to keep monetary independence on the other.

The effects of international capital inflows on domestic economy and macroeconomic policymaking are heatedly debated. Some researchers doubt the long-term benefits of capital inflows, since the volatility added extra risks to both domestic and global economy. Other negative impacts include crowding-out effects, financial sector risks and threats to national governments’ autonomy in the area of macroeconomic policy (Ghose, 2004; Buigut and Rao, 2011). When facing increasing large capital inflows, a country’s central bank will encounter dilemma of maintaining monetary independence and exchange rate stability. Reinhart and Reinhart (2008) suggested that while global capital inflows were inevitable, accumulation of reserves was a way to mitigate the Trilemma. Altinkemer (1998) believed “the accumulation of reserve to intervene in capital markets would lead to monetary expansion and inflation, unless sterilized. However, sterilized intervention, in turn can be costly, since it carries the risk of increasing interest rates and reinforcing further capital inflows, thereby causing quasi-fiscal losses to the Central Bank.” Besides, sterilization can encourage macro and micro moral hazard, leading financial sector distortions. Therefore, sterilization would not be sustainable in long-run. (Aizenman and Glick, 2008; Taguchi, 2011)

In this paper, we will analyze the impacts of international capital inflows on the choices between two important policy objectives: exchange rate stability and monetary independence, taking into consideration that various capital inflows that tried to force China’s capital markets open despite of strict government-imposed capital regulations. We adopt the “Diamond chart” method (Aizenman et al, 2008) to review the impacts of the capital inflows on the configurations of China’s Impossible Trinity over time. However, instead of using Aizenman’s additional indicator of IR/GDP to measure the international reserves (IR) hoarding as a way to mitigate the Trilemma, we innovatively use a new indicator, the extent of sterilization, to further reveal Chinese policymakers’ efforts to reconcile the Impossible Trinity. We find that in order to retain some degree of monetary autonomy, the extent of sterilization has continuously increased. However, the sustainability of sterilization is questionable in the future, and its effects on reconciling the Impossible Trinity would also be in question. Thus, we suggest more exchange rate flexibility and appropriate capital controls should be adopted in long-run.
The rest of the paper is organized as follows: Section II reviews the extent of China’s international capital inflows and measures its capital market openness. In section III, we measure China’s Impossible Trinity by constructing calculable indexes of Monetary Independence (MI), Exchange Rate Stability (ERS) and Capital Market Openness (CMO). Then, we test the linear relations of the three policy objectives in the Impossible Trinity to find out whether the three indexes are “binding”. Section IV concludes the paper.

2. Extent of China’s International Capital Inflows

2.1 Overview of International Capital Inflows in China

After 2002, when the cyclical downturn hit the United States while China maintained high growth rates, the influx of capital flows into China surged. As is reported by the IMF, the average annual growth rate of capital inflows to China during 2002-2007 exceeded 35%. However, with the outburst of global financial crisis in 2008, capital inflows to China plunged sharply by 40%. Banking credit inflows even reversed to outflows. Yet, with China’s strong economic recovery in 2009, international capital inflows regained quickly, and demonstrated an accelerated trend of inward flows. The monetary policies of Quantitative Easing launched by the Federal Reserve boosted the capital outflows from the United States to China, pushing up inflationary pressure and asset prices in Chinese markets.

Under the balance of payments calculation scheme, international investments can be divided into three categories: foreign direct investment, portfolio investment and other investment. As is evident from Figure 1, all three categories of investment inflows were very low in China prior to the 1990s. Other investment inflows were slightly larger than the other two categories. In 1992, capital inflows, especially foreign direct investment (FDI) inflows, began to rise gradually. Overall FDI inflows have experienced steady growth without major fluctuations. This trend has been attributed to the Chinese government’s preferential tax relief policies and other incentives. China’s relatively low labor cost, potential domestic markets and steady economic growth also made it an attractive destination for FDI. In 2002, when China entered the World Trade Organization (WTO), China’s FDI inflow surged even further. The fastest FDI growth occurred in 2007 and reached its highest level in 2008 at $147.8 billion. It then was cut by half, to about $78.2 billion in 2009, when the global financial crisis was at rage.

