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Liberalization of Foreign Exchange Controls: Japan's Experiences and Its Implications for China

Abstract

The paper reviews Japan's experiences with the liberalization of foreign exchange controls, and attempts to identify its policy implications for China, focusing on foreign exchange rate regime, capital mobility restrictions, sterilized interventions, and independence of monetary policy.

To provide a theoretic foundation, the paper first sets up a simple enlarged Mundell-Fleming model and analyses whether capital account controls and sterilized interventions can maintain managed floating rate regime and independent monetary policy simultaneously. The author argues that it is theoretically possible for a finite time and it is increasingly difficult under circumstances of the expansion in current transactions, and large and persistent capital mobility.

Secondly, the paper presents an overview on Japan's experiences in liberalization of foreign exchange controls from immediate postwar to 1990. Japan adopted gradual steps to liberalize foreign exchange controls, with the freedom in current account in 1964, the shift of exchange rate from pegged to managed floating in 1971, and finally to freely floating in 1973, and the liberalization of capital account in 1980. Japanese experiences of liberalization on foreign exchange controls are mixed. Japan's long resistances to the unavoidable yen revaluation led to subsequently large revaluation, and extremely expansionary policy responses to yen revaluation caused high inflation and assets bubble, i.e. the Nixon Shock, and the Plaza Agreement.

Thirdly, the paper analyzes China's recent experiences on foreign exchange controls under strong revaluation expectation and persistent and large capital inflow, with a focus on heavily managed floating rate, large trade-related capital movements and massive sterilized interventions. It is increasingly difficult for Chinese authority to control capital movements with the expansion in real transactions, and conduct sterilized interventions with the large capital inflow and skyrocketing international reserves.

Fourthly, the empirical research finds that China's capital controls become less binding moderately, and the degree of sterilization is perfect for monetary base, but is highly imperfect (just half) in terms of M2. This can partly explains China's latest occurred commodities inflation, assets bubble and economic overheating. Therefore, capital restrictions and massive sterilized interventions are not enough to support the stability of the RMB and the independence of monetary policy. It is apparent that Chinese massive sterilizations can't be sustainable, even inconsideration into huge fiscal costs, exchange risks and efficiency losses.

Finally, based on a comparison of similarities and differences between past Japan and present China, the author identifies some specific policy implications for China's future liberation. The recommended sequencing for China's gradual liberalization in foreign

exchange control is easing regulations on capital outflow and implementing the RMB internationalization, strengthening domestic financial sector, developing an active bond market and large participators in foreign exchange markets, adopting a freely float rate with capital account controls, and liberating long-term capital mobility first and then short-term capital movements.

1. Introduction[①]

Generally, targets of foreign exchange controls are not only to stabilize the exchange rate of domestic currency through the sale and purchase of foreign exchange that accompany imports, exports, and international transactions, but also to prevent foreign monetary conditions from influencing domestic interest rates, money supply and inflation (Fukao, 1990). This paper reviews Japan's experiences with the gradual liberalization of foreign exchange controls during the period from immediate postwar to 1990, focusing on foreign exchange rate regime, capital mobility restrictions, sterilized interventions and monetary policy independence, and attempts to identify its implications for China.

China has made tremendous achievements in economic growth in past thirty years, by attracting foreign direct investment and increasing manufactures export. With the domestic currency unification (devaluing of the official rate of the RMB, and unifying the official and market rate) in 1994, liberalization of current transactions in 1996, and entrance into WTO in 2001, China has successfully become a main export base with increasing size of trade surplus, probably due to undervalued currency, low labor and environmental cost, and enhanced competitive capabilities of products. However, China's successful export-led growth pattern now faces several severe constraints externally and internally, partly owing to its sheer size. In the eye of the US and other advanced countries, the RMB is significantly undervalued and China's competitive advantages from the undervaluation hurts their industries, and China is a major player of current global imbalance. Some observers even criticized that China's over-savings are the source of liquidity glut in the world and current global financial crisis. In inside of China, the attitude toward large export surplus and exchange rate is contradictory. On the one hand, China is anxious about negative effects of export surplus and devalued currency, such as, unwanted capital inflow, commodities inflation and asset bubbles, increasing fiscal cost, financial repression, and exchange rate risk originated from huge foreign reserves. On the other hand, China highly depends on foreign demand to stimulate economic growth and to relax problems of unemployment through maintaining a competitive exchange rate.

It is well known that the choice between fixed and flexible exchange rates often involves the issue of exchange controls because countries can't maintain free international transactions, fixed exchange rates and independent monetary polices at the same time. When the fixed exchange rate (the dollar peg) is chosen and the capital mobility is free, an independent monetary policy is impossible. Capital movements force domestic interest rate equal to that of the US. If the exchange rate is free floating, an independent monetary policy differs from the US can be maintained. Alternatively, controls on capital transactions can make fixed exchange rate and independent monetary policy both maintained. In practice, many developing countries, including advanced countries in 1960s and 1970s, had used various forms of capital controls. However, capital controls become much more difficult when the economy is integrated with other economy and expanded in foreign trade. Moreover, it is increasingly difficult for an economy to implement sterilized interventions when it holds huge international reserves and experiences large and persistent capital inflow. Even an

economy can maintain the stability of nominal exchange rate and monetary autonomy in short term, it can't avoid appreciation in real exchange rate through a rise in inflation due to the Balassa-Samuelson effect.

China's recent experiences show that it can neither stop capital inflows nor maintain an independent monetary policy. Large and persistent surplus in trade balance leads to revaluation expectation on the RMB, hence substantial amount foreign capital flows into china with the intention to bet the large profit of revaluation, and which further strengthens the one-way option on the currency. To mitigate the revaluation pressure on RMB, Chinese monetary authorities conduct intervention by purchasing foreign currency and selling domestic currency. It is sure that the official interventions will produce unavoidable impacts on China's monetary base and threat the independency of monetary policy. When the monetary authority purchases foreign exchange, the balance of foreign assets of the central bank rises initially, then the counterpart of the increase in foreign reserves is a corresponding growth in the deposits of commercial banks at the central bank. Therefore, official foreign exchange intervention changes the monetary base at the prevailing exchange rate. In order to restore the money supply partially or fully, the Chinese authority implemented some sterilized actions, such as, issuing central bank bills, reserves requirements and bank loan quota, to neutralize the capital inflows and maintain money supply unchanged. But these sterilized actions and resultant accumulation of foreign reserves inevitably lead to large fiscal costs, financial repression and exchange risks. Even with massive sterilized interventions, Chinese economy overheating began to appear in 2006 and accelerated in 2007-08 due to capital inflow, featuring with commodities inflation, assets bubble, and excessive investments. Under the double attacks of contractionary monetary policy and global financial crisis, China's recent bubble collapsed. Now, with a sign of recovery in world economy and persistent capital inflows, China faces same problems again.

Against such background, this paper intends to identify relevant policy implications for China to help it to deal with the issue of liberalization in foreign exchange controls as smoothly as possible, by reviewing the process that Japan followed in the liberalization of current transactions in 1964, exchange rate regime in 1971-73 and capital accounts in 1980, and analyzing Japanese lessons drawn from the Nixon Shock and the Plaza Agreement, the two seemingly failed cases of exchange rate policy. Now, China's sudden rise to a major player in the global economic stage, due to rapid economic growth, is similar to Japanese rapid growth in the period from early 1950s to early 1970s. Therefore, lessons drawn from Japanese experiences in the 1970s and 1980s are valuable and deserve China to learn from them carefully.

The rest of the paper is organized as follows. Section II analyses whether capital transactions controls and sterilized interventions can maintain the heavily managed floating rate regime and the independent monetary policy via setting up a simple enlarged Mundell-Fleming model. Section III reviews Japan's experiences on liberalization in foreign exchange controls during the period from immediate postwar to 1990, focusing on foreign exchange rate regime, capital mobility restrictions and monetary policy independence. Section IV analyzes China's recent experiences on foreign exchange controls under strong revaluation expectation and persistent and large capital inflow, with a focus on the heavily managed floating rate, capital movements through some current accounts (circumventing capital regulations), interventions, and sterilizations. Section V estimates the effectiveness of China's sterilized interventions through examining the relationship among components of monetary base (reserve money), such as, changes in the net foreign assets and changes in the net domestic assets, and changes in the aggregate money M2. Finally, the paper presents concluding remarks and Japanese implications for China.

2. A Simple Enlarged Mundell-Fleming Model

According to the theorem of "Impossible Trinity", perfect capital mobility, fixed exchange rate and independent monetary policy can't maintain simultaneously. In practice, Japan and China, particularly recent China, had frequently implemented the policy mix of partial capital mobility, heavily managed floating rate and sterilized intervention to seek the target of independent monetary policy. To analyze effectiveness of the policy mix, we set up a simple enlarged Mundell-Fleming model based on Frankel (1997) and Yu (2008b).

2.1 Settings of the Model

2.1.1 Assumptions

Basic assumptions of the model are as follows:

(1)The domestic economy is small in relation to the rest of the world, hence values of world variables (world income, prices and interest rate) are exogenous.

(2)The domestic economy produces a single composite good, traded on world markets, but an imperfect substitute for world output.

(3)Domestic output is demand-determined, with its price, P, constant. The foreign currency price of world output, P^*, is also assumed constant.

2.1.2 Goods Market

Demand for output Y comes from both domestic aggregate demand, A, and net foreign demand for domestic goods, TB, hence the open economy IS curve can be described as:

$$Y = A(i,Y,\ldots) + TB(eP^*/P, Y, \ldots) \tag{IS}$$

where i is the domestic interest rate. The nominal exchange rate, e, measured as number of units of domestic currency per unit of foreign currency, hence a rise in e represents a depreciation or devaluation of the domestic currency. The three dots are meant to indicate that there are other variables that might enter the domestic aggregate demand function, such as, wealth, and the trade balance function include trade policy and fluctuations in income.

The IS curve is a downward-sloping relation between Y and i. It is obvious that the open economy IS Schedule is steeper than the closed economy counterpart, and the open economy multiplier is smaller than that of the corresponding closed economy. The position of the IS curve depends on the exchange rate. For example, a depreciation of domestic currency (rise in e) leads to exports increase while imports decrease, therefore the demand for domestic output increase and hence IS curve shifts to right.

2.1.3 Money Market

The equilibrium condition of money market is given by

$$L(i,Y,\ldots)P = \bar{M} \tag{LM}$$

where L is the demand for money, $\bar{M}$ the money supply. Other variables that might enter the money demand function include expected return rate of assets (stock and real estate), and inflation rate. A rise in assets return or inflation will lead to a decrease in money demand. In the case of China, the degree of development in financial market and uncertainty in expected income will produce important influence on residents' money demand. The equation LM describes the open economy LM curve. The LM curve is an upward-sloping relation between Y and i. The slope of LM curve depends on the sensitivity of money demand to interest rate. A rise in money supply or a fall in money demand leads the LM curve shift to the right.

According to money market equilibrium conditions as written in Equation LM, if monetary authorities are unable to influence interest rate, they are unable to determine the money supply, and the money stock is determined endogenously by the money demand. In the case of emerging countries like China, financial markets are not well-developed and interest rates are highly regulated, fixed assets investment and money demand are insensitive to changes in interest rates. Thus, in terms of developing countries, success at influencing interest rate is probably not the sole, or the most proper way to define an independent monetary policy. Therefore, the best way of defining an independent monetary policy is central bank's success at influencing broad aggregate money(M2), domestic demand and output in the short run (prices are sticky) and influencing the level of prices in the long run.

2.1.4 Overall Balance of Payments

The overall balance of payments (BOP) is the sum of the current account and the capital account (KA). Because trade balance is the predominantly largest part of current balance, it is convenient to assume that trade balance equals to current balance. Hence, the overall balance can be expressed as:

$$BP = TB + KA$$

The capital transactions balance is given by:

$$KA = KA(i - i^*, \Delta e^e, \ldots)$$

where i^* is the exogenous foreign interest rate, and Δe^e is expected appreciation (depreciation)

of the domestic currency. Other variables that might enter the capital account function include exchange rate uncertainty, default risk, and the stocks of domestic and foreign assets already held.

The responsiveness of capital transactions to the interest rate differentials between domestic and foreign currency denominated assets represents the degree of capital mobility. If the responsiveness coefficient is infinite, this indicates that there existed no barriers to international capital flow for a country, and hence the degree of capital mobility is perfect. If the coefficient is zero, which means that cross-border capital transactions are totally prohibited and there existed no capital mobility. If it is finite, this represents that the removal of barriers to international capital flow is not complete. In the case of imperfect capital mobility, the existence of capital controls and transactions costs prevents instantaneous adjustment of capital movements to interest rate differentials, and hence the adjustment pattern belongs to a stock adjustment model.

The overall BOP equilibrium, hence BP curve, can be described as:

$$BP = TB(eP^*/P, Y, \ldots) + KA(i - i^*, \Delta e^e, \ldots) = 0$$

(BP)

The slope of BP curve depends on the degree of capital mobility. If the capital mobility is perfect, imperfect and zero, then the BP curve is horizontal, upward-sloping, and vertical respectively.

2.1.5 Intervention and Sterilization

BOP disequilibria give rise to disequilibrium on the foreign exchange market. BOP surplus leads to excess demand for domestic currency in the foreign exchange market, and the appreciation pressure of domestic currency increases. On the contrary, BOP deficit generally results in excessive supply of domestic currency and an increase in downward pressure. Under the regime of flexible exchange rate, BOP disequilibrium leads to adjustments in the value of domestic currency, hence the disequilibrium reduces and IS curve shifts. Under the fixed exchange regime, the monetary authorities intervene in foreign exchange market by purchasing foreign (domestic) currency and selling domestic (foreign) currency to maintain the stability of domestic currency, hence money supply changes and LM curve shifts.

According to the "Impossible Trinity" theorem based on the Mundell-Fleming Model, fixed exchange rate, free capital mobility and independent monetary policy are unable to maintain at the same time. Japan and China had obtained surplus in the account of overall BOP for a long time. To stabilize their domestic currency, the monetary authorities entered into foreign exchange market by purchasing foreign currency assets and selling domestic currencies. However, these interventions inevitably lead to the increase in money supply. To maintain the aggregate money supply unchanged, the central banks adopted some sterilization policies, such as, selling treasury securities, issuing central banks bills, reserve requirements and bank loan quota.

In consideration into the diversity of sterilization actions among different countries, it is worthy of discussing into the specific definition of sterilization before analyzing their impacts on the amount of monetary base or aggregate money. A narrow technical definition of sterilization restricts the policy actions to open market operations or other measures to leave the monetary base unchanged. However, outside of advanced countries, such as, US and Japan, particularly in emerging countries, open market operations are not as frequently used, because the government securities markets and financial markets are not as well-developed. The monetary authorities instead frequently raise reserves requirements on commercial banks or take administrative measures, such as, loan quota and window guidance, to prevent broader monetary aggregates like M1 or M2 from increasing, even if the monetary base does increase substantially (Frankel, 1997). A typical example is China in 2007-08. Due to the skyrocketing foreign reserves, and the shallowness and thinness of the government securities and financial markets, the Chinese monetary authorities heavily depended on raising reserves requirements and bank loan quota instead of open market operations to maintain the stable growth of broad aggregate money. Therefore, success at influencing the interest rate is not the only, or the most proper way of defining sterilization or an independent monetary policy. The most proper way of defining sterilization is probably the monetary authorities' success at determining money supply.

We can analyze the effect of foreign exchange market intervention on money supply particularly monetary base via the central bank's balance sheet (seen in Table 2.1). Success at

maintaining unchanged monetary base represents that the effectiveness of sterilization is perfect or an independent monetary policy is attained. In the case of Japan, the open market operation (selling government securities) is the sole way to sterilize capital inflow. Thus, the balance sheet identity of Japan monetary authority is given by:

$$FR + GS = MB$$

If without changes in government securities, GS, hence $\Delta FR = \Delta MB$. This means that variations in foreign reserve due to intervention lead to changes in monetary base on a one-for-one basis in absence of sterilizations. If the monetary authority implements sterilized actions by purchasing or selling government debt and has an intention to offset the impact of foreign exchange market intervention on the domestic money supply, then $\Delta FR = -\Delta GS$ and $\Delta MB = 0$.

Table 2.1   The Central Bank's Balance Sheet

Assets	Liabilities
Foreign Exchange Reserves (FR)	Currency in Circulation and Deposits(MB)
Government Securities (GS)	Central Bank Bills (CBB)
FR+GS	MB+CBB

In the case of China, owing to the less developed government debt market, the monetary authority generally issues central bank bills (CBBs) to sterilize capital inflow and maintain monetary base unchanged, namely, $\Delta FR = \Delta CBB$ and $\Delta MB = 0$. The ultimate target of Chinese monetary authorities' sterilized actions is to leave the aggregate money supply, M2, instead of monetary base unchanged, therefore raising reserve requirements and imposing bank loan quota are the two most powerful ways to neutralize capital inflows, and both approaches can influence money multiplier (mm) substantially. Hence, the variation in M2 can be given by:

$$\Delta M2 = \Delta mm \cdot MB + mm \cdot \Delta MB = 0$$

Although sterilization can temporarily influence money stock, it faces the problem of sustainability. In absence of changes in other policies, the BOP deficit sterilization will be associated with a continuous loss of reserves. Therefore it can only continue until reserves are exhausted. In the case of surplus, reserves are being accumulated and there is no upper limit to a country's reserves. When the degree of capital mobility rises, sterilized operations become more difficult to conduct, for both deficit and surplus.

2.2 Perfect Capital Mobility, Exchange Rate Regime and Independence of Monetary Policy

We begin with Mundell-Fleming Model illustrated with the familiar textbook graphs of the IS, LM and BP curves, corresponding to our three equations. As seen in Figure 2.1, income Y is shown on the horizontal axis, and interest rate i is shown on the vertical axis, under the assumption that price level is pre-determined in short run.

Assume first that spot exchange rate is pegged: $e = \bar{e}$. If the pegged exchange rate is considered to be sufficiently permanent that there are on fears of changes in the value of domestic currency, then $\Delta e^e = 0$, and investors can treat domestic assets and foreign assets as perfect substitute owing to without exchange risk.

Under conditions of perfect capital mobility, the capital account is infinitely sensitive to the interest rate differentials. Hence, the interest rate parity condition can be given by:

$$i - i^* = 0$$

The above equation implies that domestic interest rate is tied down to the exogenous foreign interest rate. On such circumstances, other factor except interest rate doesn't matter for capital transactions.

Now, we analyze impacts of credit contraction, money demand decrease, trade surplus and expected appreciation of domestic currency on money supply and independence of monetary policy respectively under conditions of perfect capital mobility.

2.2.1 Credit contraction

With perfect capital mobility and pegged exchange rate, there is no scope for independent monetary policy measured by the interest rate. As seen in Figure 2.1a, if the monetary authority implements contractionary monetary policy to reduce domestic credit and inflation, this leads to a rise in domestic interest rate and a potentially inflow of infinite amount of

foreign capital (Point M). To maintain the pegged exchange rate of domestic currency, the monetary authority has to purchase foreign currency and sell domestic currency in foreign exchange market, and this causes the continuous accumulation of foreign reserves and the increase in domestic money supply. Obviously, a rise in money supply leads to a fall in domestic interest rate, hence the monetary authority can't manipulate the interest rate and monetary policy loses independence. Although sterilizations can temporarily restrict the growth in money supply and the fall in interest rate, fiscal cost of sterilization is huge, and the monetary authority is forced to give up the attempt to reduce money supply, and the economy returns to starting point. Therefore, under conditions of perfect capital mobility and fixed exchange rate, the monetary authority can't set domestic interest rate independently.

Figure 2.1 Credit Contraction

a. perfect capital mobility   b. partial capital mobility
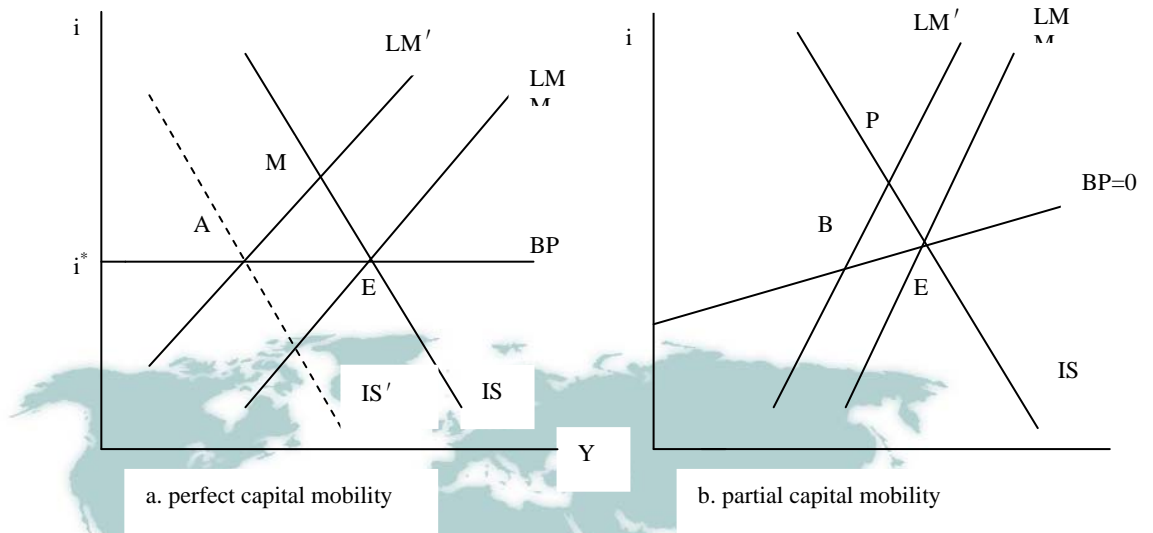
If the monetary authority gives up fixed exchange rate and allows an appreciation of domestic currency. The loss of price competitiveness leads a deterioration in trade balance and leftward shift of the IS curve. The economy finally moves to point A. Hence, under conditions of perfect capital mobility and a floating exchange rate, the degree of independence of monetary policy reaches peak, measured by the effect on the magnitude of money supply. Therefore, with free capital movements, the "Impossible Trinity" works, the choice for the central bank is to give up monetary autonomy or exchange stability.

2.2.2 Trade Balance Improvement and Expected Appreciation

Figure 2.2a illustrates an improvement in trade balance and expected appreciation of domestic currency. The improvement in trade account is probably attributed to an exogenous export boom, or an enhancement in competitiveness of domestic products as a response to a real devaluation. The IS curve shifts rightward, putting upward pressure on the interest rate and attracting foreign capital flow in. Further, the continuous improvement in trade balance leads to an appreciation expectation on domestic currency, and hence inflow of foreign capital. If exchange rate is fixed, the inflow of international capital induces an increase in the magnitude of money stock on a one-for-one basis in absence of sterilization, then, the LM curve shifts rightward. The economy moves from point O to point F. If the monetary authority conducts sterilized intervention to keep money stock unchanged, the inflow of capital leads to increase in foreign reserves without upper limit. The central bank will give up the attempt to maintain pegged rate due to mounting fiscal cost. If the monetary authority abandons exchange rate peg, domestic currency keeps appreciating until the economy returns to trade balance, the IS curve and Y return to their starting point at E.

Figure 2.2 Trade Balance Improvement and Expected Appreciation of Domestic Currency

a. perfect capital mobility   b. partial capital mobility
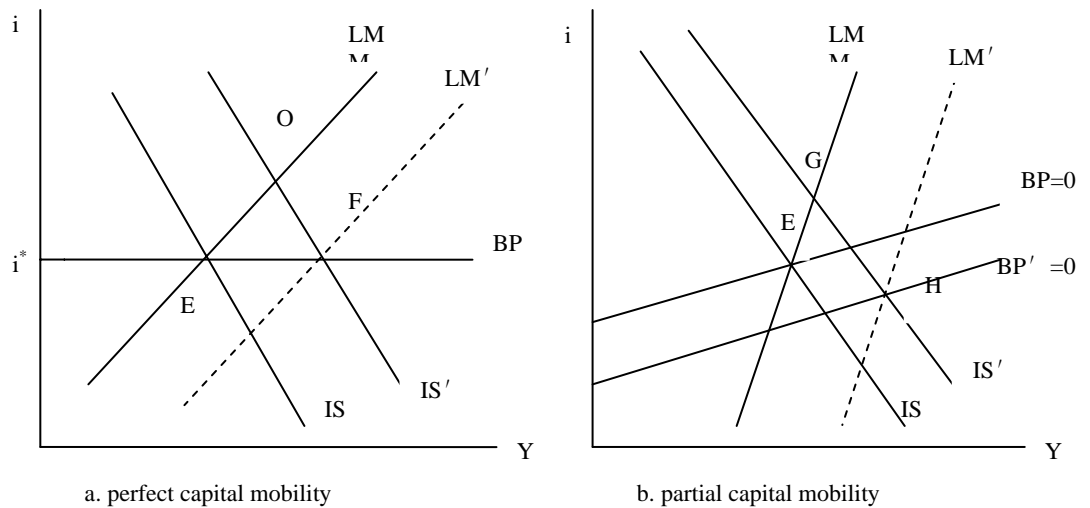
2.2.3 Money Demand Decrease

Figure 2.3a illustrates the case of a fall in demand for money due to a rise in returns of non-money assets, i.e. stock and real estate, and expected inflation attributed to a moderate inflation: a rightward shift in the LM curve. Evidently, a moderate inflation can offset partly the momentum of rightward shift of the LM curve. With perfect capital mobility and fixed exchange rate, a rightward shift in LM curve leads to a fall in domestic interest rate, hence capital flows out persistently and money stock decreases continuously in absence of sterilization. Even with sterilization, the central bank can't maintain fixed exchange rate sustainably because its international reserves will exhaust soon.

The alternative is the monetary authorities give up pegged exchange rate and allow domestic currency depreciation. The enhancement in price competitiveness leads to an improvement of trade balance and a rightward shift of the IS curve. The economy moves from the transient point N to the equilibrium point C. This case shows that a change in money demand has an effective impact on real economy, which implies again that independence of monetary policy reaches peak under circumstances of floating rate and free mobility.

2.3 Partial Capital Mobility, Managed Floating Rate and Independence of Monetary Policy

As discussed in the above section, it is clear that the monetary authority who gives up freedom to vary exchange rate, also abandons an independent monetary policy, whether measured by interest rate or money supply, under conditions of free capital movements. Can China retain some degree of monetary autonomy with partial capital mobility and managed floating rate? Now, we analyze applicability of the theorem of "Impossible Trinity" in recent China. China's recent situations are quite different from those of advanced countries, such as, strong restricted capital transactions, heavily managed floating exchange rate, and frequently used sterilized interventions featuring with administrative measures.

The BP curve is now an upward-sloping relation between Y and i. A rise in income leads to increase in import and deterioration in trade balance. Under the conditions of the overall balance of payments equals to zero, interest rate must rise a bit to attract foreign capital to finance trade deficit. Also, the less developed financial market makes the responsiveness of investment and money demand to interest rate is much lower than that of advanced countries, hence, the slope of the IS curve and the LM curve is steep.

Figure 2.3 Money Demand Decrease

a. perfect capital mobility   b. partial capital mobility
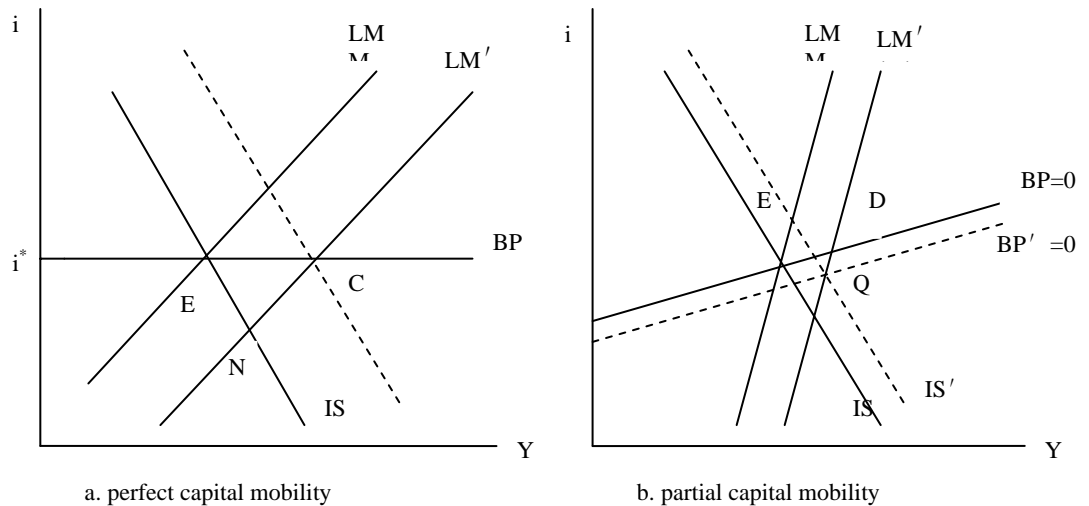
2.3.1 Credit Contraction

Figure 2.1b considers a deliberate reduction in domestic credit of the monetary authorities with an attempt to reduce inflation. The LM curve shifts leftward and the economy moves to point P. To maintain stability of the currency, it is viable for the monetary authority to conduct sterilization to make the economy stay at point P for a finite time, in presence of barriers to capital movement. If the central bank continues sterilization, it can maintain domestic interest rate higher than international level for some time. If the authority abandons sterilization, capital inflow leads to increase in money supply, hence the LM curve shifts rightward and the economy finally returns back to staring point E. Although the ultimate outcome is same as that of perfect capital mobility, the monetary authority retains some degree of autonomy for a finite time interval.

If Chinese central bank liberalizes significantly the management of domestic currency, the RMB appreciates, and net export decreases due to deterioration in products' competitive capabilities. Hence, the IS curve and BP curve shifts leftward. Finally, the economy moves to a new equilibrium point, where the IS, LM and BP curve intersects. The result is qualitatively similar to Figure 2.1a, but less extreme.

2.3.2 Trade Balance Improvement and Expected Appreciation

An improvement in trade balance and the expected appreciation on domestic currency can be examined under conditions of partial capital mobility and managed floating rate in Figure 2.2b. Trade balance improvement shifts the IS curve and the BP curve to the right, and the economy moves from point E to G with domestic interest rate higher than international level, hence attracts foreign capital inflows. At the same time, the appreciation expectation on the RMB shifts the BP curve further rightward, thus the interest rate spread $(i - i^*)$ enlarges and attracts more capital. Therefore, under circumstances of the "twin surplus" (trade surplus and capital surplus), the monetary authority has to conduct massive sterilized interventions to neutralize capital inflow and mitigate appreciation pressure on the RMB.

If the central bank continues to sterilize, both money supply and higher interest rate can maintain unchanged for a finite time at the price of increasing fiscal cost and efficiency loss. If the authority stops sterilization, money supply increases with capital inflow on a one-for-one basis, and the LM curve shifts rightward, and the economy reaches a new equilibrium point H, where output, money stock and interest rate all changed. Although ultimate results are the same as those of free capital mobility, it takes some time for the economy moves from point G to point H.

