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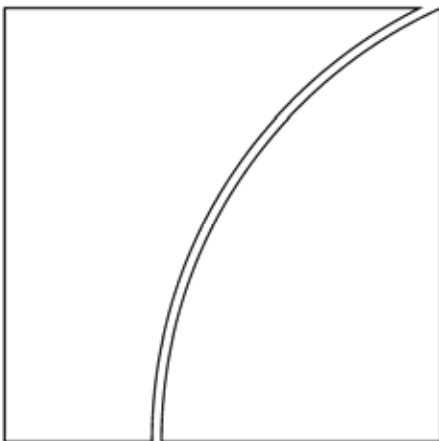
No 233

Do China's capital controls still bind? Implications for monetary autonomy and capital liberalisation

by Guonan Ma and Robert N McCauley

Monetary and Economic Department

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Abstract

The paper argues that China's capital controls remain substantially binding. This has allowed the Chinese authorities to retain some degree of short-term monetary autonomy, despite the fixed exchange rate up to July 2005. Although the Chinese capital controls have not been watertight, we find sustained and significant gaps between onshore and offshore renminbi interest rates and persistent dollar/renminbi interest rate differentials during the period of a de facto dollar peg. While some cross-border flows do respond to market expectations and relative yields, they have not been large enough to equalise onshore and offshore renminbi yields.

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The paper argues that China's capital controls remain substantially binding. This has allowed the Chinese authorities to retain some degree of short-term monetary autonomy, despite the fixed exchange rate up to July 2005. Although the Chinese capital controls have not been watertight, we find sustained and significant gaps between onshore and offshore renminbi interest rates and persistent dollar/renminbi interest rate differentials during the period of a de facto dollar peg. While some cross-border flows do respond to market expectations and relative yields, they have not been large enough to equalise onshore and offshore renminbi yields.

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Do China's capital controls still bind? Implications for monetary autonomy and capital liberalisation

Guonan Ma and Robert N McCauley¹

1. Introduction

Divergent interpretations of the interaction of monetary and foreign exchange policies in China often arise from different assumptions regarding the efficacy of capital controls. At one extreme is the view that capital controls merely change the form of capital flows without altering their magnitude. On this interpretation, pegging the exchange rate or closely managing its path implies that China imports its monetary policy and lacks control over domestic short-term interest rates. At the other extreme is the view that capital controls are still effective or binding enough to allow short-term interest rates to be set domestically, even though the exchange rate is managed. The contrasts between these views sharpen in the context of growing cross-border flows under both the current and capital accounts over the past 10 years.

Different views on the status quo also inform the interpretation of the likely results of further liberalisation of capital flows. Again, at one extreme, this would just unevenly lower transactions costs and thereby alter the mix of cross-border capital flows, but without necessarily affecting their total volume. On this interpretation, capital account liberalisation might be of interest to specialists in international finance, but not to those who follow the Chinese macroeconomy. At the other extreme, capital account liberalisation would influence both the scale and composition of capital flows and ultimately force a choice between exchange rate management and an independent monetary policy.

This paper examines both price and flow evidence to determine how effective China's capital controls have been in the past and remain at present. We put the analysis of prices first because it provides the most telling evidence on the question. Our basic conclusion is that sustained interest rate differentials argue that Chinese capital controls have continued to bind, despite the responsiveness of cross-border flows to price signals in an increasingly open economy. These observed differentials cannot in our view be plausibly accounted for by liquidity or credit factors. Even the narrowing of these differentials since the unpegging of the renminbi in July 2005 leaves them at substantial levels. If capital controls still bite, future liberalisation is likely to proceed incrementally in order to accommodate a shifting balance of exchange-rate, and financial- and monetary-stability objectives.

In this paper, we define monetary autonomy narrowly in terms of the government's ability to set short-term domestic interest rates. Such a definition may be appropriate to many industrial countries where monetary policy has confined itself to setting a short-term interest rate. In fact, China's monetary policy employs a wide variety of other instruments, including setting administered deposit and minimum lending rates as well as quantitative measures like reserve requirements, lending quotas, window guidance and administrative restrictions on investment. Such measures could give China's monetary policy room for manoeuvre even

¹ The authors wish to thank participants at the Seoul "China and emerging Asia: reorganising the global economy" conference of 11-12 May 2006, the Bellagio "New monetary and exchange-rate arrangements for East Asia" conference of 22-27 May 2006 and a BIS seminar for their comments. Special thanks go to Claudio Borio, George M von Furstenberg and Yu Yongding. The views expressed are the authors' and not necessarily those of the Bank for International Settlements.

if its short-term interest rates were tightly constrained by the exchange rate policy. Thus, a finding that short-term interest rates are not tightly constrained implies a fortiori monetary independence in the broader sense that is more relevant in the case of China.

In what follows, Section 2 describes the increasing openness of the Chinese economy to cross-border flows as background for both price and flow analysis to follow. Then Section 3 reviews and updates the price evidence that capital controls are still binding. In particular we test whether onshore and offshore renminbi interest rates are substantially the same. Recognising the practical difficulty of drawing appropriate comparisons given the low level of development of money markets in China, we introduce a comparison based on a newly introduced liquid instrument, the People's Bank of China (PBC) bill. Section 4 examines the gap between renminbi and US dollar short-term interest rates during the period of de facto dollar pegging of the renminbi between the mid-1990s and July 2005, arguing that these rates converged as China's inflation fell from double-digit levels in the early 1990s and not evidently since. Section 5 demonstrates the responsiveness of various measures of capital flows to interest-rate differentials and exchange-rate expectations. Section 6 discusses challenges to China's capital account liberalisation. The last section concludes.

2. Growing cross-border flows vis-à-vis China

China's capital control regime has two important features. First, capital controls tended to be tighter for cross-border flows thought to be more volatile than for more stable flows. Second, the regulatory regime over time has shifted from one biased against outflows towards one managing two-way cross-border capital flows in a more balanced fashion. Related to the latter is the tendency for policymakers to systemically "lean against the wind" in the sense that control measures over outflows are strengthened to resist depreciation pressures on the exchange rate and vice versa. While such a discriminated control regime may complicate any analysis, more stringent control measures over short-term flows to resist prevailing market pressures would highlight short-term interest rates as a useful measure of the efficacy of capital controls.

One factor conditioning the efficacy of capital controls is the size of external flows. Despite continued capital controls, the past two decades have witnessed a rapid rise in China's cross-border flows on both the current and capital accounts. As a percentage of GDP, China's gross cross-border flows more than quintupled to above 120% in 2005 from less than 20% in 1982 (Graph 1), with a noticeable acceleration in the 1990s. Also, notwithstanding the remarkable expansion of gross current account flows, China's capital account flows have been gaining relative importance.² In 2005, gross capital account flows represented one third of China's total gross cross-border flows, compared with just 13% in 1982 and 25% in 1990.³

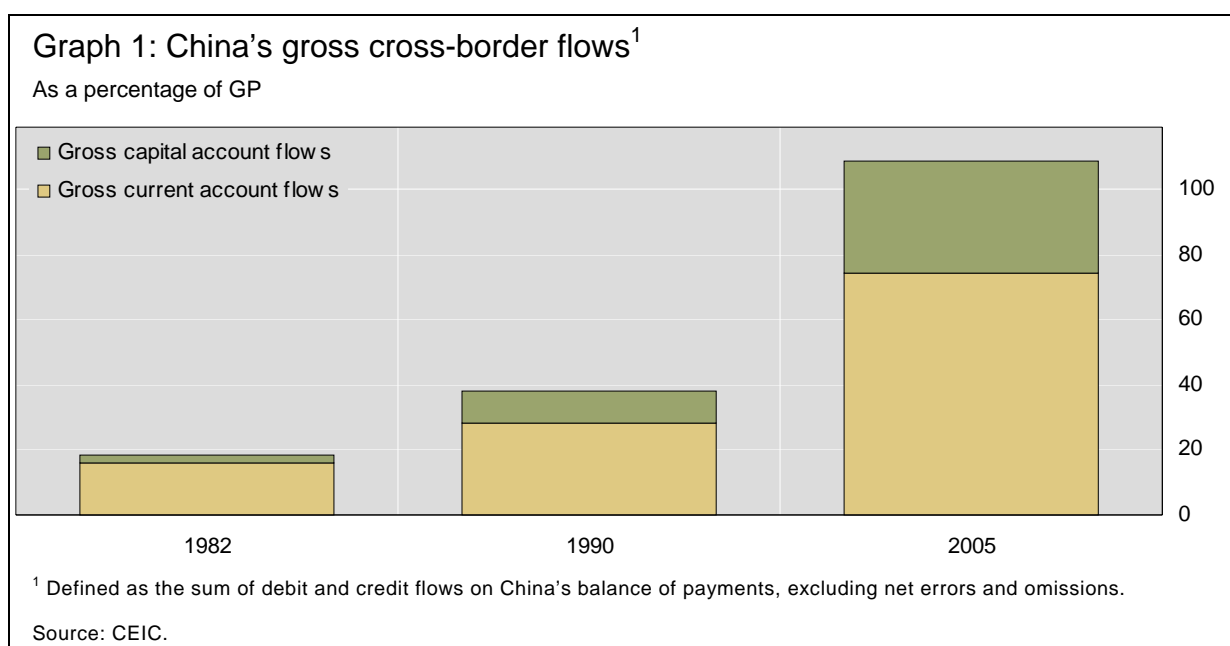
The backdrop of growing cross-border flows suggests that the Chinese economy has grown more open and integrated into the global economy and thus more prone to influences from global markets. In particular, larger external flows point to more potential opportunities to

² Lane and Milesi-Ferretti (2006) find that China's stock of international assets and liabilities has barely kept pace with the global stock, in contrast to China's growing share of global GDP and international trade. They compare asset/liability stocks to GDP flows, while we compare two types of international flows. On our measure, China's financial integration is outpacing its trade integration.

³ Gross capital account flows are likely underestimated relative to gross current account flows because some capital flows take the form of current account transactions in order to avoid official restrictions (see below). Also, most reported bank-related gross flows represent changes between two dates and do not capture any intervening gross flows.

avoid and to evade capital controls. This in turn puts into question the efficacy of capital controls, with implications for both monetary autonomy, financial stability and future capital-account liberalisation.

