

## THE COSTS AND IMPLICATIONS OF PBC STERILIZATION

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Since China revalued its currency against the U.S. dollar by 2.1 percent in July 2005, from RMB 8.27 per US\$ to RMB 8.11, the RMB has appreciated by a further 14 per cent percent to about RMB 6.97 per US\$ (as of May 2008). On a trade-weighted basis, however, the currency has appreciated less than half this amount. Using J.P. Morgan's trade-weighted index (broad basis) for the RMB, the currency appreciated just 6.1 percent in nominal terms between August 2005 and May 2008. Although the currency has been very gradually appreciating, the flexibility promised by China's leaders has been more illusory than real, and, more importantly, the underlying international payment imbalances have continued to widen both in absolute terms and as a fraction of GDP.

In this article, I set out the magnitude of the problem of China's international payment imbalances, summarize the techniques used by the People's Bank of China to sterilize China's overall balance of payments surplus, and assess the costs and benefits of the PBC's sterilization strategy—both from a theoretical perspective and in the light of the experience of other East Asian currencies that have witnessed large-scale sterilization operations in the past. I also consider whether, for the purpose of ensuring satisfactory monetary arrangements in the 21st century, it is appropriate for a country of the size and stature of China to delay adjustment by means of large-scale sterilization.

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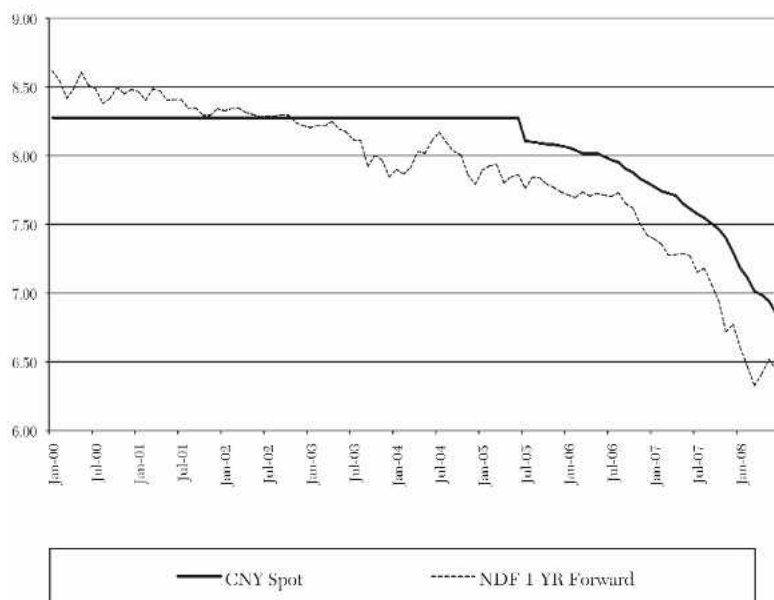
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## China's International Payments Imbalance

In the period prior to 2002, there were few presumptions that China's currency would appreciate. There had been a long history of devaluations between 1960 and 1994. However, following the devaluation of 1994 and the subsequent monetary reforms the external value of the currency was held stable against the US\$, notably throughout the Asian financial crisis of 1997–98. Nevertheless, the NDF (non-deliverable forward) value of China's currency traded at a persistent discount to the spot value of the currency (that is, weaker than the spot rate of around 8.27 per US\$) until December 2002 when it moved to a premium for the first time (Figure 1). In the same year, the errors and omissions item in China's balance of payments shifted from negative to positive, suggesting a change from unreported outflows to unreported inflows. In 2003 and 2004 both the current account and the capital account showed marked increases in the size of their surpluses.