The alternative, of course, is the central bank to allow the currency to fluctuate more freely, and the loss of price competitiveness leads to the IS curve and the BP curve shift to the left. The weakness of appreciation expectation makes the BP shift leftward further. Therefore, the economy ultimately returns back to starting point, but the process takes a finite of time in presence of barriers to capital movement.

2.3.3 Money Demand Decrease

Figure 2.3b illustrates the case of a fall in demand for money due to a rise in returns of non-money assets (stock and real estate) and a moderate expected inflation. The real effect of a decrease in money demand equals to that of an increase in money supply, and hence the LM curve shifts rightward and domestic interest rate falls. This case corresponds to China's recent situation from 2006 to October 2008. In this period, China had experienced a significant reduction in money demand due to bubbles in stock market and real estate market, and the increase in assets returns substantially reduce residents' demand for money. Further, a moderate inflation expectation also reduces money demand owing to Chinese overheated economy.

Opposite to credit contraction illustrated in Figure 2.1b, a reduction in money demand leads to interest rate fall and capital outflow. In presence of sterilized intervention, the low interest rate can retains for some time. If sterilizations stop, capital outflow leads to decrease in money supply, and the LM curve shifts gradually leftward and returns back to starting point. If the authority allows the currency to depreciate, the IS curve and BP curve shifts rightward, and the economy finally reaches a new equilibrium point Q.

An interesting case is that trade surplus, appreciation expectation and money demand decrease happened simultaneously. This is what China had experienced in recent years. As discussed in Figure 2.2b, trade surplus and appreciation expectation on RMB leads to persistent capital inflow in presence of sterilized intervention. Further, a fall in money demand aggravates the existing massive sterilization task of the monetary authorities. If the government can't discern changes in money demand, inflation rate will rise even in presence of massive sterilization. Although sterilized intervention can help the monetary authority to retain a certain degree of autonomy for a finite of time, the size of foreign reserves and sterilized intervention should have an upper limit. Because the unlimited accumulation of foreign reserves and subsequent sterilization produces huge fiscal cost by issuing central bank bills, and economic efficiency loss, such as, financial repression and bank loan quota. Therefore, the sterilization is not sustainable with large and persistent capital inflow. Thus, the sole solution to China's recent difficulty in accumulation of international reserves and sterilized intervention is to allow the RMB to fluctuate, which can reduce China's overdependence on export and the inflow of unwanted foreign capital.

2.4 Conclusion

As the theorem of "Impossible Trinity" states that perfect capital mobility, fixed exchange rate and independent monetary policy cannot maintain simultaneously. With perfect capital mobility, the monetary authority faces an alternative choice between pegged exchange rate and independent monetary policy. Under conditions of partial capital mobility, sterilized intervention can help the monetary authority to retain a certain degree of monetary autonomy without giving up fixed exchange rate or heavily managed floating rate.

However, the price of sterilization is interest payments, bank repression and resources allocation inefficiency. In terms of economic efficiency, the size of international reserves and sterilized intervention should restrict to a limit scale. Moreover, an important pretext of the effectiveness of sterilization depends on the degree of capital transactions restrictions. But a stricter capital control produces negative effect on current transactions. Therefore, sterilization is not sustainable, particularly under conditions of large and persistent capital inflow.

In this regard, a typical example is China. Since 2000, Chinese monetary authorities have frequently implemented the policy mix of partial capital mobility, heavily managed floating rate and sterilized intervention to seek the target of independent monetary policy. Even with strict capital controls and massive sterilization, the effectiveness of Chinese sterilization is quite limit, i.e. the appearance of assets bubble and inflation, even disregard the huge fiscal cost, exchange rate risk and efficiency loss.

3. Japan's Experiences: from Immediate Postwar to 1990[①]

This section discusses Japan's experiences on liberalization in foreign exchange controls during the period from immediate postwar to 1990, focusing on foreign exchange rate regime,

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[①]Regarding the liberalization process of Japan's foreign exchange rate and capital transactions controls, Fukao(1990, 2003) had provided comprehensive and detailed overviews.

capital mobility restrictions and monetary policy independence. First came the adoption of a fixed exchange rate with extremely strict foreign exchange controls in the immediate post-war years, then current transactions liberalized in 1964, and the exchange rate regime shifted to managed floating in 1971, then to freely floating in 1973 while maintaining capital movement controls, finally, capital transactions barriers abolished in 1980s.

3.1 From Immediate Postwar to 1964: Current Transactions Restrictions

3.1.1 Basic Institutional Environment

During the period from the immediate postwar to 1964, Japan had imposed strict controls on all oversea transactions, not only on capital transactions but also export and import transactions, due to shortage in foreign assets. Under the exchange controls system of 1950s, the Japanese government was directly involved in the allocation of scare foreign exchange through mechanisms based on Foreign Exchange Budget. With more favorable performance of Japanese exports and restoration of convertibility of most European currencies, the restrictive exchange controls became increasingly flexible in 1950s. All non-trade transactions between residents and non-residents were prohibited in principle, all non-trade transactions between residents involving foreign currency and all transactions between non-residents involving yen subject to control.

From 1945 to 1949, Japan's trade and payment had been controlled strictly by the Supreme Commander for the Allied Powers (SCAP). Then with start of the cold war, the policy of US toward Japan changed and encouraged Japan's rapid return to international economy and economic self-dependence through trade. In March 1949, the Foreign Exchange Control Board (FECB) was set up to prepare for transfer of the authority over foreign trade and payments from SCAP to the Japanese government.

With promulgation of the Foreign Exchange and Foreign Trade Control Law (FEFTCL) in December 1949, the Japanese government assumed controls over trade subsequently. The law set forth the principle of general prohibition on foreign exchange and capital transactions with freedom as exceptions. Under this system, exports were carried out relatively freely, while imports of goods and services and capital transactions were highly controlled. The law also stipulated that the Foreign Exchange Budget (FEB) be formulated for the purpose of allocating foreign exchange for external payments. The FEB prescribed foreign exchange payments on the basis of anticipated foreign exchange receipts for the period concerned, and which must be approved by the Cabinet Ministerial Council with the Prime Minister as chairman. The foreign exchange holdings concentrated in the government were allocated for foreign payments on a quarterly basis starting in January 1951 through the foreign exchange budget system, and which was on semi-annual basis from fiscal 1952 and abolished in April 1964. Therefore, the FEFTCL was legal framework, and the FEB was central tool of Japan's restrictive trade and payment system.

Under the FEFTCL, a policy of foreign exchange concentration was adopted. The foreign exchange concentration system required all residents, except licensed, to surrender foreign means of payment and claimable assets acquired to authorized foreign exchange banks within 10 days of acquisition. Authorized foreign exchange banks bought foreign exchange from their customers for the account of Foreign Exchange Special Account of the national budget. Foreign exchange banks were obligated to sell foreign exchange holding to the Bank of Japan.

In August 1952, the FECB was abolished, and its authority on management of exchange controls and foreign reserves was transferred to the Ministry of Finance (MOF). The MOF was responsible for general foreign exchange control, which assumed responsibility for concentration of foreign exchange reserves, management of the Foreign Exchange Special Account, and administration of foreign investment control. The Bank of Japan (BOJ) was given charge of much of routine day-to-day operations of the system as the agent of national government (Takagi, 1997).

Under conditions of private enterprises were allowed to engage in foreign trade, it was possible for large sums of foreign exchanges to move across borders through changing the timing of payment for imports and receipt of export proceeds. In an attempt to control such leads and lags, the standard settlement system was established to impose time limits for settlement of imports and exports in November 1950, and which was liberalized gradually until the end of 1980s (Fukao, 1990).

3.1.2 Pegged Rate and Foreign Exchange Controls

On April 25, 1949, a single exchange rate of 360¥/US$ was established. In June 1952, foreign exchange banks were allowed to hold foreign exchange deposits with overseas banks with a size limit, and settlements of trade transactions were carried out through these accounts. This was a shift in the foreign exchange concentration in terms of banks' net foreign exchange balances. With such developments, the Tokyo foreign exchange market reopened as a venue for domestic foreign exchange banks to adjust their foreign exchange balances. In this market, the official selling rate of the dollar was 360.35 yen and the official buying rate was 359.65 yen.

The conversion of yen obtained by non-residents into foreign exchange was strictly restrained so that the holding of yen-denominated assets by non-residents was very limited, and private sector capital movements were prohibited. In January 1956, twenty leading trading companies were allowed to hold a small amount of foreign currencies as operating funds. In January 1959, the MOF removed all restrictions on spot and forward dealings in designated currencies by authorized foreign exchange banks.

On July 1, 1960, partial external convertibility of the yen was established by the creation of non-resident free yen accounts. Free yen accounts could be opened by non-residents with any authorized foreign exchange bank in Japan and credited with yen proceeds from most current transactions, and the accounts could be converted into any of the designated currencies. However, other yen accounts could not converted freely into foreign exchange. Therefore, international trade transactions could be settled through the transfer of the non-resident yen deposits.

In April 1963, BOJ began official intervention in the foreign exchange market. Fixed official rates (concentration rates) for transactions with the MOF became flexible. Spot exchange rate for transactions between banks and their clients were liberalized. BOJ intervened to restore equilibrium within the range of ±0.75% of IMF parity.

3.1.3 Balance of Payments

From Figure 3.1, we can clearly see that Japan's trade deficits had been offset by huge surplus in transfer balance (aid came from U.S.) until 1951, indicates that the aid from the United States was essential for Japan to import food and other indispensable items in immediate postwar period. From 1951 to 1952, Japan obtained huge special procurements from U.S. owing to the Korean War, and recorded a surplus in current balance. With reduction in foreign demand related to Korean War and increase in domestic demand, Japan's current account turned to deficit in most of years from 1953 to 1964.

Figure 3.1   Japan's Current Balance, 1946-1964   (millions of USD)
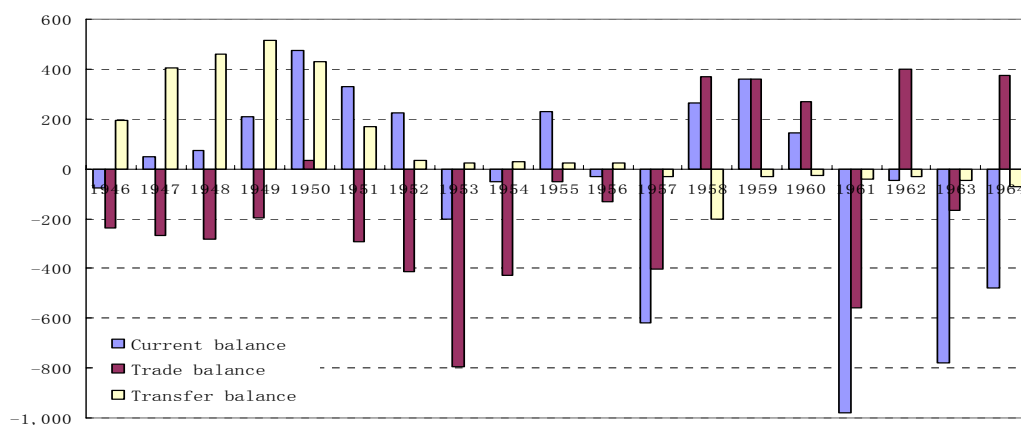
Source: Japan Statistics Bureau.

With the restoration of external convertibility for major European currencies in December 1958, Japan began to aware the benefit of a more open trade and payment system. At the same time, Japan faced increasing pressure to ease trade restrictions under the condition that a deterioration in US balance payment during 1958-59. It was against this background that the program "Plan for Trade and Exchange liberalization" was approved by the government in June 1960 and implemented over following three years.

Figure 3.2   Japan's Balance of Payment, 1949-1964   (millions of USD)
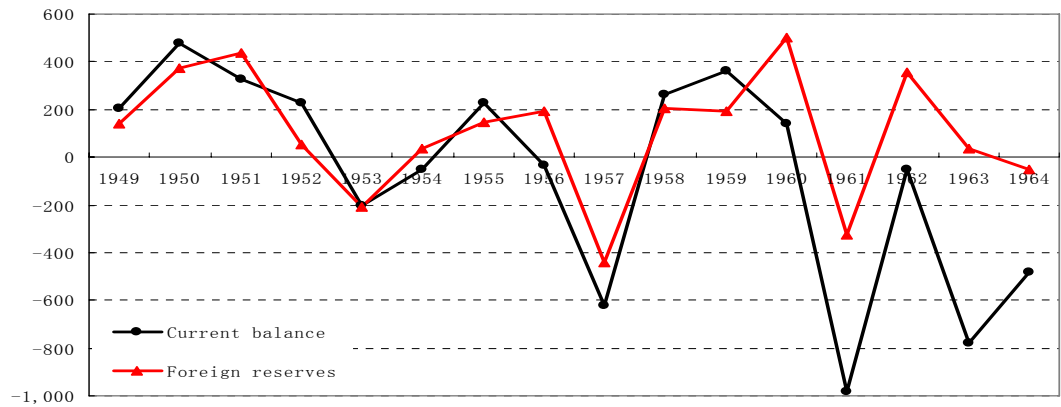
Source: Japan Statistics Bureau, IMF International Financial Statistics (IFS).

As Figure 3.2 shows, variation in current account balance was almost equal to increase in foreign exchange reserve since immediate post war until 1960, which demonstrates that the movement of private capital is very small. In the period of 1961-64, Japan's current account balance deteriorated significantly, and the gap between balance of current account and changes in foreign exchange reserve enlarged. An important reason for the enlarged gap is the rapid increase in Japan's loans borrowed from IMF.

In August 1952, Japan obtained IMF membership with the obligation of keeping an exchange rate band of ±1% around the IMF parity of 360￥/US$, and therefore it could get the fund support from IMF when it experienced problems of balance of payments. In 1954, Japan joined in GATT and had loosed restrictions on commodities trade since.

In one word, in the period of post war, Japan often experienced a shortage of foreign exchange reserves. This is the reason why Japan implemented strict exchange control through the foreign exchange concentration system and the foreign exchange budget system. Although Japan could maintain independency of monetary policy with fixed exchange rate and the balance of current account financed by changing in foreign exchange reserves or loans borrowed from IMF, this system counteracted the expansion of Japanese transactions with external economies and its economic development (Fukao, 1990).

3.2 1964-1971: Fixed Exchange Rate under IMF System
3.2.1 Gradual Liberalization in Capital Transactions

In April 1964, Japan became IMF Article 8 status nation and abolished exchange controls on current transactions, particularly abolition of foreign exchange budget system and permission for tourists to get foreign exchange. Through these measures, the conversion of yen into foreign exchange for imports and services became free. At the same time, Japan joined in OECD. Although the IMF's Articles of Agreement allow controls on capital account transactions, the OECD make it a principle to liberalize capital account transactions. Therefore, Japan faced the pressure to remove controls on capital transactions when it joined in the OECD.

May 1964, Japan authorities allowed major securities companies to establish non-resident special accounts for securities to facilitate securities investment by non-residents. In June 1967, Japan began to liberalize inward Foreign Direct Investment, and the First Foreign Capital Liberalization Package proscribed that the upper limit of automatic authorization was 50% holding for 33 industries, and 100% holding for 17 industries respectively. Japan eased regulations on portfolio investment in Japanese stocks in the subsequent month. For example, the upper limit on combined holding of non-resident investors as a whole under automatic approval for stock acquisition raised from 10% to 15% for restricted industries, and from 15% to 20% for non-restricted industries, and the upper limit for individual investor raised from 5% to 7%(Aramaki, 2006).

In the year of 1968-70, with increase in current surplus and capital inflow, Japan strengthened restrictions on capital inflows while loosed controls on capital outflows. In February 1968, Japan restricted the size of conversion into yen of foreign currencies by authorized foreign exchange banks obtained through oversea borrowings. October 1969, Japan began to liberalize outward foreign direct investment. April 1970, the liberalization of

outward portfolio investment started, and which was totally banned before. June 1972, Japan's outward investment was liberalized in principle.

3.2.2 Short-term Capital Movement Channels

With abolition of foreign exchange controls on current transactions, a certain degree of liberalization in capital account related to exports and imports was inevitable. For example, there are many cases that export payments are received before actual delivery, and which is a real capital inflow. And there are some instances that long-term export credits are essential to make current transactions favorably, which means capital outflow. On the import side, prepayment (capital outflow) and postponed payment (capital inflow) also often occur. Such capital transactions are necessary for smooth trading relationship and hence increase following the expansion of Japan's foreign trade, despite restricted by the standard settlement system. Therefore, it is possible that an increase in capital transactions related to current transactions can make the private sector change foreign exchange holdings substantially.

With the elimination of exchange controls on current transactions, there existed a potential for big capital flows. During 1960s, average share of export and import in Japan's GDP was 16%, while the proportion of foreign exchange reserve to GDP was nearly 2%, therefore, the amount of capital flows just from two months shift in the leads and lags will surpass that of foreign exchange reserve. Thus, it is necessary for Japan to continue strict controls on capital transactions to maintain independent monetary policy.

According to Fukao(1990), Japan's capital flows arising from uncovered interest arbitrage can occurred in two forms: The first ones are genuinely uncovered and direct arbitrage of nominal interest differentials between domestic and foreign market, such as changes in import usance in foreign currency terms, changes in the foreign currency-denominated advances on contracted exports, and changes in the free-yen deposits of non-residents. The second ones are covered transactions in exporters or importers themselves but their counterparties perform uncovered interest arbitrage. A typical example is spot-forward swaps by banks. If exports, who would have to sell dollars in the future, would obtain benefit from selling dollars forward at a good price based on covered interest rate conditions, foreign exchange banks that usually were counterparties in these transactions would buy dollars forward with yen. In order to hedge, the banks also borrowed dollars and sold those spot for yen. Such transactions by foreign exchange banks would involve selling spot dollars for spot yen and buying forward dollars for future yen (spot-forward swaps) were called yen conversion transactions, because they arose from borrowing from dollars and converting them into yen for investment.

3.2.3 Revaluation Expectations, Short-term Capital Inflow and Monetary Policy

In the period of from 1964 to the eve of the Nixon Shock, Japan's continuous trade surplus led to an increase in revaluation pressure of the yen and correspondingly large short-term capital inflow, hence it was difficult for the monetary authority to maintain independence of monetary policy under pegged rate system.

From Figure 3.3, we can see that Japan's current balance had showed persistent surplus after 1968, and amount of foreign exchange reserve grew rapidly. In the summer of 1971, just before the Nixon Shock, although exchange controls were still strict, a huge amount of short-term foreign capital entered into Japan under strong expectation of yen revaluation. Increase in official exchange reserves during 1971 was considerably larger than current account surplus. These capital flows mostly came from activities of Japanese companies abroad. The subsidiaries of Japanese firms borrowed large amounts of dollars, and used them to remit prepayments for exports to parent companies or to purchase yen-denominated securities. Although there were controls on the advances for contracted exports, the effectiveness of such controls was very limited when huge profits over a short term could be obtained.

As shown in the Figure, expected revaluation produces a significant influence on capital movements. During 1960s, capital flows expanded due to the liberalization of current transactions, and differentials between current account balance and changes in official exchange reserves became lager comparing to those of 1950s. But these divergences were relatively small. The main reason was that, when no parity changes were expected, the uncovered interest arbitrages couldn't provide substantial profit opportunities dues to relatively small interest rate differentials and strict controls on capital transactions. However, when maintenance of fixed parities was in suspicion, the profitability of capital movements would grow substantially. For example, if the yen was revalued versus the dollar, the

uncovered dollar sales and yen purchases could produce a large profit in a short period (Fukao, 1990).

Over the period of yen revaluation, exporters would be subject to large exchange losses that had foreign exchange denominated export contracts or claims on foreign exchanges with deferred export payments if such contracts were un-hedged. Thus, it was essential for exporters to hedge transactions of dollar sales. Even if revaluation expectations are incorrect, there is no risk of loss. So, speculations and hedges are same under conditions that yen revaluation was expected. This is the reason why such speculations and hedges are called "one way options". Therefore, when expected parity rate changes, speculations and hedges are quite different from those under a floating exchange rate system.

Figure 3.3 Japan's Balance of Payments, 1965-1973 (Seasonally adjusted, in percent of GDP)
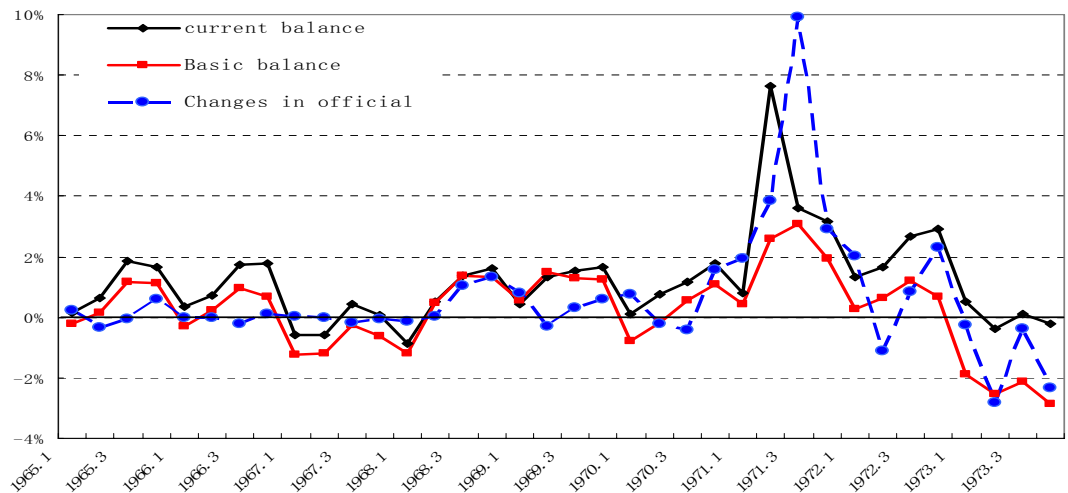
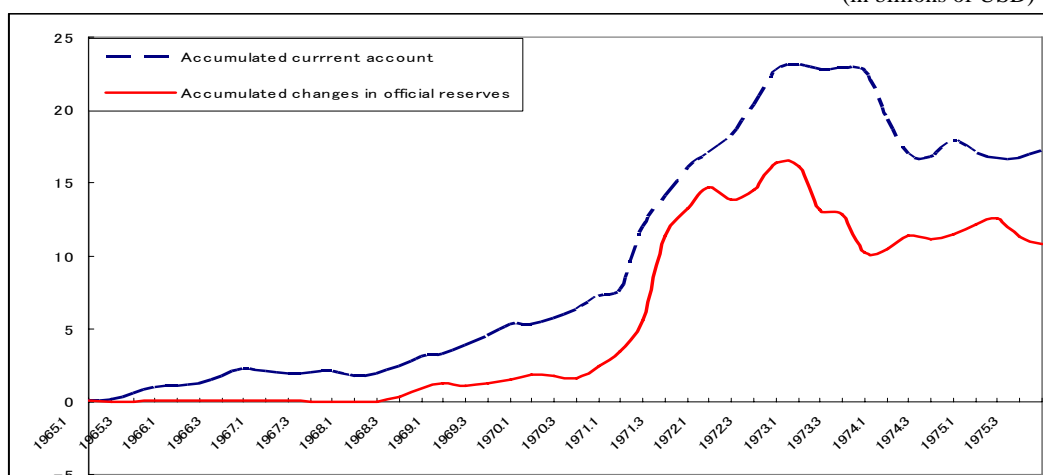Source: Balance of Payments Monthly (various issues) and IFS.

The large capital flows makes independence of monetary policy difficult to maintain under the fixed exchange rate system. In order to control such capital flows, the monetary authority imposed strict controls on pure capital transactions and limited the period of leads and lags that accompanied with imports and exports. When the pressure of capital inflows was very strong, the authorities imposed much stronger exchange controls through setting yen conversion quotas and exerting over foreign exchange banks upper limits on outstanding amounts of short term borrowings from abroad. Thus, it becomes clear that maintenance of fixed exchange rates contradicted independent monetary policy.

3.2.4 Revaluation Expectation and Distribution of Foreign Exchange Positions

As shown in Figure 3.4, we can approximately estimate the distribution of Japanese foreign exchange positions between the government and private sectors through the approach borrowed from Fukao(1990). The difference between accumulated current balance and accumulated changes in official reserves is the portion of current account surplus that not held by the government, which can be seen as roughly as the net foreign exchange position of the private sectors. From 1965 to 1968, the foreign exchange reserves were nearly zero, and hence most of the surplus in current account was transferred into foreign exchange positions held by private sectors. From 1969 to 1971, both private sector foreign exchange holdings and official reserves increased with the growth of surplus in current account. In 1971, although the surplus in current account increased substantially, the amount of foreign exchange positions that private sectors held only rose a little with anticipation that an imminent devaluation of the dollar, and most of current balances were held by the government as short-term foreign exchange reserves. Under revaluation expectation on domestic currency, the private sector would sell large accumulated dollar positions to the government to escape exchange risk, while the government just passively purchased the dollar to maintain the fixed parity rate, so the amount of foreign exchange reserves increased sharply. Therefore, the private sector would shift exchange risk to the government with expectation that local currency revalue soon.

Figure 3.4 Accumulated Current Account Balance and Accumulated Changes in Official Reserves

(in billions of USD)

Source: Balance of Payments Monthly (various issues).

3.3 1971-1973: Shifting from Managed Floating Rate to Floating Rate

3.3.1 The Nixon Shock and Capital inflow

After 1968, Japan obtained persistent current surplus and continuous increase in foreign reserves. On the contrary, US economy became overheated owing to the Vietnam War. In 1971, the US showed a trade deficit for the first time in postwar history and capital outflow increased sharply. During this period, Japan's exchange control shifted from preventing capital outflow to encourage it. From April 1970 to August 1971, investment trusts and insurance companies were permitted to purchase foreign securities successively, and general investors were also granted blanket permission to sell and purchase foreign securities. However, capital exports from Japan didn't rise substantially owing to the strong anticipation of a devaluation of the dollar. With the German mark began to float in May 1971, huge capital flowed into Japan under expectation that the yen would also be revalued and floated. Consequently, Japan's foreign exchange reserve rose from $4.4 billion at the end of 1970 to $7.9 billion at the end of July 1971.

The famous Nixon Shock occurred on August 15, 1971, when US president Richard Nixon unilaterally declared that his government would impose a 10% import surcharge and stop conversion of the dollar into gold in terms of US's deteriorating balances of payment. Capital inflows into Japan in the 11 days between August 16 and August 27 attained $4 billion as advances for contracted exports, just before the yen's shift to managed floating rate system. Japan's foreign exchange reserve then amounted to $12 billion (Fukao,1990). This indicates that liberalization of exchange controls on current transactions allowed huge capital flows despite strict exchange controls on pure capital transactions.

On August 28, 1971, Japan shifted to managed floating rate, and the postwar fixed exchange rate system collapsed. In this period, extremely tight exchange controls were still imposed to an extent that made even current transaction difficult, while the authorities revalued the yen gradually and internationally in the market. With the Simthsonian Agreement at the end of 1971, a temporary return to fixed exchange rate occurred, but floating exchange rate resumed in the spring of 1973.

3.3.2 Arguments on Yen Revaluation

In this period, public opinion was strongly against a further revaluation. The grounds are: (1) Yen revaluation hurts Japan's state benefit of stimulating exports and earning foreign exchange assets. (2)Dollar should devalue rather than yen revalue, or reform the international currency system to reach the target. (3)Yen revaluation will produce huge negative impacts on domestic enterprises. (4)Yen parity will lose stability if the trend of yen appreciation can't be stopped. (5)Yen revaluation will make Japan lose the engine of economic growth. (6) Yen revaluation has no effect of stabilizing domestic prices. (7) There are no grounds to revalue the yen which has been in weakness domestically (Kwan, 2009).

Japanese government also regarded that yen revaluation would threat its economy and should attempt to avoid yen revaluation. To stabilize the yen, the authorities implemented

policy actions to reduce surplus in Japan's balance of payments. These actions include: current balance policies with features of exports restrictions and imports stimulations, such as, abolition of preferential tax rates and credit supports in export, and import liberalization; capital balance policies stimulating outward investment and outward aids; expansionary fiscal policy and easing monetary policies to enlarge aggregate demand; adjustment inflation policies with features of raising domestic prices and wages policies.

To study the issue of yen revaluation in depth, Japan established the Seminar on Exchange Rate Policy in July 1971. The seminar argued that Japan's persistent large trade surplus should be attributed to basic imbalance. They refuted the against-yen-revaluation view based on the preconditions of gradual revaluation of yen. Their grounds are the followings:

(1)The accumulation of surplus in current transactions seems to accord with Japan's economic benefit, but it will depresses domestic consumption, investment and government expenditures and make them lower than those of production, and it will import inflation from deficit countries and aggravate difficulties in international financial cooperation.

(2)Reforming international currency system to overcome the weakness of dollar standard needs a long time to acquire agreement among many countries, and it can't be realized by Japan's own strength. Therefore, it's urgent for Japan to correct unfavorable impacts of persistent trade surplus on real economy.

(3)Although yen revaluation aggravates competitions that Japanese enterprises faced in oversea markets, there is great possibility that the unfavorable impacts of yen gradual revaluation will be absorbed by the transitional processes, considering into their continuous enhancement of competitive capabilities. At the same time, expansionary fiscal policy can overcome the fall in domestic demand and the rise in unemployment.

(4)Under conditions of persistent surplus in balances of payment, it is necessary to change the value of yen substantially to adjust imbalance in BOP. The large and sharp changes in domestic currency generally produce important shocks on economy, while negative effects of gradual revaluation are moderate.

(5)Although yen revaluation will cause negative effect on productivity progress and economic growth through restricting the growth in enterprises' profits and salaries, the engines of economic growth decide on basic factors, such as, fixed capital investment and technological progress, rather than the relationship between salary growth and productivity progress.

(6)The target of yen revaluation is to reduce negative effects of imbalance in BOP on Japan's overall economy, and price policy is just one factor of yen revaluation. The integration of yen revaluation and import liberalization will produce satisfactory effects on the adjustment in BOP and the stability of domestic prices.

(7)Yen revaluation will help the yen to become stronger domestically through enhancing its outward purchase power (Kwan, 2009).

Based on above benefits of a strong yen, the seminar thought that it is too late for the yen to shift from managed floating to freely floating and suggested Japanese government should choose proactively yen revaluation again or free floating sooner. However, this view couldn't get wide support from the public. The government adopted a highly loose monetary and fiscal policy. Hence, Japan had to face both ways of real appreciation through nominal appreciation and "adjustment inflation". In fact, a real revaluation through inflation is at least as bad as a nominal appreciation for export industries, because inflation has a negative effect on resources allocation efficiency of market prices[1].

3.3.3 Revaluation Expectation and Capital Movement Controls

Under the background of increase in the pressure of yen revaluation and capital inflows, the foreign exchange concentration system was abolished, and the possession of foreign currencies by residents was liberalized in May 1972. To hold down the rapid growth of foreign exchange reserves, the authorities not only loosened controls on capital outflows, but also discouraged capital inflows. Japanese authority imposed more strict capital controls in 1972, such as, the restrictions in receiving advances on contracted exports, high reserve requirements on increases in non-resident free yen deposits, and upper limit on the ratio of amount of Japanese securities purchases to that of sales for non-residents (Fukao, 1990).