Growing trade and financial openness, however, does not support an immediate conclusion about the efficacy of capital controls. In particular, even large and highly responsive cross-border flows may limit without gutting capital controls, just as small and stable flows need not imply effective controls. A more direct and stringent test of capital control effectiveness is whether substantial cross-border arbitrage opportunities persist for a considerable period of time. Such a test, based not on flows but on onshore and offshore prices, can also indicate how the effectiveness has varied over time. When price and flow measures are consistent with each other, one may arrive at an easy conclusion regarding capital mobility, but when they point in different directions, price evidence should be given more weight. In what follows, we examine both measures but put more weight on the price measures in gauging the degree of capital mobility.



3. Price test of capital mobility: onshore and offshore renminbi yields

This section analyses the combination of onshore renminbi interest rates, offshore US dollar rates and non-deliverable forward (NDF) exchange rates to test for capital mobility between China and the offshore financial markets. The null hypothesis is that there are no substantial differences between renminbi interest rates onshore on the one hand and those implied by the offshore NDFs in conjunction with US dollar Libor on the other.⁴ The methodology of estimating such onshore/offshore renminbi yield gaps is based on Ma et al (2004), as detailed in Appendix 1. The idea is that large and persistent onshore/offshore yield gaps suggest significant cross-border market segmentation and thus binding capital controls; but

⁴ For related literature on capital mobility and controls, see Frankel (1992) and Otani and Tiwari (1981). Capital controls are also discussed in the contexts of liberalisation sequence (Frankel (2006), Prasad et al (2005)) and financial contagion (Kawai (2003)). An overview of the Asian NDF markets can be found in Ma et al (2004) and Debelle et al (2006).

occasional small gaps do not necessarily imply ineffectiveness of capital controls. We interpret the evidence as supporting the alternative hypothesis of there being an economically substantial gap between on- and offshore renminbi yields. Acceptance of this hypothesis favours the view that capital controls in China have so far remained binding.

3.1 Measuring onshore and offshore renminbi yield differentials

Especially in the case of relatively less developed money and foreign exchange markets, instruments must be chosen carefully to perform this test. Care must be exercised in the dimensions of maturity, liquidity and credit. Ideally, one wants to compare instruments of identical maturity, enjoying the same liquidity, that are issued by the same private parties, usually banks. An appropriate comparison would be between the yields on large US dollar certificates of deposit in New York versus yields on US dollar deposits posted in London by the top-rated banks that report to the British Bankers Association (BBA). Such a comparison is often based on the three-month maturity that is very representative of both domestic and offshore yields. The banks involved in the comparison are quite similar in their double-A credit standing.

3.1.1 Liquidity considerations

In the case of China, the challenge in practice has come from getting a reasonable match between a representative renminbi money market yield, on the one hand, and the NDF rate, on the other. In particular, the interbank renminbi money market trades with greatest liquidity at very short maturities – overnight to seven days, while the NDF market trades with greatest liquidity at longer tenors of three months to one year.

This paper improves on the previous estimates of onshore/offshore renminbi yield gaps in the dimension of liquidity (Ma et al (2004)). The latter traded off the above considerations and chose to compare the three-month China interbank offered rate (Chibor) yield to the three-month NDF.⁵ This comparison stretched to a relatively long and illiquid maturity in the domestic money market, on the one hand, and took a relatively short maturity in the offshore market, on the other. Here, we update these earlier measures as well as complement the earlier analysis with a new comparison based on a different pair of instruments. In particular, we also compare the weekly auction rates for PBC one-year bills available since 2004 to the one-year NDF. This choice compares liquid instruments in both markets, although it introduces possible credit differences between the sovereign bill and the bank NDF or deposit (see below).

Liquidity across the two markets matches well at the one-year tenor. The PBC issued CNY1.2 trillion (about \$150 billion) of its one-year bills in 2005 out of a total bill issuance of CNY2.8 trillion, for an average weekly issuance of about \$3 billion equivalent.⁶ In January–March 2006, issuance ranged between CNY40 and CNY120 billion per week. In the NDF market, the one-year is reportedly the most traded maturity (Ma et al (2004), Debelle et al (2006)).

The less liquid the instruments that are used to arbitrage onshore and offshore yields, the less telling are small observed yield differences. One can think of an arbitrage tunnel inside which further arbitrage transactions are not profitable, given bid-ask spreads and any tendency for flows of orders to move the market. The upshot is that a finding that capital

⁵ The PBC introduced a new set of benchmark interbank money market reference rates, Shanghai interbank offered rates (Shibor), in January 2007.

⁶ *China Money*, 2006, no 2, p 76.

controls are ineffective could well be consistent with observed yield gaps of, say, 25 basis points or less.

3.1.2 Credit considerations

With regard to credit, comparing sovereign and bank yields on onshore and offshore instruments, respectively, is problematic in principle, but in practice it does not skew the comparison substantially. Credit default swaps suggest that the credit standing of China attracts an insurance payment of only a handful of basis points more than that of the major international banks that form the US dollar Libor panel (Table 1). Since offshore renminbi rates were lower than the onshore PBC bill yield in the period 2004–06, the mixing of sovereign and bank credit does widen the estimated yield gap for this period, thus favouring the finding that capital controls are effective. But as we shall see below, the scale of the estimated yield differences of 100 to 400 basis points dwarfs the 5–basis–point credit difference.

With our earlier comparison of Chibor and offshore yields, credit differences actually tended to reduce the absolute value of the observed yield differentials over much of the sample period. In 1999–2001, highly rated banks dealing offshore under international law paid higher (implied) yields than did domestic Chinese banks dealing onshore. Taking into account the credit difference would only have widened the gap.

Table 1
**Credit default swap rates for People’s Republic of China and British Bankers
 Association’s Libor panel banks**

At the one-year maturity in 2004–06, in basis points

Issuer	Low	High	Average
People’s Republic of China	5.4	27.6	11.2
US dollar Libor panel members:			
Bank of America	2.7	24.6	6.8
Barclays	5.0	9.0	6.9
Citibank	1.9	15.5	4.7
HBOS	1.8	9.0	4.5
HSBC	2.2	9.8	4.2
JPMorgan Chase	1.3	23.0	4.9
Lloyds	1.9	6.5	3.4
BMTU	6.8	63.0	19.0
Norinchukin	5.8	20.0	9.4
Rabobank	3.4	11.9	5.9
Royal Bank of Scotland	2.7	6.2	4.0
Royal Bank of Canada	2.0	11.4	5.1
UBS	1.9	7.3	3.5
WestLB	2.8	22.8	6.9
<i>Average across banks</i>	3.0	17.1	6.4

Source: Markit.

3.1.3 An example of cross-border arbitrage on renminbi interest rates

Before examining the data, it might be useful to consider a particular example of an arbitrage transaction at the one-year tenor by a multinational firm with a profitable operation in China. Since September 2003, the offshore speculative demand to be long in renminbi has given the treasurer of such a firm a strong incentive in effect to hold renminbi onshore and to sell them forward offshore (ie lending renminbi onshore and borrowing them offshore).⁷ One way of constructing such a position is for the affiliate in China not to convert renminbi into dollars in order to remit a dividend to its parent outside China. Instead the funds are retained in renminbi and invested in the Chinese money market. The yield on the one-year deposit is proxied by the PBC bill rate (one can think of a bank taking the funds in trust and investing in the PBC bill). Thus, renminbi funds have been lent onshore.

Simultaneously, the affiliate borrows dollars at one-year Libor, replacing the cash flow of the unpaid dividend from China, and sells renminbi one year forward against US dollars, say to a hedge fund. This combination of dollar borrowing and forward position amounts to borrowing renminbi offshore and converting the proceeds into dollars, and the rate of interest paid is (by construction) the relatively low NDF-implied renminbi yield. At the year-end, the renminbi invested onshore can be sold for dollars at the then prevailing spot exchange rate that is also used to determine any profit or loss on the NDF, leaving the firm with the arbitrage gain between the interest rate in the Chinese money market and the lower offshore yield. Thus, by lagging a current dollar payment, namely the profit repatriation, the firm has in effect acquired a long renminbi position and locked in a gain by selling it offshore.⁸

One of the useful features of this example is that it shows that arbitrage between the onshore money market and the offshore forward market is not limited to banks. Of course, not all foreign firms operating in China are profitable; some have entered joint ventures that may constrain such arbitrage and not all would be willing to increase their balance sheet in China. Nevertheless, such corporate opportunities are telling because otherwise a failure of interest rates to be equalised could be taken to be merely a symptom of the inefficiency of Chinese banks. Instead, the profit opportunities present themselves to global companies that can be presumed to bring to China efficient treasury operations and indeed the benefit of having operated within and around capital controls in other economies.

3.2 Onshore-offshore renminbi yield differentials based on three-month Chibor

As noted, our earlier analysis compared a domestic interest rate, the so-called three-month Chibor, to the offshore renminbi rate implied by three-month NDFs and dollar Libor. We found economically very significant differences. Graph 2 compares the three-month yield gap for the renminbi with Asian peers for the periods 1999–2001 and 2002–04. The absolute value of the gap between renminbi yields onshore and offshore averaged 250–300 basis points in the five years to early 2004. This placed China in the middle of our sample and indeed is very wide compared to the onshore-offshore differential of 50–100 basis points for the Korean won over the same period and a gap of 20–30 basis points observed for the yen before capital controls were lifted in the early 1980s (Otani and Tiwari (1981)). The narrowing

⁷ Concessionary income tax levels for foreign invested firms in China are not far from the generally low corporate tax rates in Hong Kong and their combination would not obviously materially alter the arbitrage incentive described here. Local Chinese tax codes may also distort incentives for retained earnings and dividends. Nevertheless, as far as we can tell, there were no major corporate tax regime changes during the period under study.

⁸ An opposite case could be considered for the earlier period in the wake of the Asian crisis. A multinational firm in China could profit from a short-onshore, long-offshore renminbi position. If it could borrow renminbi onshore, it could accelerate dollar payments to an affiliate abroad and buy renminbi forward against dollars offshore.

of the differentials in 2002–04 was in fact less evident in the case of China than for most of the other Asian currencies.