FIGURE 1  
CHINESE YUAN SPOT AND FORWARD



Since the revaluation of July 2005, and despite the gradual subsequent appreciation of the RMB against the U.S. dollar and other currencies, the low level of the Chinese currency is causing China to run increasingly large overall (current plus private sector capital account) surpluses in its balance of payments. The simplest measure of that overall (current and capital) surplus is the increase in China's foreign exchange reserves.<sup>1</sup> In 2006, the overall surplus was \$246 billion or 9.1 percent of GDP, while the current account surplus was \$249 billion or 9.2 percent of GDP (Table 1). In 2007, the current account surplus increased to \$371.8 billion or 11.1 percent of GDP. Similarly, the overall surplus in 2007 was \$461.7 billion, or 13.8 percent of

TABLE 1  
CHINA'S BALANCE OF PAYMENTS  
(US\$ Millions)

	Current Account	Capital Account	Errors and Omissions	Overall Balance	Change in Reserves*
1998	31,472	-6,275	-18,902	6,248	-6,248
1999	21,115	5,204	-17,641	8,652	-8,652
2000	20,518	1,958	-11,748	10,693	-10,693
2001	17,401	34,832	-4,732	47,447	-47,447
2002	35,422	32,341	7,504	75,217	-75,217
2003	45,875	52,774	17,985	116,586	-116,586
2004	68,659	110,729	26,834	206,153	-206,153
2005	160,818	58,862	-16,441	207,342	-207,342
2006	249,866	6,017	-13,048	246,855	-246,845
2007	371,800	73,500	16,400	461,700	-461,700

\*Since acquisitions of assets abroad are outflows, the sign for an increase in reserves in balance of payments accounting is negative.

SOURCE: State Administration of Foreign Exchange.

<sup>1</sup>For the purpose of ensuring a clean measure of PBC intervention in the foreign exchange market, reported monthly changes of foreign exchange reserves should be adjusted for interest receipts and valuation gains on the outstanding stock, as well as for transfers of reserves to the equity of state-owned banks.

GDP. By any standard, these imbalances are of a very substantial magnitude, and will have large consequences for both China's trading partners as well as for China itself.

## PBC's Sterilization Techniques

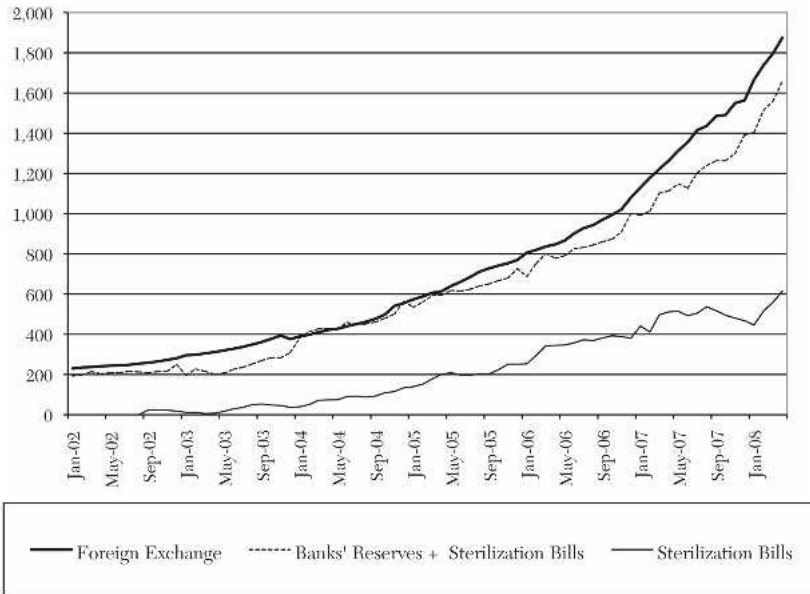
The overall surpluses in the balance of payments require the PBC, China's central bank, to intervene almost daily and buy any excess foreign currency on the Shanghai foreign exchange market in order to hold down the value of the RMB. Based on 250 trading days per year, the PBC's foreign exchange purchases exceeded \$1.8 billion per day in 2007. In making these purchases, the PBC typically credits the reserve accounts of mainland banks with an equivalent amount of RMB, which in the normal course of events would cause China's money supply to accelerate (as in 2002–03), and this in turn would normally lead to inflation. The inflation—if permitted—would at some point render China uncompetitive at the prevailing exchange rate, and the balance of payments would revert to balance or even deficit.