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[1] Fukao(2003) strongly criticized the opinion of "adjustment inflation", and he called these economists as "pseudo-economists". He thought that these politicians and pseudo-economists couldn't understand the principle, in terms of exporters, a real appreciation through inflation is as bad as a nominal appreciation.

As seen in Figure 3.5, Japan's long-term capital outflows rose substantially with the expansion of foreign direct investments, credits related to plant exports, and loans for acquiring overseas resources and securing distribution channels. However, short term capital outflows and foreign securities investment didn't expand under the anticipation that the dollar would devaluate in the near future. In fact, with the intention to obtain huge uncovered profit from yen revaluation and interest differentials, short-term foreign capital persistently flowed into Japan. However, the size of short-term capital inflows was relatively small due to Japan's strict capital controls.

### 3.3.4 Foreign Exchange Market Intervention

In the intervention of the foreign exchange market, the Bank of Japan acts as the agent of the Ministry of Finance under the Foreign Exchange Fund Special Account. When BOJ purchases foreign exchange currencies, the balance of government foreign assets increases, while the balance of government deposits at the central bank decreases. The decrease in government deposits is corresponding to increase in the deposits of commercial banks at the central bank. Thus, the official foreign exchange market intervention immediately changes monetary base at the prevailing exchange rate. In order to restore part or all of monetary base and government deposits, the BOJ purchases foreign exchange positions from the Foreign Exchange Fund Special Account, and the amount of cash that the BOJ uses to purchase foreign exchange bills is financed by issuance of Central Bank Notes. Therefore, Japanese monetary authorities' intervention is fully sterilized. The balance in the account of official foreign reserves of the central bank is affected through this foreign exchange market intervention.

Figure 3.5　Japan's Capital Transactions, 1961-1973　(in percent of GDP)
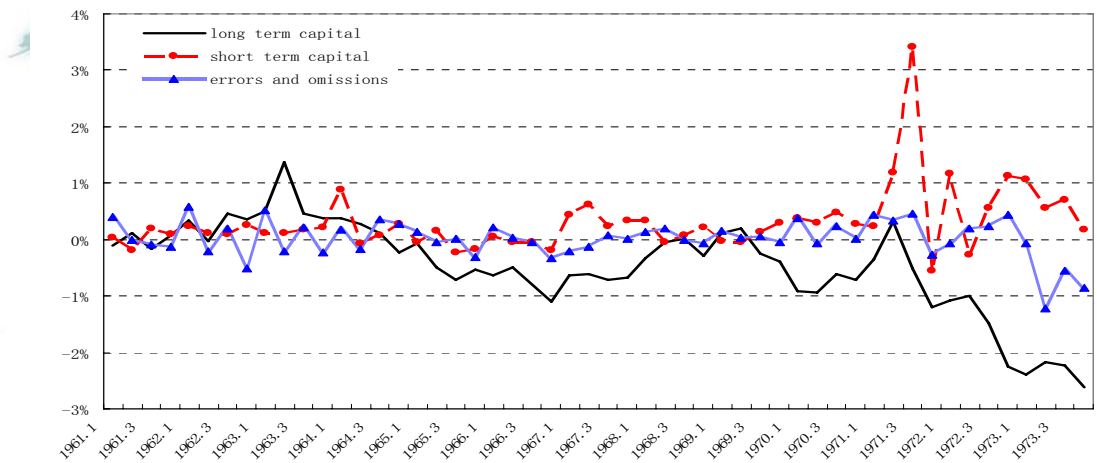
Source: Balance of Payments Monthly (various issues) and IFS.

Figure 3.6　Japan's Official Foreign Exchange Intervention: 1968-1974 (in billions of USD)
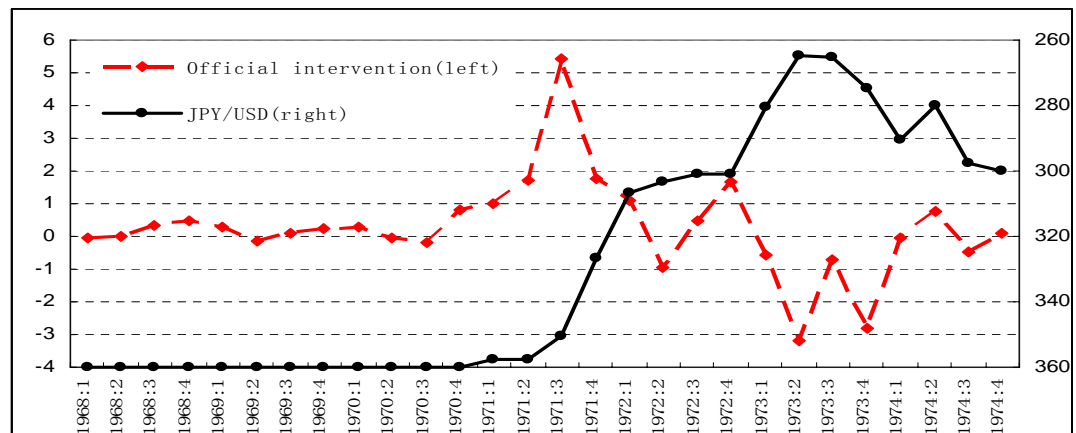
Source: IFS and the author's calculations.

Because the intervention data of the Japanese authorities is not public before 1991, it is impossible to obtain the data on a daily or weekly basis. In this paper, we use the approach of

Takagi (1989) to acquire a proxy of the amount of official foreign exchange market intervention by calculating changes in the end-of-period balance of foreign exchange reserves (RES) on quarterly basis adjusted for estimated interest earnings during this period. One such proxy can be given by:

$$I_t = RES_t - RES_{t-1} - R_{TBt}[(RES_t + RES_{t-1})/2]$$

where I_t is amount of intervention during period t, RES_t is foreign exchange reserves at the end of period t, R_{TBt} is average six-month U.S. Treasury bill rate during period t, all variables are denominated in U.S. dollar.

As Figure 3.6 shows, Japan actually hadn't conducted meaningfully official intervention in foreign exchange market before 1970. However, in 1970, with an attempt to mitigate the strong one-way anticipation of the yen revaluation and maintain fixed exchange parity, Japanese monetary authorities implemented official intervention through purchasing dollars and selling yens. During the period from the winter 1970 to the end of 1972, the authority had purchased 13 billion dollars, and in the fall of 1971, the amount of dollars purchase peaked at 5.4 billion.

In the summer of 1973, the yen exchange rate peaked at 265 yen per dollar, and then the yen began to depreciate, the monetary authority stepped into foreign exchange market to support yen by selling dollar and purchasing yen. In 1974, when depreciation of the yen became gradual, the amount of dollar selling of the authority declined substantially, and the exchange rate of the yen had been stabilized at around 300 JPY/USD from mid-1974 to mid-1976.

3.3.5 Attempts to Stabilize Exchange Rate and Mistakes in Macroeconomic Polices

After the Nixon Shock, the yen immediately revalued from the old parity of ￥360 per USD to 340, and reached 315 at the end of 1971 in spite of exchange market intervention of the authority. In order to counteract deflationary impacts of the yen revaluation, Japanese government implemented relaxed fiscal and monetary policy. Another target of the expansionary macroeconomic policy is to reduce current surplus and avoid a further revaluation of domestic currency. Then, the Simthsonian Agreement was reached in December 1971, the IMF parity was revalued to ￥308/US$, and exchange rate fluctuation band was widened to ±2.5%. The extent of yen revaluation was much higher than generally anticipated, and hence fiscal and monetary policy was further relaxed.

Figure 3.7 Japan's Money Supply, CPI, and JPY/USD Rate, 1970-1973
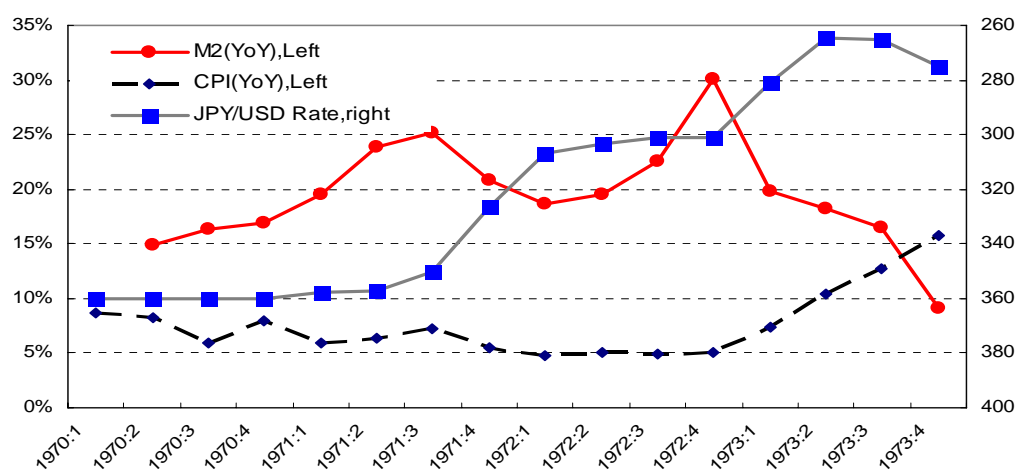
Source: Annual Economic Statistics (various issues) and CEIC.

Japanese current account surplus continued to expand due to the "J-curve" effect even after the substantial revaluation of the yen (Figure 3.5). From the middle of 1972, the pressure of yen appreciation strengthened, and the yen stuck at the upper end of the band around ￥308/US$. In an attempt to avoid another revaluation, the Bank of Japan further reduced its discount rate to 4.25 percent, the lowest in the postwar era, and the government introduced an expansionary fiscal policy to stimulate the economy. This was a fatal mistake because the growth rate of money supply (M2) had already attained 20%. Such extremely loose monetary

and fiscal policy maintained in the Fiscal Year 1973. Even with these efforts, the stability of the yen exchange rate couldn't be maintained, and the yen eventually floated with other currencies after the dollar crisis in February 1973.

An unavoidable consequence of such loose monetary and fiscal policy is high inflation. As seen in Figure 3.7, inflation had started to accelerate since early 1973, and the Bank of Japan raised the discount rate to 6 percent. But it is too late, and inflation rate soon rose to double digits. The oil crisis worsened the high inflation, which peaked at 24 percent in 1974. Just after the oil crisis, the monetary and fiscal policy was sharply tightened, and Japanese economy decelerated rapidly and recorded a minus growth in 1974 first time in the postwar era. The Japanese authorities' long resistance to exchange rate flexibility from 1969 to 1972 had eventually resulted in hyperinflation in 1973-74 (Kuroda, 2004).

3.4 1973-1980: Freely Floating Rate with Capital Transactions Controls
3.4.1 Exchange Rate Stabilizations and Swift Changes in Capital Controls

Foreign exchange controls in the period of the yen appreciation were aimed to suppress capital inflows and encourage capital outflows. But when the currency began to become weak, the controls turned toward the opposite side, suppressing capital outflows and welcoming capital inflows. As Figure 3.8 and Figure 3.9 show, from mid-1973 to mid-1974, Japan's current balance recorded deficit, the deficit reached 2% of GDP, due to Japan's overheated economy and effects of yen revaluation. At the same time, the oil crisis in October 1973 exacerbated the existed severe inflation in Japan. Hence, the selling pressure on the yen had developed in 1974.

Figure 3.8 Japan's Capital Transactions and Average Exchange Rate, 1973-1980 (in percent of GDP)
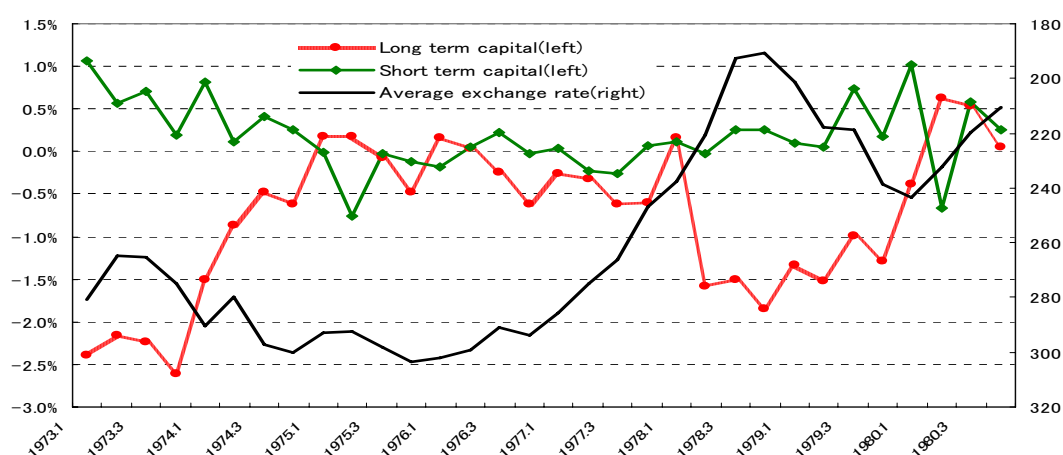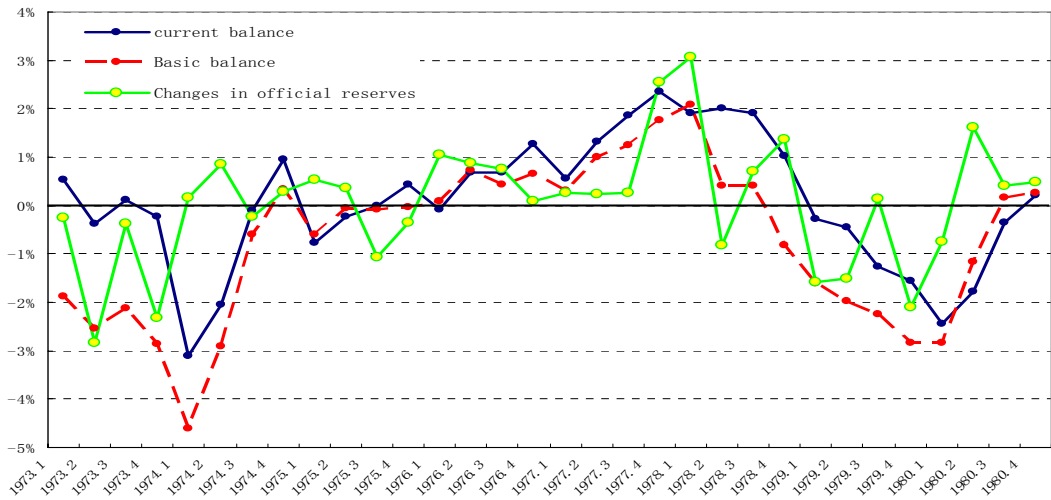

Source: Balance of Payments Monthly (various issues) and CEIC.

With increased depreciation pressure on the yen, the authority first abolished exchange controls on capital inflows and then strengthened controls on capital outflows. Controls on zero net increase in the amount of inward securities investment were abolished at the end of 1973. The ratio of reserve requirement on the increase in non-resident free yen deposits were decreased at the same time. Controls on receiving prepayments on contracted exports were relaxed in early 1974. On the other side, controls on capital outflows tightened significantly at the same time, such as, the mechanism of voluntary restraints on net increase in foreign investment was introduced for banks, securities companies, investment trusts, and insurance companies; controls on zero net increase in residents' foreign currency deposits.

At the end of 1974, Japan's current account nearly returned to balance when the economy entered into a recession. Japan recorded current balance surplus partly due to relatively slow recovery in 1975, and it continued to obtain trade surplus in 1976. Since 1977, the amount of foreign exchange reserves and foreign exchange position held by private sector increased, and the yen purchase pressure began to strengthen. To alleviate the pressure of the yen appreciation in 1977, the authority undertook official market intervention through buying the dollar and selling the yen, and relaxed capital export controls while strengthened restrictions on capital import. Controls on the outstanding balances of foreign currency deposits held by residents and the investment in short-term foreign securities by residents were abolished in

June 1977. Also, a 50% reserve requirement on increased in the free yen deposits was introduced in November 1977, and the reserve ratio reached 100%, which means that the increase in free yen accounts really has no interest payment. In addition, the investment in yen-denominated securities was strictly controlled.

Figure 3.9 Japan's Balance of Payments, 1973-80   (in percent of GDP)

Source: Balance of Payments Monthly (various issues) and IFS.

The yen continued to appreciate until November 1978, when the Cater administration announced the dollar support measures. Due to effects of high yen and the expansion of Japanese economy, the surplus in current balance shrank rapidly and turned negative in 1979. The second oil crisis caused a large increase in crude oil prices, and which further worsened the imbalance of Japan's current transactions. Thus, Japan's current account recorded deficits in 1979 and 1980. Facing this changing situation, the exchange controls again shifted to the opposite direction that imposed during the high yen period, such as abolishment of capital inflow controls, and cancellation of prohibition of non-resident participation in repo transactions in 1979.

3.4.2 Features of Capital Movements under Floating Rate System

As seen in Figure 3.8 and Figure 3.10, Japan's long–term capital transactions fluctuated substantially during the period between 1973 and 1980. When the appreciation pressure of the yen strengthened, the authorities encouraged capital exports particularly outward direct investment to alleviate the appreciation pressure. On the other side, when the yen was weak, the authorities strengthened restrictions on capital outflows and outward direct investment. During the period between 1971 and 1973, when the yen showed a strong revaluation trend, Japan's capital exports particularly net foreign direct investment increased rapidly until the end of 1973, and the net capital export peaked 2.5% of GDP in the that year. When the yen became weak in 1974, Japan's net foreign direct investment shrank quickly. When the yen became strong in 1978, the amount of Japan's outward foreign direct investment kept expanding until 1979.

However, Japan's short term capital movement became much stable after Japan shifted to floating exchange rate system, and the huge short-term capital inflows appeared in 1971 due to increase in import usance and advances on contracted exports was not seen again. The reason for the lack of large short-term capital movement may be attributed to the fact that, large and uncertain changes in exchange rate were possible under a floating rate, in contrast to the one-way option under a fixed rate, hence, short-term exchange rate speculation was much more risky. Thus, Japan's shift from fixed rate to floating rate in the spring 1973 caused a major change in exchange risk associated with holding assets and liabilities denominated in foreign currencies. Under a fixed rate system, when a change in parity is expected, there existed a one-way option, which means that holding assets or liabilities in foreign currencies can obtain large profits without risk. However, under a floating rate, the holdings of foreign currency assets and liabilities are associated with large possibility of incurring a loss. This change of the risk structure meant a large decline in short-term capital mobility in comparison to that of fixed rate system. Therefore, the control of the exchange rate through foreign exchange market intervention became easier. However, when the foreign exchange market is

thin, such as, the low mobility of private capital flows, the authorities' refusal to finance current account balance would cause large fluctuations in the exchange rate (Fukao, 1990).

Figure 3.10 Japan's Outward FDI and Long-term Securities Investment (in billions of USD)
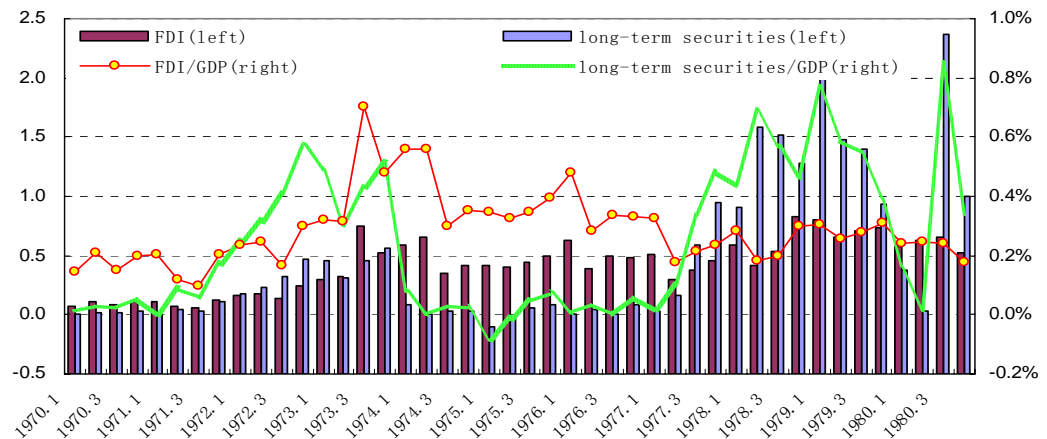

Source: Balance of Payments Monthly (various issues).

3.4.3 Foreign Exchange Market Intervention

In 1976, when the yen showed a sign of appreciation, the Japanese authority changed the direction of intervention, and began to purchase dollar and sell yen to support the dollar. The authority scaled down the amount of intervention and generally limited intervention to smooth operations to allow the gradual appreciation of the yen after the G7 meeting in 1976. However, when the yen appreciation accelerated in later 1977 and early 1978, the authority intervened heavily in market to suppress the strong appreciation pressure of the yen. To stabilize the currency, BOJ cooperated with central banks of United States, Germany, and Switzerland and implemented coordinated interventions by selling yen (Takagi, 1989).

As seen in Figure 3.11, the yen began to depreciate sharply at the end of 1978 and continued rapid decline until the end of 1979, and the exchange rate of the yen versus the dollar declined from around 190 to 240. As a response, BOJ's intervention to support the yen was massive in the winter of 1978 and spring of 1979. In 1980, the exchange rate of yen recovered gradually, and the intervention limited to a small amount.

Figure 3.11 Japan's Official Foreign Exchange Intervention (in billions of USD)
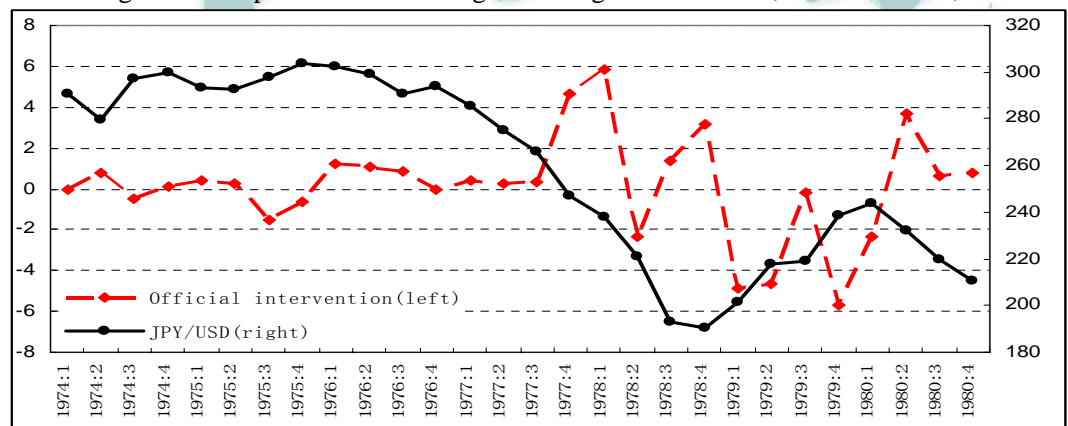
Source: BIS and author's calculation.

As shown in Figure 3.12, Japanese foreign exchange reserves and real effective exchange rate of the yen showed a highly concurrent movement relationship, which means that Japan's official intervention in the foreign exchange market followed "leaning-against-the-wind" strategy in 1970s. In this period, the liberation of international capital transactions was relatively limited, private capital movements was relatively small, hence it is essential for Japanese authorities to intervene in the foreign exchange market to finance the imbalance of current transactions. For example, in 1977 and 1978, nearly two thirds of Japan's surplus in current balance was financed by the increase in official foreign reserves. In spite of heavy

interventions, both real effective exchange rate and nominal exchange rate of the yen rose substantially between 1977 and 1978. Thus, official intervention cannot absorb the current account surplus and eliminate the pressure of appreciation ex ante.

In sum, with the increase in current surplus and relatively strict controls on foreign exchange, the private sector couldn't absorb a large amount of foreign currency assets due to insufficient outward investment opportunities (securities investment and FDI), and this leads to a selling pressure in foreign currency assets (the dollar). To mitigate the appreciation pressure of domestic currency, the Japanese authority passively carried out official dollar purchase to absorb large current account surplus. The passive official intervention would lead to a large appreciation of the domestic currency. If the authorities implemented aggressive intervention measures by absorbing surplus in current balance into official foreign reserves, this would give rise to one-way option similar to that of the summer in 1971. Therefore, with the trend of rising current surplus in Japan, the appreciation of the yen can't be avoided.

Figure 3.12 Japan's Real Effective Exchange Rate and Foreign Exchange Reserves, 1971-1980

(Spring, 1971=100)
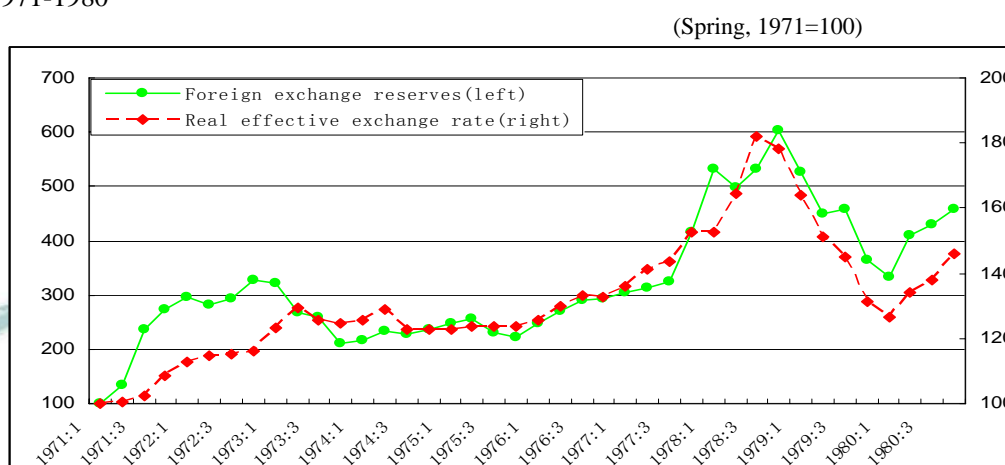
Source: BIS and IFS.

3.5 1980-1990: A Floating Exchange Rate under Free Capital Mobility
3.5.1 The New Foreign Exchange Law

In December 1980, a new foreign exchange law, the Law Partially Revising the Foreign Exchange and Foreign Trade Control Law, was implemented. In comparison to the old law, the new law shifted fundamentally the basic principle of foreign exchange controls in Japan from that of "prohibition of foreign transactions with exceptions" to "freedom of transactions with exceptions".

Under this law, Japanese residents could buy and sell foreign currency assets freely if they dealt with authorized foreign exchange banks and designated securities companies as their counterparties (Fukao, 2003). Moreover, non-residents could freely deposit the yen and foreign currencies in Japanese banks, but the interest rates on yen deposits were subject to the upper limit of the Temporary Interest Rate Adjustment Law. The restrictions on foreign securities investment by institutional investors such as life and casualty insurance companies, trust banks, and the postal life insurance system still maintained, and they were liberalized in 1980s.

Regarding capital transactions, the new law imposed some control measures in the following emergency situations: (1) when maintenance of balance of payments equilibrium was difficult; (2) in the case of sharp fluctuations in the foreign exchange market; (3) when financial market were adversely affected because of international capital movements (Fukao, 1990).

3.5.2 Japan's Capital Movements

With the liberalization of international capital transactions and high interest rates in the United States in the first half of 1980s, Japan's outward foreign securities investments became quite active, and the yen followed a downward trend until the beginning of 1985. In response to the weakness of the yen, Japan's current account surplus increased substantially. In the spring of 1985, the downward trend of the yen reversed and began to show a strong upward trend. After the Plaza Agreement, the yen had experienced a sharp appreciation.

As seen in Figure 3.13, there existed large differences in the trends of current balance, basic balance and changes in official reserves. The divergence between current balance and basic balance was the huge increase in long-term capital outflows, particularly the sharp increase in long-term foreign securities investment of the private sector. With the increasing deficits in basic balance, the rise in Japan's foreign exchange reserves reflected the fact that there existed large inflows of short-term capital through foreign exchange banks.

Figure 3.13 Japan's Balance of Payments, 1980-1991   (in percent of GDP)
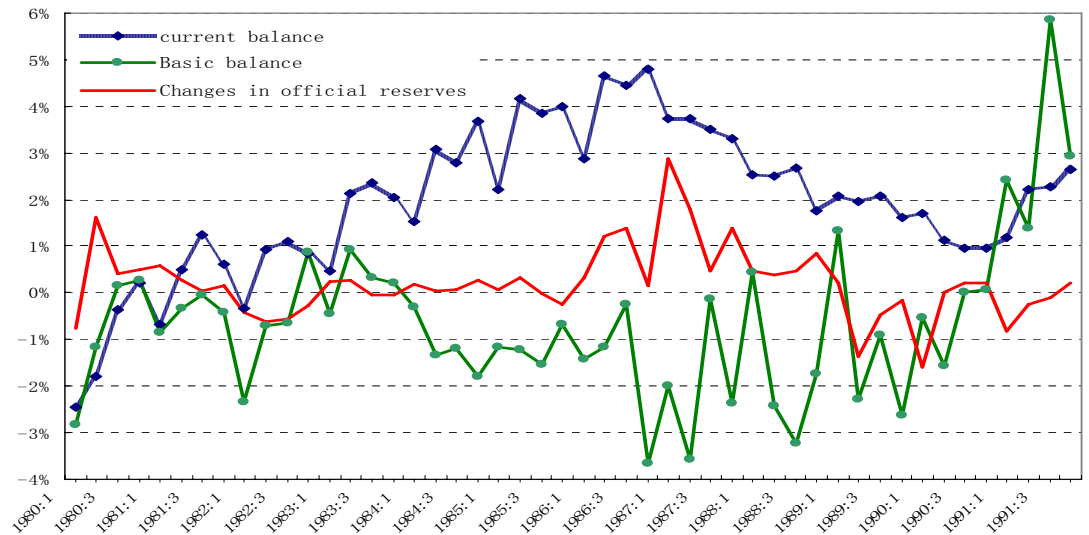
Source: Balance of Payments Monthly (various issues).

Figure 3.14 Japan's Capital Transactions, 1980-1991   (in percent of GDP)
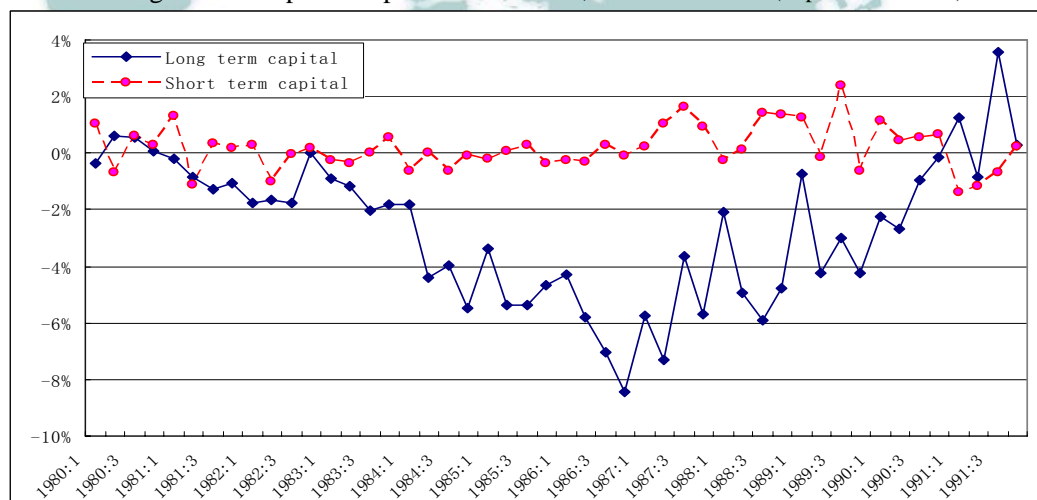
Source: Balance of Payments Monthly (various issues).