An updated estimate of the yield gap for 1999–2006 reveals an even bigger average gap of 310 basis points in absolute value and also suggests several distinct phases of market conditions (Graph 3). In general, if controls bind, one would expect offshore rates above onshore rates when market participants are positioning for renminbi weakness and the net direction of flows of funds is outward; conversely offshore rates would fall below onshore rates when positioning favours renminbi strength and funds are seeking to enter China. In the period from the Asian financial crisis to early 2001, the weight of offshore positioning was in the direction of a weakening renminbi, resulting in higher yields offshore. This was consistent with China's foreign exchange reserves growing more slowly than would be suggested by the reported current account and net direct investment balances (see Section 5). Then followed a period of smaller differences during 2001-02 that saw offshore rates below those onshore but with a gap less than 150 basis points. This period featured more balanced positioning on the renminbi. With the intensification of public pressure from trading partners on China's exchange rate policy in September 2003, however, offshore yields dropped substantially below their onshore counterparts. The weight of offshore positioning was in the direction of a strengthening renminbi. As Chinese companies converted dollar holdings or borrowings into renminbi, reserve growth accelerated, far exceeding the pace that could be explained by the current account surplus and direct investment inflows (see Section 5). The average yield gap widened to more than 360 basis points during January 2003 to April 2006. The gap reached a peak of 800 basis points in mid-2005 when the implied offshore yield fell well below zero.⁹ But since the July 2005 policy change, the yield gap has narrowed markedly to less than 200 basis points.

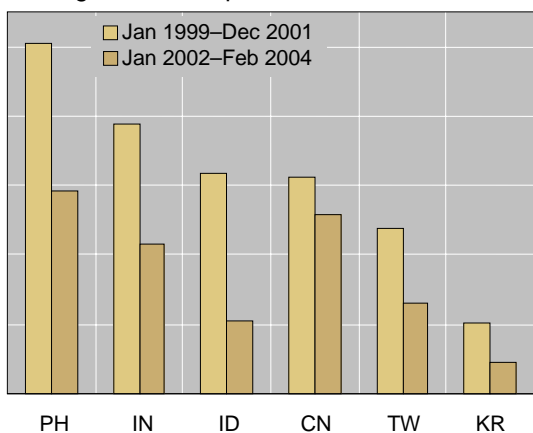
The principal message based on both our previous and more updated estimates of three-month tenor of the Chibor and renminbi NDF is that the onshore/offshore gap in the renminbi yields has been persistently substantial in absolute terms and its sign has been consistent with prevailing market pressures. In other words, hitherto, China's capital controls have prevented sufficient cross-border arbitrage to equalise onshore and offshore short-term yields.

⁹ Negative nominal interest rates implied by the pricing of forward exchange rates are not prima facie evidence of an inefficient market. It might be recalled that, during the period of zero yen interest rates, fractionally negative interest rates in yen were implied by yen/dollar swaps. What kept the negative interest rate only fractionally negative was foreign banks' parking the yen funds in non-interest-bearing current accounts at the Bank of Japan. The analogy is imperfect because the negative interest rate in yen available to foreign banks reflected the credit standing of the Japanese banks and their need to raise dollars. But the analogy is useful in that it highlights the fact that in the Chinese case controls prevented non-residents from obtaining interest-bearing or even non-interest-bearing long positions in the renminbi onshore, so some were willing to pay interest on long forward positions offshore.

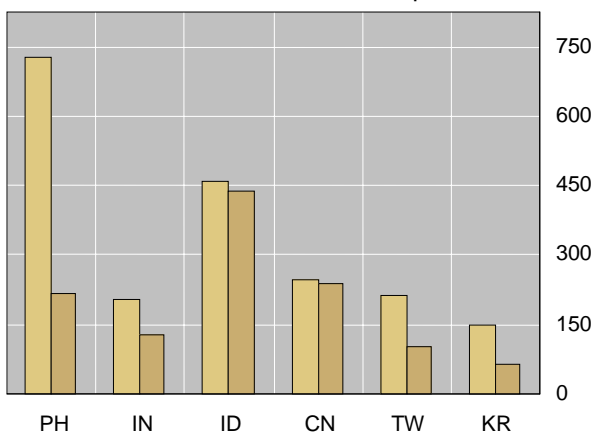
Graph 2: Average absolute onshore-offshore yield spreads

In basis points

Average absolute spread



Standard deviation of the absolute spread

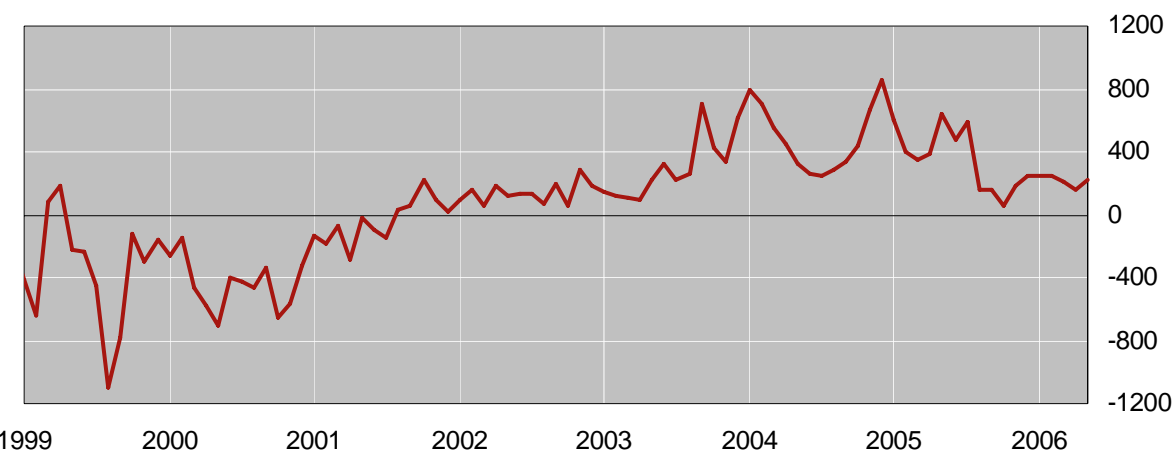


Note: PH = Philippines; IN = India; ID = Indonesia; CN = China; TW = Taiwan (China); KR = Korea.

Source: Ma et al (2004).

Graph 3: Onshore less offshore CNY yields, based on three-month Chibor

In basis points



Note: Onshore less offshore yield.

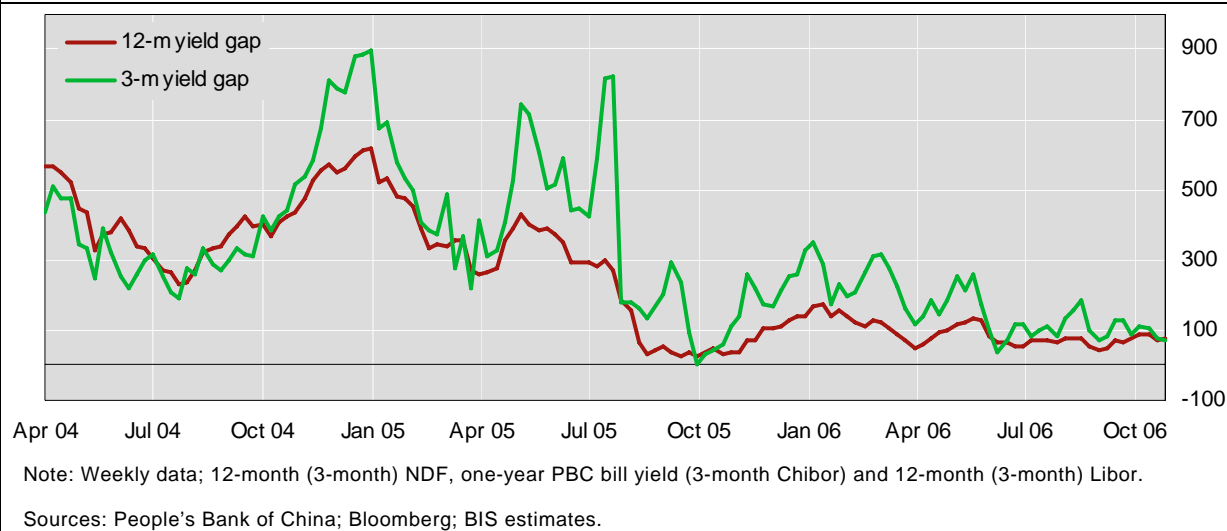
Sources: Bloomberg; PBC; authors' own estimates.

3.3 Onshore-offshore renminbi yield differentials based on PBC bills

The above finding that offshore renminbi yields have traded consistently below those onshore over the past two years is confirmed by another test based on a newly available and more liquid benchmark money market yield in renminbi in China. As noted above, the introduction of a weekly auction of PBC bills in early 2004 has provided an alternative basis for comparison of domestic renminbi money market yields with the renminbi yields implied by the NDFs traded offshore. This more telling and updated test, covering the two and half years between April 2004 and November 2006, produces a much smoother estimate of the yield gap, consistent with better liquidity in both markets (Graph 4).