Similarly, portfolio and other investment inflows also witnessed a rapid growth. Figure 1 shows that the inflows of portfolio and other investment were limited and quite prone to fluctuation before 2002. In the wake of China’s entry to the WTO, the portfolio and other investments began to rise to fulfill commitment to open capital market gradually. In particular, the growth of portfolio investment inflows was promoted by the reform of Chinese securities markets. The implementation of Qualified Foreign Institutional Investors (QFIIs) reduced the barriers of capital controls in China, and provided a channel for foreign investments to Chinese stock markets. However, the development of China’s portfolio market has always been gradual, partially because of the lessons learnt from the Asian financial crisis in 1997,
when the countries opened their capital markets too quickly to prevent the negative effects of international currency speculation. Besides, the increase of the “other investment” inflows results from both the reduction of capital controls and the growing anticipation of Renminbi appreciation.

When compared with FDI and portfolio investments, the “Other investment” category, which includes bank lending and trade credits, are the most volatile one. That is because the large amounts of “hot money” slip into China via this channel, seeking short-term profits from the interest rate differential between China and the U.S. and expectations of a Renminbi (RMB) appreciation. These speculative “hot money” can move very quickly in and out of Chinese markets, potentially leading to market instability. The “Other investment” inflows increased dramatically during 2002-2007, but suddenly dropped to even a negative number in 2008; however, in 2009 the number rebounded to the level of about 3/4 of 2007. However, portfolio investment inflow was most sensitive towards external shocks. It began to drop as soon as the subprime mortgage crisis occurred in 2007. The most insensitive one is FDI inflow, which didn't drop until 2009, maybe because FDI is typically long-term, irreversible and difficult to move.

2.2 Measurements of Capital Market Openness

How to measure capital account openness has long been a challenge to the researchers. Until now, existing literatures provide two major approaches to measuring capital market openness: \textit{de jure} measurement and \textit{de facto} measurement.

\textit{De jure} measurement

\textit{De jure} measurements are based on the IMF’s Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER). These measures try to construct “shares” to reflect the fraction of years in the sample in which a country’s capital account was open (see Kose \textit{et al.} 2006). The KAOPEN$^3$ index, which is one of the \textit{de jure} measurements, developed by Chinn and Ito (2008), is used more frequently in recent years due to its advantages of comprehensiveness and practicability.

The common advantage of \textit{de jure} measurements is the convenience to compare the capital account openness between different countries. However, they also suffer from a variety of shortcomings. First, they do not accurately reflect the degree of the capital account openness since these approaches are partially based on various restrictions associated with foreign exchange transactions that may not necessarily impede capital flows. Second, they do not reflect the effectiveness of the enforcement of capital controls, because in some countries, the provisions can be unchanged, while the enforcement can change over time. In some other countries, in spite of the strict restrictions on capital market, government officials are not effective in controlling capital inflows, like China. Finally, it is inevitable that the AREAER, the basis of \textit{de jure} measurements, fails to include the existence of certain capital controls that are actually quite influential in some countries (See Kose \textit{et al.} 2006). To solve above
problems, many researchers turn to de facto measurements.

De facto measurement

Similar to measuring trade openness, de facto measurement (Lane and Milessi-Ferreti, 2007) calculates a country's capital market openness by utilizing the ratio of the sum of gross inflows and outflows to national GDP, based on actual flows. However, this approach is prone to measurement error, since annual flows tend to be quite volatile. Many researchers are opposed to this measurement also because they believe the capital flows were endogenous, and some portfolio investment flows were not driven by market openness, but by other factors, like interest rate spreads or anticipations of currency appreciation. (Chen, 2006) To mitigate these problems, Kose et al. (2006) introduced a modified approach, which utilizes the sum of gross stocks of foreign assets and liabilities as a ratio to GDP.