However, having experienced several episodes of monetary acceleration, inflation and its aftermath (in the form of social disturbances) in the past three decades (for example, in 1988–89 and 1993–95), the Chinese authorities seem nowadays determined to implement monetary policy in such a way as to avoid the same sequence of results. Therefore, after buying foreign currency and thus creating RMB, the PBC subsequently removes the RMB from the banking system. It has learned the techniques for doing this from other Asian central banks that have routinely conducted such sterilization operations over the past two or three decades.<sup>2</sup>

The essence of the PBC sterilization techniques is (1) to raise reserve requirements against deposits of commercial banks, and (2) to issue RMB-denominated bills and bonds (called sterilization bills or bonds) to the banks and other financial institutions. As of May 2008 the level of reserve requirements was 16.5 percent of bank deposits (up from 6 percent in 2003), while the value of sterilization bills had reached 10 percent of bank deposits. In total, therefore, no less than 26.5 percent of Chinese commercial banks' deposits is immobilized, or placed with the central bank. Figure 2 shows that if the level of total reserve requirements and the volume of outstanding sterilization bills

<sup>2</sup>The Bank of Japan was the first Asian central bank to practice these techniques in the late 1960s (see Suzuki 1980).

FIGURE 2  
 PBC FOREIGN RESERVES AND STERILIZATION INSTRUMENTS  
 (US\$ Billions)



are summed, the results are approximately equal (in US\$ terms) to the value of China’s foreign exchange reserves. In short, under current operating procedures the value of sterilization instruments outstanding increases roughly in line with the level of foreign exchange reserves.

### Costs and Benefits of PBC Sterilization

Sterilizing inflows is not a costless procedure. In fact, it leads to significant distortions that may be highly costly to correct in the long run. The question is: What kinds of distortions are created by the sterilization operations? Here I focus on four.

#### *Distortions Created by Sterilization*

First, by keeping the undervalued currency cheap, sterilization tends to encourage over-expansion of the export sector, while inflation (or real exchange rate adjustment) in the pegging country—China—is delayed. As a corollary, numerous domestic sectors such as

housing, health care, education, entertainment, and other non-export-related infrastructure investment are restricted below their optimum size. Corresponding but converse misallocations will occur in the economies of China's trading partners.

Second, parallel to these real-sector distortions, there are significant financial-sector distortions. Sterilization distorts interest rates and the asset portfolio of Chinese commercial banks. Instead of lending to normal commercial customers such as firms and individuals, the banks are compelled (by higher reserve requirements) or induced (by purchase of PBC sterilization bills) to lend money back to the central bank. The absorption by the PBC of these excess RMB (created from the PBC's intervention operations) implies some distortion of interest rates, typically keeping them at higher levels than would otherwise be the case.<sup>3</sup> This outcome is part of the process that prevents the expansion of bank lending and money growth, and thereby appears to delay or prevent any upturn in inflation.

Third, the central bank balance sheet expands massively as it absorbs funds from the banks and invests the proceeds in foreign exchange reserves. In China's current circumstances, the accumulation of foreign exchange assets by the central bank is taking the place of increased domestic spending by Chinese firms and households, which would in turn give rise to greater imports, reducing the overall payments imbalance. Alternatively, in contrast to the case where the RMB is allowed to appreciate and Chinese firms and individuals are free to buy assets abroad, the official stockpile of foreign exchange reserves is replacing the acquisition of a more diversified, higher return portfolio of foreign assets (such as businesses, factories, real estate, and natural resources) by the Chinese commercial sector.

Fourth, overseas the accumulation of large volumes of U.S. Treasuries by China and other countries with rapidly growing foreign exchange reserves has reduced the yield on U.S. Treasuries and similar assets below what they would otherwise be. This result, of course, is part of the explanation for Greenspan's conundrum concerning "the broadly unanticipated behavior of world bond markets"—that is, the unexpectedly low yields in bond markets in recent years. Ben Bernanke and others have referred to this phenomenon as a "global savings glut."