Graph 4: Onshore less offshore NDF-implied yields

In basis points



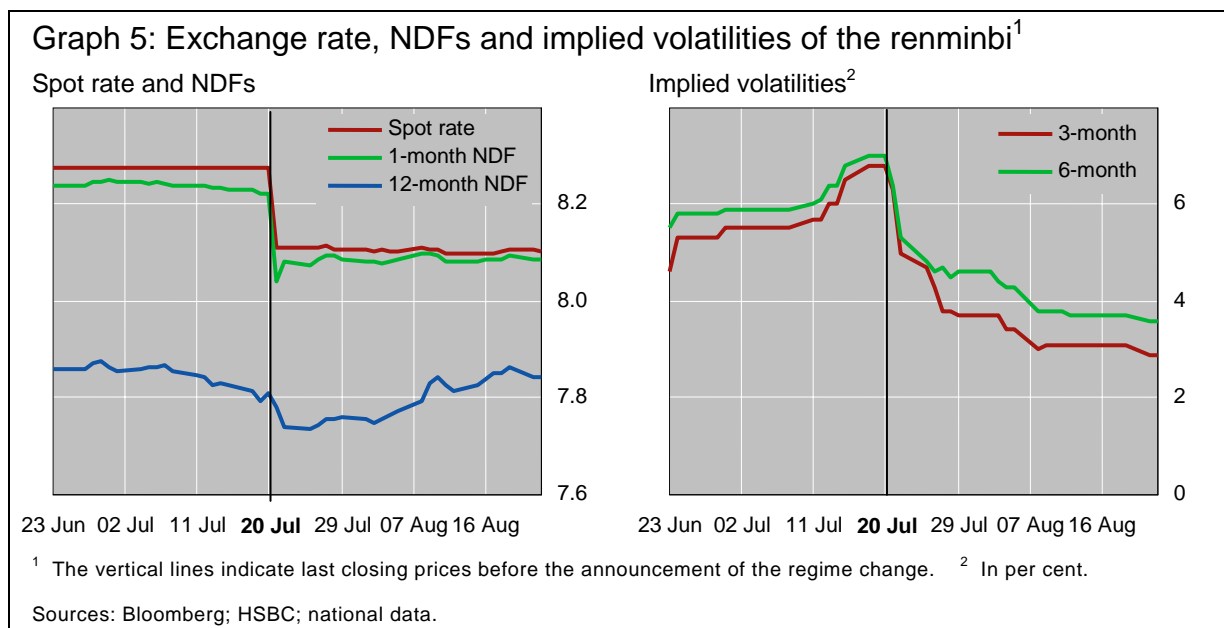
This more refined and updated test based on trading in liquid market segments offers further evidence of binding controls. During the period April 2004 to November 2006, the one-year PBC bill yielded on average 250 basis points more than the yield implied by the offshore NDF. These 250 basis points compares to an average of 320 basis points based on the three-month Chibor. Both suggest two distinct phases in the yield gaps since April 2004. Before the July 2005 policy move, the gap was wider and more volatile, reacting to policy comments and market rumours. The average spread for this first phase was more than 400 basis points on both estimates. After the July 2005 policy shift, the yield gap has shrunk to 100–200 basis points for three-month Chibor and the one-year PBC bill auction yields.

It is remarkable that the onshore-offshore interest differential narrowed sharply in the wake of the July 2005 policy change and has remained quite stable since. How should this recent convergence of offshore to onshore renminbi yields be interpreted? Those observers with a prior conviction that capital controls lose effectiveness in the presence of growing cross-border flows can read the reduction of the onshore-offshore renminbi interest rate differential as demonstrating their priors. This possible interpretation is simple and is supported to some extent by the flow evidence to be discussed in Section 5.

We offer a more nuanced interpretation that allows scope for both policy and temporary opportunities to evade controls. Regarding policy, we see the initial narrowing of the onshore and offshore renminbi yield differential as a chosen outcome of policy rather than as a forced outcome of the weight of money. In the approach to the depegging, the Chinese authorities doubtless appreciated the risk of a market reaction to any managed exit strategy. In these circumstances, prudence might suggest a policy of not relying too heavily on capital controls, even if these were judged generally effective. As it happened, rising US interest rates offered the option of what might be termed an opportunistic policy of uncovered interest parity. Thus, in the months before and after July 2005, the Chinese authorities widened the renminbi-dollar interest gap, by reducing the one-year PBC bill rate through policy rate cuts against the backdrop of rising US policy rates. This opened up a 3–4 percentage point gap between US and renminbi yields. Then after July 2005, the Chinese authorities shaped expectations of a 3–4% annual appreciation through statements and the actual pace of the spot crawl. Indeed, market expectations seemed to have been remarkably well contained during the transition, as can be seen from the NDF markets and the implied volatility (Graph 5). The consistency of such exchange rate expectations and the dollar-renminbi interest rate differential served to keep onshore and offshore renminbi rates not too far out of line. Our interpretation suggests that the PBC de facto behaved as if interest rate parity were an operating target in setting

interest rates and the speed of the crawl, thereby possibly lowering the risks inherent in the regime transition. This approach reduced the reliance on the considerable capital controls still in place, albeit to some extent at the cost of relying more on the non-interest rate instruments of monetary policy.

There were also temporary opportunities to evade the capital controls that arose because of the lag between market development and the articulation of capital controls. In particular, the development in 2006 of an onshore forward market might have added a new channel for inflows that helped to narrow the onshore-offshore differential. An onshore renminbi forward market was first introduced in late 2005, in which the forward rates were primarily priced by differentials between onshore interest rates and US dollar interest rates and made available mainly for hedging for real underlying transactions. This onshore forward market allowed some players with a presence in both the onshore and offshore markets to arbitrage. In particular, such players could buy renminbi forward in the onshore market (at relatively high implied interest rates) and simultaneously sell renminbi forward in the offshore market (at relatively low implied interest rates). Much like borrowing renminbi offshore and placing renminbi onshore, such transactions would tend to raise the offshore interest rates towards domestic interest rate levels, bringing the onshore and offshore forward curve closer to each other than otherwise. Such transactions were apparently made possible by a lacuna in the onshore prudential regulation of net foreign currency positions for banks, which set limits on net spot but not forward positions. In response to the resultant inflows, the Chinese authorities in the third quarter of 2006 tightened the rules, to prohibit onshore institutions from participating in the offshore NDF market and to include forward positions in the new prudential regulations on net bank foreign currency positions. In effect, the development of the onshore forward market created a temporary channel for arbitrage, though not one wide enough to raise offshore rates to domestic levels.



In sum, the wide differences between onshore and offshore renminbi interest rates point to the efficacy of capital controls. Most recently, the Chinese authorities guided domestic interest rates and expectations of appreciation into broad consistency with rising US dollar interest rates to reduce the risks inherent in the initial exchange rate regime shift. The resulting 1 percentage point gap between onshore and offshore renminbi yields might have been desired in order to lessen the policy burden on capital controls, which have been binding but not watertight.

Going forward, developments may once again widen the gap between onshore and offshore renminbi rates and put capital controls to a stronger test. For one thing, the accelerated pace of spot appreciation since mid-2006 might condition market expectations. Indeed, the onshore/offshore yield gap widened again to 200–300 basis points in January 2007 as offshore rates returned to zero. The experience with the onshore forwards in 2006, however, suggests that maintaining effective capital controls gets harder with the development of financial markets and further deregulation of cross-border transactions.

4. Price measures: tests of uncovered interest parity

The failure of the onshore and offshore renminbi yields to equalise through cross-border arbitrage indicates that capital controls bite. This in turn points to a degree of monetary independence in China. This section addresses this question directly by first assessing the relationship between short-term yields in China and the United States and then comparing the renminbi/dollar short-term interest rate gap with those of the HKD/dollar and euro/dollar pairs.

4.1 Interest rate differentials in a period of de facto fixed exchange rates

China and the United States went through very distinct interest rate cycles during 1996–2006, despite the de facto dollar peg of the Chinese renminbi until July 2005. Graph 6 reveals sizeable and sustained albeit varying differentials between short-term renminbi yields in China and US dollar yields in the United States and the United Kingdom. Yield differentials, whether measured in terms of policy rates or short-term money market rates, have generally been 100 basis points or more in absolute value. In sum, experience between the tightening of the peg to the dollar in 1997 and its loosening in mid-2005 suggested that the Chinese monetary authorities could still set a somewhat independent domestic policy (even in the face of capital flows responsive to the resulting yield gap, as shown below).

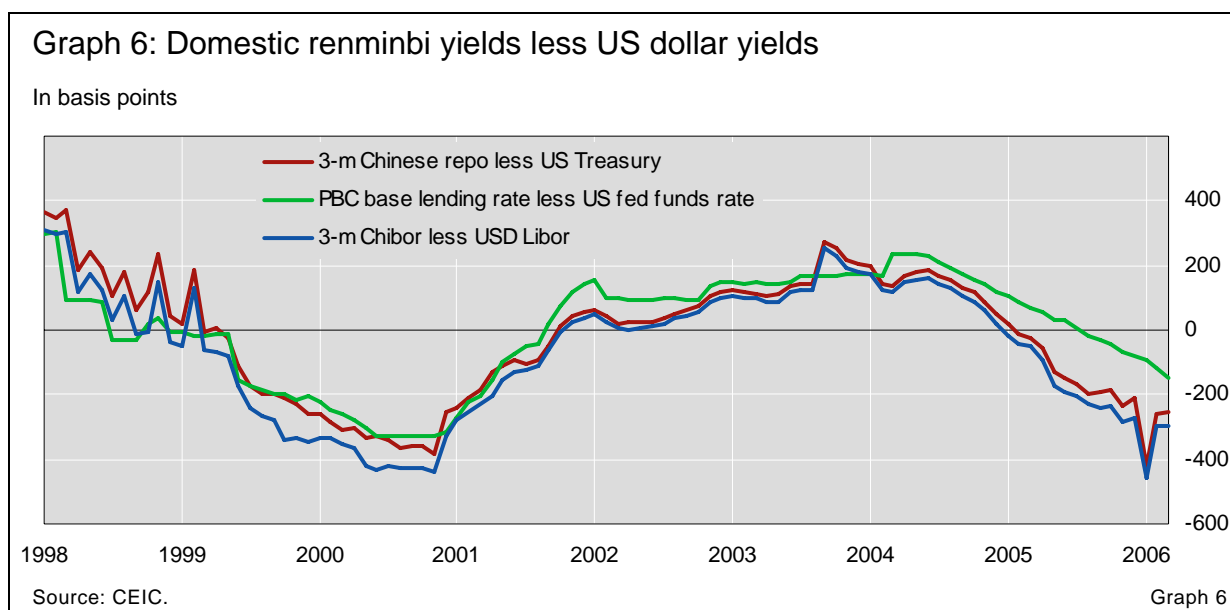
Cheung et al (2003) fit autoregressive models to the short-term interest rate differential between China and the United States and find that “the lagged uncovered interest differential variables are positively significant and indicative of strong persistence...If monies are free to move across markets, arbitrage can generate profits based on the pattern of persistent deviation and help restore the parity. However, this kind of arbitrage activity is quite difficult, especially in the short run, given the prevailing capital controls in the PRC”.

Another finding of Cheung et al (2003) has been read by Eichengreen (2005) as indicating that the capital controls have become less effective over time. In particular, Cheung et al. report a statistically significant downtrend in the interest rate differential over the sample period January 1996 to May 2002.¹⁰ Eichengreen’s interpretation is weakened, however, since the result depends on data from the early to mid-1990s. Recall that China experienced a bout of moderately high inflation, reaching 20%, in 1994–95, triggering a draconian tightening by the authorities. The one-month Chinese interbank rate remained at double digit levels in 1995–97 and remained at 6–8% throughout 1998. Only after the Asian financial crisis had delivered sharp deflationary shocks to the Chinese economy through its appreciation of the effective exchange rate of the renminbi did Chinese policymakers cut interest rates repeatedly.