Figure 2 depicts China’s capital market openness by using de jure measure (right-hand-side) and de facto measure (left-hand-side). In the de facto measure, the index ranges between 0 and 1. Higher values of this index indicate higher degrees of China’s capital market openness (See paragraphs of “Capital Market Openness” in next chapter for detailed calculation of this index). On the right-hand-side of the Figure 2, we show the results of de jure measure by using KAOPEN index. This index can be either above or below zero. For countries whose KAOPEN indices below zero, their capital market openness would be relatively low. Similar with de facto measure, higher values of KAOPEN index indicate higher degrees of capital market openness, and vice versa. The capital market openness remained unchanged at -1.2 between 1993 and 2009 in the de jure measure, which indicates a relatively low level of China’s capital market openness. However, by using the de facto measure, we found an increasing level of China’s capital market openness, and this trend intensified after 2003.

The de jure measurement fails to reflect the change of China’s capital market integration in recent years. Since this paper intends to analyze Chinese capital market openness over time without comparing with other countries, we adopt de facto measurement, specifically, the sum of gross stocks of foreign assets and liabilities as a ratio to GDP.

3. Empirical Analysis of the Impossible Trinity in China

As mentioned above, international capital inflows are volatile and have brought potential risks to many emerging markets whose domestic financial systems are not well established. Therefore, the biggest challenge to many emerging markets, including China, should be how to balance different macroeconomic policies in the face of an ever larger and more complicated international capital inflow. One way to explore this is to use the framework of the Impossible Trinity. The Impossible Trinity, introduced by Mundell (1963), refers to the fact that any country cannot simultaneously have free capital flows, an independent monetary policy and a fixed exchange rate. Instead, it can at most achieve two of the three goals simultaneously.

This section will first construct a measure system to calculate the three indexes in the
Impossible Trinity, and then test whether the three indexes of the Impossible Trinity are “binding” by using linear regression formula.

3.1 Construction of the Impossible Trinity Measures

Monetary Independence

Traditionally, the interest rate and inflation rate are often chosen to be proxy variables for monetary independence. However, the use of inflation rate can be confusing because the calculation of Consumers Price Index (CPI) or Producer Price Index (PPI) vary so much from country to country that they are not comparable across different countries. The difference in short-term interest rates in different countries is a better proxy variable to reflect monetary independence. This paper adopts a method used by Aizenman et al. (2009) to measure the index of monetary independence. It is defined as:

\[
MI = 1 - \frac{\text{corr}(i, i^*) - (-1)}{1 - (-1)}
\]

(1)

where \( i \) refers to China’s money market rates, and \( i^* \) refers to the U.S. money market rates. This index ranges between 0 and 1. A higher index value indicates a higher degree of monetary policy independence. Here, we choose the weighted average of overnight interbank bank interest rate (monthly)\(^5\) and the overnight federal funds effective rate (monthly)\(^6\) as China and the US money market rates respectively.

Exchange Rate Stability

Used by Aizenman et al. (2009) to measure exchange rate stability, formula (2) is the normalized “annual standard deviations of the monthly exchange rate between the home country and the base country.” The index will be between 0 and 1:

\[
ERS = \frac{1}{1 + \frac{\text{std}(\text{exch rate})}{|d \ln E_r/dt| + 0.01}}
\]

(2)

\(|d \ln E_r/dt|\) is the absolute value of the year-on-year depreciation rate using the exchange rate as of December of the same year. Higher value of ERS index indicates a more stable movement of the exchange rate against the currency of the base country. We use the average monthly midpoint of the Renminbi against dollar.\(^7\)

Capital Market Openness

The capital market openness in China is calculated by
\[ CMO = \frac{FA + FL}{GDP} \]  

(3)

where \( FA \) refers to the annual gross stock of foreign assets, and \( FL \) refers to the annual gross stock of foreign liabilities. The formula allows us to analyze the change of China’s capital market openness over time. In order to make this measurement comparable with others, we normalize the index to lie between 0 and 1. Higher values of this index indicate a higher degree of China’s capital market freedom.

