

# The Chinese currency: how undervalued and how much does it matter?

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China's currency regime has recently become a contentious issue. Some commentators argue that significant undervaluation of the renminbi (RMB) is contributing to global external imbalances. Others assert that any plausible appreciation of the RMB is unlikely to affect global current account positions significantly. Instead, a more flexible exchange rate regime is argued to be necessary for internal balance by providing policy makers with a more effective monetary policy instrument. The Chinese Government has made cautious initial steps toward a more flexible regime, but faces continued pressure to allow further currency movement.

The size of the imbalance in China's external payments suggests that the RMB is significantly undervalued. This does not appear to have had significant adverse effects on the Chinese economy to date, but the costs of holding down the exchange rate are likely to rise in the future. While the contribution of the RMB to external imbalances is often exaggerated, currency adjustment will be a necessary element of the adjustment process. A more flexible exchange rate is in China's medium-term interests, but the pace of adjustment and its sequencing with other reforms will need to be carefully managed. Precipitate moves could be costly both to China and to global markets.

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1 The authors are from International Economy Division, the Australian Treasury. This article has benefited from comments and suggestions provided by Nathan Dal Bon, Stephen Joske, David Parker, Martin Parkinson, David Pearl and Brian Thomas. The views in this article are those of the authors and not necessarily those of the Australian Treasury.

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## Introduction

The value of China's currency, the renminbi (RMB), has recently become a contentious issue.<sup>2</sup> The RMB had, until July 2005, been pegged to the US dollar at a virtually unchanged rate for a decade. For most of this period China's exchange rate regime attracted little criticism: indeed, it was widely seen as contributing to internal and external stability. Under the peg, China was able to control previously high inflation and sustain GDP growth at an average rate of nearly 9 per cent. During the 1997-98 Asian financial crisis, China was praised for resisting pressure to devalue the RMB, which could have triggered further destabilising depreciations of other Asian currencies.

More recently, however, there has been mounting external pressure on China to allow the RMB to appreciate against the dollar. There is a widespread view that the RMB is now significantly undervalued, with some arguing that this is a matter of global concern. This change of attitude reflects a number of factors:

- the widening of the United States current account deficit to over 6 per cent of US GDP;
- depreciation of the US dollar (and hence, the RMB) against most other currencies from early 2002;
- China's rapid economic growth and increasing role in the world economy; and
- the scale of China's accumulation of foreign reserves, reflecting strong capital inflow and the authorities' efforts to hold the RMB stable against the US dollar.

A major source of external pressure has come from US manufacturing interests and elements within the US Congress who have threatened to impose retaliatory duties on Chinese imports if the RMB is not allowed to appreciate.<sup>3</sup> These responses are to a large extent misguided, as RMB revaluation will by itself have limited impact on the US current account. But they highlight the risk of a protectionist backlash in the US and elsewhere – a backlash that would pose real risks for the world economy.

A concern of many observers, such as the International Monetary Fund (IMF), is that the continuing build-up of global imbalances entails substantial risks to the world economy. In this view, exchange rate adjustment by China is one element of a wider

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2 The 'renminbi' is the official name of the Chinese currency, while 'yuan' is the denomination.

3 The Schumer-Graham bill calls for a 27.5 per cent ad valorem tariff on Chinese imports 180 days after the bill's passage unless the RMB is substantially revalued to near its fair market value. This figure is the mid-point of the range of estimates of RMB undervaluation (15 to 40 per cent) presented to Congress.

set of measures needed to address these imbalances, including fiscal consolidation in the US and structural reforms in Europe and Japan. A supporting argument is that greater flexibility would assist economic management in China by providing the capacity to run a more independent monetary policy, reducing the risk that an undervalued exchange rate will lead to excessive monetary expansion and inflation.

Against the background of these pressures and concerns, the Chinese Government revalued the RMB by 2 per cent against the US dollar on 21 July 2005. It also announced that the RMB would no longer be formally pegged to the US dollar, but would be managed with reference to a basket of currencies. In practice, the bilateral US dollar rate has continued to be tightly managed and further RMB appreciation against the dollar has so far been limited.