¹⁰ The authors caution: “there is a subtlety involved in using parity conditions to evaluate the level of integration. When a parity condition is rejected, then...diminutions of deviations may be due either to greater economic integration, greater convergence of economic policies, or both” (p 6). We incline to policy convergence.

The econometric evidence in Appendix 2 confirms the hypothesis of significant CNY/USD interest rate differentials. This is a strong statement that on average, China's capital controls had been effective in maintaining a wedge between interest rates on the US dollar and renminbi, despite the de facto dollar peg of the renminbi. Our statistical tests do not support the hypothesis of trend decline in the interest rate differentials, once a break in the sample is allowed. In particular, during 2001–05 when China considerably deepened its participation in the global economy and controls were generally relaxed, the estimated trend convergence of short-term interest rates has the wrong sign in all of the cases. If closer financial integration forces interest rate convergence given exchange rate stability, it is hard to account for the lack of convergence in the more recent years.

Thus, the distinct interest rate cycles in China and the United States support the idea that China's capital controls have bound sufficiently to provide policymakers some degree of short-term monetary autonomy under a de facto dollar peg.¹¹ We interpret the observed convergence of policy rates in the 1990s as owing more to inflation convergence than weaker capital controls. Rather than happenstance, the inflation and interest rate convergence in 1996–2000 can be seen as reflecting the dollar peg's provision of a useful medium-term monetary anchor through traded goods prices.¹² However, what matters for the present analysis is that, in the context of low inflation in both countries, capital controls have permitted Chinese interest rates to diverge from those of the Federal Reserve, notwithstanding the exchange rate linkage.



¹¹ Indeed, Granger causality tests suggest that of the three interest rate pairs shown in Graph 6, none of the causality runs from the US rate to the Chinese rate. Indeed, the null hypothesis that the three-month Chinese repo yield does not cause the three-month US Treasury bill yield cannot be rejected. This runs counter to the general view that the United States is a global interest rate setter and China a follower.

¹² Robert Mundell and Ron McKinnon have long stressed the importance of the renminbi's de facto dollar peg as a credible nominal anchor. It remains, however, an empirical question as to how much of the inflation convergence should be attributed to this anchor as opposed to strong-arm Chinese macro controls. The US Fed tightened aggressively from 1994 to mid-1995 when the renminbi was first stabilised against the US dollar. In the following three years, the Fed eased somewhat while former Premier Zhu Rongji took forceful measures to control domestic inflation until the Asian crisis delivered strong deflationary shocks to the Chinese economy.

4.2 Relative monetary independence

It might be objected that the yield differentials just considered are not wide enough to indicate monetary independence. This objection suggests the usefulness of some benchmarks. How do the differentials between domestic renminbi yields and US dollar yields compare to those between HK dollar and US dollar yields as well as those between euro and dollar yields? As a small open economy, Hong Kong has a dollar-based currency board system and no capital controls whatsoever. The euro area, on the other hand, is a large economy, but one with a flexible exchange rate and an open capital account. The latter is a much more stringent test than a benchmark based on the USD/HKD pair. Any similarity in dollar and euro yields cannot reflect the exchange rate policy of the euro area (unlike, say, any similarity in USD and HKD yields).

The HKD/USD benchmark highlights the efficacy of capital controls in China, since Hong Kong has complete capital mobility but China has maintained substantial controls, yet both had tightly linked their currencies to the US dollar. As expected, Table 2 shows that the HKD/USD yield pairs exhibit much narrower and more stable differentials and much higher correlations than do the Chibor/Libor pairs at both one-week and three-month maturities. In particular, the Hibor/Libor correlations are close to unity, compared to less than one third for the Chibor/Libor pairs. This is a classical case of a small open economy choosing a fixed change rate and giving up its monetary autonomy, regardless of the respective business cycles. Hence the HKD/USD benchmark is highly advantageous to our argument that China's capital controls have substantially hindered cross-border arbitrage. One drawback of using the HKD/USD benchmark, however, is that it can only suggest that China's interest rate setting has more room to manoeuvre than an economy with very little such room.

Table 2

Interbank rate differentials: renminbi–USD and HKD–USD (bps)

	One-week		Three-month	
	Chibor/Libor	Hibor/Libor	Chibor/Libor	Hibor/Libor
Ave of absolute difference	160.5	54.1	166.6	47.0
Max of the differential	173.4	71.2	213.2	99.7
Min of the differential	-429.6	-222.8	-439.0	-213.0
Standard deviation	181.4	54.8	194.9	58.9
Correlation coefficient	0.32	0.97	0.21	0.97

Note: The interbank market offer rates are Chibor for the renminbi, Libor for the US dollar and Hibor for the Hong Kong dollar; monthly data from January 1999 to March 2006.

Source: CEIC.

A more stringent test based on the EUR/USD benchmark, where there is a strong presumption of autonomy in interest rate setting, still supports our arguments. It is more stringent because even other things being equal, the sheer size of the euro area or China would secure itself greater autonomy relative to Hong Kong. Table 3 shows that the EUR/USD yield pairs have narrower and more stable differentials than do the CNY/USD pairs. More tellingly, for the period under consideration, Euribor and Libor exhibit greater positive co-movement than do Chibor and Libor. These results hold as well across split samples. Thus, the evidence from interbank market yields suggests that China, with a fixed exchange rate and continued capital controls, does not import its interest rate policy from the

United States to any greater extent than the euro area. This observation is consistent with the view that capital controls in China remain binding.

Table 3

Interbank rate differentials: renminbi–USD and euro–USD (bps)

	One-week		Three-month	
	Chibor/Libor	Euribor/Libor	Chibor/Libor	Euribor/Libor
Ave of absolute difference	160.47	143.45	166.64	144.56
Max of the differential	173.36	190.04	213.16	166.81
Min of the differential	-429.58	-281.50	-439.01	-284.07
Standard deviation	181.39	156.60	194.88	157.37
Correlation coefficient	0.32	0.58	0.21	0.60

Note: The interbank market offer rates are Chibor for the renminbi, Libor for the US dollar and Euribor for the euro; monthly data from January 1999 to March 2006.

Source: CEIC.

5. Flow evidence on the effectiveness of capital controls

Flow measures provide useful indications of cross-border interactions between the onshore and offshore markets, giving indirect evidence of capital mobility. However, there are two qualifications to using flow evidence to gauge the efficacy of capital controls. First, the intensity of capital controls over different types of capital flows may vary. Thus capital mobility could differ across types of capital flows. Adapting the analysis to such differences, however, is made difficult by more restricted flows in effect taking the form of less restricted flows. Second, observed flow measures of capital mobility cannot address the question of how large a flow is required to equalise the associated prices. Thus, such evidence needs to be combined with discussion of price measures. The evidence on flows suggests that China's capital controls are not watertight, with certain cross-border flows responding to market conditions, but does not challenge the findings that capital controls have still bound.

5.1 A discriminating regime of capital controls

China's regulatory system discriminates among different cross-border flows. Given a large trade sector, the current account convertibility commitment in 1996 and the WTO entry in 2001, China's current account has been quite open. With respect to the capital account, controls apply only to a quarter or so of the IMF categories (Prasad and Wei (2005)). Encouraging foreign direct investment (FDI) has been a long-held policy, and movements on this account and in associated trade credit have the potential to arbitrage onshore and offshore yields (see Section 3.1.3 above). Outward direct investment, to be discussed below, has until recently been tightly regulated and thus has provided little scope for such arbitrage. Portfolio flows and most external debts have been tightly controlled. However, authorised banks have been allowed to transact cross-border to accommodate decisions of onshore non-bank depositors and borrowers, including those depositing and borrowing in foreign currency.

Hence care must be taken in both devising and interpreting flow measures when gauging the efficacy of capital controls. For instance, large FDI inflows need not suggest ineffective capital controls, although they may provide scope for arbitrage transactions. Conversely, a lack of bank flows may only indicate the combined response to currency expectations and relative yields. We discuss a variety of such flow measures below, in order of the complexity of their construction.

5.2 Cross-border flows under the current account

As investors respond to market pressure, remaining capital controls may induce some capital flows to circumvent official regulations via a large and liberalised current account. Two particular current receipts and payments give such evidence. They are rising net inward remittance transfers and stagnant dividend/interest payments in recent years. Both point to the possibility that avoidance and evasion of capital controls are distorting the current account.

Remittance inflows, predominantly private, more than tripled between 2001 and 2005, suggesting capital inflows from Chinese residents' overseas relatives (Graph 7). In 2005, net current transfers reached \$25 billion, up from \$8 billion in 2001, and represented some 15% of China's current account surplus. Outward current transfers rose only to \$2.5 billion in 2005 from \$0.6 billion in 2001. The Chinese government, which had traditionally encouraged such dollar inflows, moved in late 2004 to require banks to report unusually large remittance inflows and the related dollar sales, with a threshold of daily conversion of dollars into the renminbi in excess of \$10,000 per transaction (SAFE (2004)). This new reporting requirement remains effective to date.

The other flow measure is the suspiciously weak current investment income payments by multinational firms and other foreign investors in China.¹³ Outward dividend and interest remittances by foreign companies operating in China has levelled off at around \$25 billion per annum since 2001, after quintupling between 1995 and 2000 (Graph 7). This is rather puzzling even given the decline in interest rates on dollar debts after 2000, considering that both of China's external debt and equity liability reportedly doubled during this period. At the same time, most Chinese companies listed at the Hong Kong Stock Exchange recorded stronger corporate profits. These oddly stagnant current account outflows could be a possible sign of disguised capital inflows into China. As discussed earlier, there are strong incentives for foreign firms to delay converting their renminbi profits onshore into dollars even if they cover this long renminbi position through offshore NDFs.