Table 1 shows the range of variation on all the three indices during the 14-year period from 1996 to 2009 under our study. The results show that the mean value of ERS, which is about 0.673, stays at a higher level than the other two. All the maximum values of the three indicators are close to 1, and the minimum values are close to 0. The standard deviation of the three indices, which reflects how much the indices deviate from their mean value, ranges between 0.2 to 0.4, and the standard deviation of MI is the smallest one, which is only 0.208.

Figure 3 describes the evolution of the Impossible Trinity index in China over time. There are several prominent characteristics of the three indices. First, the indices of China’s capital market openness increased gradually from 1996 to 2009. Second, although the exchange rate stability increased from 0.5 to approximately 0.9 during 1996-1998, it remained at a high level around 0.9 until 2004. It then dropped suddenly to a very low level around 0.2 in 2005, and remained stable until 2009. The plunge in 2005 was caused by China’s exchange regime reform, which broke China’s fixed peg to the dollar, and shifted to a more flexible exchange rate system. Renminbi was pegged to a basket of currencies, instead of US dollars only. Since then, China experienced a steady but gradual appreciation of the Renminbi until August 2008, when the global financial crisis hit. The Chinese government chose to re-intervene in the foreign exchange market to preserve the value of Renminbi so as to prevent negative impacts in the domestic market through foreign exchange channels. Lastly, the monetary independence index didn’t take to an obvious one-way trend; the index fluctuated during the period observed. Figure 3 indicates that except for 1997, 2003 and 2005, the indices in other years were basically below 0.6. Especially in 2006, it seems that China’s monetary independence deteriorated dramatically. This was mainly caused by the overheated domestic economy. In order to prevent inverted interest rates, the central bank intervened by raising interest rates. At the same time, other countries were also facing global inflation, and had to raise their interest rates, including the United States. This led to the linkage of interest rates between the U.S. and China, thereby weakening the index of China’s monetary independence.

To better evaluate the evolution of these indices over time, Aizenman et al. (2008) constructed a “Diamond chart,” in which they added to the three Trilemma dimensions a measurement of international reserves hoarding (IR/GDP), an index to describe the trend of mitigating the Impossible Trinity by accumulating international reserves. Gupta and Abhijit (2010) applied the similar method to India and confirmed that India’s policymakers try to use international reserve hoarding to mitigate the Trilemma. The rationale behind this is that a
country who wants to maintain its currency value has to accumulate international reserves when large amount of international capital inflows to this country. However, this is not the end of the country’s attempt to reconcile the Trilemma; instead, in the case of China, it has to further use open market operations, reserve requirements and window guidance to sterilize the domestic liquidity problems resulted from the accumulation of international reserves. Although the indicator of IR/GDP could be meaningful, it is limited to further explain the extent of sterilization. Thus, we measure the extent of sterilization (as a share of GDP)\(^9\) as the fourth vertex of the “Diamond chart.” To make the indices comparable, we normalize the extent of sterilization between 0 and 1. Higher values of sterilization reflect greater efforts made by central bank to sterilize.

As is depicted from Figure 4(b), although the openness of Chinese capital market increased gradually between 1998 and 2004, the overall openness of capital market was limited. At the same period of time, however, exchange rate stability remained at a steady high level near 1. The monetary independence index fluctuated, but its overall level remained relatively high. The extent of sterilization increased modestly, indicating liquidity problem was under control. Therefore, policymakers still retained monetary independence and exchange rate stability during this period of time.