During the period between 1983 and 1990, the current account surplus and private banking sector short-term capital inflows continued, which was corresponding to the huge outflows of long-term capital in the form of oversea securities investment and FDI, and the increase in official exchange reserves. The outflow of long-term capital corresponding to the net inflow of short-term capital may be seen that Japan's role of international financial intermediary at a certain degree (Fukao, 1990). In fact, the volume of outflows of long-term capital was much larger than that of short-term capital inflows (see Figure 3.14), adding the persistent surplus in current account, which means that Japan was more a saver than a financial intermediary to the rest of the world.

### 3.5.3 Japan's Long-term Capital Outflow

With the implementation of the new foreign exchange law, the demand for domestic assets was low and there was a rapid liberalization of foreign securities investments for institutional investors in the first half years of 1980s. Such as, pension trusts and the postal life insurance system were permitted to invest up to 10% of total assets in foreign currency-denominated

instruments in January 1981, and May 1983 respectively.

Because of the extremely high interest rates in the United States and the slow recovery of Japanese economy, there was a substantial increase in Japan's oversea long-term securities investment (see Figure 3.15), and which resulted in strong pressure of selling yen between 1981 and 1985. As a response to the weak yen, the monetary authority introduced temporary exchange controls on foreign securities investment. For example, insurance companies, pension trusts, and postal life insurance system were subject to upper limit on increase in foreign exchange investment. When the yen experienced sharp appreciation after 1985, such upper limits on the ratio of foreign securities holding to total assets were significantly loosened.

Between 1985 and mid-1987, Japan had experienced the expansion of the investment of oversea securities despite the sharp depreciation of the dollar and the fall in interest rates in the United States. This expansion could be attributed to liberalization in foreign securities investment controls on institutional investors and expectation that the weakness of the dollar would be reversed soon. However, the holdings of dollar assets by Japanese institutional investors had incurred large capital loss due to huge depreciation of the dollar. Japanese institutional investors hence reduced their foreign securities investment in mid-1987 and thereafter, and which strengthened the yen vis-à-vis the dollar.

Figure 3.15 Japan's Outward FDI and Long-term Securities Investment (in billions of USD)
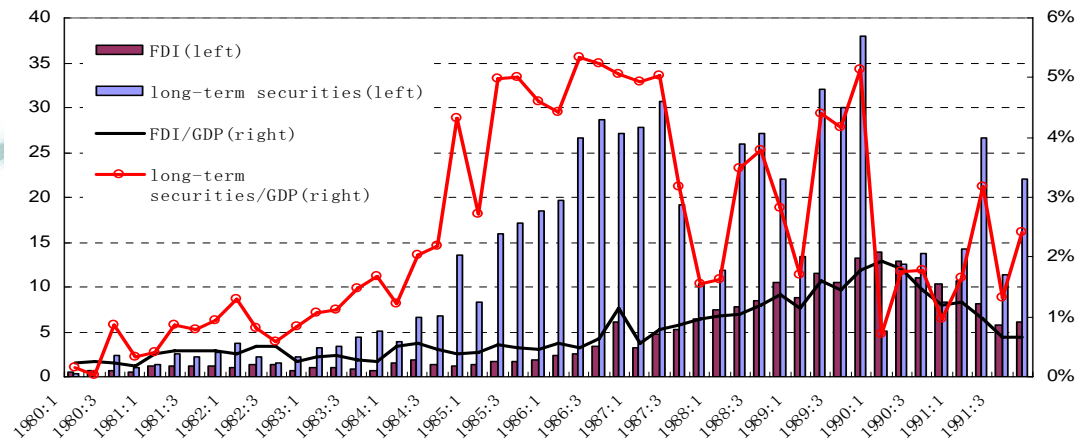
Source: Balance of Payments Monthly (various issues).

With subsequent substantial depreciation of the dollar and fall in interest rates in the United States after the Plaza Agreement, Japan's foreign securities investment faced rising exchange rates risks and downward interest revenues, thus there was a fall in the ratio of outstanding foreign securities investment to overall assets. The share of long-term foreign securities investment in GDP fell from the peak 5% to around 2%. In fact, many institutional investors' real investment level was far below the upper limit, which means that the upper limit is not a binding constraint.

The expansion of Japan's foreign direct investment was accelerated by the yen's appreciation. Comparing to large fluctuations in foreign securities investments, Japan' outward FDI had shown a strong and stable growth trend despite rising exchange rate risks. The percentage of the Japanese surplus in current balance that was financed by FDI continued to rise, and peaked at 2% of GDP by the first quarter of 1990, and which surpassed that of current surplus.

As a growing important player in the world trade and economy, it was essential for Japan to control resources supply sources, establish oversea marketing channels, and mitigate trade disputes through FDI. In fact, FDI is an efficient way to hedge the risk of exchange rate and inflation through investment in real assets rather than nominal securities. Because the time horizon for FDI is quite long, even if inflation and currency depreciation occurred in the receiving country, there existed a considerable hedge opportunities through the increase in prices of acquired real assets.
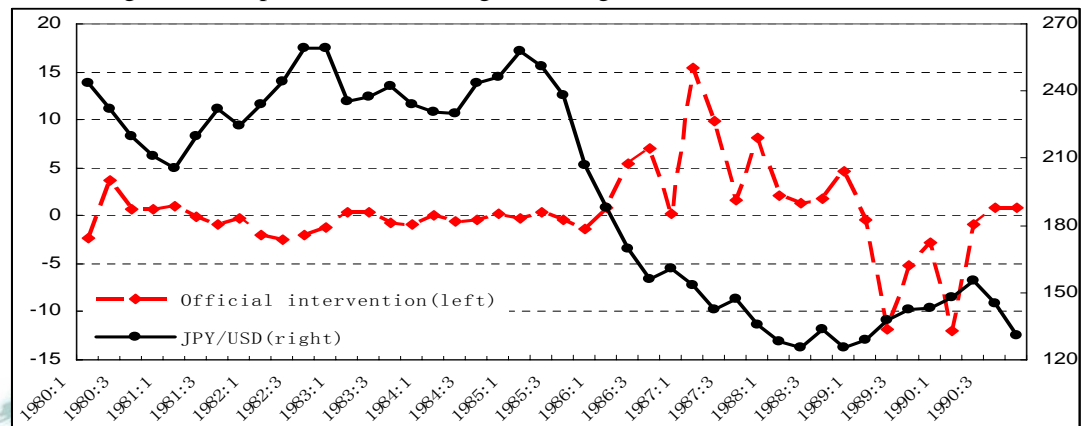
3.5.4 Foreign Exchange Market Intervention

In Figure 3.16, we can clearly see that the emphasis was placed exclusively on the nominal value of the yen against the dollar when the Japanese authorities intervened in foreign

exchange market. In early half of 1980s, particularly 1983-85, the yen showed a sign of weakness, the Japanese authority refrained from active intervention in foreign exchange market, although they sell dollar occasionally in coordinated with the central banks of other major countries.

The yen began sharp and sustained appreciation following the Plaza Agreement in September 1985. The Bank of Japan joined the central banks of other G-5 countries in selling dollars on massive scale in coordinated intervention from late September through the end of October. However, when the yen arrived around 200 to the dollar in late 1985, the stance of intervention shifted from appreciating the yen to stabilizing the yen, though with little apparent success (Takagi, 1989). With further appreciation of the yen in 1986, the authority heavily intervened in the foreign exchange market by buying massive dollars.

Figure 3.16 Japan's Official Foreign Exchange Intervention   (in billions of USD)

Source: BIS and author's calculation.

In late February 1987, the authorities of G-6 declared that they would intervene in the foreign exchange market to help to maintain the exchange rate of main currencies at "around current levels" based on the Louvre Accord. To restore stability of the yen as soon as possible, the Bank of Japan intervened in the market actively. We can see the huge size of intervention of Japanese authority in Figure 3.16, the average intervention scale was around 8 billion dollar on quarter basis in the year of 1987-88.

During the period of between 1989 and mid-1990, the yen showed an evident sign of weakness, the Bank of Japan intervened heavily in the market by selling massive amount of dollars to support the yen. When the purchase pressure of the yen increased gradually in 1990, the authority changed intervention direction immediately, but the size of intervention scaled down substantially.

3.5.5 The Plaza Agreement, Assets Bubble and Mistakes in Monetary Policy

In the early 1980s, the United States faced the problems of "twin deficits": the coexistence of the government deficit and current account deficit. The implementation of a tight monetary policy to overcome high inflation and an expansionary fiscal policy featured with huge tax cuts and military expenditures increase in the United States had given rise to high interest rates and strong dollar, and which further brought about a huge government deficit and an equally large current account deficit. At that time, there were strong protectionism sentiments and movements in industries and Congress of U.S. At the same time, other G5 countries were closely concerned the increasing protectionism in U.S. and feared that it could ruin the multilateral trading system.

On September 22, 1985, the famous Plaza Agreement was signed, and the G5 agreed that they would jointly intervene in the foreign exchange market to depreciate the significantly overvalued dollar. Then the dollar had experienced rapid and substantial depreciation particularly vis-à-vis the yen in the subsequent two years. The dollar fell from around 240 yen to below 200 in three months, and continued to decline throughout 1986 and reached 160 at the end of this year. This means that the yen had appreciated 50% in fifteen months (see Figure 3.16).

Figure 3.16　Japan's Money Supply, CPI, and JPY/USD Rate, 1980-1991
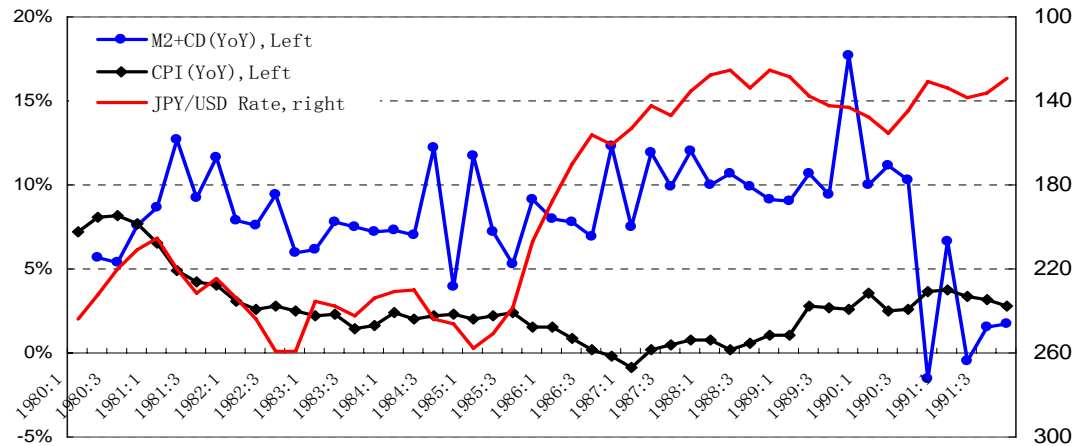
Source: Economic Statistics Annual (various issues) and IFS.

The Japanese economy was severely depressed by the sudden, substantial appreciation of the yen, and authorities implemented a series of economic policies to stimulate the economy. But the economy didn't respond to these stimulating policy actions with the uncertainty expectations on the yen's exchange rate. Under the pressures of strong criticisms from industrialists and politicians, the Japanese government negotiated with the U.S. to stop further depreciation of the dollar, and finally the "Louvre Accord" was reached by the G6 countries on February 22, 1987. After the "Louvre Accord", the dollar continued to depreciate vis-à-vis the yen, and reached the trough and stabilized around 130 in 1988.

In order to overcome the depression effects of huge appreciation of the yen, the Bank of Japan implemented extremely loose monetary policy in the period between 1986 and mid-1989. The Bank of Japan reduced the discount rate four times in 1986, and the discount rate fall from 5% at the end of 1985 to 2.5% in February 1987(see Figure 3.17). The growth of money supply began to accelerate in the third quarter of 1985, and M2+CD kept increasing at the speed of two digits in the period from 1987 to the autumn of 1990. However, prices were quite stable, the CPI even declined slightly in late 1986 and early 1987, and which possibly reflected the deflationary effect of substantial appreciation of the yen.

Figure 3.17　Japan's asset price index and discount rate, 1980-1991
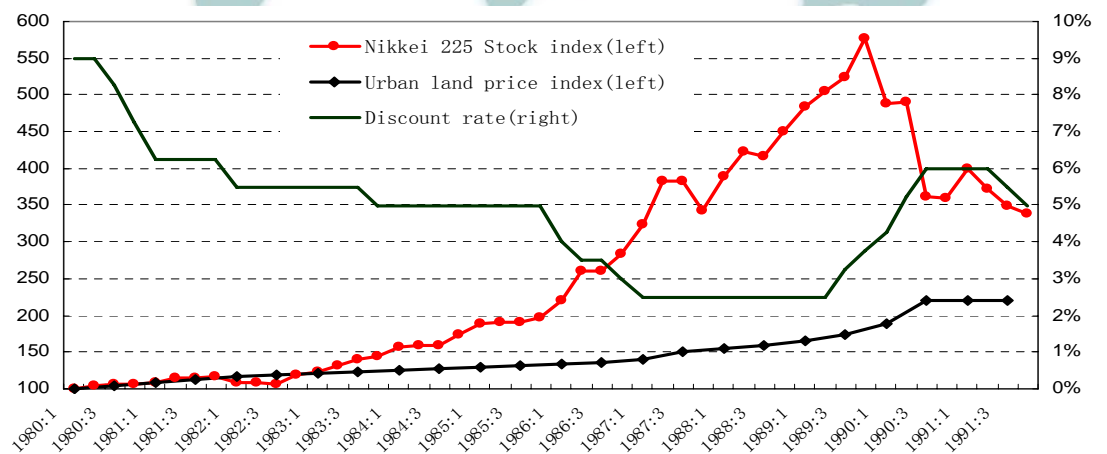
Source: Economic Statistics Annual (various issues) and CEIC.

The implied sign of the stability of prices was so misguiding that it was publicly regarded that Japanese economy was not heated. However, in fact, the Japanese economy became overheated in 1987, the asset prices, such as stock prices and urban land prices were rising rapidly and the surplus in current balance was declining sharply. Thus, to calm down the economy, Japan's monetary policy should have tightened. Unfortunately, on October 19, 1978 the "Black Monday" crash occurred, the Bank of Japan could not raise the discount rate to coordinate with the United States. The extremely low interest rates and over expansion of

money supply, caused commercial bank lending overly expanded, particularly to the real estate and construction sectors. The Bank of Japan first raised the discount rate in May 1989. But it was too late, the bubble economy was full blown.

To depress the asset bubbles, the Bank of Japan had raised the discount rates five times during the period between mid-1989 and August 1990, and the discount rate rose rapidly from 2.5% to 6%. The stock prices soon collapsed in 1990, and the land bubble burst in 1991. The real economy began to slow down in 1991. The sharp asset deflation and severe economic downturn resulted in huge nonperforming loans in the banking sector, and the long growth slump of the Japanese continued for more than ten years. It is obvious that the monetary policy was overly stern, and which produced calamitous impacts on Japanese economy. If Japanese asset bubbles could land softly, the negative effect of the gradual decline of asset bubbles might be much moderate. Therefore, the Japanese authorities' efforts to overcome the deflationary impact from the yen's appreciation in 1985-89 created a huge asset bubble, which subsequently burst, leading to a long economic stagnation of 1990s and 2000s, the so-called "lost decade"(Kuroda, 2004).

3.6 Conclusions

The major conclusions of this chapter are as follows:

(1) It is much more difficult for Japanese monetary authority to restrict capital movements after it liberalized current account by 1964 with the rapid expansion of foreign trade, due to trade-related of capital movements, such as, trade credit, leads and lags. Although Japan imposed so tight controls on capital movements that they even hindered current transactions before the immediate end of pegged rate regime, it couldn't suppress the huge inflow of short-term capital. Therefore, for a country that actively involved in current transactions, such as Japan and China, it is extremely difficult to imposed strict and effective capital controls without hurting current transactions under conditions of free current account.

(2) Japan's experience in the period of 1971-73 indicates that the managed floating rate regime is a transitional system and it should shift to the floating rate regime. Japan also faced the classical problem of "Impossible Trinity". Japanese authority attempted to seek the autonomy of monetary policy and fixed or quasi-fixed[①] rate regime while imposed tight controls on capital movements. However, the authority couldn't control capital mobility effectively with liberalization in current transactions. Therefore, Japan could neither keep pegged rate nor maintain an independent monetary policy. If Japan had shifted to floating in 1972, the high inflation in 1973 should have minimized.

(3) Japan's experience in the period between 1973 and 1980 shows that it is possible to implement freely floating rate while maintaining restrictions on capital transactions. In this regard, China can implement freely floating rate while maintain capital transactions controls. In fact, this view has been increasingly accepted around the world after the Asian financial crisis in 1997[②]. Under such restricted floating rate regime, the exchange rate will be determined in domestic foreign exchange rate market. With no allowance of the participation of foreign investors, the domestic foreign exchange market will be shin and shallow, hence a relatively small change in current balance will possibly produce a large fluctuation in domestic currency. Therefore, the government should enter into the market to act as the dominant seller or buyer of foreign currencies. However, the merit of this regime is that it can help the practiced countries, particularly emerging countries to avoid the attack of huge sudden capital movements likes the Asian financial crisis.

(4)Japan's shift from fixed exchange rate to freely floating rate tells us that the exchange risk under floating rate regime is much higher than that of fixed rate system. Under fixed exchange rate regime when a change in parity is expected, there always existed one way option, in which the holding assets or liabilities denominated in foreign currency can obtain profits without risks. This will attract large short term capital inflow or outflow. However,

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[①]In fact, managed floating rate regime is very similar to fixed rate system. The fixed parity is pegged at an anchor currency, while the managed floating rate is pegged to a basket of currencies. Thus, managed floating rate is much more difficult to manage comparing to fixed exchange rate system. China's current managed floating rate regime is much heavily depended on the management, and just includes a little factor of floating. In consideration to maintain the stability of the RMB versus the dollar, the rate regime of RMB has really returned to peg at the dollar during the period of US financial crisis.

[②]Aramaki(2006) made a detail survey on the stance changes of IMF about the liberalization of exchange rate while capital transactions restricted.

there existed no such opportunities that can provide sure profits under the floating rate, hence, the holding of foreign assets or liabilities will have a large possibilities of incurring a loss, and this will discourage the movements of speculative short term capital. Thus, a floating exchange rate is a solution to the persistent short-term capital inflow.

(5)With persistent and huge surplus in current balance, the relatively gradual growth of Japanese foreign exchange reserves should be attributed to the policy of the encouragement of long-term capital outflow, particularly outward foreign direct investment. The expansion of capital outflow is not only help to realize the approximate balance of Japan's payments but also conducive to maintain the relative stability of the yen.

(6)The Japanese authority's intervention in foreign exchange market can't hold down the appreciation pressure of the yen. The "leaning-against-the-wind" passive official intervention would lead to a large appreciation of the domestic currency, while the aggressive interventions would give rise to one-way option similar to that of the summer in 1971.

(7) It is not yen appreciation but Japanese authorities' overly expansionary macroeconomic policies to overcome the deflationary impact of yen appreciation caused Japanese assets bubble and long slack economic growth. The sharp appreciation of the yen may be partly attributed to Japanese authorities' long resistance to exchange rate flexibility.

(8)The flexibilities that Japanese enterprises had manifested against the yen appreciation are much better than the expectations of government officials. Although the yen appreciation had produced negative impacts on Japanese economy, Japan has successively improved industrial structure and enhanced enterprises' competitive capabilities under great pressure of yen appreciation. However, the problem is that the yen appreciated too substantially and sharply.

(9) For a large and relatively closed economy like Japan with an export/GDP ratio of 10% in the early 1970s, it was impossible to abandon independent monetary policy as a macro instrument (Fukao, 2003). Thus, as a large and relatively closed economy, China should choose an independent monetary policy rather than a fixed exchange rate regime.

4. China's Recent Situations

This paper analyzes China's recent experience on foreign exchange controls under circumstances on strong revaluation expectation on domestic currency, and persistent and large capital inflow, focusing on highly managed floating rate, capital movements through some current accounts (circumventing capital regulations) and capital accounts (mainly FDI), and sterilized interventions. With rapid expansion in real transactions and skyrocketing size of foreign reserves, it is increasingly difficult to impose capital restrictions and implement sterilized interventions, hence China's monetary autonomy and stability of the local currency can't maintain simultaneously.

4.1 Basic Institutional Environment

4.1.1 Foreign Exchange Rate Regime: Shifting from Pegged to Managed Floating

On July 21, 2005, China implemented currency reform and introduced a new exchange rate system called "Managed Floating Exchange Rate" based on BBC (Band, Basket, and Crawling), and allowed RMB for a small and first revaluation from 8.28 to 8.11 RMB per US dollar. Before that, the Chinese authorities pegged the RMB price of the US dollar within a very narrow range. Regarding the band, the authority officially limited the daily range of fluctuation of the RMB verses US dollar to±0.3%, and which was widened to±0.5% later, but the actual fluctuation range of the RMB is much narrower. On the basket, the regime of RMB exchange rate was shifted from strictly pegged at US dollar to a basket of main currencies, such as, dollar, euro and yen. Regarding the crawling, the authority allowed the RMB appreciate gradually against the dollar, and Chinese authority had to intervene massively in foreign exchange market to keep the RMB from rising fast. Under the one way option of stable appreciation of the RMB, large speculative capital flowed into China and induced commodities and assets bubble, to address increasing pressure on inflation and foreign reserves, the pace of appreciation of the RMB accelerated in 2007. Since the late half of 2008, with unfolding of the global financial crisis and strong appreciation of US dollar, the RMB has stopped appreciation against dollar and actually returned back to peg at US dollar. Therefore, the RMB has appreciated significantly since the US financial crisis.

4.1.2 A Discriminating Regime of Capital Controls

China's approach to liberalization through selective easing of regulations is also similar to

Japan's experiences before the comprehensive liberalization of capital account. With liberalization of current transactions in 1996 and WTO entry in 2001, China's current account has been quite free. As Japan did before 1980, China implements a principle of general prohibition in capital transactions, with exceptions of freedom. Under this regime, capital transactions are extensively regulated and authorization is awarded individually.

Despite official reluctance to relax exchange and capital control, China's own experience in recent years has shown that the effectiveness of capital control has, over time, diminished and the system has become difficult to sustain, especially given the fact that current account convertibility, while bringing about massive efficiency gains, has also created numerous leakage and loopholes for illicit capital flows. The economic and social costs associated with continued draconian control over capital movement have become ever larger and better recognized. In addition to imposing heavy administrative burden for the government, capital control has caused distortion in investment decisions by Chinese enterprisers and household.

Table 4.1   China's Regulations on Capital Transactions

	Outward Investment (Outflow of Capital)	Inward Investment (Inflow of Capital)
Direct Investment	-Authorization system (authorized by Ministry of Commerce (MOC) or its provincial branch, and State Administration of Foreign Exchange (SAFE))	-Authorization system (authorized by MOC)
Securities Investment	**Issuance of stocks and bonds** -prohibited by non-residents -International Finance Corporation (IFC) and Asian Development Bank (ADB) had once issued bonds denominated in RMB (panda bond)	**Overseas issuance of stocks by residents** -Authorization system (authorized by China Securities Regulatory Commission) **Overseas issuance of bonds by residents** -Authorization system (authorized by SAFE)
	Securities transactions -Prohibited in principle -Overseas portfolio investment allowed via the qualified domestic institutional investors (QDII)	**Stocks transactions** -Prohibited in principle (investment in B stocks liberalized) -Investment in A stocks permitted via the qualified foreign institutional investors (QFII) **Bonds transactions** -prohibited
Giving/ taking loans in foreign currency	-Only through financial institutions and other entities approved by MOC and SAFE (after-the-fact report required)	**Local financial institutions and enterprises** -Authorization system **Long-term loans** -Authorized by SAFE -To be implemented in accordance with Foreign Capital Utilization Plan **Short-term loans** -Financial institutions can take short term loans within balance sheet limit approved by SAFE (after-the-fact report required) -Subject to size limit
		Foreign financial institutions and enterprises -Free. - Subject to size limit (after-the-fact report required)

Source: Aramaki (2006) and Yu (2008a).

Current capital controls regimes with features of "discouraging capital inflows and encouraging capital outflows". Measures aimed at reducing capital inflows include: (1) Super-national treatment given to foreign banks, which allowed them to borrow abroad with

fewer restrictions than that of domestic banks were cancelled. (2) Capital inflows should be based on real transactions, and capital inflows originated from FDI must be paid to the designated recipients and not allowed to enter into and stay at the RMB accounts of enterprises to wait for the RMB to appreciate (Yu, 2008a).

China's regulatory system discriminates among different kind of cross-border capital movements (Table 4.1). Regarding the capital account, controls apply to about a quarter of the IMF categories (Ma and McCauley, 2007). Encouraging foreign direct investment (FDI) is China's long-held policy, and hence capital movements on this account and related trade credit account have potential opportunity to arbitrage yield spread between onshore and offshore assets. With strong pressure of growing foreign exchange reserves, China has changed fundamentally the outward investment policy recently, and the authorization procedures of outward investment have been simplified substantially, and this will provide scope for capital movements in the future.

4.1.3 Internationalization of the RMB

An important difference between Japan's liberalization and that of China is their stance toward internationalization of their currencies. Although Japan permitted use of the yen in foreign settlements in 1960, China had always been reluctant to allow the RMB to act as a transaction medium in foreign trade. Due to the anxiety on the exchange risk and sterilization cost of huge foreign reserves, China's stance towards internationalization of the RMB has changed fundamentally since the U.S financial crisis.

A small step forward to the RMB internationalization is currency swap. China has signed currency swap agreements with six economies, such as, South Korea, Hong Kong, Malaysia, Belarus, Indonesia and Argentina, and total amount of the currency swap reaches 650 billion RMB. This will help the RMB to play the role of trade settlement currency between China and above economies, and foreign reserve currency at some degree. Although currency swap can possibly raise international status of the RMB, the exchange risk of holding such soft currencies for China is higher than that of the dollar. Therefore, as an urgent measures to overcome shortage in foreign exchange assets, the currency swap should not implement largely and continuously.

A much meaningful step to internationalization of the RMB is its initial experimental application as a settlement currency in the trade between China and adjacent economies in July 2009, such as, Hong Kong, Macao, and ASEAN countries. Shanghai, Guangzhou, Shenzhen, Zhuhai and Dongguan are chose as experimental sites for cross-borders trade settlements denominated in the RMB. Obviously, the two preconditions for internationalization of the RMB are freely floating exchange rate and liberalization in capital transactions. Thus, there is a long way to go for real internalization of the RMB.

4.2 Evolution of China's Balance of Payments

As seen in Figure 4.1, China has experienced increasingly large surplus in current balances and capital balances since 2001, and even the account of errors and omissions, which is often regarded as an approximate indicator of China's capital movement, turned into positive in most of years during this period.

China has experienced a sharp increase in current surplus relative to the capital balance despite the one way revaluation anticipations on the RMB since the currency reform in 2005. The gradual upward adjustment of the RMB further strengthened the one way expectations of revaluation. As Figure 4.2 shows, in the offshore Non-deliverable Forward (NDF)[1] market of the RMB, investors anticipated that the currency has a strong trend of revaluation and the forward exchange rate of the RMB versus US dollar persistently lower than that of the spot rate. Due to capital outflows and sharp decline in export induced by US financial turmoil, the trend of appreciation of the RMB had been reversed and the forward-spot exchange rate spread of CNY/USD has turned into positive in the period from September 2008 to March 2009. The forward-spot rate spread has turned into negative, and hence the purchase strength of the RMB has increased again since April 2009, due to China's early recovery and

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[1]Non-deliverable Forward (NDF) is a short-term forward contract on a thinly traded or nonconvertible foreign currency not otherwise internationally traded. Contracts in the NDF market are settled in cash and the profit or loss is the difference between an exchange rate agreed upon on a fixing date and the spot rate at the time on the settlement date. NDFs are typically quoted for time periods of one month to one year and are quoted and settled in U.S. Dollars.

persistent trade surplus.

Figure 4.1 China's Balance of Payment: 1982-2008   (in percent of GDP)
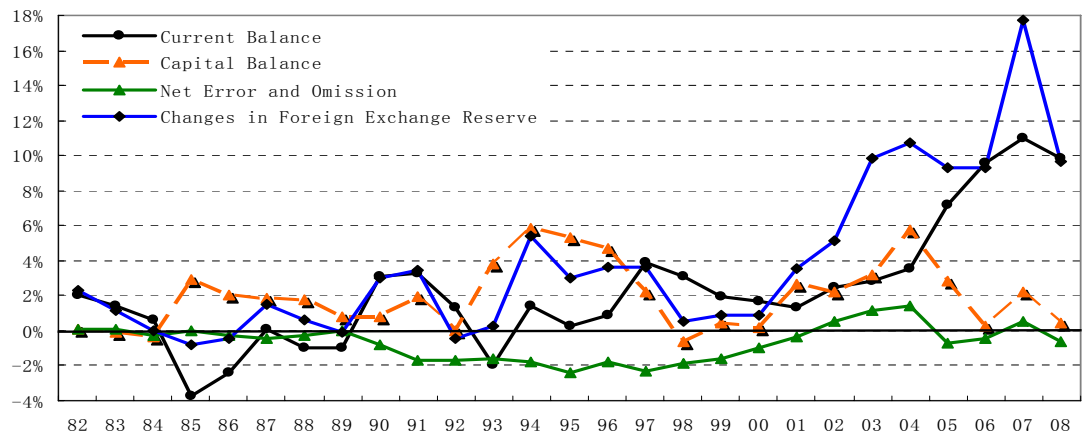
Source: CEIC.

Note: There existed $45 billion and $137 billion foreign exchange reserves were used for banks recapitalization in 2003 and capital base of China Investment Corporate Ltd. in 2007 respectively. The data on international reserves are adjusted correspondingly.

It is somewhat hard to interpret the sharp increase in China's current surplus. It has been suggested by some observers that the current favorable balance has been partly driven by over-invoicing of exports and under-invoicing of imports, outflow payments of foreign investment income, and current transfers (Yu, 2008a; Ma and McCauley,2007; Ouyang, Rajan and Willett, 2007). We will investigate them in detail. On the other hand, the decline in the capital account surplus was mainly policy-driven. To mitigate appreciation pressure of the RMB, China's authority implemented the policy of "encouraging capital outflows and discouraging capital inflows". Chinese government has loosened a number of restrictions on capital outflows to stimulate outward investments by Chinese enterprises and domestic institutional investors. At the same time, the government tightened controls on capital inflows such as imposing a quota on offshore borrowing by foreign banks operating in China in July 2004 (Ouyang, Rajan and Willett, 2007).