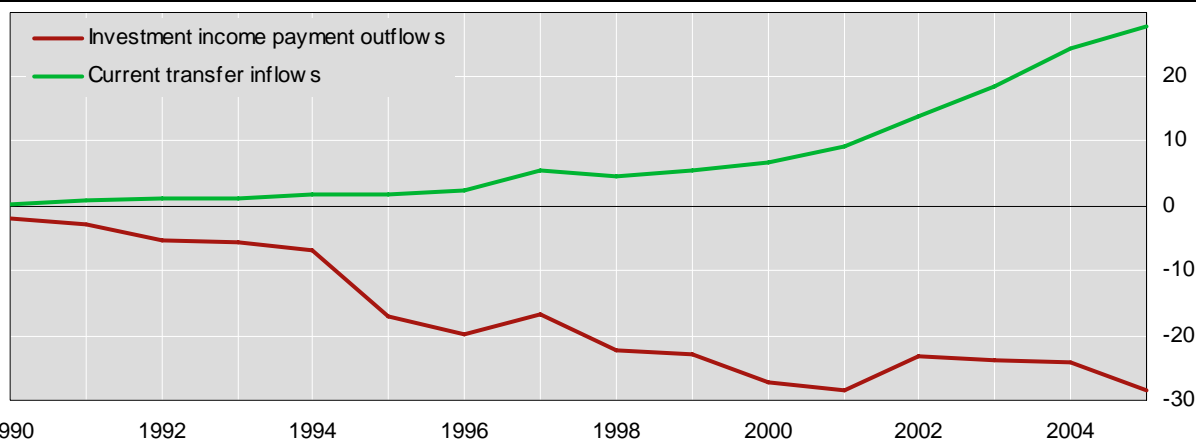
These unusual cross-border flows in recent years suggest that capital inflows could occur through a liberalised current account, especially after the authorities tightened controls on incoming capital. If we assume that in 2005 recorded remittance inflows overstated, and recorded investment income outflows understated, their respective true levels by one third, capital inflows into China through the more liberalised current account could have exceeded \$16 billion or 10% of the reported \$160 billion current account surplus.¹⁴

¹³ According to the IMF guidelines, multinationals' profits are accounted for as current account outflows regardless of whether they are paid out as interest and dividends or accompanied by offsetting capital inflows as in the case of retained earnings. In China's case, however, the actual accounting treatment of retained earnings may not conform to the IMF guidelines.

¹⁴ There could also be widespread under- and over-invoicing of exports and imports in response to market conditions.

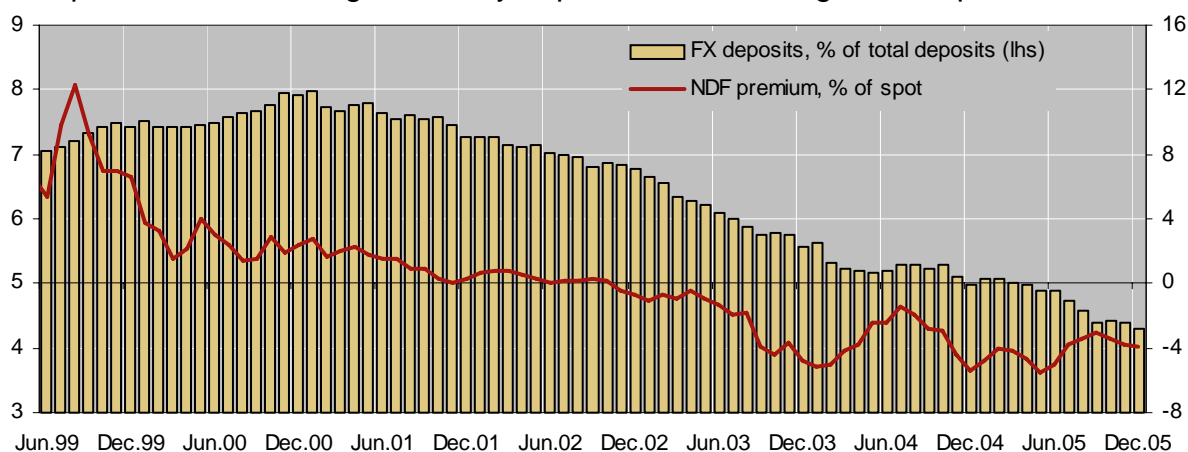
Graph 7: Investment income and current transfer flows of China

In billions of US dollars



Source: CEIC.

Graph 8: Onshore foreign currency deposits and exchange rate expectations



Note: Total deposits include both renminbi and foreign currency deposits; 12-month NDF. A negative premium indicates expectations of appreciation.

Source: CEIC; PBC; Bloomberg; authors' own estimates.

5.3 Foreign currency bank deposit flows

Changes in foreign currency deposits held by Chinese households and firms with banks in China respond to changing market conditions and give rise to cross-border flows through the banking system.¹⁵ Graph 8 shows that onshore foreign currency deposits held by Chinese residents have tracked exchange rate expectations. As a share of total bank deposits, dollar deposits rose in 1999 and 2000 when offshore speculation of renminbi depreciation prevailed, reaching a peak of 8%. Since then, appreciation expectations have led to a trend decline in the ratio (and sometimes even absolute declines of dollar deposits) to less than 4.5% of total bank deposits by the end of 2005. Ma and McCauley (2002b) show that these dollar deposits also respond to interest rate differentials.

¹⁵ See McCauley and Mo (2000) and Ma and McCauley (2002a, 2002b, 2003, 2004).

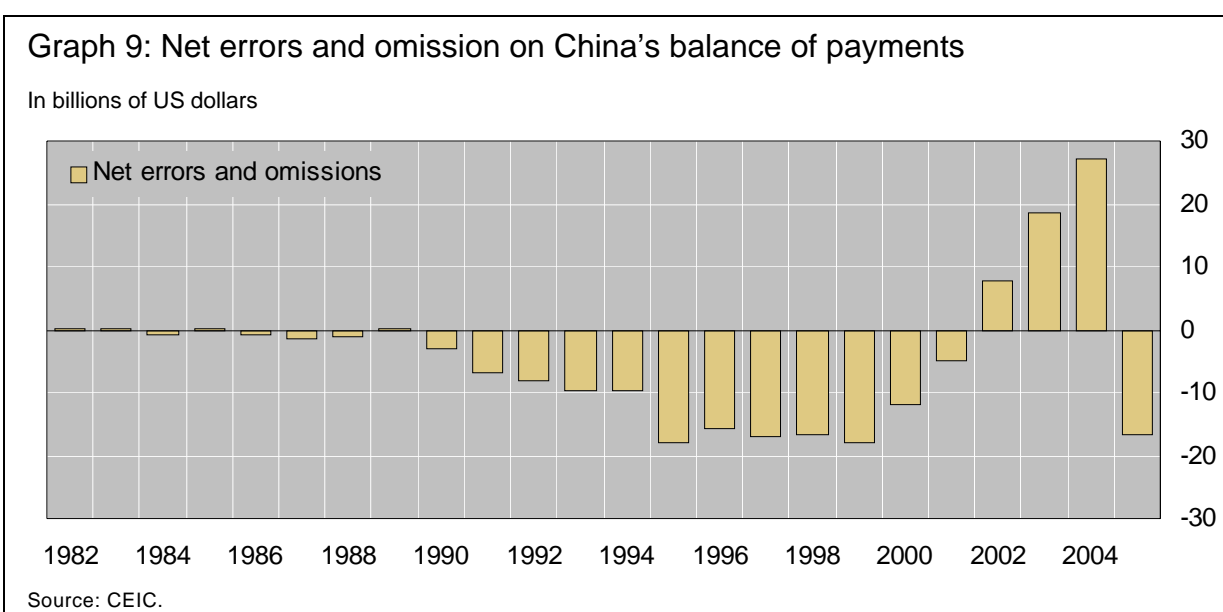
Such flows, however, do not directly shed light on the issue of the efficacy of capital controls, because Chinese residents, although subject to constraints in their dollar acquisition, are permitted to hold foreign currency deposits onshore. Similarly, the Chinese banking sector is authorised to offset domestic surpluses or deficits in dollars with cross-border deposits or borrowing from global banks. Nevertheless, these permitted cross-border flows could help reduce the effectiveness of the remaining capital controls. The main point is that they have not been large enough to eliminate the onshore/offshore renminbi yield gaps.

5.4 Net flows of errors and omissions

Cross-border flows under “errors and omissions” in the balance of payments can be seen as a general measure of unrecorded capital flows and have often been cited in the literature on China’s capital flight (Jin and Li (2005) and Song (1999)). This residual fluctuated sharply in response to market conditions, from an annual outflow of \$15 billion during the 1995–99 period of high inflation, the Asian financial crisis and expectations of renminbi depreciation to an inflow averaging \$20 billion in 2003–04 amid expectations of renminbi appreciation (Graph 9). Of this latter period, Prasad and Wei (2005) write “that, given the apparent one-way bet on the renminbi, the fact that these flows are not larger than they are suggests that capital controls may be at least partially effective”.

While often viewed as indicating the direction of unrecorded capital flows, errors and omissions should be interpreted with caution. In particular, the errors and omissions in China’s balance of payments could have captured valuation changes of the official foreign exchange reserves (positive when the dollar falls against major currencies, leading to an errors and omission inflow), which have nothing to do with capital controls or capital mobility. Thus, the surprising net outflows under errors and omissions in 2005 might have partly resulted from dollar strength (Prasad and Wei (2005)).

In sum, various flow measures point to both current account and capital account flows responding to market conditions and thus suggest limits to the effectiveness of China’s capital controls. However, some of these capital flows are permitted, while others can take place only by circumventing regulations. Moreover, the existence of large capital flows is not sufficient evidence of capital controls being so leaky as to be ineffective. What is most striking, though, is that, despite the obvious limits on the ability of capital controls to prevent very substantial cross-border flows, sizeable onshore-offshore yield gaps have persisted, as have very distinct US-China interest rate cycles.



6. Challenges to capital account liberalisation

Whether China's capital controls still bite may carry important implications for future capital liberalisation. In particular, the current effectiveness may condition the pace and sequence of decontrol. On the one hand, if controls are largely ineffective and non-binding, the task of further liberalisation would be relatively simple and the effect would be mostly on the recorded composition of capital flows, with more implications for financial stability than for monetary policy. If, on the other hand, capital controls remain substantially binding, future liberalisation still poses real challenges to policymakers, and the pace of decontrol, potentially affecting both the scale of capital flows and their composition, carries important implications for monetary policy as well.

Looking ahead, Chinese policymakers face two related challenges in liberalising the capital account. First is setting rules to manage more volatile short-term capital flows such as portfolio and deposit flows. As noted above, China's current account openness has already made it more difficult to control such short-term flows, while China's ample foreign exchange liquidity makes it easier to accept their inherent volatility. The second challenge is to open up additional channels for permitted capital outflows and to put in place a regulatory framework to deal with the associated risks (Ma and McCauley (2003)). This section discusses three such liberalisation measures: easier outward direct investment, further relaxation of the "qualified foreign institutional investors" (QFII) and "qualified domestic institutional investors" (QDII) schemes, and freer conversion of renminbi deposits into dollars for overseas uses.