From 2005 to 2008, the configuration of the Impossible Trinity and the extent of sterilization began to change obviously. Figure 4(c) shows that a substantial increase of capital market openness during this period of time, accompanied with an almost identical growth rate in the extent of sterilization. The high-level of Chinese capital market openness forced policymakers to re-adjust policy objectives within the Impossible Trinity. Therefore, to some extent, policymakers gave up the exchange rate stability to answer the increase in capital market openness. In 2005, China ended the fixed exchange rate regime and gradually shifted to a more flexible managed floating exchange rate system. Under the new system, however, the Renminbi seems to have only one direction. The expectations around Renminbi appreciation promoted a growing amount of capital influx to China through a variety of ways. To avoid problems associated with out-of-controlled exchange rate fluctuations, the government continued to intervene in the foreign exchange market. The central bank’s foreign exchange reserves were forced to expand due to the intervention on exchange rate. The accumulation of foreign exchange reserves again raised expectations for inflation. To mitigate inflation, the central bank had to raise the interest rate, which had a passive impact on monetary independence. As is evident from Figure 4(c), monetary independence deteriorated largely in 2006. In addition, raising interest rates would cause greater capital inflows and the need for a Renminbi appreciation. In order to reduce these side-effects, the central bank reinforced sterilization.

Figure 4(d) indicates that the degree of capital market openness peaked in 2009. At the same time, the Chinese government resumed exchange rate stability. Since many advanced economies launched expansionary monetary policies, especially the U.S., weakening the dollar and strengthening the Renminbi, China began to once again suffer from greater capital inflows due to both large interest rates differential and expectation of RMB appreciation. To
avoid excessive volatility of the value of the Renminbi, Chinese government went on intervening in the exchange market by accumulating foreign reserves. However, inflationary pressure had become increasingly serious, which called for effective monetary policy to control the situation. Under the circumstances, raising interest rates seemed to be most convenient and effective, but it would lead to more capital inflows by expanding spreads. Thus, policymakers prefer to raise the reserve requirement ratio rather than raising interest rates. Besides, the monetary authority also issued People’s Bank of China (PBOC) bills as a way to sterilized excess liquidity. All the four indices almost reached their vertices in Figure 4(d), which indicates that Chinese officials sought to retain all the three goals simultaneously by taking on sterilization.

However, whether the sterilization is a perfect method to reconcile the conflicts between the monetary independence and the exchange rate stability is still under the question. To shed some light on this issue, we want to consider two aspects of the sterilization: the effectiveness and the cost. The first consideration of effectiveness means whether all the sterilized actions can effectively offset the excess money supply resulted from the intervention of exchange rate and resulting international reserve accumulation. However, this is not the whole story, because even though the sterilized actions are effective, their costs could be too high for China’s central bank to carry out the sterilization. If so, the sterilization would still be unsustainable, and could not be an ideal method to resolve the conflicts.

The sterilization cost for People’s Bank of China (PBOC) mainly comes from the interest payments. Table 2 illustrates the PBOC’s interest expense on sterilization by breaking down into three categories: frozen reserve requirement (FRR), PBOC bills, and sell repos. The latter two categories are the tools for open market operations. The total interest expense rose dramatically from 2000 to 2008. Although it dropped sharply in 2009 due to interest expense cut-down on open market operations, it was still sizable and kept growing in 2010. Whether the sterilization is sustainable becomes a tricky question. The rising costs of sterilization will make it increasingly unsustainable, which means monetary independence will also be under challenges. Thus, from the perspective of the Impossible Trinity, more exchange rate flexibility would be a possible solution.

3.2 The Linear Relationship between the Impossible Trinity indices

Though previous analyses are helpful for us to understand the evolution of international macroeconomic policy orientation over time, they fail to show whether the three policy objectives are “binding”. In other words, if the Impossible Trinity existed in China, the three indices would have to trade off. The choices among the policy objectives in the Impossible Trinity mean that increasing one variable, say higher capital market openness, should lead to a lower monetary independence, or lower exchange rate stability, or a combination of the two. Hence, we test the validity of the simplest form of the Impossible Trinity via a linear tradeoff. Specifically, we test whether the weighted sum of the three policy variables equals to a constant 1. This would enable us to test the existence of the Impossible Trinity, by examining the fitness of the linear regression. The linear regression formula is defined as follows:
If fitness for the regression model is high, the linear specification is good enough to explain the tradeoff among the three policy objectives. However, lower fitness would suggest either nonexistence of the Impossible Trinity, or that the linear relationship is susceptible. We use the data between 1996 and 2009 since the earliest official data of the weighted average overnight interbank bank interest rate in China, which is used to determine the \( MI \) index, can only be collected from 1996. The results, tested by Stata, can be found in Table 3.