<sup>3</sup>This result holds even though China's interest rate structure is below equilibrium; the artificially low rates are higher than they would otherwise be.

I now turn to make an assessment of China's sterilization by answering a series of questions.

*Does Sterilization Achieve Its Ultimate Objectives? Does It Fend Off Unwanted Business Fluctuations and Undesirably High Inflation?*

By continuing to maintain its currency at below-equilibrium levels, China's overall balance of payments can be balanced only by large outflows in the form of official acquisitions of foreign assets. With China's currency managers focusing primarily on the RMB/US\$ axis and the US\$ falling, the Chinese currency has failed to appreciate as much as many countries (for example, in Europe) might have expected, aggravating any undervaluation of the RMB and further increasing China's trade surpluses. The end result will be further expansion of the export sector, and a spillover of spending from higher profits and wages in the export sector into the domestic sectors of the economy. In effect, overheating will eventually emerge, but by different channels—primarily through spillovers from export-led growth rather than directly from domestic demand growth.

To put it another way, sterilization suppresses the monetary expansion that would otherwise occur under conditions of an undervalued exchange rate, but it cannot prevent other needed economic adjustments. The fact that there is an overall balance of payments surplus is a signal that the economy is super-competitive at current exchange rates. To return to an equilibrium level of competitiveness without exchange rate adjustment, either the domestic price level must adjust via monetary expansion and inflation, or the export sector must expand until the incremental spending (from raw material procurement, as well as increased wages and profits) spills over into other sectors sufficiently to produce the same result.

*How Long Can PBC Sterilization Continue? What Are the Limits to Sterilization?*

One answer is: only so long as it is profitable to the central bank. The question of profitability is determined by two variables—the spread between the cost of issuing sterilization bills and the returns on foreign assets, and the size of the sterilization issues relative to the stock of foreign assets. What usually puts an end to sterilization is that the central bank starts making spread losses when the interest cost of the sterilization bills that it is issuing begins to exceed the yield

it is earning on its U.S. Treasuries (or other foreign assets) that it holds. So far this is not happening in China, but as China raises interest rates further, as it surely must to cool the economy, then such spread losses could start to emerge.<sup>4</sup> The other variable is the size of the bond issues relative to the stock of foreign assets. In the early stages, after September 2002, there was only partial sterilization, and the stock of domestic bond issues was therefore very small in relation to the stock of China's foreign assets. Since mid-2004 the pace of sterilization has been stepped up, and the maturity of the bond issues has been lengthened to three years. The current situation in China is reminiscent of the experience of Malaysia in the mid-1990s. In that episode, sterilization operations by Bank Negara Malaysia reached a substantial scale and Malaysian interest rates exceeded U.S. interest rates for an extended period. As a result the Bank Negara started making spread-losses, and was ultimately instructed by the government to cease sterilization operations.

Another possible answer is: until all the commercial banks' assets are absorbed by reserve requirements and holdings of sterilization bills. In this case bank lending to the non-bank sector would have ceased, and all bank credit would be in the form of claims on the central bank. As reported above, Chinese commercial bank claims on the central bank have reached about 26.5 percent of total deposits. This situation compares with the episode in Taiwan in 1985–86 when the Central Bank of China, Taiwan's central bank, used no less than five instruments (treasury bills, CDs, and savings bonds all issued by the CBC, together with reserve requirements on banks' deposits and reserve requirements imposed on the Postal Savings System) to sterilize inflows. At one stage the volume of sterilization instruments reached 40 percent of total bank deposits, or twice the size of M1A, almost equal to M1B, and more than twice the size of the monetary base.