6.1 Outward direct investment

Since 2001, China has experimented with a policy of promoting overseas direct investment by Chinese companies. The previous discouragement of such outflows was in contrast to the long-pursued policy of encouraging inflows of foreign direct investment. The result of this policy bias is the order of magnitude difference between an estimated \$610 billion of direct investment liability and the corresponding \$55 billion of such assets in China's end-2005 international investment position. As of June 2006, the government had scrapped 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. This policy shift aims to promote outflows to lessen the external surplus, to secure access to natural resources overseas and to encourage the growth of selected large Chinese companies. Outbound direct investment by Chinese companies rose from less than \$2 billion in 2004 to \$11 billion in 2005.

However, with capital controls still biting, the impact of this policy shift on China's capital account could extend in effect well beyond the category of direct investment itself, if the experience in other Asian economies offers any guidance. With an expanded overseas presence, treasurers of Chinese companies could more readily manage their financial and currency exposure with large-scale transactions spanning both their onshore and offshore operations. Such enhanced ability to engage in cross-border arbitrage could weaken controls on other types of capital flows and foreign exchange activities (such as trade credit and covered forward trading). The Korean experience before and during the Asian financial crisis suggests that inter-office trade credit flows, debts incurred by overseas subsidiaries and cross-guarantees all afforded Korean conglomerates extra degrees of freedom in the face of various official restrictions (Cho and McCauley (2003)). Thus, Chinese policymakers need to be aware of the potential for restricted transactions to occur in effect within the intra-corporate accounts of Chinese-based multinationals.

6.2 Qualified institutional investor schemes

China has attempted to institutionalise the management of two-way portfolio flows under the so-called QFII and QDII schemes. The former regulates portfolio inflows while the latter manages outflows. Both schemes involve pre-approval procedures, quota management, foreign exchange conversion rules, instrument restrictions and intensive reporting requirements.

Before the QFII scheme was first introduced in 2003, foreign investors could not invest in local equity and bonds onshore, with the sole exception of a tiny foreign currency denominated B-share market. Until the QDII scheme, non-bank Chinese residents were prohibited from directly investing in overseas securities, while banks could invest their own dollar liquidity in fixed income instruments. Resident issues of both equity and debt securities in offshore markets must also go through a rigorous approval process.¹⁶ Non-resident issuers found it impossible to tap the onshore markets before the two special IFC and ADB renminbi bond issues in 2005.¹⁷ In early 2007, a pilot scheme permitting Chinese companies to issue corporate bonds denominated in renminbi in Hong Kong was announced. Thus, by and large, measured two-way portfolio flows are effectively regulated and their variation can be expected to shed little light on the efficacy of capital controls (hence their exclusion from the flow measures examined in Section 5).

6.2.1 Qualified foreign institutional investor scheme (QFII)

The QFII scheme was initially introduced to boost the domestic stock markets.¹⁸ As of early 2007, the investment quota for the QFII scheme had reached a cumulative \$10 billion, divided among 52 QFII investors.¹⁹ The total QFII investment amounts to 3% of China's tradable stock market capitalisation. This compares with some 40% of foreign ownership in the Korean stock markets and 7% in Taiwan, China (hereafter Taiwan) in 2002. In India, foreign institutional investors own 6% of the total stock market capitalisation but represent nearly 18% for the top 200 companies listed in the Bombay Stock Exchange. The Asian experience provides overwhelming evidence that foreign portfolio investors in Asia are more interested in equity securities than in local debt securities, either because of portfolio considerations or of market impediments to investing in local fixed income instruments.

There is room for further relaxing China's QFII scheme. Domestically, there is a need to expand the role of institutional investors in the retail-dominated Chinese stock markets. In the end, however, such QFII arrangements can be seen as no more than transitional measures in the process of capital account liberalisation. For example, a similar QFII scheme in Taiwan was established in 1992 and abolished in 2003 as the authorities gained experience and confidence, not least as a result of their large holdings of international reserves.

¹⁶ Examples include the so-called H shares issued by Chinese companies on the Hong Kong Stock Exchange and international bonds issued by China Development Bank. Beside H shares, Chinese companies have also sought listing on other international stock exchanges such as the New York Stock Exchange (N shares), London Stock Exchange (L shares) and Singapore Stock Exchange (S shares).

¹⁷ IFC and ADB issued so-called renminbi-denominated "panda bonds" worth CNY 1.13 billion and CNY 1 billion, respectively, in China in 2005.

¹⁸ The Chinese A-share stock market had been languishing for several years before the boom in 2006.

¹⁹ QFII players have access only to exchange-listed local currency securities in China (A-shares, local currency convertible bonds, government bonds and mutual funds) but could not directly participate in China's interbank bond and money markets. The China Index Bond Fund of the ABF2 family has been the first ever QFII allowed to invest in the interbank bond market. Global banks also have access to the interbank bond and money markets through their domestic branches, however.

6.2.2 Qualified domestic institutional investor (QDII) scheme

In April 2006, the PBC formally announced a QDII scheme that permits Chinese individuals and companies to invest in overseas securities. The new scheme comprises three key elements. First, Chinese individuals and institutions can, via authorised banks and subject to quotas, convert their renminbi bank deposits into dollars onshore for investing in overseas “fixed income” products. Second, Chinese individuals and institutions can, via authorised securities companies and fund managers and subject to quotas, invest dollar deposits now held onshore into overseas securities including equity shares.²⁰ Third, authorised domestic insurers can convert their renminbi funds into dollars to invest in overseas bond and money market instruments, subject to prudential requirements.

The QDII scheme is designed to manage portfolio outflows via licensed banks and fund managers and with the aid of investment quota and instrument restrictions. Through the scheme, Chinese private sector investors gain institutionalised access to international financial markets. The timing of the introduction of the QDII scheme seems comfortable, since it permits some autonomous cross-border portfolio flows needed for a more market-based renminbi exchange rate, and helps to hold down the rapid foreign reserve buildup at the PBC.²¹

Looking ahead, both the QFII and QDII schemes may interact to shape the liberalisation process. While accelerated portfolio inflows via a bigger QFII window may spur further relaxation of the QDII scheme that caps portfolio outflows, a more liberalised QDII channel may potentially invite even more capital inflows. Thus, these two schemes are likely to expand two-way gross portfolio flows, allow volatile net portfolio flows in response to market conditions and thereby make capital controls less binding over time. In sum, policymakers need to anticipate the possibility that further liberalisation of the currently still binding controls may lead to increased volatility in cross-border flows.

6.3 Generalised liberalisation of resident deposit conversion

As the QDII scheme evolves, China’s capital decontrol will progress to a stage where Chinese households and companies are free to convert their bank deposits between local and foreign currencies and move their funds cross-border, for whatever purposes. Conceptually, there could be two distinct liberalisation phases in this process. First, Chinese residents might be allowed to freely convert renminbi and foreign currency bank deposits onshore. Second, Chinese residents might be allowed to transfer foreign or local currency funds cross-border via the banking sector without restrictions.

As already discussed, foreign currency deposits in China have been sensitive to both relative yields and exchange rate expectations (Ma and McCauley (2002b)). If China’s capital controls currently remain binding, policymakers need to assess the potential for instability arising from freer switching of bank deposits between renminbi and foreign currency. Onshore currency conversion of bank deposits will have ramifications for cross-border bank flows, since a change in the difference between onshore dollar deposits and dollar loans in the Chinese banking sector tends to result in a net cross-border interbank flow. These cross-border transactions in turn show up in the positions of international banks vis-à-vis Chinese banks as reported to the BIS.

²⁰ As discussed in Ma and McCauley (2002b), the Chinese government similarly opened up the foreign currency denominated B-share market to Chinese residents already holding dollar deposits onshore.

²¹ The QDII scheme has operated informally on a trial basis since late 2005 and involved China’s National Social Securities Fund and selected Chinese insurers.

An important liberalisation step was the January 2007 PBC/SAFE announcement of a \$50,000 ceiling on free two-way conversion between renminbi and foreign currency by Chinese individuals per person per year. On the reasonable assumption that 10 million wealthier Chinese residents could take full advantage of this quota, the gross annual onshore switching of renminbi into dollars could reach \$500 billion or nearly 25% of the total renminbi household savings deposits as of 2006. This still partial liberalisation thus already allows much more than the 5% diversification upon liberalisation envisioned by Goldstein (2004). More importantly, within the \$50,000 quota, Chinese residents can freely transfer their dollar funds cross-border.

This possible shift under the \$50,000 ceiling can be usefully compared to other Asian benchmarks for both the level and variation of foreign currency deposits (Table 4). At one extreme, the share of foreign currency deposits is nearly half of the overall deposits in Hong Kong's liberal banking sector (Lai and Shi (2003)). At the other extreme, "deposit dollarisation" represents no more than 3% of the total deposits in India's restricted banking system. China's ratio rests in the middle, comparable to that of Taiwan and Korea. In the case of Indonesia, on the other hand, the recent history of high inflation may partly explain the relatively high share of dollar deposits in its onshore banking system. We think that Taiwan, where remaining controls on resident purchases of dollars essentially do not bind, may be the most relevant case for China – the ceilings of Taiwanese individuals and companies converting their NT dollars into US dollars are, respectively, \$5 million and \$50 million (US) a year.

Variation in the foreign currency deposit share could be a source of instability in cross-border capital flows. As restrictions on currency conversion are eased, one would expect that the holding of foreign currency deposits by residents could become more responsive to interest rate differentials and exchange rate expectations.²² A regime of liberal currency switches of bank deposits thus might not only raise the average dollar share but make foreign currency deposits less sticky and thus raise their volatility. This volatility of the foreign currency deposit share, as measured by the annualised standard deviation of monthly changes in the share, ranges from 0.3 to 2.5 percentage points for the selected Asian markets (Table 4). Indonesia has the highest standard deviation, where much of the variation must reflect valuation changes from the volatile rupiah exchange rate rather than the flows that are of interest to policymakers.