The fitness for the above regression model is 94.78%, and the adjusted fitness is 93.35%. As is evident from above results, the fitness is rich enough to explain the tradeoff among the three policy goals in China. In addition, Table 3 also indicates that the levels of significance for the estimated coefficients of \( ERS \) and \( EMO \) are high enough to refuse the null hypothesis. Although we cannot refuse the null hypothesis for the coefficient of \( MI \) since the result would not have been significant at the 0.1 level, we find that its p-value is very close to 10%.

However, the estimated coefficients in the above regression model could only provide estimated weights for the three policy objectives, and they alone could not provide sufficient information on the extent of the policy objectives China has actually achieved. Hence, to investigate how much of the policy goal that China would like to achieve, we utilize the product of the estimated coefficients and the actual values for the variables such as \( aMI_t \), \( bERS_t \), and \( cCMO_t \).

As is evident from the impossible trinity theory, any country would face three combinations of three policy goals. They are the combination of monetary independence and exchange rate stability \( (aMI + bERS) \), the combination of exchange rate stability and capital market openness \( (bERS + cCMO) \) and the combination of monetary independence and capital market openness \( (aMI + cCMO) \). Figure 5(a) depicts the “accumulative effects”, which is the contribution or significance of a specific combination of policy choices. Similarly, Figure 5(b) depicts the “individual effects”, which is the significance of one policy choice. From the above figure, we find that before 2003, the combination of monetary independence and exchange rate stability \( (aMI + bERS) \) was more significant than the contributions of the other two policy combinations. During 2004-2009, the situation became complicated, as the three lines crisscross. Especially in 2009, the three policy combinations together were the most significant, exceeding 1.

Besides, the individual effects described by Figure 5(b) indicate that the significance of exchange rate stability was higher than that of the other two policy goals before 2004. Since 2005 the significance of exchange rate stability reduced sharply and began to fall behind that of capital market openness. Although it regained some in 2009, the significance of the exchange rate still lagged behind that of capital market openness, indicating the growing
capital market openness in China has become an inevitable process.

Therefore, under this model, China faces tradeoffs among the three policy choices of the Impossible Trinity. In other words, China could choose at most two policy objectives among monetary independence, exchange rate stability and capital market openness, and give up the other. In this analysis, we can reach the conclusion that China retained a combination of monetary independence and exchange rate stability before 2004. After 2005, our calculations fail to show a clear combination of policy choices; however, the significance of capital market undeniably has increased, while the significance of exchange rate stability has declined.

4. Conclusion

In this paper, we analyzed the size of capital inflows and the extent of capital market openness in China by using both de jure and de facto measures. China’s capital market openness improved substantially due to both Chinese authorities’ promotion and pressures from large foreign capital inflows. These capital inflows in turn have largely influenced macroeconomic policymaking in China, leading to increasing difficulties to solve the Trilemma. The global economic downturn leads to further accommodative monetary policies in the U.S., which would induce more speculative capital inflows flood into emerging markets, including China. Meanwhile, growing CPI index forced Chinese officials to implement more effective contractionary monetary policies to confront with serious inflationary pressures. Currently, Chinese authorities ease the imported inflationary pressures by using sterilization, but the sterilized tools are proved to be costly and unsustainable. Under this circumstance, we find that to maintain monetary independence, more exchange rate flexibility should be taken in the future. However, it does not mean one-way appreciation of RMB, but to weaken the speculative motives of short-term capital inflows by expanding the range of exchange rate fluctuations.