Figure 4.2   Spot and Forward Exchange Rate of the RMB: 1999.1-2009.6
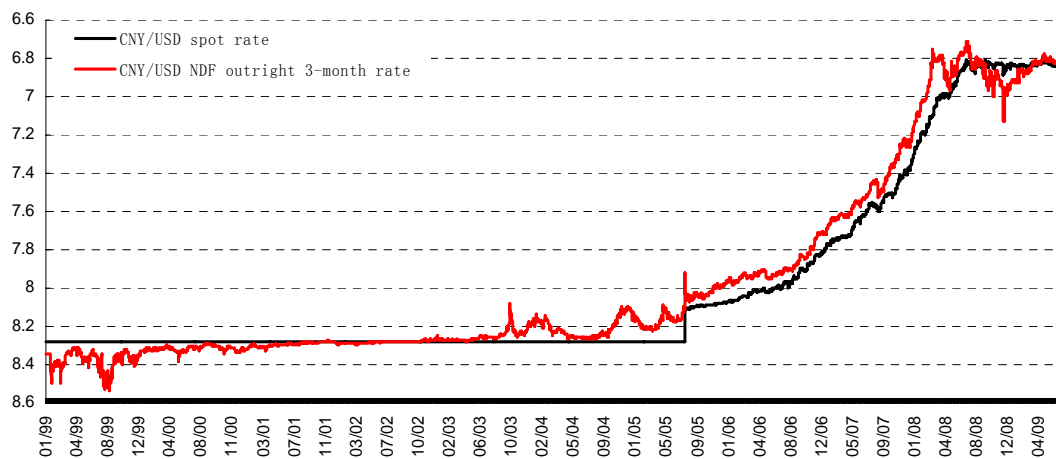
Source: Bloomberg.

Consequently, China's foreign exchange reserves increased substantially during this period. At the end of 2008, the amount of China's reserves skyrocketed at $1.95 trillion (now surpasses $2 trillion), is around two times as much as that of Japan, the traditionally largest foreign reserves holder. Obviously, China's huge reserves are always regards as a sign that the RMB is seriously undervalued and will revalue significantly in the near future. With lessons from Asian financial crisis, large foreign reserves are also tend to be viewed as an indicator of "strong fundamentals", hence leads to an upgrade of the country's credit ratings. This revaluation anticipation of the RMB (capital gains) and low risk perceptions motivated

large-scale capital inflow into China and led to a rapid increase in foreign reserves as the People's Bank of China (PBOC) intervened in the foreign exchange market to purchase excess US dollar.

### 4.3 Current Account Transactions

With liberalization of current transactions, there are potential channels that unwanted capital movements occur via current accounts, particularly when the authority imposed strict restrictions on capital flows. As seen in Figure 4.3, the balances of trade, income and transfer all have recorded surplus, and these current account surpluses have showed a clear growth trend in recent years. Such growing surpluses are totally true current transactions surpluses or include some unwanted capital inflows? To answer this question, we now examine them in detail.

4.3.1 Trade Balance

Since 2005, China's trade surplus increased sharply and replaced capital transactions surplus as the most important contributing factor to rapid accumulation in foreign exchange reserves. China had obtained moderate trade surplus between 1994 and 2004. However, China's trade surplus increased dramatically in 2005, and the scale of surplus reached 134 billion USD, which is 1.3 times more than that of 2004. This strong growth trend has maintained till 2008. It is rather difficult to explain the sharp expansion of trade surplus in the perspective of China's structural changes like drastic enhancement of enterprises' competitive capabilities, or macroeconomic factors, such as, economic downturn[1].

Although the rapid expansion in trade surplus should be highly related to the establishment of China's status as "world factory" and the flourish of export processing industries in recent years, the arbitraged capital inflows to obtain potential profits may be another important factor. Anecdotal evidences show that a frequent way for unwanted capital to evade capital movement restrictions is over-invoicing exports and under-invoicing imports. Owing to importance of foreign funded enterprises in Chinese import and export, with a share of 55% in 2008, it is easy for them to evade capital regulations through international transfer prices.

Figure 4.3 China's Current Account Transactions: 1982-2008 (in billions of USD)
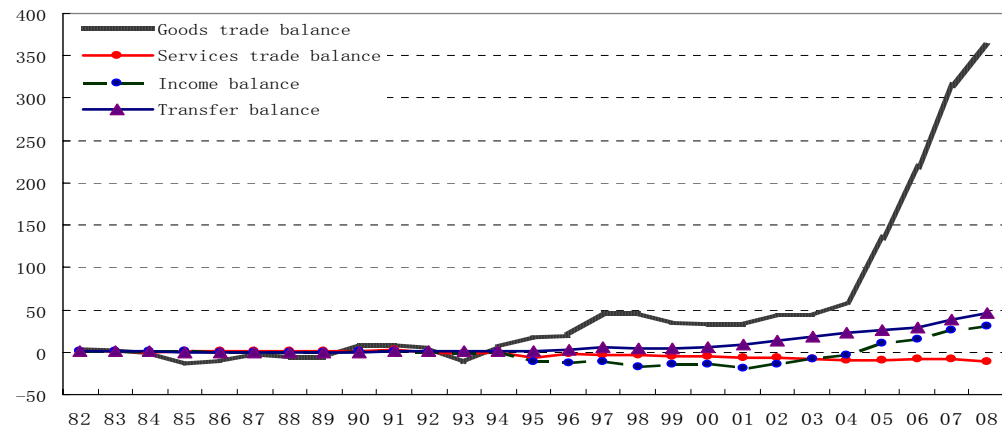
Source: CEIC.

When China's foreign funded firms carry out goods trade with their parent companies, they receive high prices for exports while pay imports at low prices. Therefore, these multinational companies can obtain sure profits from the RMB revaluation through transfer prices. Due to the freedom in remittance of outward investment income payments by foreign investors, so the amount of unwanted capital inflows that disguised as export revenue depends on effectiveness of government's supervision on international transfer prices and potential revaluation range of the RMB.

The unwanted capital inflows associated with international transfer prices could produce substantial impacts on China's trade surplus. For example, the scale of import and export of China's foreign funded firms in 2008 is around 1410 billion USD, a ±5% departure from

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[1] Some observers think that China's sudden drastic increase in trade surplus since 2005 seems attributed to two factors: one is the business cyclical factor, the economy slowed down due to the government's contracted policy; the other is Chinese export model dominated by processing trade was finally established and China became the export platform of multinational firms (Yu, 2008a).

market price will cause 141 billion unwanted capital flows into China, and whose share in total trade surplus of 2008 is about 40%[①]. Thus, the one-way anticipation of RMB revaluation and strict controls on capital inflows provide much incentive for multinational firms in China to circumvent capital mobility restrictions through international transfer prices.

Therefore, under the liberalization of current transactions and the regime of heavily managed floating rate, it is difficult for the authority to effectively control short term capital movements. According to Japan's experiences, the floating rate will increase uncertainty risks of capital movements associated with fluctuation in the value of RMB with capital account controls. To discourage large amount capital movements, China should float its currency while maintaining capital transactions restrictions.

4.3.2 Transfers

Under circumstances of free current transactions, capital restrictions will induce some capital inflows to circumvent official regulations through the large and liberalized current account. Two current receipts and payments give such example. They are the growing net inward remittance transfers and the stagnant dividend payments in recent years. We analyze remittance transfers first, and then discuss dividend payments.

As seen in Figure 4.4, with strong revaluation anticipation, the scale of inflow capital remittance transfers increased stably and rapidly during the period between 2001 and 2008. In 2008, the size of remittance transfer inflows reached $52.6 billion, which is nearly 5.8 times as much as that of 2001, and whose share in total current surplus attained 12.3%. In late 2004, Chinese authorities' attitude towards such capital inflows changed, with a shift from encouragement to discouragement. Banks are required to report unusually large remittance capital inflows and related dollar sales, with a threshold of daily conversion of the dollar into the RMB of $10,000 per transaction (Ma and McCauley, 2007). This new reporting requirement is still effective to date.

Figure 4.4 China's Investment Income Payment Outflow and Current Transfer Inflow (in billions of USD)
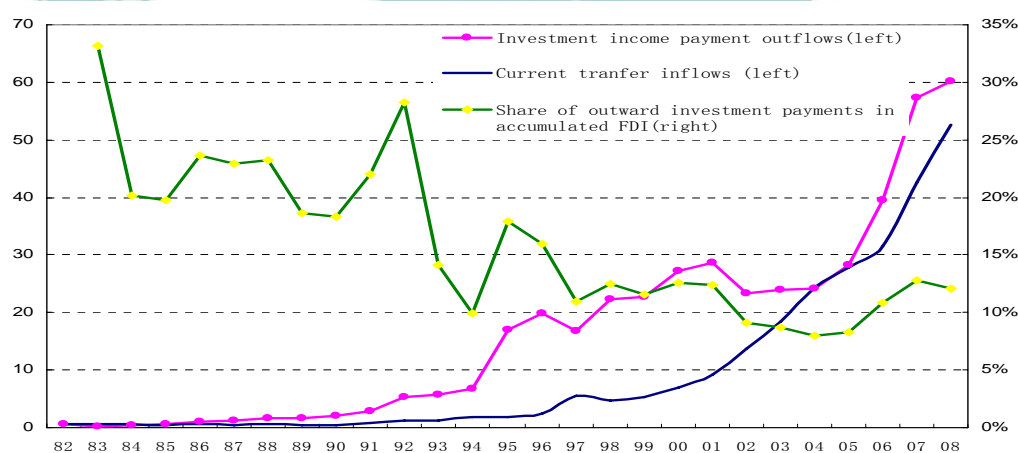
Source: CEIC and author's calculation.

Note: Under the assumption that the discount rate of FDI is 10% and the amount of FDI before 1982 is zero, we can obtain the proximate value of accumulated FDI since 1982.

4.3.3 Investment Income Payments

Another important potential channel for capital inflows is the outward payments of investment income by foreign fund enterprises. Given the rapid expansion of FDI in China, it is suspicious that the stagnant investment income payments by multinational companies and other foreign investors in the period of 2001-05, after experiencing rapid growth in years of 1994-2000. However, the outward dividend and interest payments increased substantially in 2007 and 2008, and main reason is possibly that the headquarters of multinational companies faced liquidity crunch owing to U.S. financial crisis.

The share of outward investment payments in accumulated FDI also showed an evident decline trend in this period (Figure 4.4). In China's case, the profits of multinational firms

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[①]A former head of National Administration of Statistics once claimed that one third of china's trade surplus in 2006 was hot money (Yu, 2008a).

can be used for three purposes: outward dividend and interest remittances; reinvestment (which will be calculated into FDI); non-remitted retained earnings. With revaluation anticipation in 2001-06, foreign investors will increase the amount of FDI and non-remitted retained earnings as much as possible to arbitrage the huge potential and sure profits of RMB revaluation. Therefore, there are strong incentives for foreign investors to delay converting their RMB profits onshore into dollar. Thus, it is clear that this stagnant current account outflows could be a possible sign of capital inflows into China.

In sum, these cross-border flows through accounts of trade, current transfer and outward investment income payments in recent years suggest that capital movements could occur via a liberalized current account, particularly after the authorities' tightened controls on capital inflows.

4.4 Capital Account Transactions

It is apparent that increase of China's capital balance since 2001 was largely due to a surge in portfolio capital flows as well as "other investments" (i.e. short term capital flows), most likely a reflection of one-way option of the RMB.

4.4.1 Foreign Direct Investment

With features of relative stability and associated with benefits such as transfers of technological and managerial expertise, FDI has generally been the dominant form of China's capital inflows under the background of capital transactions restrictions. This kind of capital inflows can be divided into three stages: 1979-91; 1992-2000; from 2001 to the present (Yu, 2008a). In the first stage, although FDI inflows into China grew steadily, the mount of FDI was still rather small. In the period of 1992-2000, with acceleration of China's reform and open-up, FDI inflows increased at the speed of leapfrog. From $4.4 billion in 1991, FDI increased dramatically to $11 billion in 1992, a jump of 1.5 times, and the inflow reached $38 billion in 2000, 3.4 times as much as that of 1992. In the third stage, with the establishment of China's status as "world factory" after entry into WTO and the revaluation pressure of the RMB gradually accumulated, average growth rate of FDI inflow attained 20% (Figure 4.5). In the year of 1982-2008, the accumulated FDI inflows reached $975 billion, and the share of FDI in China's total fixed investment reached about 10%.

Figure 4.5 China's FDI and Securities Investment   (in billions of USD)
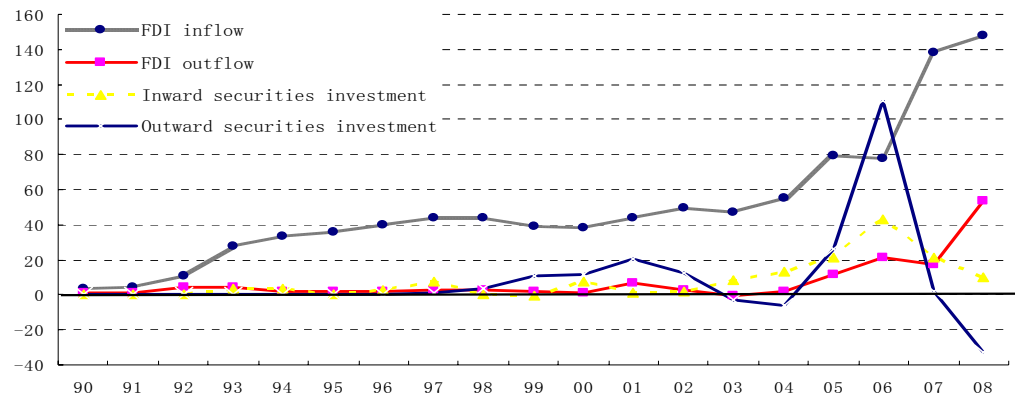
Source: CEIC.

In 2001, China began to implement the policy of stimulating oversea direct investment by Chinese companies. The previous discouragement of such capital outflow was in sharp contrast to the long pursued policy of encouraging inflows of foreign direct investment. In June 2006, Chinese authority had delimited restrictions on foreign exchange quotas for outward investment, simplified approval and annual review processes, allowed all profits to be reinvested abroad and improved access to offshore guarantees issued by Chinese banks. With announcement of the "Management Method of Investment Abroad" on March 16, 2009, the Ministry of Commerce (MOC) transferred most of authorization powers to the provincial branches and simplified substantially procedures of authorization of outward investments.

This policy shift intends to increase capital outflows to reduce external surplus, to secure access to oversea natural resources and to establish market distributional channels for Chinese products. In the year of 1992 and 2004, China's outward investment was in stagnancy, and average amount of this category outflows was $2.6 billion. However, with the increasing accumulation of foreign reserves, China's outward investment has accelerated

substantially since 2005. The scale of outward investment rose from $11.3 billion in 2005 to $53.5 billion in 2008.

The impacts of the outward investment encouragement policy on China's capital account will be much broader than the direct investment itself. With an expanded overseas presence, Chinese firms should manage their financial and currency exposure with large scale transactions spanning both onshore and offshore operations. Such abilities to engage in cross-border arbitrage could weaken the effectiveness of controls on capital transactions, such as trade credit and covered forward trading (Ma and McCauley, 2007). The Japanese experiences showed that trade credit was the dominant type of short term capital movements between domestic enterprises and their oversea affiliated companies under strong purchase pressure of the yen in 1971. Therefore, China's authority should be aware of the potential for restricted transactions to occur within the intra-corporate accounts of Chinese-based multinationals.

4.4.2 Qualified Institutional Investor Schemes

China attempted to manage the two-way portfolio flows through the schemes of Qualified Foreign Institutional Investor (QFII) and Qualified Domestic Institutional Investor (QDII). The QFII manages portfolio capital inflows, while the QDII regulates portfolio capital outflows. Both schemes are transitional institutional arrangements allowing capital movements between domestic markets and abroad while China maintains restrictions on capital transactions and the inconvertibility of the RMB under the capital account. The two schemes involve pre-authorized procedures, quota management, foreign exchange conversion rules, instruments restrictions and intensive reporting requirements.

The initial aim of introducing QFII was to boost domestic markets in 2003, and Chinese stock market had been languishing for several years before the boom in 2006. Before QFII, foreign investors couldn't invest in Chinese local equities and bonds, with exception of a tiny foreign currency denominated B-share stock market. In October 2007, 52 foreign institutions had obtained QFII status, and the investment quota for QFII scheme had reached a cumulative $10 billion. At that time, the total quota of QFII amounts to $30 billion. Because Chinese stock market is still a relatively retail dominated market, it is necessary to expand the role of institutional investors, therefore, there is room for further relaxing China's QFII scheme. However, due to the worry about the stock market controlled by QFIIs, it is little possible that the quota will increase quickly in the near future.

In April 2006, with the aim to hold down strong pressure of unwanted capital inflows and the early bubble in domestic stock market, the Chinese authority announced a QDII scheme that permits Chinese individuals and companies to invest in overseas securities. The QDII scheme is designed to manage portfolio outflows via authorized banks, securities companies and investment funds subject to investment quota and investment instruments. Under the new regime, Chinese investors can convert their RMB bank deposits into dollars onshore for investing in overseas fixed-income products through authorized banks, or investing overseas securities including equity shares via authorized securities companies and fund managers, both subject to quotas; authorized domestic insurers can convert their RMB funds into dollars to invest in oversea bonds and market instruments, subject to prudential requirements (Ma and McCauley, 2007).

As a response to this encouraging policy, China's outward portfolio investment increases dramatically in 2006. However, with the collapse of assets prices resulting from US financial crisis in 2007-2008, Chinese investors had suffered a huge loss in portfolio investment and withdrawn much of their outward investments by QDIIs. Thus, the balance of securities investment turned positive in 2007-08 can be mainly attributed to the substantially withdraw of Chinese outward securities investment (Figure 4.5).

4.4.3 Foreign Currency Bank Deposit Flows

Changes in foreign currency bank deposits onshore by Chinese households and firms have been sensitive to exchange rate expectations on the RMB and the yield spread between the RMB and US dollar, which gives rise to cross-border flows through the banking system (Ma and McCauley, 2002). For example, when the anticipation of RMB weakness strengthened or the interest rate spread widened, the total expected yields on foreign currency deposits would increase, and which encourages the holding of foreign currency deposits. However, the impact of exchange rate expectation on Chinese foreign currency deposit is much more important than that of interest rates spread.

Figure 4.6 Interest Spread of One-year Bank Deposits Onshore between USD and RMB
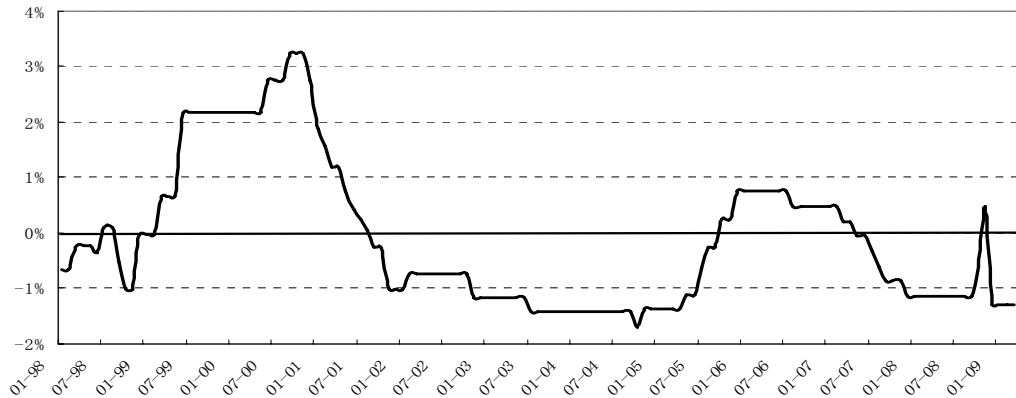

Source: PBOC.

As Figure 4.6 and Figure 4.7 show, with weak expectations on the RMB and large yield differential between the dollar and the RMB, the amount of foreign currency deposit increased rapidly in the year of 1999-2001, rising from $103 billion in 1999 to $134.9 billion in 2001. With strong revaluation pressure of the RMB and negative interest spread of the two currency deposit, the growth rate of Chinese foreign currency deposits has slowed down significantly since 2002 and even turned into minus in some years. The share of onshore foreign currency deposits in total bank deposits rose in 1999 and 2000 when the RMB devaluation speculation prevailed, reaching a peak of 8.5%. Since 2001, appreciation anticipation has led to persistent decline in the ratio, decreasing to 2.6% in 2008, even absolute decline in foreign currency deposits.

Chinese household foreign currency savings had declined persistently during the period between mid-2003 and March 2008, falling from $90.8 billion in mid-2003 to $46.6 billion in March 2008[1]. The sensitivity of enterprises' deposit to exchange rate and interest spread was much lower than that of households. The difference in sensitivity of the two types of deposits can be mainly attributed to their different targets. The main target of enterprises is transactions demand, such as, import payments and outward FDI, while that of the household is to obtain yields.

Figure 4.7 Chinese Residents' Foreign Currency Deposits (in billions of USD)
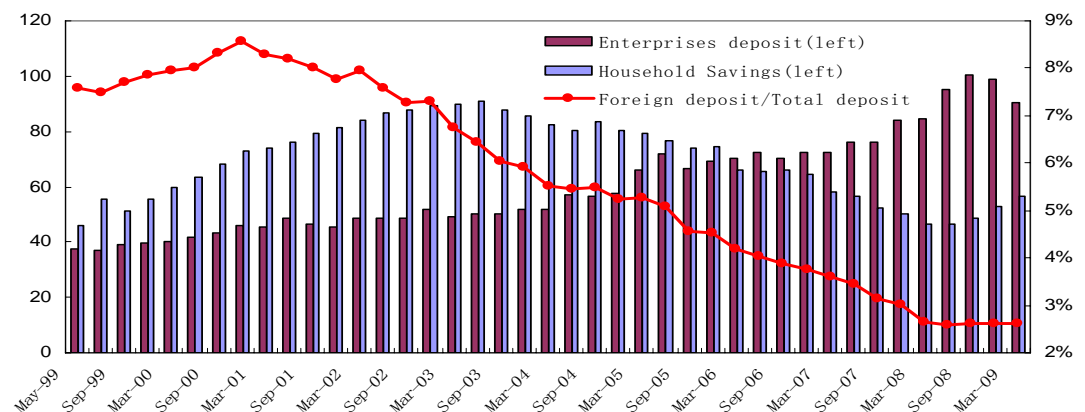
Source: CEIC.

The key difference in holding US dollars between the public and the central bank is that, in the latter case, it becomes part of base (or high-powered) money. A declining appetite by the Chinese public to hold US dollar deposits has increasingly left the central bank as a "buyer of last resort" of US dollars. Of course, a persistently strong shift of US dollars from the public

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[1] Although the interest rate spread between the dollar and the RMB turned into positive again during the period from October 2005 to April 2007, household foreign currency savings haven't stopped declining. This means that the effect of interest rate spread on household savings demand was overwhelmed by anticipated changes in the exchange rate of the RMB.

to the central bank necessitates sterilization, which is exactly what has been happening in China. Chinese bank managers and official reserve managers also needed to find uses for such foreign currencies, and large part of which would be invested into the US debt market.

4.4.4 Trade Credit and Loans

China has limited external debt to low levels, and non-FDI private capital inflows have typically been quite limited, until recently. Its outflows are dominated by official reserve assets and unrecorded private sector outflows.

Figure 4.8 China's Trade Credit and Loans: 1997-2008 (in billions of USD)
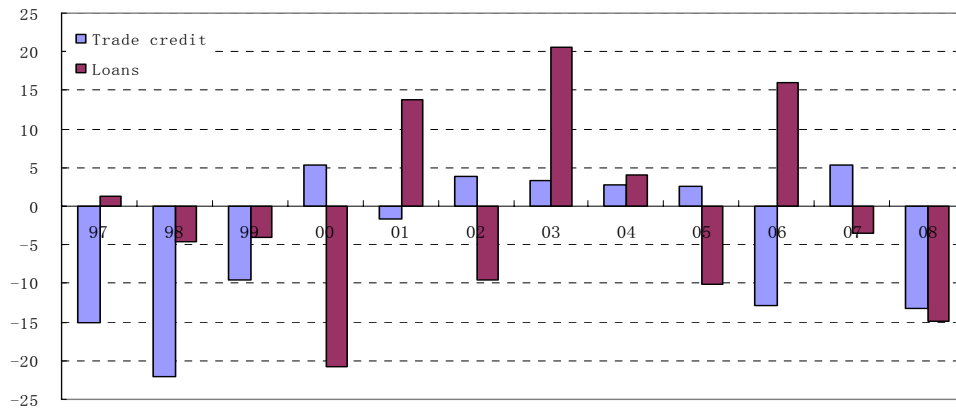
Source: CEIC.

Due to China's cautious attitude towards external debt, capital movements under the account of trade credits and loans are quite limited. As a response to this policy, there has been little sovereign borrowing and enterprises have been discouraged to borrow external debts. With the growing pressure in the RMB revaluation and unwanted capital inflow in recent years, Chinese authority tightened controls on capital inflows and imposed quotas on external debts to domestic financial institutions and companies, and the foreign banks operating in China, traditionally have much more freedom in taking external debts, also are subject to quotas. Therefore, it is very difficult for unwanted capital to flow into China via these capital accounts.

As seen in Figure 4.8, the variation in the balance of trade credits and loans is rather minimal. According to Japanese experience, leads and lags (dominant form of trade credit) in exports and imports constituted the dominant source of short term capital movements in 1970s. However, in china's case, trade credit is highly associated with real trade not the market expectation on the exchange rate of the RMB. For example, trade credit outflow amounts to around $12 billion in 2006 and 2008 respectively, while this type inflow in 2005 was $2.5 billion.

4.4.5 Net Flows of Errors and Omissions

Cross-border capital flows under the account of errors and omissions are often seen as a general measure of unrecorded capital movements in China. The residual fluctuated sharply in response to market conditions, particularly the expectation on changes in the value of local currency.

During the period of 1995-2000, China had experienced the attack of high inflation and the Asian financial crisis, and devaluation pressure of the RMB increased significantly, therefore, the average annual capital outflows reached $17 billion. However, with stable growth in current account surplus since 2001, purchase strength of the RMB increasingly strengthened, and average capital inflows attained $23 billion in 2003-04. In 2005-06, the time of gradual appreciation of the RMB, the average annual capital outflows was about $15 billion. Given one-way option on the RMB, the moderate capital outflow under the account of errors and omissions suggests that China's capital controls may be at least partially effective. In the latter half of 2008, under the background of overall liquidity crunches in developed countries' financial markets, capital outflows through this residual account increased sharply and reached $43 billion. This substantial capital outflow surely shows that there existed capital movements via the residual account.

However, while often regarded as an indicator for unrecorded capital movements, errors and omissions should be interpreted with caution. In fact, the errors and omissions account could have captured valuation changes of the official foreign exchange reserves. When dollar

falls against other major currencies, the value of foreign exchange reserves denominated in dollar will rise, hence leads to an errors and omissions inflow, and which has nothing to do with capital inflows; while dollar appreciates, causing the dollar value of foreign reserve decline and capital outflows on the residual account. Therefore, the substantial increase in net outflows under errors and omissions in late half 2008 might have partly resulted from strong dollar.

4.4.6 Interest Rate Differentials and Effectiveness of Capital Controls

The effectiveness of capital controls can also be observed in differentials between onshore RMB interest rates and offshore RMB (EuroRMB) interest rates. The former are Chinese domestic interbank lending interest rates, and the latter are abroad interbank offered rates. To test for capital mobility between China and offshore financial market, this section will analyze the relationship among onshore RMB interest rates, Eurodollar interest rates and Non-deliverable forward (NDF) exchange rates.

Due to china's strict capital controls and the internationalization process of RMB just started with allowance to act as a settlement currency in trade between China and adjacent economies in July 2009, thus data on offshore interest rates can't be available. According to the approach of Fukao(1990), the RMB offshore interest rate can be estimated by the three-month Eurodollar rate and the three-month spot-forward spread of RMB-dollar exchange rate on the Hong Kong NDF foreign exchange market.

With free capital movements, it is obvious that there are no substantial differences between RMB interest rates onshore and those implied by the offshore NDFs associated with USD LIBOR, because rapid capital movements with the intention to arbitrage surely potential profits will eliminate any large spread in interest rates. Therefore, the RMB interest rate offshore on the one hand and combination of the Eurodollar interest rate and the RMB-dollar spot-forward spread on the other hand has the following relationship:

EuroRMB interest rate = Eurodollar interest rate +NDF dollar forward premium

However, with strict capital controls, there were large differentials between these two interest rates. The large and persistent onshore and offshore yield differences suggest significant cross-border market segmentation and thus binding capital controls, but small gaps do not necessarily imply ineffectiveness of capital controls.

Figure 4.9 compares three-month China Interbank Offered Rate (CHIBOR) with three-month offshore (or EuroRMB) interest rates (monthly average data). As the Figure shows, there existed persistent and large differentials between three-month RMB interest rates onshore and offshore, which reflects that China's capital control is still binding. However, due to the fact that there is still lack of well-functioned money and capital markets in China, we should be cautious to judge the effectiveness of China's capital restrictions by interest rates spread.

Figure 4.9 Onshore and Offshore Interest Rate of the RMB: 2000.1-2009.4
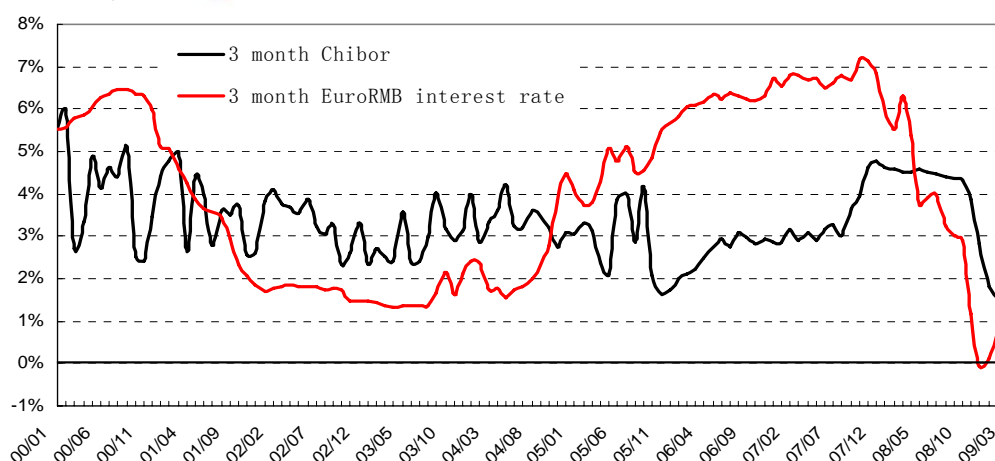
Source: Bloomberg, CEIC and author's calculation.
Note: The interest rate of the 3-month EuroRMB is the average monthly data.

In sum, various capital movements via current account and capital account responding to market conditions suggest that there existed limits to effectiveness of China's capital controls. However, the existence of large capital flows is not sufficient evidence of capital controls

being so leaky as to be ineffective (Ma and McCauley, 2007). Because some capital movements are permitted, while other flows take place only through circumventing regulations. Moreover, the persistence of sizeable onshore-offshore yield gaps proves that China's capital control is at least partially effective.