### *What Happens When the Central Bank Starts to Unwind Sterilization?*

The outstanding stock of bills and bonds issued by the central bank would gradually be allowed to mature, and at maturity the overhang of liquidity that had been bottled up by the central bank would

<sup>4</sup>Foreign exchange losses may also become an issue, but as yet they are not material compared with the importance and relative success in controlling the growth of M2.



start to flow back to the commercial banks. Bank lending and monetary growth would accelerate, and the suppressed inflation would emerge. It was at this stage in the mid-1990s that Malaysia's problems became serious. In the space of a few months bank lending to the private sector accelerated from 10 percent per annum to over 30 percent per annum. At the same time monetary growth accelerated sharply. This rapid growth of money and credit contributed directly to the problems of overheating and overinvestment that later precipitated the Asian financial crisis of 1997–98.

In China's case, the controls on capital flows may for a time prevent such a sudden reversal of capital flows and drastic adjustment as occurred in the Asian financial crisis of 1997–98, but the key point remains. Allowing an extended period of overinvestment in one or two sectors that ultimately produces unacceptably low returns can shift a currency from being perceived as undervalued (as with the RMB today) or appropriately valued (as in the case of Asian currencies in 1996–97) to being suddenly overvalued.

#### *What Would Be the Trigger for a Crisis?*

The break will eventually come when one (or more) of the four distortions listed above becomes intolerable. The first distortion, overexpansion of Chinese exports, could lead the United States or Europe to impose trade restrictions in the form of penalty tariffs, quotas, or other nontariff barriers on Chinese exports. On the domestic side, if the export boom is allowed to persist, it could result in a scale of spillovers that ultimately generates domestic inflation.

The second distortion, the recycling of funds back to the central bank, could be undermined by the emergence of spread losses for the PBC, causing the State Council to terminate the policy. Unless very carefully managed, the unwinding of the liquidity overhang could itself create a surge of domestic spending.

The third distortion, the accumulation of excess foreign exchange reserves by the PBC, does not appear to have any obvious limit, unless overseas economies combine to protest and impose some kind of sanctions on China for maintaining a persistently undervalued exchange rate.

Fourth, the impact of China alone on the U.S. Treasury market or on other sovereign bond markets seems unlikely to become a cause of any major reaction, but the collective imbalances of all Asian

economies and oil producers together are a different matter. As the U.S. trade and current account deficits and international indebtedness have grown, there is a growing group of countries that have threatened to desert the dollar-buying club, resulting in further dollar weakness. In the end, a flight from the dollar by portfolio investors around the world (whether central banks, sovereign wealth funds, or private sector investors) will bring about the kind of market adjustment that is desirable. In fact, adjustments are now starting to occur in the U.S. trade accounts as exports have accelerated while imports have slowed, causing the U.S. trade deficit to narrow.

However, to the extent that the RMB has followed the US\$ downward, any existing RMB undervaluation against third-country currencies such as the euro or sterling has increased. That outcome is visible in the recent rapid growth of China's bilateral trade surpluses with Europe.

## Implications of PBC Sterilization for Monetary Arrangements in the 21st Century

Exchange rate mechanisms in the world today can be grouped under three headings: floating rate systems (with internal anchors such as an inflation target), pegged or managed exchange rate systems operated by central banks (some with internal anchors, others with external anchors), and currency board systems (all with external anchors). The crucial difference between the latter two systems concerns the role of the monetary authority. In pegged or managed systems the monetary authority is necessarily active, intervening in the foreign exchange market and in the domestic money markets to set the course for monetary policy. In currency board systems, by contrast, the authority is largely passive, responding only to the public's demand for currency or the banks' demand for changes in reserves. In this type of system, private sector arbitrage serves to keep interest rates and inflation expectations broadly in line with the anchor currency economy, thereby obviating the need for persistent intervention by the monetary authority.

China's exchange rate mechanism is clearly of the intermediate kind, and, as I have shown, the extent of intervention required has become so enormous as to require in turn very extensive sterilization operations. Sterilization implies the deliberate postponement of the adjustment of an economy's domestic price level or external

exchange rate to changes in the international economy. The issue at hand is what is the cost of this kind of postponement of adjustment to the international monetary system?