All indications are that China intends to proceed cautiously in increasing exchange rate flexibility. This caution can be attributed to a range of factors:

- the need to sustain rapid economic growth to absorb the exodus of workers from rural areas, and concerns about social unrest should growth falter;
- concerns that capacity to manage exchange rate volatility is limited, given fragile Chinese banks and underdeveloped financial markets; and
- a desire to avoid rewarding currency speculators.

As a result, China's new exchange rate arrangements have not had a material impact on its trade surplus or foreign reserve accumulation. This raises questions of how much further exchange rate adjustment might be needed and over what timeframe. This article will begin by examining the evidence on whether the RMB is significantly undervalued. It will then discuss the implications of an undervalued RMB for China and for the global economy and the considerations governing the pace of exchange rate adjustment.

## The concept of an equilibrium exchange rate

Assessing whether a currency is undervalued requires some benchmark for what the value of the currency ought to be. Economists normally think of this as the exchange rate consistent with equilibrium in the domestic economy (internal balance) and in the balance of payments (external balance). An undervalued exchange rate means that relative prices of domestic goods need to increase in order to switch spending from domestic to foreign goods.

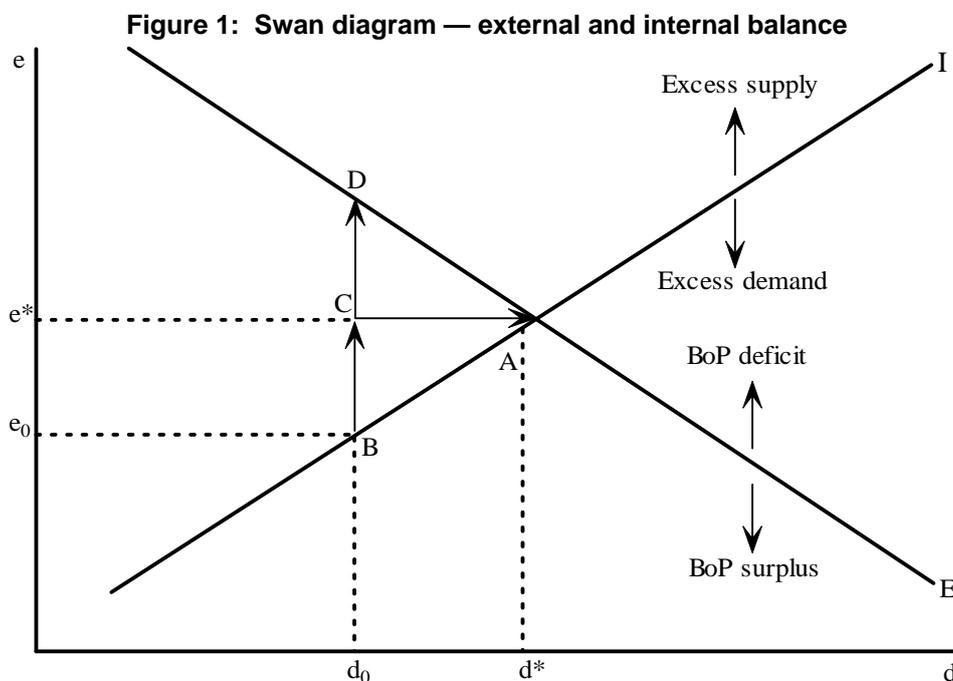
*Internal balance* is normally defined as full (non-inflationary) employment. *External balance* is normally defined as requiring a current account equal to a level of capital

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account flows that is sustainable in the medium term. This entails overall balance on external payments, with no ongoing accumulation or decumulation of foreign reserves.

While commentary tends to focus on the nominal exchange rate with the US dollar, it is preferable to focus on the *real effective exchange rate (REER)*, which is a measure of overall external competitiveness. The REER is calculated by adjusting the nominal effective exchange rate (NEER) for differences in relative prices between a country and its trading partners. The NEER (or nominal trade-weighted index, TWI) is the average of bilateral exchange rates (in index terms) with the currencies of trading partners, weighted by trade shares.