4.5 Official Market Intervention and International Reserves Accumulation
4.5.1 Foreign Exchange Market Intervention

As the most flexible tool of exchange rate management, the Chinese authority has frequently resorted to official interventions in foreign exchange market to hold down growing pressure of the RMB revaluation since 2001. Owing to availability of the data, it is impossible to study the official intervention on a weekly or daily basis. According to the approach borrowed from Takagi (1989), we can obtain a proxy of the amount of monthly official intervention by calculating changes in monthly outstanding balance of official foreign exchange reserves (RES) adjusted for estimated interest earnings and exchange rate fluctuations.

Before 2001, the scale of the international reserves was relatively small, and it is desirable to assume that they were concentrated on dollar assets. Since 2001, with rapid increase in the official reserves, Chinese authorities began to allocate foreign reserves into different currency assets to diversify exchange rate risks. It can conveniently suppose that Chinese international reserves are allocated into the dollar, the euro and the yen assets, and the share is 80%, 15% and 5% respectively, and the structure of currency assets keeps constant. In order to avoid induced valuation changes in the exchange rate to the intervention behavior of the authorities, the official reserves should be denominated in the dollar but the local currency. We also assume that yields of the dollar assets and the euro assets are same, and yield of the yen assets is zero. At the same time, we take some corresponding adjustments in the stock of foreign exchange reserves to allow for comparability, such as, $45 billion banks recapitalization and $137 billion CIC capital base. Therefore, the proxy for official intervention can be calculated by:

$I_t = RES_t - RES_{t-1} - TBR_t[(RES_t + RES_{t-1})/2]$ from January 1997 to December 2000

or $I_t = RES_t - RES_{t-1} - \Delta EXR_t - 0.95TBR_t[(RES_t + RES_{t-1})/2]$ since January 2001

where I_t is amount of interventions denominated in dollars in period t, RES_t is the dollar value of foreign exchange reserves at the end of period t, TBR_t is monthly average U.S. ten-year Treasury bond rate in period t, ΔEXR_t is the changes in dollar value of the non-dollar assets (euro, yen) due to exchange rate fluctuation against the dollar in period t.

Figure 4.10 Exchange Rate and China's Official Intervention   (in billions of USD)
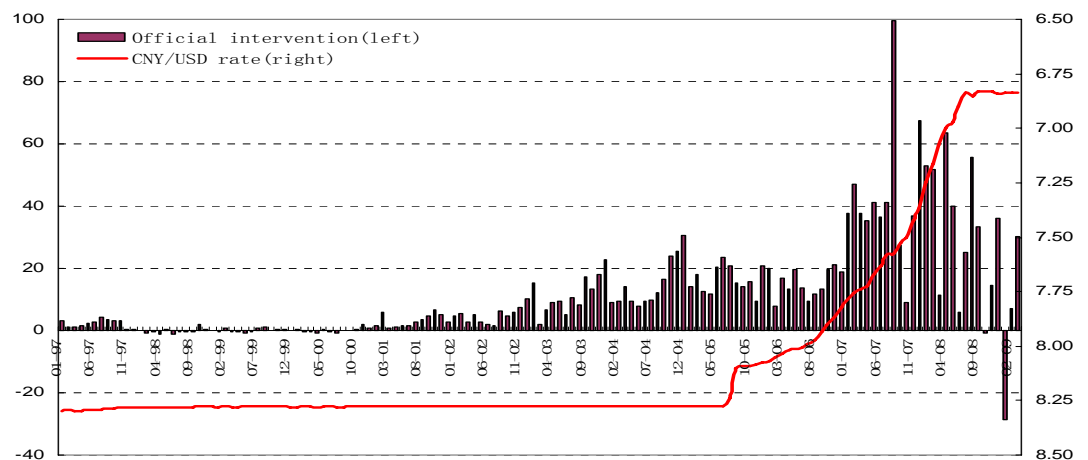
Source: CEIC and author's calculation.

As seen in Figure 4.10, Chinese authority's official intervention can be arbitrarily divided into two sub-periods, corresponding to the period before and after 2000. In 1997-2000, with

the RMB devaluation pressure due to Asian financial crisis, Chinese authority had lightly intervened in the foreign exchange market to support the RMB. In this stage, China had experienced substantial decrease in the surplus of trade and current balance, rapid decline in FDI inflows and large speculative capital outflows via the account of net error and omission. In order to maintain the fixed rate regime of the RMB, the monetary authority had tightened controls on capital outflows and entered into foreign exchange market to support the overvalued currency by selling the dollars and buying the RMB. The scale of official intervention was rather small in this period, and the monthly average intervention just reached $1 billion in absolute term.

Since 2001, the direction of Chinese authority's official intervention shifted from supporting the RMB to mitigate the revaluation through frequently purchases of dollars on a growing large scale, when the RMB showed a sign of strengthening. With successive overcome of Asian financial crisis and entry into WTO in 2001, China's current surplus and FDI inflows increased substantially, even the account of net error and mission turned into positive in some years which had maintained minus for a long time, which means that speculative capital began to flow in China to arbitrage potential profits in the RMB revaluation. The gradual appreciation of the RMB since July 2005 has further encouraged speculative capitals flow into China via current account and long term capital transactions (FDI) under strict capital restrictions. The monetary authority has intervened heavily in the foreign exchange market to suppress appreciation pressure of domestic currency since 2005, with average monthly intervention amounts to $28 billion. Since October 2008, due to shock of the global financial turmoil, some speculative capital began to flow out of China, and appreciation pressure of the RMB had eased significantly. Hence, the intensity of monetary authority's official intervention declined.

4.5.2 Foreign Reserve Accumulation

Naturally, Chinese authorities' massive official interventions led to huge foreign exchange reserves. According to public released data, China's foreign exchange reserves amounted to $1.95 trillion at the end of 2008. To allow for comparability of the amount of foreign reserves in 2003 and 2007, it is essential to add $45 billion used for bank recapitalization in 2003 and $137 billion acted as capital of China Investment Corporate Ltd. (CIC) established in 2007[①]. Figure 4.11 shows that China's international reserves has increased sharply in the past decade, particularly in 2001-08, rising from $150 billion in 1998 to $2.13 trillion in 2008, with around 7% of this buildup occurring in 2008. This has left China with the largest stock of foreign exchange reserves in the world, amounting to about 49% of GDP in 2008.

Figure 4.11 China's Adjusted Foreign Exchange Reserves   (in billions of USD)
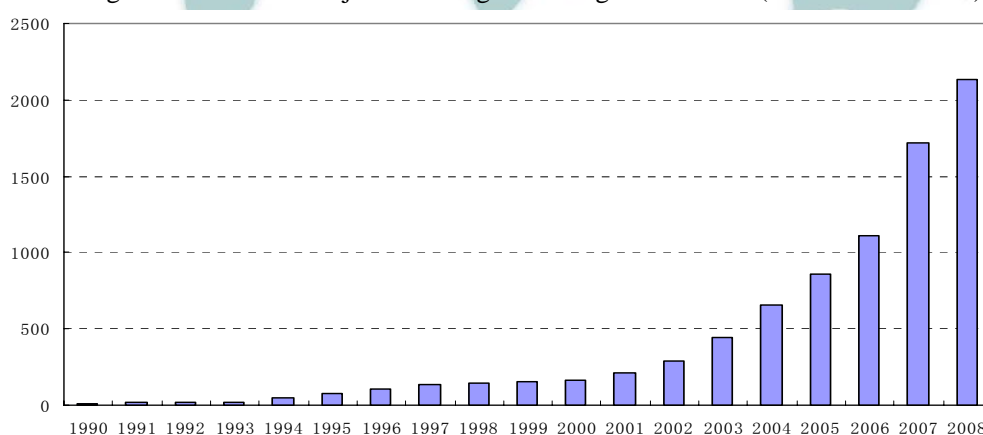
Source: CEIC and author's calculation.

[①]In order to address the problems of non-performing loans of Chinese major state-owned banks, the Central Huijin Investment Ltd, an affiliated investment institution under the PBOC, recapitalized $22.5 billion, $20 billion and $2.5 billion foreign reserves into Bank of China (BOC), China Construction Bank (CCB), and China Jianyin Investment Securities respectively in December 2003. To make use of the foreign exchange reserves efficiently, China authorities established China Investment Corporate Ltd. (CIC) in 2007, with the capital base amounted to $200 billion originated from foreign exchange reserves. CIC soon merged the Central Huijin Investment Ltd at the price of $67 billion in 2007. Therefore, the net amount of foreign reserves used for capital base of CIC was $137 billion (Zhang and Xu, 2008).

Although we have made some adjustment, the real size of international reserves is actually somewhat higher. Chinese authority has implemented some policy measures, such as, tightening controls on capital inflows while loosening restrictions on capital outflows, currency swaps between the PBOC and commercial banks, domestic banks' payments for legal reserves by foreign currencies, to repress rapid growth in official reserves. In fact, the latter two measures have no impacts on real but "statistical" international reserves. The currency swap can be regarded as a measure of sterilization, we will discuss it later.

Figure 4.12   Changes in Other Foreign Assets of the PBOC (in billions of USD)
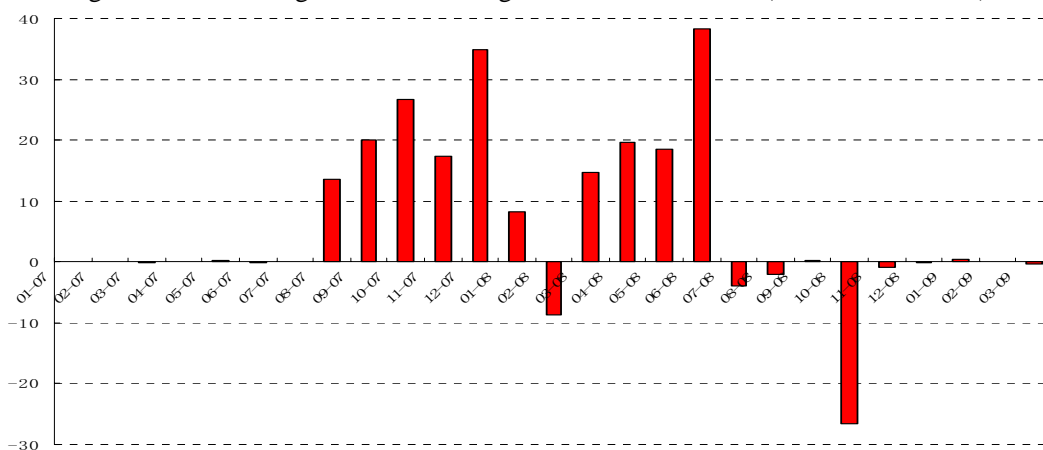
Source: PBOC.

In August 2007, commercial banks were required to pay for legal reserves by foreign currencies (mainly the dollar). In order to pay for reserves to the PBOC in dollar, commercial banks have to reduce sale of dollars to the central bank or buy dollars from the PBOC in foreign exchange market. Commercial banks' payments for legal reserves in dollar will induce a correspondingly increase in the account of "other foreign assets" of the central bank, and which helps to suppress rapid growth in potential dollars purchase by the PBOC, namely foreign exchange reserves. Because foreign currency assets on the account of "foreign exchanges" and "other foreign assets" both belong to the central bank, it is apparent that the effect of this policy is just a reallocation of foreign assets among different accounts in the PBOC.

As seen in Figure 4.12, the amount of the other foreign assets of the central bank had increased rapidly in the period from August 2007 to June 2008, and which had no any change before August 2007. With gradual decline in the legal reserves ratios due to sharp slowdown of global economy, the other foreign assets stopped growing and began to decrease in July 2008. Since August 2007, total increase in the account of other foreign assets amounts to $170 billion, and which means that the scale of China real foreign reserves in 2008 probably reached $2.3 trillion!

4.6 Sterilizations

As for official intervention and subsequent sterilization, the policies of China are quite different from Japan. In the case of Japan, sterilization nearly occurs simultaneously as (actually before) official intervention, because the yens are used for purchasing the dollars that have been obtained through selling treasury bonds or issuing the central bank bills by the BOJ. However, owing to the limited depth and breadth of China's financial market, Chinese authority's official intervention and sterilization are separated. In fact, the goal of china's sterilization is not to neutralize fully the increased monetary base originated from official intervention, but to maintain the growth rate of M2 has been in the predefined range. To realize the above target, Chinese authorities implemented various policies, particularly quantitative policies and administrative measures, such as, reserves requirements, window guidance, moral suasion, and risk warnings.

4.6.1 Open Market Operations

Open market operation is a conventional sterilization policy frequently used by the PBOC. In early 1998, the PBOC used treasury bonds and securities as sterilization tools. Due to limited size of treasury bonds, the PBOC has replaced all outstanding securities with central bank bills (CBBs) for use in the open market operations since September 2002 (Ouyang,

Rajan and Willet, 2007).

Figure 4.13   The Outstanding of China's Central Bank Bills   (in billions of RMB)
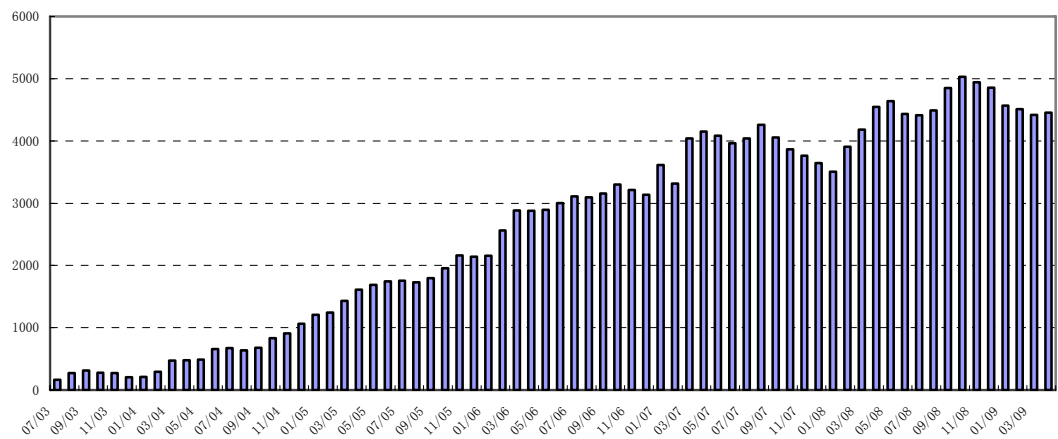
Figure 4.13 reveals that the outstanding of CBBs had experienced rapid increase during the period of 2003-07, rising from RMB 165 billion in July 2003 to around RMB 4.3 trillion in August 2007. The average monthly outstanding of the CBBs amounted to RMB 4.5 trillion in 2008, and whose share in foreign reserves was around 32%. It is apparent that the issuance of CBBs has significantly increased the government's fiscal burden, and the total interest payments of CBBs amounts to RMB 349 billion since 2002, with a share of 6% in China's tax revenue in 2008. Since 2007, the issuance of the central bank bills had slowed down significantly, and even turned into negative for several months. The reasons for the slow down in issuance of CBBs can be probably attributed to growing fiscal burden induced by interest payments and banks' passive attitudes towards purchasing CBBs due to low yields. In consideration to commercial banks' total assets of RMB 64 trillion, the share of low yield CBBs in the total bank assets is around 7%.

Figure 4.14   The Outstanding of Repurchases   (in Billion of RMB)
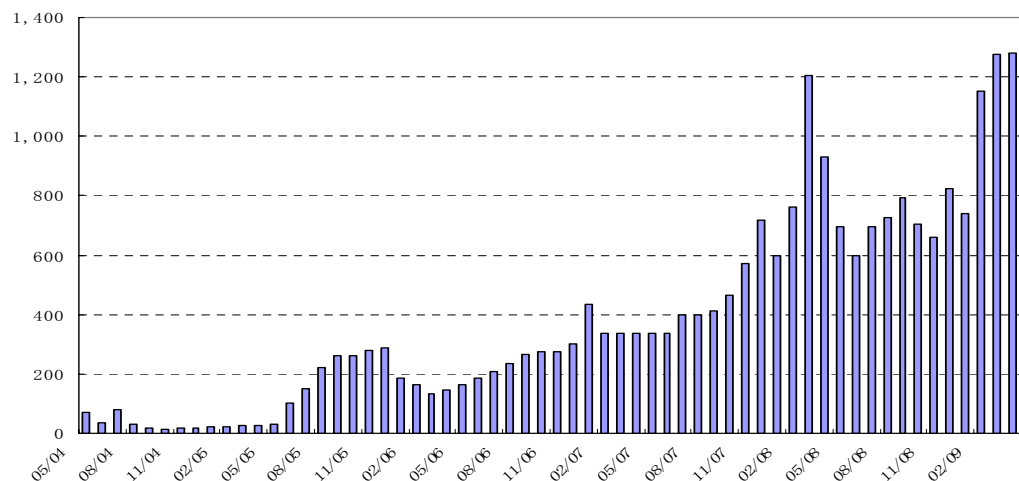
In addition, the PBOC has issued short-term repurchases ranging from 7 days to 182 days to neutralize the official intervention since May 2004. The Chinese monetary authority also attempted to issue 14-day and 21-day reverse repurchases, but their scales were minimal. Between July 2005 and March 2008, the issuance of the repurchases accelerated, and the outstanding of the debt instruments had increased substantially, rising from RMB 150 billion to 1205 billion. Owing to shock of financial crisis, the issuance of repurchases began to decrease significantly in April 2008, and now it restores increase.

4.6.2 Reserve Requirements and Bank Loan Quota

Another important policy of sterilization is reserve requirements. Under conditions of large capital inflows and economic overheating in the period of 2006-08, reserve requirements had been frequent used by the PBOC as a main instrument to sterilize the excess liquidity.

As Figure 4.15 and Figure 4.16 show, the legal reserves ratio of commercial banks had been raised continuously for 19 times from July 2006 to September 2008, rising from 8% to 17.5%. This led to sharp increase in the required reserve deposits of commercial banks in the central bank. The total increase in the reserve deposits amounted to RMB 5.43 trillion in this period, equaling to 41% of the stock of foreign reserves in 2008. This means that around 34% of increase in china's foreign reserves during this period was sterilized through raising reserve requirements, even adjusted by the rapid growth in banks' deposits! Therefore, the instrument of reserve requirement has played the most important role in reducing money multiplier and neutralizing official intervention.

In addition to reserve requirements, the PBOC has implemented administrative measures include window guidance to halt the non-government-approved construction loans and cool down specific sectors particularly the real estate industry, and other policy actions, such as, moral suasion and risk warnings, also have been frequently used to force commercial banks to maintain a reasonable credit growth with a upper limit.

Figure 4.15 China's Reserve Requirements and Benchmark Lending Rate
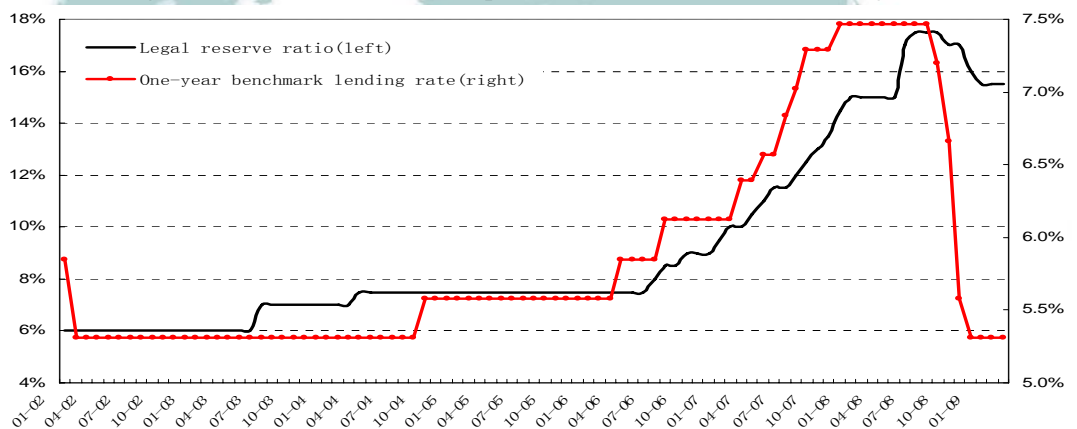
Source: People's Bank of China (PBOC).

Figure 4.16 Commercial Banks' Reserved Deposits in the Central Bank (in trillions of RMB)
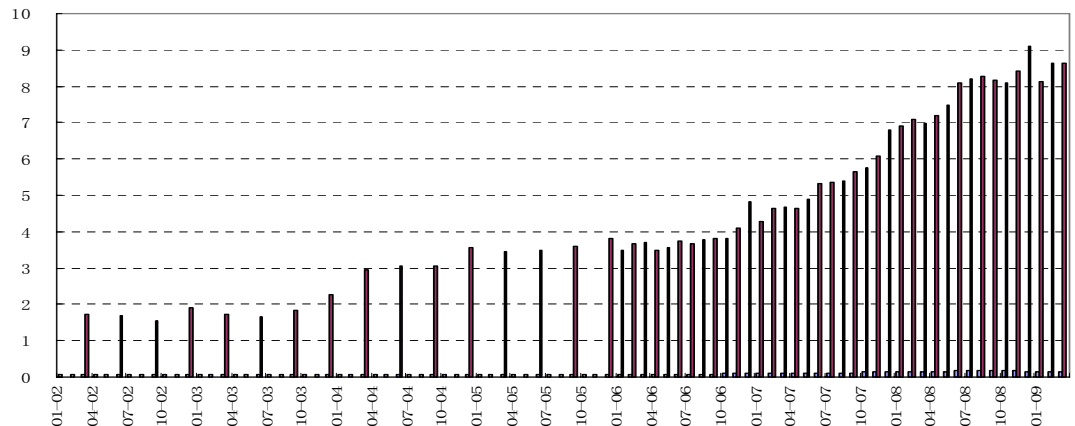
Source: PBOC and CEIC.

4.6.3 Interest Rate and Independence of Monetary Policy

To hold down the rapid escalation of excessive liquidity and assets prices, the PBOC had continuously increased benchmark rate for eight times from April 2006 to September 2008, with the one-year benchmark lending rate rising from 5.58% to 7.47% (Figure 4.15). At the same time, the monetary authority had undertaken a series of market-oriented interest rate reforms, such as broadening the floating range of lending rates of financial institutions at early 2004.

However, the continuous increase in interest rates was rather moderate, much lower than the level that market anticipated. The cautious attitude of Chinese authorities towards increasing interest rates reflects that China had faced the classical problem of "Impossible Trinity" and lacked the freedom of setting interest rates. Naturally, raising interest rates is an efficient way to repress assets bubbles and economic overheating, and which leads to decease in assets prices and domestic demand. However, under the background of partial capital movements, higher interest rate provides more incentive for foreign capital to inflow into China to bet for large profits, and this strengthens upward pressure of the RMB. To maintain gradual appreciation the local currency, the monetary authority is forced to intervene in foreign exchange market more heavily, and which aggravates the excess liquidity and creates more pressure on the sterilization of official intervention. Therefore, China has faced the classical problems of "Impossible Trinity". In the backdrop of China recent situations and the government's attitude toward the RMB exchange rate, the independency of monetary policy highly depends on effectiveness of controls on cross-capital movements.

Theoretically, China can maintain independent monetary policy[1] and heavily managed floating exchange rate through imposing tight restrictions on capital movements. However, the problem lies in that it is increasingly difficult to carry out sterner restrictions on cross-capital flow without harming China's current transactions and long-term capital movements, under conditions of liberalization in current account and rapid increase in outward direct investment. Even if China can successively control capital movements, the Chinese currency can't avoid real adjustment in value through "inflation adjustment" based on the Balassa-Samuelson Hypothesis. A typical case is real revaluation of the Japan's yen through inflation adjustment occurred at the time of Nixon Shock in 1971.

4.6.4 Currency Swaps

Another category of sterilization is currency swap between the central bank and commercial banks. The currency swap is general a one-year exchange agreement that the PBOC seeks to swap for the RMB assets of commercial banks with its foreign assets mainly denominated in dollar on an equal amount calculated by a certain exchange rate, and when the swaps contract matures, the central bank will exchange for such foreign assets with RMB assets by the predetermined exchange rate. According to swaps contract, foreign currencies obtained by commercial banks through currency swaps can only be invested in foreign assets, and are forbidden to settle for the RMB. Therefore, the PBOC can withdraw some excessive liquidity due to official intervention for a year. In addition, the predetermined exchange rate actually is an announcement of the PBOC and commercial banks' agreed anticipation on the forward exchange rate next year, and which produces some impacts on investors' expectations on the RMB. However, due to availability of data on currency swaps, we can't know the exact size of such swaps.

It is worthy of noting that cross currency swaps between countries can objectively become a way to neutralize the excess liquidity resulting from official intervention in China. Recently, to address the problem of shortage in the dollar and other main currencies resulting from the U.S. financial turmoil, the phenomena of cross currency swaps are very popular among many countries. Cross currency swap is a foreign exchange agreement between two parties to exchange principal and fixed rate interest payments on a loan in one currency for principal and fixed rate interest payments on an equal basis in another currency. China has reached cross currency swap agreements with six countries, with a total amount of RMB 650 billion, and which means that about $95 billion foreign exchange reserves has been sterilized

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[1]Because of thin and shallow financial market, Chinese monetary policy is still mainly operated under a quantity-based but price-based framework. The final target of the monetary policy is inflation and growth (employment), the intermediate target is probably M2 and bank loans, and the policy instruments may include various policy rats (including rediscount, re-lending, base lending and deposit rates), open market operations, reserve requirements and window guidance (He, Chu, Shu and Wong, 2005).

temporarily.

## 4.7 Economic Consequences of China's Sterilized Interventions

With large and persistent capital inflow, Chinese monetary authorities' massive sterilized interventions not only can't hold down economic overheating, commodities inflation and assets bubble, even in presence of stern capital transactions restrictions, but also repress development of bank sector and worsen inefficiency of resources allocation.

4.7.1 Money Supply

It is apparent that Chinese authorities' massive official interventions have produced significant impacts on China's money supply. As Figure 4.17 shows, domestic high-powered money has experienced rapid growth and large fluctuation since 2001 particularly in 2005-08, rising from the lowest 2.3% in 1998 to the peak 30.6% in 2007. It is amazing that M2 has maintained rapid and stable growth, with average speed of 17% since 2001. The degree of fluctuation in China's domestic bank loans is between monetary base and M2.

The sharp increase in reserve money (monetary base) since 2005 can be attributed to two factors: First, the reserve requirements ratio has been raised continuously for 20 times during the period of 2006-08. Secondly, the monetary authority preferred to quantity-based policies (bank loan quota and reserve requirements) rather than open market operations, and which can reduce money multiplier hence growth speed of M2. The stable growth in M2 suggests that the PBOC has actively neutralized impacts of international reserves buildup using various policies even administrative measures, therefore M2 grows at the pre-designed speed by the authorities. Owing to such administrative measures, the growth rate of bank loans is moderate in terms of China's standard, although accumulation of international reserves accelerated in 2005-08.

Figure 4.17   The Growth Rate of China's Money Supply
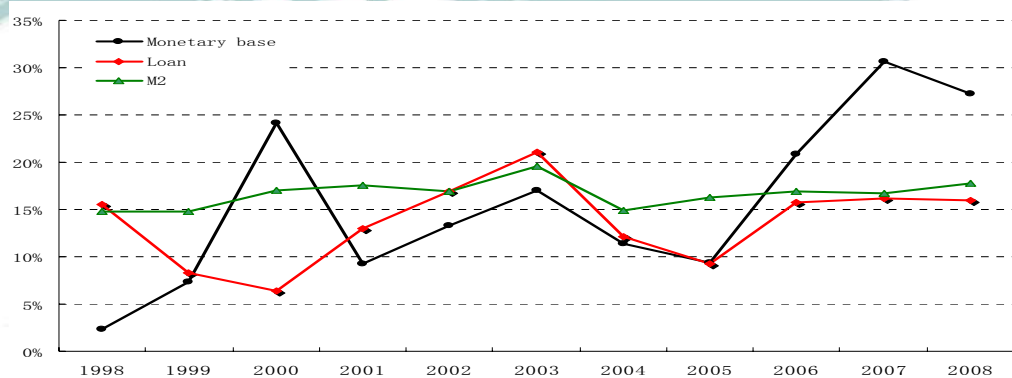
Source: CEIC.

4.7.2 Inflation and Asset Bubbles

With large and persistent capital inflows and subsequent massive official intervention, Chinese economy began to show signs of overheating in 2004, and the overheating had become much more obvious and serious between 2006 and March 2008, such as, high annual GDP growth rate of 11% (much higher than the widely accepted potential growth rate of 8%), rapid growth in CPI, stock price and house price, and rapid expansion in investment.

As seen in Figure 4.18, China's stock market had experienced sharp fluctuations in the period of 2005-08, Shanghai composite index rising from 1093 points in October 2005 to the peak of 5955 points, with an increase of 4.5 times in 2 years! And the decline of Shanghai stock index also was dramatically. It only spent 13 months that the stock market had collapsed, with a loss of more than 70% of market value in October 2008. The prices of Chinese real estates also rose rapidly, with an increase of 36.4% in the price index of new residential houses from July 2004 to July 2008[①]. The CPI began to rise in 2003, and the inflation had accelerated in the period between July 2006 and April 2008, with a total rise of 13% in the price index.

[①]According to the author's personal perceptions, this public released housing price index probably underestimated the real level. For example, in the downtown area of major cities like Beijing, the housing prices have doubled at least in this period.

Figure 4.18   China's CPI and Assets Price Index
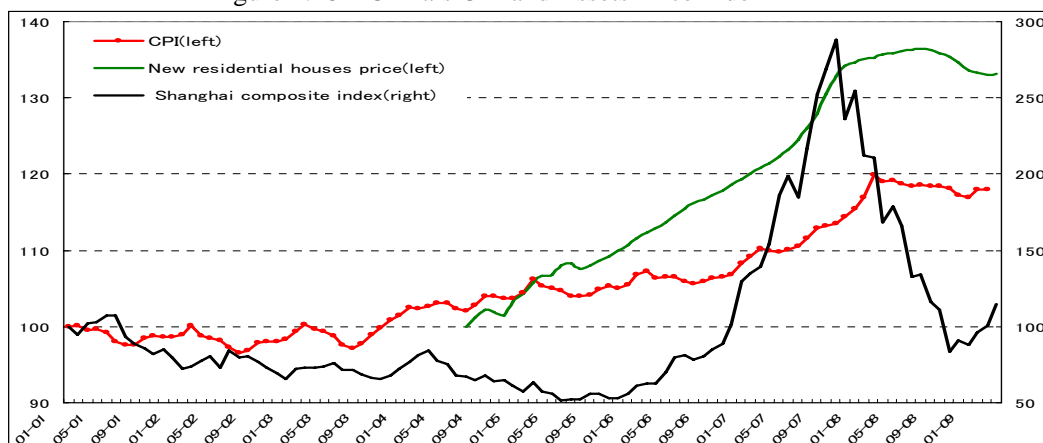
Source: CEIC.
Note: Both CPI and Shanghai composite index in January 2001 are equal to 100, and the price index of new residential in July 2004 is assumed to 100 in this figure.