Going beyond these summary statistics, Taiwan's case again provides the basis for a more relevant stress test since its foreign exchange regulations are essentially non-binding. The biggest shift to foreign currency holdings by Taiwanese bank depositors took place in the latter half of the Federal Reserve's tightening cycle in April–December 2000. This was a time when US dollar interest rates rose substantially above local interest rates against a backdrop of fairly stable expectations for the exchange rate – a bad but by no means a worst case scenario for the mainland. Then, Taiwan's foreign currency deposit share rose by 3.7 percentage points on an annualised basis. If we take this episode as a stress test for China, a rise of 4 percentage points in the foreign currency deposit share would imply a conversion of renminbi into dollar deposits on a scale of less than \$100 billion per annum. This sum is below the afore mentioned scenario of \$500 billion annual dollar purchase and well covered by China's current foreign reserve holding of \$1 trillion, even given the potential claims represented by short-term external debt of around \$170 billion. Hence, stress tests based on Asian experience indicate that China's new liberalisation measure of renminbi-dollar conversion would not appear to pose excessive liquidity risk.

²² See Fung and McCauley (2001), and Ma and McCauley (2002a and 2002b). Other factors such as exchange rate volatility as well as confidence in the local financial system may also potentially affect the observed variation of the foreign currency deposit share.

Table 4

Ratio of foreign currency deposits to total deposits (2000–05)¹

	China	India	Korea	Taiwan	Indonesia	Hong Kong
Mean	6.63	2.89	4.22	5.27	18.10	46.48
Maximum	8.02	3.42	7.59	6.38	23.50	48.30
Minimum	4.30	2.31	2.79	3.38	14.67	44.37
St Dev (annualised) ²	0.84	0.32	0.92	0.70	2.53	1.67
FC deposits (\$bn) ³	161.57	3.97	18.63	45.27	19.22	249.31

¹ Monthly data, in per cent; total deposits include both local and foreign currency deposits. ² Annualised standard deviation of monthly changes in the percentage share. ³ End of 2005.

Source: CEIC; authors' estimates.

Nevertheless, two implications of such a scenario are worth exploring. First, as Chinese residents switch renminbi into dollars and the banks sell dollars for renminbi, the PBC could well be on the other side of the market selling dollars to banks. Other things being equal, Chinese banks might add the proceeds to their offshore interbank deposits or holdings of dollar securities. This would entail a shift of China's external assets from the official sector to the banking system, amounting to the privatisation of China's official dollar holdings. Thus the dollar exposure would be more evenly distributed across the economy rather than concentrated in the official sector.

Second, an abrupt shift from renminbi to dollar deposits could pose challenges to monetary policymaking. Since dollar deposits are excluded from the current Chinese M2 measure, this shift would slow down M2 growth, other things being equal. Should this deceleration of M2 be taken seriously and resisted with lower policy rates? Or should this measured M2 weakness be discounted as a reflection of a portfolio shift bearing no message about future growth and inflation? Once this broad question is answered, monetary operations would need to take into account any foreign exchange market intervention accommodating the initial deposit shift as well as the gap between reserve requirements on renminbi and foreign currency deposits.

Beyond easing the switching of deposits onshore between currencies is policy governing the transfer of foreign or local currency funds offshore through the banking sector. The January 2007 PBC/SAFE announcement also permits the \$50,000 per person per year to be transferred offshore. Thus, in one sense, the guidepost of liberalising foreign currency bank deposit outflows has been passed. However, cross-border renminbi flows could be allowed to take place only in phases. Renminbi bank inflows from abroad should not be an issue for the time being, since offshore renminbi funding is strictly prohibited, except the limited special arrangement of renminbi bank deposits in Hong Kong (HKMA (2006)). Similarly, renminbi bank outflows could for the time being only be contemplated vis-à-vis Hong Kong. Further down the road, with offshore renminbi deposits outside Hong Kong and offshore renminbi loans, the issue of internationalising the renminbi may come into view.

7. Conclusion

We find that China's capital controls remain substantially binding. They prevent the equalisation of onshore renminbi yields and those implied by offshore NDFs. We also find that the observed convergence of short-term interest rates between China and the United

States was more characteristic of the mid- to late 1990s than of the years since. With its remaining capital controls, China's short-term interest rate setting seems less imported from the United States than either that of Hong Kong as a small open economy with a hard dollar peg or that of the euro area as a large economy with a flexible exchange rate. That said, capital flows between China and the rest of the world do respond to interest rate differentials and to expected exchange rate changes.

We have interpreted the partial convergence of onshore and offshore renminbi yields since July 2005 as reflecting the authorities' choice to act as if they were bound by interest rate parity. That is, in the transition from the pegged regime, the Chinese authorities found it convenient to take the burden off the capital controls by signalling a rate of appreciation against the dollar that is broadly consistent with the dollar-renminbi interest rate differential. We also recognise an element of unintended and temporary relaxation of capital controls resulting from financial market development getting ahead of the controls.

Over time, financial market development and further decontrols should pave the way for phased integration of China into the global market and diminish the importance of remaining controls. However, the latest onshore/offshore gaps remain large and it would be premature to assume that the authorities would not test the effectiveness of capital controls in a major way as monetary and exchange rate policies evolve. Finally, our findings may also help shed light on how policymakers in China may pace the country's ongoing capital account liberalisation. Our analysis suggests that the choices regarding liberalisation will affect more than the form of inflows.

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Appendix 1

The spread between onshore yields and NDF-implied offshore yields

In the absence of capital controls, the forward exchange rate of the home currency is linked by arbitrage to its spot rate and the interest rate differential between the home currency and the dollar through the covered interest parity condition (Ma et al (2004))

$$F = S(1+i)/(1+r^{\$})$$

where F is the forward rate, S the spot rate, r the interest rate on the home currency and $r^{\$}$ the dollar interest rate. When there are no cross-border restrictions, borrowing and lending ensure that the above holds.

However, when capital controls bind, non-residents may not have full access to onshore credit or placements, giving rising to NDFs.

$$NDF = S(1+i)/(1+r^{\$})$$

where i is the NDF-implied yield on the home currency offshore. Note that by definition, i is not constrained by the zero lower bound and could be substantially negative. To the extent that the arbitrage between the onshore money market and offshore NDF market is effectively constrained by capital controls, the NDF-implied offshore interest rate, i , can differ considerably from the interest rate prevailing in the onshore money market, r . A large and persistent onshore/offshore spread ($r - i$) indicates the presence of effective cross-border restrictions. The sign of the yield gap may also reveal prevailing market conditions – a positive sign implies appreciation pressures on the home currency in presence of capital controls and vice versa.

While a persistently big onshore/offshore yield gap indicates market segmentation, a temporary narrower gap may not necessarily suggest less effective capital controls. One possibility is that market conditions are such that appreciation or depreciation pressures on the currency happen to be largely absent so that the estimated yield gap is relatively small.

Another, in principle equivalent, approach is to estimate the implied onshore yield on the home currency using the onshore deliverable forwards and then to compare it to the NDF-implied offshore yield. Alternatively, one may directly compare the onshore deliverable forwards with their NDF counterparts to derive a forward premium spread. The merits of these different approaches depend in part on data availability and market liquidity. In China's case, these alternative measures may become more useful over time, as the relevant onshore markets develop and data become more available.

Appendix 2

We test the following three hypotheses. (1) The USD/renminbi interest rate differential (in absolute terms) is significantly different from zero. (2) The differential has shown a trend decline. (3) The average differential or its trend changed during the sample period. Our tests are based on the three measures of interest rates in Graph 6 for the period of July 1997 to July 2005 and allow for possible data breaks within this sample period. Table 5 reports the test results, confirming the view that China's capital controls remain effective.

First, for the whole sample period of 1997–2005 or for subsamples, the absolute values of the dollar/renminbi nominal interest rate differentials differ significantly from zero for all three interest rate measures. Second, though it appears from the entire sample period that the differential was trending downwards, the hypothesis of a declining trend in the dollar/renminbi interest rate differentials is rejected within the subsamples.

Finally, when the data are allowed to determine the most likely shift point, the tests reject the null hypothesis of no break. In particular, induction identifies a break in the neighbourhood of mid-2001, roughly the midpoint of the sample period. Given this break, the absolute sizes of the interest rate differentials between the renminbi and US dollar are narrower for the second half of the sample than the first half but remain substantial statistically. As noted, however, there is little evidence of a trend decline within the subsamples, and indeed we find the wrong sign for the estimated trend coefficients in all cases.

Table 5

CNY/USD interest rate differential

Y = differential between the PBC lending rate and US fed fund rate		
(1)	Y = 194.5 – 0.73 T (4.10)** (-1.05)	Adj-R ² = 0.033; DW = 0.119
(2)	Y = 152.8 D ₁ + 106.5 D ₂ + 1.57 T ₁ + 0.79 T ₂ (1.89)* (4.28)** (0.65) (0.66)	Adj-R ² = 0.11; DW = 0.145; Wald Tests: F(2, 93) = 2.06
Y = differential between 3-month Chinese repo and 3-month US T-bill		
(1)	Y = 266.0 – 1.87 T (5.4)** (-2.82)**	Adj-R ² = 0.155; DW = 0.153;
(2)	Y = 186.3 D ₁ + 47.9 D ₂ + 2.69 T ₁ + 1.88 T ₂ (2.39)** (1.86)* (1.1) (1.89)*	Adj-R ² = 0.413; DW = 0.287; Wald Tests: F(2, 132) = 9.48
Y = differential between 3-month Chibor and Libor		
(1)	Y = 272.0 – 2.02 T (5.83)** (-2.96)**	Adj-R ² = 0.218; DW = 0.258;
(2)	Y = 274.6 D ₁ + 64.0 D ₂ – 1.35 T ₁ + 1.64 T ₂ (3.75)** (2.87)** (-0.6) (1.65)*	Adj-R ² = 0.334; DW = 0.327; Wald Tests: F(2, 132) = 7.19

Note: All dependent variables are expressed in absolute value. T = linear trend; T₁ (T₂) = linear trend for the first (second) period; D₁ (D₂) = dummy variable for the first (second) period.

Newey-West estimation on the monthly data for July 1997 and July 2005; according to the log likelihood ratios, the most likely breaking points vary but concentrate around May, June and July 2001, so we impose a common break point at June 2001; the Wald Test statistics are for the joint null hypothesis of equal intercepts and slopes; numbers in the parentheses are t-statistics; ** indicates 5% significance; * indicates 10% significance.