The most dramatic case in some respects was the case of Japan in the period 1966–71. With the yen pegged to the US\$ at 360 yen, and U.S. inflation accelerating, Japan's reluctance to undergo another episode of boom-bust and inflation in the late 1960s led the Bank of Japan to introduce sterilization measures. By preventing a monetary easing, the BOJ contributed to a widening divergence between the price levels in Japan and the United States. The enhanced competitiveness of Japan at the fixed exchange rate produced a steep increase in Japan's current account surplus, which was one of the factors that prompted President Nixon to close the gold window in August 1971. From this perspective, it was Japan's sterilization operations in 1966–71 that ultimately destroyed the Bretton Woods system of fixed exchange rates. However, what made this episode so costly to the international monetary system at the time was the built-in rigidity of fixed exchange rates.

In subsequent years under managed exchange rates Japan has almost invariably sterilized the effects of its foreign exchange interventions, and, partly as a consequence, large trade and current account imbalances have persisted. However, the flexibility of the Japanese yen within fairly broad ranges has also helped to mitigate criticism of Japan's sterilization operations in international meetings of the G-7 or the IMF.

Most of the smaller East Asian economies have engaged in sterilization operations in recent decades since 1980. On the one hand, the relatively small absolute size of their economies and their trade imbalances has tended to cap the damage and limit criticism. But on the other hand, their more rigid exchange rate regimes have required them to engage in sterilization on a more extensive and continuous basis. I have quoted above examples from the experience of Malaysia and Taiwan, but Korea, Thailand, Indonesia, the Philippines, and Singapore have all engaged in sterilization practices to a greater or lesser extent.

The main differences between Japan under Bretton Woods in the 1960s, or the smaller East Asian economies in the decades from 1980 to the present, and China today concern the issue of scale and the fact that exchange rates generally are more flexible today.

As with Japan, China sterilizes almost all of its intervention, but the very large size of China's imbalances both in absolute and relative

terms inevitably implies greater potential damage to itself (in terms of misallocation of investment) and its trading partners, and invites closer international scrutiny of China's progress toward external equilibrium. On the plus side, when China runs an overall balance of payments surplus, instead of allowing its intervention actions to result in monetary acceleration, business expansion, and inflation, it cuts short the process by sterilization. While this action may stabilize the Chinese economy for a while, it is no more than a temporary palliative, buying financial stability at the cost of real distortions.

The problem for China (and other East Asian economies) is that cumulative tradeoffs of this kind exercised over several years will almost certainly exacerbate the extent of the adjustment crisis when it comes—as we saw in the case of the Asian financial crisis.

## Conclusion

For the welfare of the international monetary system as a whole, it would be desirable to devise a system that monitored and publicized the scale and persistence of sterilization operations by central banks (including China) that peg or manage their exchange rates. It is obvious that if Asian central banks operating pegged or managed exchange rates were to allow the influx of foreign currency to have its full impact on domestic monetary conditions, this policy could be highly destabilizing, causing monetary conditions to ease when the overall balance of payments was in surplus, and to tighten when the overall balance of payments was in deficit. But equally the full-scale suppression of these effects by pegging the exchange rate and at the same time sterilizing all the associated inflows or outflows only cumulates small-scale misallocations until they become large enough to precipitate a crisis.

The international community needs to be aware of the full implications of sterilization, and to discourage its use in favor of a shift toward more flexible exchange rates both in China and elsewhere in Asia. Ideally, the world needs to move from the three types of exchange rate regimes listed above to just two: fully floating regimes (with internal anchors) or currency board systems (with external anchors) where there is essentially no active intervention by the monetary authorities. In the former system, international adjustment is achieved primarily by adjustment of the external exchange rate; in

the latter system, it is achieved primarily by adjustment of the domestic price level but without extensive intervention by the monetary authority.

## Reference

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