The information that the above-mentioned two figures conveyed is contradictory. According to Figure 4.17, the moderate growth of M2 and bank loans shows that there is no clear sign of economic overheating, while Figure 4.18 displays that there existed apparent even serious assets bubble in China. What is the main source of Chinese economic overheating? There is an intuitive and popular view thinks that this overheating is originated from foreign capital inflows. However, some observers argue that, Chinese authorities' sterilization policy was generally successful, the inflation and assets bubble should mainly attributed to decrease in demand for money rather than capital inflows, and the boom in stock and real estate market led to substantial decline in deposits demand, hence money demand(Yu, 2008a). Of course, money demand is one important source for the overheating. As for this issue, there are still two factors deserve our further study: First, we should evaluate effectiveness of Chinese sterilization policy and assess role of capital inflows in the overheating. We will discuss it later in detail. Secondly, in consideration to insensitivity of M2 to assets bubble and inflation, it may be not enough to focus continuously on M2, and we probably need to broaden current monetary aggregate indicator.

4.7.3 Negative Effects of Sterilization

Although Chinese monetary authority's quantity-based even administrative actions are effective in neutralizing official intervention, their negative impacts on Chinese financial system and real economy are obvious. With continuous rise in reserve requirements and stern controls on bank loan quota, China's overheated economy finally had responded to these measures, but the response was much stronger than the government expected. In late 2007 and early 2008, Chinese economy showed a clear sign of hard-landing, and the stock market began to fall sharply in November 2007 and collapsed in some subsequent months. Since July 2008, the real estate market had been in the stagnation, housing prices stopped growing and started to fall, and sale of residential houses decreased substantially. Therefore, the collapse of China's market didn't originate from the global financial crisis but domestic factors.

A serious economic consequence of reserve requirements and bank loan quota was the worsening of credit resources allocation inefficiency. These quantity-based measures made small-and-middle local banks more disadvantageous in competition for funding resources and credit quota with state-owned and corporate banks. In consideration into costs and profits, these large banks focused on their attentions on monopoly SOEs and other large firms, and they traditionally disdain small-and-middle enterprises (SMEs) and reluctant to lend money to small enterprises, therefore, the significant decrease in funding source and credit quota of small-and-middle banks worsens the problem of credit ration that SMEs faced[1]. With liquidity crunch in official credit market, SMEs are forced to heavily depend on underground credit market to obtain working fund. Many SMEs failed due to lack of credit fund, and a

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[1]Because of the under-development of Chinese financial system, the main credit sources of SMEs are underground (unofficial) credit market and their own capital. Most of credit capitals of state-owned banks are allocated into stated-owned enterprises (SOEs), which are relatively inefficient but can obtain stable and large profits due to their monopoly powers in the market.

large amount of migrant peasant workers lost their jobs and were forced to return to their hometown. Naturally, sharp rise in default risk and liquidity crunch led to liquidity disappearance in the thin and shallow underground credit market. According to some investigation, the underground lending interest rates in Wenzhou, Zhejiang Province, a famous area for underground credit market, even skyrocketed at unbelievably 100%[①]. Ironically, the heavily managed floating exchange rate policy with the aim to stimulate economic growth and protect employment in export sectors actually has harmed economic efficiency and employment. Therefore, a solution to address China's current problems is to finish the reform of domestic currency and allow it to be determined by market.

4.8 Conclusions

China's recent experiences indicate that, the target of highly managed floating rate, partial capital mobility and independency of monetary policy can not maintain at the same time, particularly under conditions of large and persistent capital inflow, and skyrocketing foreign reserves. The independence of monetary policy highly depends on effectiveness of capital account controls and sterilization. With China's liberalization and expansion in current transactions, it is increasingly difficult to impose strict restrictions on capital mobility without hurting real transactions, because unwanted foreign capital can circumvent capital regulations and flow into China through some current accounts, such as, trade, transfer and investment income, even underground sources, under the backdrop of strong revaluation expectation on the RMB.

Under the circumstances of skyrocketing foreign reserves and not well-developed financial market, Chinese monetary authorities had to frequently implement quantity-based policy actions, even administrative measures, such as, reserves requirements, bank loan quota and window guidance, rather than market oriented open market operations (issuing the central bank bills, commercial papers and repurchases) to sterilize persistent and large capital inflow and resultant liquidity deluge. These administrative measures repressed development of Chinese financial sector, worsened inefficiency of allocation of bank credit resources and aggravated problems of credit quota that SMEs have faced, and hence produced negative effects on growth in the economy and employment. Therefore, China's current sterilized interventions are not sustainable. Actually, sterilization actions can offset partially the effect of undervaluation of the RMB on domestic economy and employment.

In sum, with free current transactions and strong revaluation on the RMB, Chinese authority can't maintain monetary independence and stability of domestic currency through capital transactions restrictions and sterilized interventions. Even the authority can successfully maintain stability of nominal foreign exchange rate, the real exchange rate can appreciate through adjustment inflation. A typical example is China's recent experience in 2006-08. Therefore, China should implement free floating exchange rate as soon as possible and remove capital account transactions barriers step by step. Moreover, the adjustment to China's imbalance economic structure and internationalization of the RMB also demand Chinese authorities to reform current restricted system on domestic currency and capital mobility.

5. Estimating the Effectiveness of Sterilization

The above section raises the question of effectiveness and cost of the Chinese monetary authority's sterilization policies in recent years. Due to data availability and difficulty in assess cost of sterilization, we will study the issue of sterilization costs in future, such as, the fiscal cost of issuing commercial papers by the PBOC, and efficiency losses in bank repressions and resources misallocations originating from reserve requirements and bank loan quotas. To answer the question of the effectiveness of sterilization, we will examine the relationship among components of monetary base (reserve money), such as, changes in the net foreign assets ($\triangle$NFA) and changes in the net domestic assets ($\triangle$NDA), and changes in the aggregate money M2 ($\triangle$M2).

5.1 Empirical Methodologies

There are a large number of empirical papers have studied central banks' policy responses

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[①]According to the author's personal experiences, the phenomena of underground lending interest rate reaches and even surpasses 24% are very common in rural areas. This reflects China's serious deficiency of financial services supply in private sectors and rural areas.

to capital inflows and impacts of capital movements on domestic monetary and economic conditions. There are two basic approaches. One approach uses the structural equation initiated by Obstfeld(1982), many studies estimate a central bank's reaction function in which changes in the net domestic assets ($\triangle$NDA) are related to changes in net foreign assets($\triangle$NFA) and a set of control variables. The coefficient on $\triangle$NFA reflects effectiveness of sterilization. If it equals -1 means that the impact on monetary base of increases in net foreign assets (foreign reserves) is fully neutralized by a reduction of the same magnitude in net domestic assets, therefore the sterilization is complete. When the coefficient is zero, there is no sterilization at all because a net increase in net foreign assets leads to a same amount of increase in reserved money. Another approach uses VAR models to analyze the transmission of an impulse from changes in the net foreign assets to changes in the net domestic assets, domestic credit and aggregate money supply (Takagi and ESaka, 1999; He, Chu, Shu and Wong, 2005).

We follow the structural framework of Obstfeld (1982) and Ouyang, Rajan and Willett (2007), and examine the relationship between $\triangle$NFA and $\triangle$NDA and $\triangle$M2 respectively. According to statistical reports of IMF's International Financial Statistics (IFS) and the PBOC, the typical balance sheet of monetary authorities (Table 5.1), the sum of net foreign assets and net domestic assets is generally equals to reserved money or monetary base, namely $\triangle$NFA +$\triangle$NDA=$\triangle$MB. In some countries, such as Japan, the basic target of sterilization is to completely neutralize impact of changes in net foreign assets on MB ($\triangle$MB=0), and this indicates that the net domestic assets should change same amount as net foreign assets but in opposite direction.

Table 5.1 Balance Sheet of Monetary Authorities

Assets	Liabilities and Equity
Foreign Assets (FA)	Currency in Circulation and Deposits/Reserved Money(MB)
Domestic Assets (DA)	Foreign Liabilities (FL)
Other Assets (OA)	Domestic Liabilities (DL)
	Other Liabilities (OL)
	Equity (K)

However, the Chinese monetary authority sterilizes impacts of increase in foreign exchange reserves not only on monetary base through instruments of open market operations, such as, issuing commercial papers, but also on aggregate money supply by changing money multiplier through raising reserves requirement ratio and conducting bank loans quotas. Thus, it is inappropriate to only measure effectiveness of sterilization on the impacts on money base, aggregate money M2 should be added. Naturally, in the case of $\triangle$M2 rather than $\triangle$NDA, complete sterilization indicates that an increase in foreign assets is not associated with a corresponding increase in overall money supply.

The typical structural equations are as follows:

$$\Delta NFA_t = \alpha_0 + \alpha_1 \Delta NDA_t + \mathbf{X}_1' \boldsymbol{\alpha}_2 + u_t \tag{5.1}$$

$$\Delta NDA_t = \beta_0 + \beta_1 \Delta NFA_t + \mathbf{X}_2' \boldsymbol{\beta}_2 + v_t \tag{5.2}$$

$$\Delta M2_t = \gamma_0 + \gamma_1 \Delta NFA_t + \mathbf{X}_2' \boldsymbol{\gamma}_2 + \varepsilon_t \tag{5.3}$$

where equation (5.1) and (5.2) are the balance of payment function, and equation (5.3) is the monetary reaction function respectively, ΔNFA and ΔNDA represent change in net foreign assets (foreign exchange reserves) and change in net domestic assets (domestic money creation) respectively. Both $\mathbf{X}_1$ and $\mathbf{X}_2$ are the vectors of control variables in the equations. α_1 is the offset coefficient. $\alpha_1 = 0$ represents no capital mobility, while $\alpha_1 = -1$ implies perfect capital mobility. β_1 is sterilization coefficient. $\beta_1 = -1$ means international reserves buildup is perfectly sterilized and $\beta_1 = 0$ represents the monetary authority doesn't sterilize at all. Thus, $\alpha_1, \beta_1 \in [-1,0]$.

When $\Delta M2$ is used instead of ΔNDA in equation (5.3), $\gamma_1 = 0$ represents complete

sterilization because a rise in foreign exchange reserves doesn't lead to increase in the broad money, while $\gamma_1 = 1$ implies no sterilization. Actually, the sterilization coefficient γ_1 should be called "non-sterilization coefficient" in term of M2. Therefore, the greater the degree of capital mobility and the smaller of sterilization coefficient represent the less effective in sterilization and less independent in monetary policy, while a small offset coefficient and a large sterilization coefficient generally imply that sterilization is effective and the central bank has fairly high independence in monetary policy to neutralize capital inflows on a sustainable base.

5.2 Models Specification

Based on the framework of Ouyang, Rajan and Willett (2007), we specify equations as follows:

$$\Delta NFA_t^* = \alpha_0 + \alpha_1 \Delta NDA_t^* + \alpha_2 \Delta LMM_{t-i} + \alpha_3 \Delta LP_{t-i} + \alpha_4 \Delta RR_{t-i} + \alpha_5 y_{ct-i}$$
$$+ \alpha_6 \Delta LREER_{t-i} + \alpha_7 FXFS_{t-i} + \alpha_8 \Delta Li_{\$t-i} + u_t$$

(5.4)

$$\Delta NDA_t^* = \beta_0 + \beta_1 \Delta NFA_t^* + \beta_2 \Delta LMM_{t-i} + \beta_3 \Delta LP_{t-i} + \beta_4 \Delta RR_{t-i} + \beta_5 y_{ct-i}$$
$$+ \beta_6 \Delta LREER_{t-i} + \beta_7 FXFS_{t-i} + \beta_8 \Delta Li_{\$t-i} + \beta_9 \Delta LSP_{t-i} + \beta_{10} G_{t-i} + v_t$$

(5.5)

$$\Delta M2_t^* = \gamma_0 + \gamma_1 \Delta NFA_t^* + \gamma_2 \Delta LMM_{t-i} + \gamma_3 \Delta LP_{t-i} + \gamma_4 \Delta RR_{t-i} + \gamma_5 y_{ct-i}$$
$$+ \gamma_6 \Delta LREER_{t-i} + \gamma_7 FXFS_{t-i} + \gamma_8 \Delta Li_{\$t-i} + \gamma_9 \Delta LSP_{t-i} + \gamma_{10} G_{t-i} + \varepsilon_t$$

(5.6)

where $i = 0, 1, \cdots n$. ΔNFA^*, ΔNDA^* and $\Delta M2^*$ are changes in the adjusted net foreign assets, adjusted net domestic assets (adjustments will be discussed in the next section) and M2 scaled by the GDP respectively. ΔLMM represents change in money multiplier for M2. ΔLP is inflation rate. ΔRR indicates change in legal reserve requirement ratio. y_c is cyclical output. $\Delta LREER$ is change in real effective exchange rate. $FXFS$ represents the forward-spot exchange rate spread of the RMB against the dollar. $\Delta Li_{\$}$ is change in time deposit rate of Eurodollar[①]. ΔLSP is change in China's A-share stock market index. G is the share of government's deficits in the GDP.

As seen in the Equation 5.4, the balance of payments function consists of seven control variables. We expect these variables influence the adjusted net foreign assets in the following ways: First, a rise in M2 money multiplier will increase supply of aggregate money and push interest rate down, hence capital inflows decrease. In addition, the rise in money multiplier will induce the monetary authority to tighten restrictive measures towards bank credit and capital inflows. Second, higher inflation rate increases investors' concerns on the depreciation of local currency and the rise in interest rate, and which will cause decline in assets price and capital losses, hence a reduce in capital inflows. Third, the rise in the legal reserve requirement ratios will cause an increase in domestic interest rate and provide an incentive for capital inflows. Fourth, a domestic boom in output will worsen the current account and reduce the outstanding of foreign exchange reserves through income effect. However, domestic prosperity will strengthen confidence of foreign investors and encourage capital inflows. Thus, higher real output has a double-sword effect on capital inflows. Fifth, a rise in real effective exchange rate leads to double impacts on capital mobility. The appreciation of local currency generally causes a worse in current account balance and a decrease in foreign exchange reserves. However, the appreciation of the RMB probably strengthens further appreciation expectation and hence attracting capital inflows particularly under conditions of gradual appreciation. Therefore, the impact of changes in real effective exchange rate on net foreign assets is undetermined. Sixth, the larger in the exchange rate spread between forward

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[①]In theory, the interest rate spread between the RMB and the dollar is a better variable comparing to the time deposit interest rate of the dollar. However, due to the still largely regulated interest rate of the RMB by the government and the relatively effective in the controls on cross-capital movements, the coefficients of the interest rate spread in the regression equations are often insignificant or have wrong direction. Therefore, we use interest rate of the dollar instead of the interest rate spread between the two currencies.

and spot of the RMB against the dollar, the stronger in the pressure of appreciation (depreciation) of the local currency, and there are more foreign capital will flow in (out). Seventh, increase in the interest rate of the Eurodollar will discourage capital inflows.

As Equation 5.5 shows, the monetary policy function consists of nine control variables that are considered to probably important factors impacting monetary actions. The Chinese monetary authority generally conducts contractionary monetary policy in response to a rise in inflation, domestic economic boom, a rise in money multiplier and expected exchange rate depreciation, hence, the expected coefficient for the above variables should be negative. Specifically, these variables impact the adjusted net domestic assets through the following ways: First, the impact of rise in money multiplier on the net domestic assets depends on the type of monetary authority's contractionary measures. When the authority uses open market operations measures to offset increase in money multiplier, the size of net domestic assets will decrease. When the authority implements measures of reserve requirements to reduce money multiplier directly, the amount of net domestic assets probably increases. Therefore, change in money multiplier produces double-sword effects on the net domestic assets, and a rise in reserve requirements makes domestic assets increase. Second, a rise in real GDP growth rate above the trend will lead to a contractionary policy response and hence expected coefficient is negative. Third, an increase in the real effective exchange rate and the RMB revaluation pressure will force the authority implement expansionary monetary policy, hence, the expected coefficient of the REER and the forward-spot exchange rate spread is positive and negative respectively. Fourth, a rise in the deposit rate of Eurodollar discourages cross capital inflows and the net domestic assets tend to fall. Lastly, increase in assets prices generally induces the authority's contractionary policy response, particularly under circumstances of assets bubble.

When $\Delta M 2^*$ is used instead of ΔNDA^* in Equation 5.6, some changes in coefficients of control variables will occur correspondingly. First, a rise in the domestic economic boom, such as, higher inflation rate, higher real output growth above the trend and higher stock price index generally engenders the monetary authority's contractionary policy actions, hence expected coefficients of these variables are negative. Second, maintaining stability of exchange rate is an important target of Chinese monetary authority, therefore, a decrease in the interest rate in Eurodollar, an appreciation in the real effective exchange rate and an increase in revaluation expectation on local currency, generally cause the authority to implement loose monetary policy to mitigate revaluation pressure, and hence the aggregate money supply increases. Third, a rise in aggregate money supply generally accompanies with increase in government fiscal deficits, because the authority has to finance the government expenditure through increasing money supply.

5.3 Variables and Data

Our estimations are based on monthly data over the sample period from 1999:6 to 2009:3. Most of data come from the CEIC database, the rest data are from other sources. For example, reserve requirements data comes from the PBOC, three month RMB non-deliverable forward rate (NDF) against the dollar is from the Bloomberg, and real effective exchange rate of the RMB come from the Bank of International Settlement (BIS). Table 5.2 summarizes definitions and measurements of various variables in the estimated equations. The definitions, measurements and adjustments of these variables are discussed as follows.

The dependent variables, such as the changes in the adjusted ΔNFA^*, ΔNDA^* and $\Delta M 2^*$, are scaled by the monthly GDP. The monthly GDP is measured by distributing quarterly GDP into corresponding three months weighted by the ratio of industrial value added. We can directly obtain the data on China's foreign exchange reserves and its foreign liabilities from the PBOC, hence we can easily get the data on the net foreign assets. However, it is worthy of noting that some components of foreign exchange reserves accumulation are not associated with corresponding changes in monetary base, such as exchange rate fluctuation and investment interest income. Therefore, we should exclude the non-policy related changes in the NFAs due to revaluation effects and interest income.

Although there are no officially released data about currency composition of China's international reserves, a public accepted view think that the share of dollar assets should reach even surpass 80%. To simplify, we suppose that all of China's foreign assets are

invested in dollar assets[①]. The change in net foreign assets due to the revaluation effect is:

$$RE_t = NFA_{t-1}(\frac{e_t - e_{t-1}}{e_{t-1}}) \tag{5.7}$$

where e_t is the average exchange rate the RMB against the dollar at time t.

Assuming all of China's international reserves are invested in US ten-year treasury bonds, hence the interest yield of international reserves at month t is:

$$yd_t = \frac{i_{TBt}}{12} \frac{NFA_{t-1} + NFA_t}{2} \tag{5.8}$$

where i_{TB} is interest rate of US ten-year nominal interest rate.

If we subtract equation (5.7) and (5.8) from the NFA, and scaled by the monthly GDP, then the adjusted NFA can be obtained as following:

$$NFA_t^* = \frac{NFA_t - RE_t - yd_t}{GDP_t} = \frac{NFA_t - NFA_{t-1}(e_t/e_{t-1} - 1) - i_{TBt}(NFA_{t-1} + NFA_t)/24}{GDP_t} \tag{5.9}$$

According to the formula $MB = NFA + NDA$, the adjusted NDA can be written as:

$$NDA_t^* = MB_t/GDP_t - NFA_t^* \tag{5.10}$$

NFA_t^* and NDA_t^* will be used as dependent variables in Equation (5.4) and (5.5) respectively. Another dependent variable $M2_t^*$ used in Equation (5.6) can be expressed as $M2_t$ scaled by the monthly GDP_t, namely $M2_t^* = M2_t/GDP_t$.

Regarding the control variable of cyclical income (y_c), we use the Hodrick-Prescott (HP) Filter method to measure trend of real GDP. The Hodrick-Prescott Filter is a smoothing method that is widely used among macroeconomists to obtain a smooth estimate of the long-term trend component of a series. If we suppose GDP^T is the HP trend of the output, hence cyclical income scaled by long-term trend of real GDP can be expressed as $y_c = (GDP - GDP^T)/GDP^T$. The other various control variables are listed clearly with definitions and measures in the Table 5.2, it is not necessary to explain them in detail further.

5.4 Empirical Results

We use the method of Ordinary Least Squares (OLS) to estimate the equation (5.4), (5.5) and (5.6). The estimation process consists of three steps: First, conducting Augmented Dickey-Fuller (ADF) unit root test to check for stationery to all variables. Second, setting up structural regression equations and estimating these equations. Finally, applying various tests to the estimated equations and evaluating their quality, such as, the autocorrelation and heteroskedasticity test, the CUSUM test and the Chow breakpoint test.

Table 5.2   Definitions and Measurements of the Variables

Variables	Definitions	Measurements
NFA	Foreign reserves denominated in domestic currency minus foreign liabilities.	Foreign exchange (assets)－Foreign liabilities
△NFA*	The change in NFA excluding revaluation effect and interest income scaled by the monthly GDP.	$\dfrac{\Delta[NFA_t - (\frac{e_t - e_{t-1}}{e_{t-1}})NFA_{t-1} - \frac{i_{TBt}}{12}(\frac{NFA_t + NFA_{t-1}}{2})]}{GDP_t}$
△NDA*	The change in (net domestic assets + net other assets – capital item) + revaluation effect + interest income scaled by the GDP.	$\dfrac{\Delta MB_t}{GDP_t} - \Delta NFA_t^*$

[①]We also suppose that China's foreign assets consist of the dollar, euro and yen assets, and their shares are 80%, 15% and 5% respectively in the last chapter. We found that there just existed small difference in the value of foreign exchange reserves among different assumptions about the international reserves structure.

△M2*	The change in M2 scaled by the monthly GDP.	$\dfrac{\Delta M2_t}{GDP_t}$
△LMM	The change in money multiplier (MM) for M2 (MM= M2/Monetary Base).	$\ln(MM_t) - \ln(MM_{t-1})$
△LREER	The change in the real effective exchange rate (REER).	$\ln(REER_t) - \ln(REER_{t-1})$
△RR or △LRR	The change in commercial banks' reserve requirement ratio.	$RR_t - RR_{t-1}$ or $\ln(RR_t) - \ln(RR_{t-1})$
△LP	The change in CPI index P (inflation rate).	$\ln P_t - \ln P_{t-1}$
FXFS	The average spread between 3-month NDF forward rate (F_{NDF}) and spot rate (S) of RMB against the dollar.	$\dfrac{\ln F_{NDFt} - \ln S_t}{\ln S_t}$
△Li$_\$$	The change in six-month Eurodollar deposit rate.	$\ln(i_{\$t}) - \ln(i_{\$t-1})$
△LSP	The change in the stock index of Shanghai Composite (SP) or yields of stock investment.	$\ln(SP_t) - \ln(SP_{t-1})$
y_c	Cyclical income. The monthly real output deviates from its trend (GDP^T) scaled by the HP-filter output trend.	$\dfrac{GDP_t - GDP_t^T}{GDP_t^T}$
G	The share of the government's deficits in the monthly GDP.	Government deficits/GDP

5.4.1 ADF Test

To avoid the problem of "Spurious Correlations", it is necessary to conduct stationary test before estimate the OLS equations. We apply the standard ADF unit root test to each of variables with the lag length of the ADF test equation decided by the Schwartz Information Criterion (SIC) or Akaike Information Criterion (AIC). The ADF test results are listed in the Table 5.3. As the Table shows, all variables are stationary at 5 percent significant levels.

Table 5.3 ADF Unit Roots Test for China's Data: 1999:6-2009:3

Variables	Type of Test (c, t, n)	ADF Test Statistic H$_0$:Variable has a unit root	Test Result
△NFA*	(c,0,1)	-3.60***	I(0)
△NDA*	(c,0,0)	-10.9***	I(0)
△M2*①	(c,0,0)	-11.1***	I(0)
△LMM	(c,0,0)	-13.7***	I(0)
△LREER	(c,0,0)	-11.3***	I(0)
△RR	(c,t,0)	-1.95**	I(0)
△LRR	(c,0,0)	-9.30***	I(0)
△p	(c,0,0)	-8.38***	I(0)
FXFS	(0,0,0)	-2.11**	I(0)
△Li$_\$$	(c,0,0)	-6.04***	I(0)
△LSP	(c,0,1)	-5.35***	I(0)
y_c	(c,0,12)	-4.48***	I(0)
G	(0,0,12)	-1.95**	I(0)

Note: "c", "t" and "n" designates intercept, trend and lag length respectively. "*", "**", and "***" denotes the ADF test statistic is significant at 10%, 5% and 1% respectively.
① The sample range of △M2* is 1999:6-2008:12. △M2* is not stationary in the sample of 1999:6-2009:03.

5.4.2 The Balance of Payment Function △NFA*

The estimated balance of payment function is as the following:

$$\Delta NFA_t^* = \underset{(10.5)}{0.0562} - \underset{(-7.36)}{0.3022}\Delta NDA_t^* - \underset{(-6.00)}{0.3431}\Delta LMM_t - \underset{(-2.12)}{1.6281}\Delta LP_{t-4} + \underset{(2.00)}{0.0319}\Delta RR_{t-1}$$

$$- \underset{(-3.76)}{2.3684}\, y_{ct-2} + \underset{(3.74)}{1.1339}\Delta LEER_{t-4} - \underset{(-2.83)}{0.6948}\Delta LEER_{t-6} - \underset{(-2.00)}{2.7752}FXFS_t - \underset{(-4.32)}{5.1583}FXFS_{t-12} \qquad (5.11)$$

where R^2=0.655, $\overline{R}^2 = 0.622$ and DW=2.10. The statistics magnitudes in brackets of the equation are t statistics (same hereafter). The results of the Correlogram-Q-statistics test and the Auto-
regressive conditional heteroskedasticity (ARCH) LM test to residuals of the equation show that the residual series has no autocorrelation, partial correlation and heteroskedasticity. The CUSUM test finds that both the cumulative sum statistic and the cumulative sum of squares statistic go inside the area between two 5% critical lines, and which is suggestive of coefficients, parameters or variances stability respectively (Figure 5.1).

As seen in Equation 5.11, the estimated offset coefficient is around 0.30 and statistically significant, indicating a fairly large degree of capital mobility despite China's capital controls [1]. The money multiplier, inflation and legal reserves requirement ratio are statistically significant with correct estimated signs, suggesting that a rise in money multiplier and reserves requirement and a fall in inflation rate leads to an increase in interest rate and foreign capital inflow. The lagged cyclical output is statistically significant and negative, which means that the income effect causing a worse in current account probably outweighs the impact that positive cyclical output on attracting foreign capital. The coefficients of the spread of NDF forward and spot exchange rate are statistically significant and economically negative, suggesting expectation on the RMB revaluation produces a strong impact on capital inflow. The different sign of the lagged REER term in different period shows that appreciation of the local currency produces double-sword effects on cross-border capital mobility, and its positive impact on capital inflows through strengthening appreciation expectation is probably larger than negative effect on current balance under China's recent gradual appreciation policy.

Figure 5.1 The CUSUM Stability Test
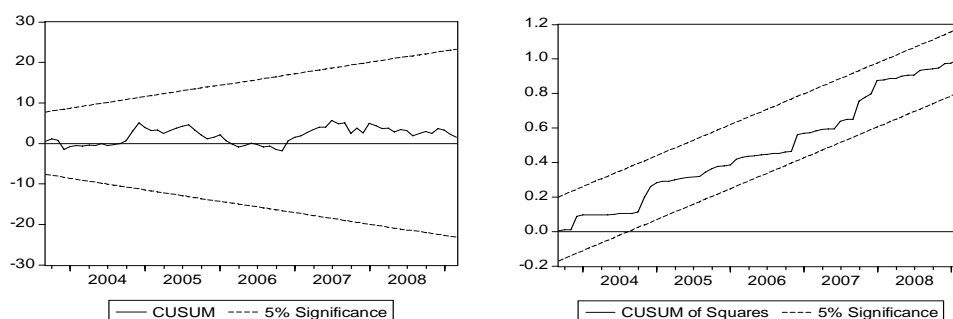
5.4.3 The Monetary Reaction Function △NDA*
5.4.3.1 Complete Sample 1999:06-2009:03

The estimated monetary reaction function can be written as following:

$$\Delta NDA_t^* = \underset{(4.25)}{0.0380} - \underset{(-10.7)}{0.9620}\Delta NFA_t^* - \underset{(-14.7)}{0.8855}\Delta LMM_t + \underset{(9.07)}{0.6501}\Delta LMM_{t-12} + \underset{(1.79)}{0.0324}\Delta RR_{t-1}$$

$$+ \underset{(2.30)}{3.1251}\, y_{ct} - \underset{(-3.58)}{4.9319}\, y_{ct-1} + \underset{(1.75)}{1.2994}\, y_{ct-4} + \underset{(3.17)}{1.0795}\Delta LREER_{t-4} - \underset{(-5.59)}{9.8483}FXFS_{t-12} \qquad (5.12)$$

$$- \underset{(-2.35)}{0.1449}\Delta Li_{\$t} + \underset{(13.5)}{0.6832}\Delta NDA_{t-12}^* - \underset{(-2.50)}{0.0911}\Delta NDA_{t-16}^*$$

where R^2=0.911, $\overline{R}^2 = 0.898$ and DW=1.68. The residual tests show that the residual series from the estimated equation has no autocorrelation and partial correlation but heteroskedasticity. As seen in Figure 5.2, the cumulative sum of squares statistic moves

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[1] The offset coefficients that Ouyang, Rajan and Willett (2007) estimated are much larger and reached around 0.63 to 0.70, reflecting that a substantial degree of capital movement and the high ineffectiveness in China's capital controls. In consideration into China's current strict restrictions on capital transactions, the author thinks that the value of 0.30 for offset coefficient is probably more credible.

outside the area between the two critical lines, and which is suggestive of parameters or variances instability.

As Equation 5.12 shows, the estimated sterilization coefficient is statistically significant and is around 0.96, indicating that Chinese monetary authority has massively sterilized the accumulation of foreign exchange reserves in recent years. The opposite sign between money multiplier and lagged term shows that its increase has no certain but generally negative impact on monetary base. To maintain stability of aggregate money supply is an important target for Chinese monetary policy, the authority can implement open market operations to reduce monetary base or raise legal reserves requirement ratio to lower money multiplier. Cyclical output and its lagged terms produce undetermined but generally negative impacts on monetary base, because the authority tends to conduct contractionary policy to address economic overheating, hence the money base and net domestic assets decrease. The significantly positive sign of the legal reserves requirement ratio indicates that its increase certainly leads to a rise in monetary base. The lagged REER term has positive sign reflects that the authority generally carries out expansionary monetary policy to mitigate the appreciation pressure of the currency by reducing interest rate. The significantly positive sign of the forward-spot spread shows that revaluation expectation attracts capital inflow and hence increase in monetary base. The significantly negative sign of the Eurodollar interest rate suggests that a rise in yields of foreign assets will attract capital to move out, hence leads to decrease in the dollar purchase by the authority and monetary base.