Of course, existing capital controls and regulations, including “macro-prudential” regulations, are reasonable. Capital controls can at least be effective as the first threshold for inward capital flows, and to some extent insulate China from unstable external attacks. Macro-prudential regulations might be a way to ease the problem in solving the Impossible Trinity dilemma in a long run. More studies about this issue are needed in the future.

Endnotes

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Qualified foreign institutional investors (QFIIs) program, which was launched in 2002, allows licensed foreign investors to invest in A shares in China’s mainland stock exchange and other domestic securities. QFIIs should subject to several restrictions, including minimum experience in the industry (5 years for fund managers; 30 years for insurance companies) and the equivalent of at least US$10 billion in assets under management in the latest financial year and must be clear of any major irregularities in its home market over the past three years, etc. QFIIs must set up special Renminbi accounts with domestic banks and use the services of domestic securities companies.

See Chinn and Ito (2008) for more detailed information on the construction of KAOPEN index.

See http://web.pdx.edu/~ito/kaopen_2009.xls for China’s KAOPEN index.

China’s data comes from the China Economic Information Network: http://www.cei.gov.cn/ The annual MI index is monthly based by using data from January to December, except for the MI index in 1996, because the earliest official data of weighted average of the overnight interbank bank interest rate in China can only be collected from July, 1996.

Published on Board of Governors of the Federal Reserve System http://www.federalreserve.gov/datadownload/

Data come from the China State Administration of Foreign Exchange website: http://www.safe.gov.cn/model_safe/index.html


The extent of sterilization is calculated and normalized by using the sum of the frozen reserve requirement, the scale of central bank bills as a ratio to GDP. The frozen reserve requirement is calculated by using the weighted average method. Besides, the central bank bill as a tool in open market operations didn’t start until 22 April, 2003, so the scale of central bank bills

References


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Figure 1: Level and Composition of Gross Capital Inflows in China, 1982-2009


Figure 2: Capital Market Openness in China, 1993-2009

Sources: Chinn and Ito (2008); Lane and Milesi-Ferreti (2007); IMF IFS (2010); calculated by authors,
Figure 3: The Evolution of the Impossible Trinity Index in China, 1996-2009

![Graph showing the evolution of the Impossible Trinity Index in China, 1996-2009.](image)

**Source:** Authors’ calculations

Figure 4: Configurations of the Impossible Trinity and Sterilization

![Diagram showing configurations of the Impossible Trinity and sterilization.](image)

**Sources:** IMF IFS (2010), PBOC (http://www.pbc.gov.cn), calculated by authors
Figure 5: Policy Orientation

(a) Cumulative Effects

- $aMI+bERS$
- $aMI+cCMO$
- $bERS+cCMO$
- $aMI+bERS+cCMO$
- value of 1


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Source: Authors’ calculation

(b) Individual Effects

- $aMI$
- $bERS$
- $cCMO$
- value of 1


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Table 1: Key Summary Statistics

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Source: Authors’ calculation

Table 2: The PBOC’s Interest Expense on Sterilization, 2000-2010 (Unit: RMBbn)

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<td>4.83</td>
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<td>2010</td>
<td>191.01</td>
<td>83.19</td>
<td>29.82</td>
<td>304.02</td>
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</table>

Sources: Wind, PBOC website (http://www.pbc.gov.cn), calculated by authors

Table 3: Regression Outputs

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<th>MI</th>
<th>ERS</th>
<th>CMO</th>
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<td>0.67781</td>
<td>0.56417</td>
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<td>[0.1898]</td>
<td>[0.1794]</td>
<td>[0.3070]</td>
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<tr>
<td>R-squared</td>
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<tr>
<td>Adjusted R-squared</td>
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</table>

Notes:
Sample: 1996-2009, with 14 observations after adjustments.

Since the earliest official official monthly data of the weighted average overnight interbank bank interest rate in China, which is used to determine the MI index, can only be collected from 1996, the outputs before this period will not be included in this table.

Robust standard errors in brackets; *significant at 10%; **significant at 5%, ***significant at 1%.