Figure 5.2 The CUSUM Stability Test
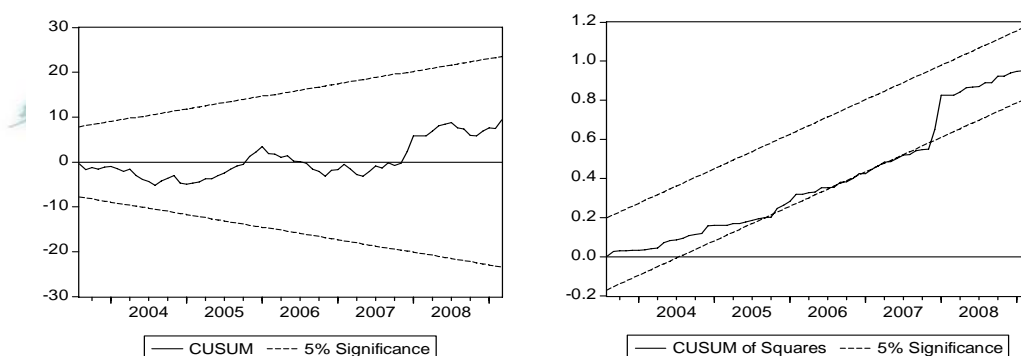
The instability of the monetary reaction function is probably attributed to the factor of structural changes. During the sample period, the amount and structure of China's capital movements has changed fundamentally. The Chow break point test shows that there existed a break point at the point of September 2003. Hence, we divide the sample of 1999:06-2009:03 into two sub-samples with the ranges of 1999:06-2003:08 and 2003:09-2009:03 respectively.

5.4.3.2 Sub-sample 1999:06-2003:08

The estimated monetary reaction equation with the sub-sample of 1999:06-2003:08 is the following:

$$\Delta NDA_t^* = \underset{(1.15)}{0.0094} - \underset{(-4.52)}{0.6419}\, \Delta NFA_t^* - \underset{(-11.9)}{0.8065}\, \Delta LMM_t + \underset{(14.4)}{1.0422}\, \Delta LMM_{t-12} - \underset{(-2.33)}{1.6326}\, y_{ct-6}$$

$$- \underset{(-3.30)}{0.2525}\, \Delta Li_{\$t-11} + \underset{(20.7)}{0.8701}\, \Delta NDA_{t-12}^* - \underset{(-3.73)}{0.1465}\, \Delta NDA_{t-16}^* \qquad (5.13)$$

where R^2=0.959, $\bar{R}^2 = 0.947$ and DW=2.33. The residual tests show that the residual series has no autocorrelation, partial correlation and heteroskedasticity, and the CUSUM tests suggest the stability of the equation in coefficients, parameters and variances (Figure 5.3).

As seen in Equation 5.13, the estimated sterilization coefficient is also statistically significant and is around 0.64, suggesting that the PBOC had conducted moderate neutralization during the period of 1999:06-2003:08, and which is suit to the moderate capital inflows in this period. The money multiplier and its lagged term generally produce negative impact on monetary base. The coefficient of the cyclical output is significantly negative, indicating that the authority generally has the intention to conduct contractionary monetary policy to address economic overheating. The Eurodollar interest rate has correct sign.

Figure 5.3 The CUSUM Stability Test
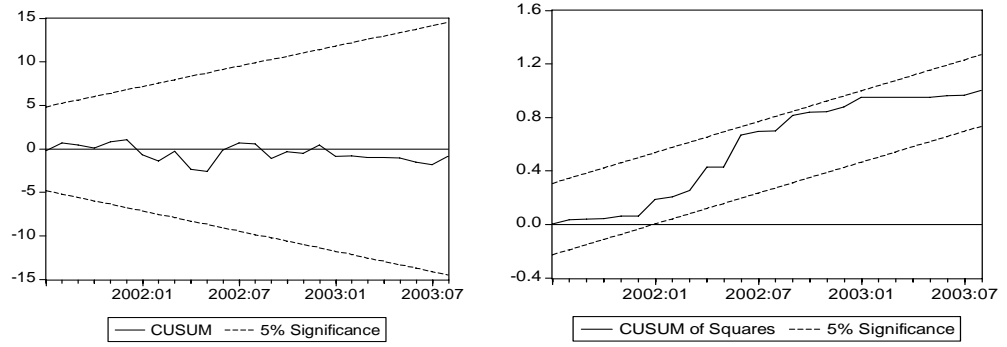
5.4.3.3 Sub-sample 2003:09-2009:03

The estimated monetary reaction function with the sub-sample of 2003:09-2009:03 can be written as the following:

$$\Delta NDA_t^* = \underset{(3.39)}{0.0608} - \underset{(-9.72)}{0.9709}\,\Delta NFA_t^* - \underset{(-14.4)}{1.0101}\Delta LMM_t + \underset{(6.38)}{0.5272}\Delta LMM_{t-12} + \underset{(1.98)}{0.4809}\Delta LRR_{t-11}$$

$$+ \underset{(2.13)}{3.7446}\,y_{ct} - \underset{(-3.17)}{5.4450}\,y_{ct-1} + \underset{(1.98)}{2.0417}\,y_{ct-4} + \underset{(3.89)}{1.5871}\Delta LREER_{t-4} - \underset{(-1.91)}{4.5971}\,FXFS_{t-11} \qquad (5.14)$$

$$- \underset{(-3.28)}{0.2570}\Delta Li_{\$t} - \underset{(-1.98)}{0.1592}\Delta LSP_{t-6} + \underset{(9.67)}{0.5832}\Delta NDA_{t-12}^*$$

where R^2=0.930, $\bar{R}^2 = 0.915$ and DW=1.65. The residual series has no autocorrelation, partial correlation and heteroskedasticity, and the equation is stable in coefficients, parameters and variances (Figure 5.4).

Figure 5.4 The CUSUM Stability Test
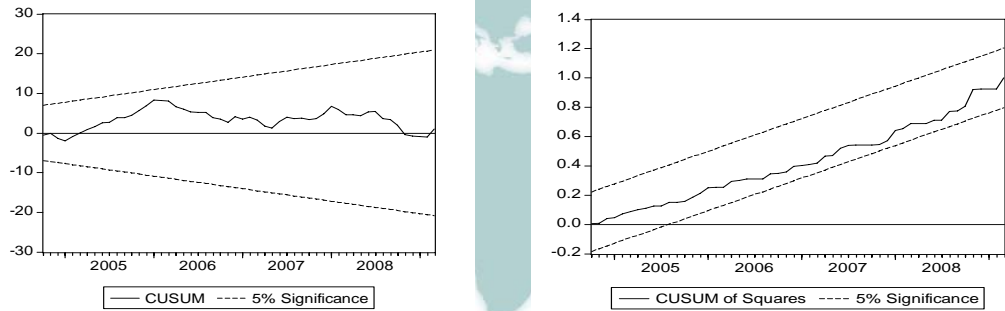
The estimated sterilization coefficient is statistically significant and is around 0.97, with an increase of 51% in comparison to the preceding sample period, indicating that the Chinese authority had conducted massive sterilization under the background of large and persistent capital inflows during the period of 2003:09-2009:03. The negative lagged stock price index indicates that the authority tends to implement contractionary policy to mitigate the upward pressure on asset prices particularly under the backdrop of asset bubbles. The cyclical output, money multiplier and their lagged terms generally produce negative impacts on monetary base and the NDAs. The coefficients of the rest control variables and its lagged terms are statistically significant with correct signs.

5.4.4 The Monetary Reaction Function △M2*

The estimated monetary reaction function with △M2* as the dependent variable can be expressed as the following:

$$\Delta M2_t^* = \underset{(4.43)}{0.1636} + \underset{(3.90)}{0.5698}\Delta NFA_t^* - \underset{(-1.92)}{0.0703}\Delta RR_{t-3} - \underset{(-2.33)}{3.0128}\,y_{ct} + \underset{(3.89)}{1.5871}\Delta LREER_{t-4}$$

$$- \underset{(-2.64)}{10.143}\,FXFS_{t-2} - \underset{(-1.78)}{2.3061}\Delta LP_{t-1} - \underset{(-3.21)}{0.3671}\Delta Li_{\$t-1} - \underset{(-2.13)}{0.2745}\Delta LSP_{t-12} + \underset{(1.70)}{1.6861}\,G_{t-2} \qquad (5.15)$$

$$- \underset{(-2.40)}{0.2228}\Delta M2_{t-1}^* + \underset{(2.93)}{0.2705}\Delta M2_{t-3}^*$$

where R^2=0.390, $\bar{R}^2 = 0.324$ and DW=2.03. The residual tests show that the residual series has no autocorrelation, partial correlation and heteroskedasticity, and the CUSUM tests suggest the stability of the equation in coefficients, parameters and variances (Figure 5.5).

As seen in Equation 5.15, the estimated non-sterilization coefficient is significantly positive and is around 0.57, indicating that a unit rise in the international reserves leads to

around 0.57 unit increase in M2, the aggregate money supply, hence the share of sterilization of the accumulation just reached 43%. Therefore, although Chinese authority had implemented many policies even administrative measures to neutralize accumulation of international reserves in the sample period of 1999:09-2008:12, the effectiveness of Chinese sterilization policy is quite limited in term of M2.

The coefficient of the government deficit is significantly positive, suggesting that the authorities are forced to expand aggregate money supply to provide a funding source for increase in government expenditures. The significantly negative sign of the reserve requirement ratio means that a rise in its value certainly leads to a decrease in the aggregate money supply. The coefficients of the inflation, stock price and cyclical output (domestic economic boom) are significantly negative, suggesting the authority tends to implement contractionary monetary policy by reducing money supply when the economy shows some signs of overheating in commodities, assets and real economy. The coefficients of the forward-spot exchange rate spread, real effective exchange rate and Eurodollar interest rate are statistically significant with correct signs.

Figure 5.5 The CUSUM Stability Test
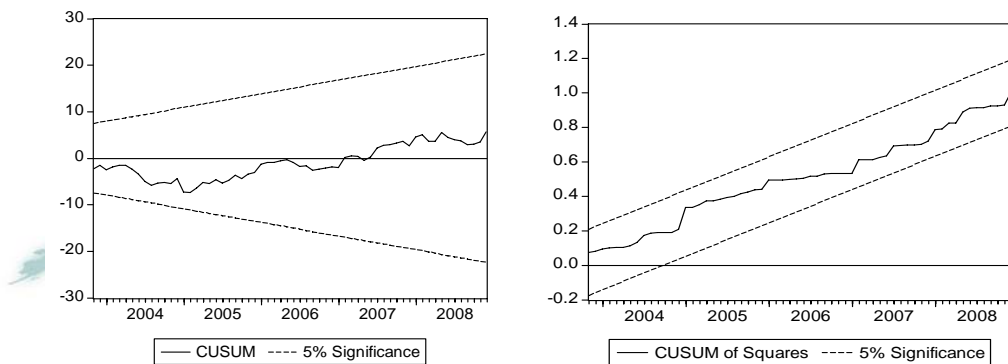
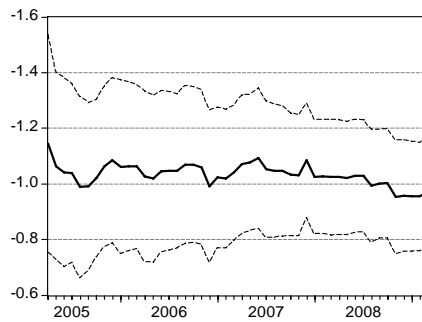### 5.4.5 Estimated Recursive Offset and Sterilization Coefficients

The method of recursive coefficients estimation is often used to check for stability of the estimated equation, and the stability of the equation depends on stability of recursive coefficients. In addition, w can apply the method of recursive estimation to estimate dynamic evolution of offset and sterilization coefficients (Figure 5.7).

As seen in Figure 5.7a, the recursive offset coefficient remained fairly stable between early 2005 and mid-2007 at around 0.25 before rising rapidly from hereafter to an average of about 0.32 in 2008, indicating that capital mobility increased significantly in the latter period. As Figure 5.7b-c shows, there existed an obvious structural change in the recursive sterilization coefficient. During the sub-sample period from early 2002 to mid-2003, the degree of sterilization had remained fairly stable and fluctuated around a relatively low level of 0.60. However, the sterilization coefficient had rose sharply and fluctuated around 1.05 in the period between late 2003 and 2007, indicating that the authority had over-sterilized accumulation of international reserves. Since early 2008, the sterilization degree began to decrease moderately and maintained at around 0.95 at the end of March 2009.
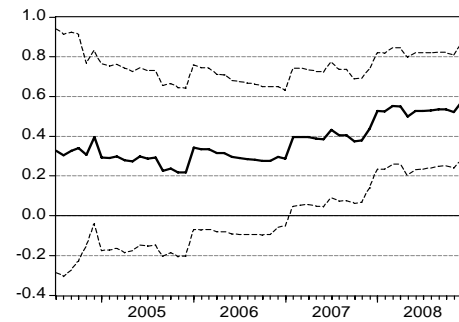
Figure 5.7 Estimated Recursive Offset and Sterilization Coefficients
a. Offset Coefficient   b. Sterilization Coefficient: 1999:06-2003:08
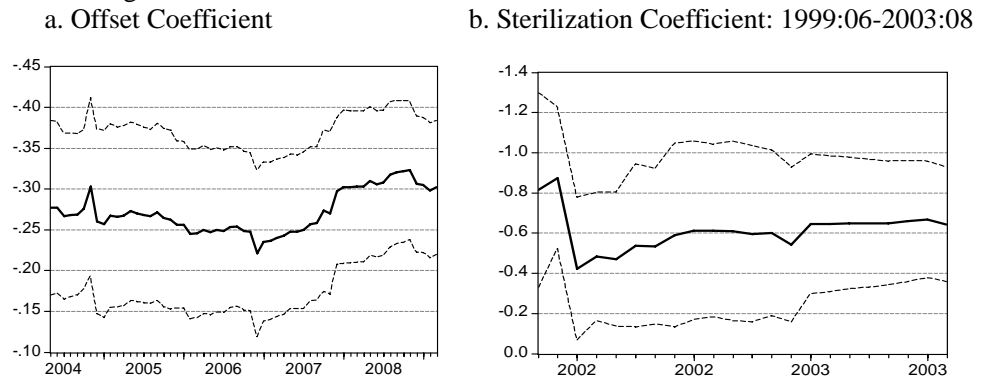
c. Sterilization Coefficient: 2003:09-2009:03   d. Non-sterilization Coefficient

In the case of M2, the non-sterilization coefficient increased fairly rapidly, rising from around 0.30 in the period of 2004-06 to about 0.40 in 2007 and 0.50 in 2008, which suggests that the degree of sterilization decreased from around 0.70 in 2005 to about 0.50 in 2008. The rise in the offset coefficient and decrease in the sterilization degree reflects that effectiveness of Chinese authority's neutralization policy has been declining in recent years. Therefore, it is much more difficult for Chinese authority to maintain independent monetary policy through sterilizing large and persistent capital inflows under the backdrop of China's large capital inflow and skyrocketing international reserves.

5.5 Conclusion

Our empirical results indicate that effectiveness of Chinese cross-capital movement has increased moderately in recent years, rising from around 0.25 in 2005 to above 0.30 in 2008. This is consistent with some scholars' judgments on China's capital controls have been becoming less binding (Ma and McCauley, 2005; Prasad and Wei, 2005). However, the increased capital inflows and international reserves had been nearly completely sterilized, or even over-sterilized in term of the monetary base, hence it seems that the gradual rise in effectiveness of capital movement hasn't undermined independency of China's monetary policy. But at the same time, we find that sterilization effectiveness is quite poor if we examine the non-sterilization coefficient in the perspective of M2, nearly more than a half increase in foreign reserves hasn't been sterilized. This can partly explains China's latest occurred commodities inflation, assets bubble and economic overheating. Because Chinese authority has frequently used many policy actions even administrative measures in addition to open market operations to neutralize increase in international reserves, the sterilization coefficient of M2 is a better indicator to valuate effectiveness of neutralization comparing to that of NDAs.

In a word, with rise in offset coefficient while fall in sterilization coefficient, it is increasingly difficult for Chinese authority to maintain independent monetary policy through sterilizing the impacts of continuous accumulation of foreign reserves on domestic broad money supply, under the background of large and persistent capital inflows and skyrocketing international reserves. It is apparent that Chinese recent massive sterilization policy can't be sustainable, even if inconsideration into induced increasingly fiscal costs, exchange rate risks and financial repression losses. Thus, Chinese authority should continue to relax management of the exchange rate and take further steps towards deregulations of capital outflows.

6. Concluding Remarks and Policy Implications
6.1 Concluding Remarks

As the "Impossible Trinity" states that, perfect capital mobility, fixed exchange rate and independent monetary policy cannot maintain simultaneously. The enlarged Mundell-Fleming Model of the paper concludes that monetary autonomy can be attained for a finite of time while maintaining pegged (or heavily managed floating) exchange rate, imposing capital controls and conducting sterilized interventions. The degree of independence of monetary policy depends on effectiveness of capital transactions restrictions and sterilization of capital inflow. However, it is increasingly difficult to implement capital restrictions with free and expansionary current trade, and to conduct sterilized interventions under circumstances of huge foreign reserves and large and persistent capital inflow. Under such conditions, the monetary authority can neither control capital mobility nor maintain monetary autonomy effectively.

The second section of the paper provides an overview of Japan's liberalization of foreign exchange in the period from immediate postwar to 1990, focusing on changes in foreign exchange rate regime, capital mobility restrictions and sterilized interventions. Japan adopted gradual steps to liberalize foreign exchange controls, with the freedom in current account in 1964, the shift of exchange rate from pegged to managed floating in 1971, and finally to freely floating in 1973, and the liberalization of capital account in 1980. Japanese experiences on liberalization of foreign exchange controls are mixed. There are some good experiences, i.e. the relatively undervalued yen could help to stimulate rapid growth in exports and economy, the allowance of the yen to float substantially reduced short-term capital movements due to the rise in foreign exchange risks, and the gradual liberalization of international transactions helped Japan to maintain stabilities of economy and prices. The lessons for Japanese authority are the followings: it paid too much attention on the stability of nominal exchange rate of the yen against the dollar through massive interventions, even via inflation adjustments; its long resistances to the yen revaluation (appreciation) led to a large and substantial revaluation (appreciation) of the currency in the Nixon Shock and the Plaza Agreement; it overestimated deflationary effect of yen revaluation and its extremely expansionary macroeconomic policy responses induced high inflation in 1973-74 and asset bubbles in late 1980s. Japan's experience with fixed exchange rate in 1964-71 and managed floating rate in 1971-73 showed that the limits of capital account restrictions can do to support a fixed or heavily managed floating exchange rate system under circumstances of liberalization of current transactions. Because trade-related capital movements (i.e. leads and lags, international transfer prices) were sufficient to destroy the pegged or heavily managed floating rate system. Therefore, it is impossible to achieve simultaneously both stability of domestic currency and independence of monetary policy, even with capital account restrictions and massive sterilized interventions.

The third section analyzes China's recent situations on foreign exchange controls since 2001 particularly 2005, focusing on heavily managed floating rate, strict capital account controls and massive sterilized interventions. Some categories of capital movements circumvented capital regulations and flowed into China through current accounts, such as, over-invoicing exports and under-invoicing imports, international transfers, outward payments of investment income. Some arbitraged capital movements via the account of trade credit (leads and lags) and errors and omissions. Therefore, it is increasingly difficult for Chinese authority to control capital movements, with liberalization and expansion in real transactions. Moreover, under circumstances on persistent and large capital inflows and skyrocketing international reserves, it is also much more difficult to conduct sterilized interventions. Even with massive and administrative sterilizations, China couldn't avoid economic overheating, commodities inflation and assets bubble, such as, open market operations, reserve requirements and bank loan quota. Thus, capital restrictions and massive sterilized interventions are not enough to support stability of the RMB and independence of monetary policy.

The fourth part estimates effectiveness of China's capital controls and sterilizations through examining the relationship between changes in the net foreign assets or aggregate money M2 and changes in the net domestic assets. Our empirical results indicate that China's capital controls become less binding moderately, and degree of sterilization is perfect for monetary base (MB), while it is imperfect (just half) in terms of M2. Because the primary target of Chinese sterilizations is to maintain stable growth in M2 rather than MB, the sterilization coefficient of M2 is a better indicator to valuate effectiveness of sterilization. Hence, imperfect sterilization of capital inflow can partly explains China's latest occurred commodities inflation, assets bubble and economic overheating. With rise in offset coefficient while fall in sterilization coefficient, China can't maintain independent monetary policy and heavily managed floating rate simultaneously through massive sterilized interventions. Therefore, it is apparent that Chinese massive sterilizations can't be sustainable, even inconsideration into huge fiscal costs, exchange risks and efficiency losses.

6.2 Similarities and Differences between Past Japan and Present China

To analyze the relevancy of Japanese experiences in the period from immediate postwar to 1990 to China's policy implications for liberalization of foreign exchange controls, we present a comparison of similarities and differences between Japan in the past and China today.

6.2.1 Similarities

There are basic similarities of context between present China and Japan in the 1960s and 1970s, such as, a sudden rise to a major player in the global economic stage under the background of rapid economic growth, persistent and large trade surplus, long-term revaluation pressure on domestic currency, started liberalization in capital account following free current transactions.

As Japan did before 1990, China employs a principle of general prohibition and freedom in exceptions, with heavily regulated and individually authorized capital transactions, and implements selective easing measures on capital controls. The direction of Japan's restrictive system on capital movement began to change just before the Nixon Shock, switching from "encouraging the inflow and discouraging the outflow" to "discouraging the inflow and encouraging the outflow". Recently, China's restrictive system has experienced similar shift, with the implementation of easing regulations on capital outflows while strengthening controls on capital inflows, namely "easy out, difficult in". In Japan, inward foreign direct investment was first liberalized in the process of liberalization in capital transactions. In this regard, China is not just the same as Japan, and goes so far that gives favorable treatments to foreign investors.

Japan's liberalization process in foreign exchange rate regime and capital transactions was extremely complex, due to changes in exchange rate (from a peg to a managed float, finally a freely float), a substantial currency revaluation, and large capital inflows. In this aspect, Japan's experiences are relevant to China, while China's exchange rate has shifted from pegged to managed floating and revaluated around 20% against the dollar since July 2005, with a further revaluation pressure on the currency still existed and the flexibility in the rate movements needs to be enhanced.

A commonality between Japan and China is their attitude toward free floating rate of domestic currency. With strong revaluation pressure, both Japan and China had a long resistance to revaluation or free floating, worrying about damaged effects of substantial revaluation and excessive fluctuations of the currency on export sectors. It is ridiculous that Japan even conducted inflation adjustment policy to avoid appreciation of nominal exchange rate in early 1970s. China's current exchange rate policy is also not wise, and China has paid a high cost for stability of the RMB, such as, commodities inflation, asset bubble, and large fiscal cost and exchange risk due to increasing amount of foreign reserves.

Both Japan and China attempted to seek the target of the stability of domestic currency and independence of monetary policy through capital account restrictions and sterilized interventions. Actually, they couldn't realize any target of stability of domestic currency, capital account restrictions, and independent monetary policy. For example, Japan's large revaluation and high inflation after the Nixon Shock, sharp appreciation and assets bubble after the Plaza Agreement, and China's significant revaluation, commodities inflation, and assets bubble in 2007-08.

6.2.2 Differences

The differences between past Japan and present China are as follows:

The environmental difference between past Japan and present China is worldwide stance toward floating exchange rate and capital account liberalization, and increase in the size of capital movements. In 1960s and 1970s, foreign exchange rate management and capital account controls were the norm in most developed countries. Hence, Japan could gradually liberalize foreign exchange controls and frequently switch directions of capital control measures to stabilize nominal exchange rate of the yen. However, unlike that time, the idea of liberalization is widely accepted today, and many countries, both developed and developing, had made substantial progresses in liberalizations of capital account. In this regards, negative reactions to backward measures, if implemented, could be very strong (Aramaki, 2006). Therefore, it is better to respond to changes in situations by stopping further liberalization and using emergency measures rather than major backward steps. Moreover, the scale of present cross-border capital movements increases substantially, hence the risk in the liberalization of capital account rises significantly. Therefore, it is important for China to move ahead steadily, without any major backward steps in liberalization of capital account.

A main difference between Japan and China is their stance toward internationalization of their currency. Japan allowed use of the yen in foreign settlements in 1960. China had always prohibited use of the RMB as settlement currency in international transactions until July 2009. Now, the Chinese authority begins to allow experimental use of RMB in the trade between

China and its adjacent economies, such as, Hong Kong, Macao and ASEAN, due to anxiety about large exchange risk of huge foreign reserves.

Reflecting the different policy of internationalization of domestic currency, Japan introduced the non-resident free-yen deposit account in 1960, and the free-yen account had become a major source of Japan short-term capital movement. China has no such system exists (Aramaki, 2006). However, with allowance of Hong Kong individual residents to open RMB deposit accounts in Hong Kong banks in February 2004 and experimental use of RMB as settlement currency in July 2009, RMB denominated account will become a potential important source of China's capital flow.

Another difference is the attitude toward inward portfolio securities investment. Japan gradually eased regulations on inward portfolio securities investment in parallel with inward FDI. China generally prohibited inward securities investment except the QFII scheme.

6.3 Policy Implications

Based on the above-mentioned similarities and differences, let us examine policy implications of Japanese experiences in the high growth era for China. In consideration into internal and external risks China now faces, such as, high dependence on exports, risk of huge cross-border capital movements due to the RMB revaluation expectation, large exchange rate risk originated from skyrocketing international reserves, potential risks of capital inflow sudden stop and capital flight, and the not well-developed, highly regulated and SOEs dominated domestic financial sector, it is appropriate to adopt a gradual approach to the liberalization of foreign exchange controls as Japan had employed in the past. However, the gradual approach doesn't mean the liberalization process is slow or delayed. With diminished effectiveness of regulations and increasingly less binding of capital controls, the schedule of liberalization in foreign exchange controls can't be as long as decades as Japan in the past and the process of liberalization should be shortened substantially. Thus, Chinese monetary authority should take immediate and decisive actions to advance the liberalization of foreign exchange controls.

The crux is the transition from managed floating rate with capital controls to freely floating rate with capital mobility. On the sequencing of liberalization in foreign exchange controls, it is widely recognized that appropriate order is to liberalize those with the least risk first and those with greater risk later, to start with experimental liberalization, and then proceed to general liberalization, to flexibly revise the initial schedule in response to a change in circumstances, and to retain emergence measures for the event of a crisis (Aramaki, 2006). Concretely, the design of framework of China's liberalization in exchange rate regime and capital controls should consider into short, medium and long-term factors. Therefore, based on Japanese experiences, the recommended sequencing for China's liberalization is as follows:

(1)**Further easing regulations on capital outflow and implementing internationalization of the RMB.** The burdensome task for China's monetary authorities now is to reduce scale of cross-border capital inflow, particularly arbitraged short-term capital movements, and international reserves. Under the conditions of diminished effectiveness of capital regulations, an efficient approach to reduce capital balance surplus is to relax regulations on capital outflows as Japan had employed, with an encouragement of outward FDI, outward long-term portfolio securities investments, and issuance of the panda bonds denominated in RMB in domestic market. Alternative way to reduce China's international reserves is internationalization of the RMB. China has taken too cautious stance toward internationalization of domestic currency comparing to Japan. However, internationalization of RMB depends on its easiness of conversion in international transactions.

(2) **Strengthening domestic financial sector.** It was argued that the strengthening of domestic financial sector need to be realized before capital account liberalization. If liberalization of financial sector lagged behind capital account, capital movements between regulated domestic markets and free oversea markets could be amplified, particularly under the regime of pegged rate. Therefore, it is risky to liberalize capital account before financial sector. The strengthening of China's financial sector should give emphases on reducing entry barriers, relaxing regulations on interest rates and financial instruments, developing financial markets particularly bond markets, and eliminating administrative measures. To pursue stability of domestic financial system, it is also important to enhance independence of the PBOC and financial supervision agencies from China's government.

(3) Developing an active bond market and large participators in foreign exchange markets. Free floating rate works fine when domestic financial and capital markets are deep and stable. To prepare for inevitable floating of the RMB, it is necessary to liberate bond market and develop large participating financial institutions to avoid large fluctuation in foreign exchange market. In order to develop stabilizing market forces in foreign exchange market, it is necessary to have two-way movements of long-term capital. A liberalized bond market can provide channels for above capital movements, hence the bond market is a stabilizer for foreign exchange market. Without active participation of large financial institutions, the foreign exchange market will be thin and shallow, and the shallow foreign exchange market could have created a highly unstable RMB/dollar market, hence the monetary authority has to intervene to stabilize the currency market and to avoid large fluctuations in domestic currency. Large financial institutions such as life insurance companies and mutual funds have to develop capacities to manage foreign exchange risk. It takes time for these institutions to develop dealing, accounting and risk controlling capacity for such financial transactions. The Chinese authority should start early to allow domestic financial institutions to conduct limited foreign exchange transactions (Fukao, 2003).

(4) Adopting a freely float rate with capital account controls. A move to floating rate system is a difficult decision for macro policymakers in any country. However, the long-run cost of adjustment through floating would be much lower than the passive strategy of "adjustment inflation" followed by Japan in the 1970s. Moreover, Japanese experiences in 1971-73 and present China's actual backward to pegged rate show that managed floating rate is a transient currency system, the RMB should shift to freely floating rate regime earlier. However, Chinese authority has taken extremely conservative stance toward the float of the RMB, even gotten the sickness of "fear of float", similar to Japanese long-term resistance to the yen revaluation in the past. In fact, Chinese government just overestimates negative shocks of RMB float on employment and economic growth, while underestimates, or even neglects large cost of maintaining a fixed exchange rate, such as, economic fluctuations, efficiency loss and exchange rate risk. In the case of Japan, the pressure of capital flow could be mitigated by a floating exchange rate due to a rise in exchange risk. Moreover, the shift from managed float to free float can help adjustment and improvement in industrial structure, and reduction in external imbalance. In early days, due to the underdevelopment in foreign exchange market, Chinese monetary authority should intervene in foreign exchange market, to avoid large fluctuation in the exchange rate of domestic currency.

(5)Liberating long term capital mobility first and short term capital movements follows. Since the Asian financial crisis, a deep rooted idea in China is that capital inflow sudden stop and capital flight will lead to the crisis of domestic currency and financial system. Owing to Asian financial crisis and recognition of weakness in domestic financial system, China government has significantly changed its attitude toward liberation of capital controls, and the liberation program planned to start in the beginning of the new century has been postponed without time limits. Considering into China's current skyrocketing international reserves, large capital inflow reversals can do lead to significant fall in asset prices and selling pressure on the RMB, but can't produce a currency and financial crisis. With a robust domestic financial system and a float rate, it is essential for China to remove barriers to long-term capital transactions and short-term capital movements, timely and orderly. Moreover, the float rate can substantially reduce the scale of potential short-term capital flow. Therefore, the liberalization of capital account unnecessarily leads to large cross-border capital movement. In the process of capital liberalization, Chinese authorities should flexibly revise the initial schedule in response to a change in circumstances, and to retain emergence measures for the event of a crisis.

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