The Swan diagram (Swan 1963) provides a simple framework for understanding the relationship between the REER and internal and external balance (Figure 1). The curves I and E are combinations of domestic demand ( $d$ ) and the REER ( $e$ ) consistent with internal and external balance respectively. The curve I is upward-sloping because higher domestic demand requires a higher REER to maintain internal balance, as spending must be switched from domestic goods to imports to avoid excess demand. Conversely, the curve E is downward-sloping because higher domestic demand requires a lower REER to maintain external balance, as domestic traded goods need to become more competitive to offset increased imports. External and internal balance can only be simultaneously achieved at point A where the two curves intersect.



Note: An increase in  $e$  is an appreciation.

Suppose the economy is at point B, at internal balance but with a large balance of payments surplus. In this case the REER is undervalued, as restoring equilibrium requires an appreciation from  $e_0$  to  $e^*$ . (If the economy were instead at point C, there would be no undervaluation, as the balance of payments surplus would be solely the result of insufficient domestic demand.)

Appreciation is not, however, sufficient to restore equilibrium. Domestic demand must also expand from  $d_0$  to  $d^*$ , in order to move to the equilibrium point A. (Specifically, demand must expand relative to supply; equivalently, saving must fall relative to investment.) Appreciation alone would move the economy to point C, only partly correcting the external imbalance but creating an internal imbalance by pushing the economy into excess supply. An appreciation sufficient to remove the external imbalance (point D) would only exacerbate the internal imbalance. In either case, excess supply would put downward pressure on relative prices, reversing the real appreciation over time and pushing the economy back toward point B.

This illustrates a key point that is sometimes overlooked. In general, exchange rate adjustment is a necessary, but not sufficient, condition for addressing external imbalances while maintaining internal balance. A satisfactory resolution of global imbalances will require a combination of exchange rate adjustment, expansion of domestic demand (increase in investment relative to saving) in surplus economies and slowing of domestic demand (increase in saving relative to investment) in deficit economies.<sup>4</sup> The RMB's role in global imbalances will be explored in more detail later in the article.

Note that the economy is not likely to stay at point B indefinitely. This is because accumulation of foreign reserves tends to drive monetary expansion, pushing the economy into excess demand. Eventually real appreciation may occur through higher inflation even if the nominal exchange rate is constrained. This issue will be discussed in more detail later in the article.

## How undervalued is the RMB?

### Chinese exchange rate developments

Chart 1 shows movements in China's nominal and real exchange rates since 1990. In response to a period of very high inflation in the period 1992 to 1995, the Chinese Government devalued the official exchange rate by 33 per cent in January 1994 and

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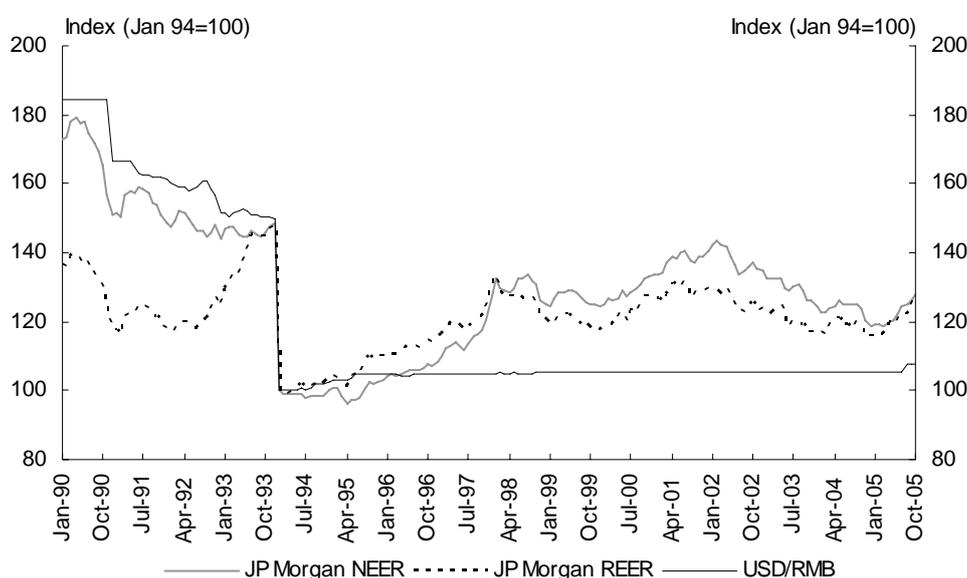
4 If either of the latter two adjustments were not to occur, the risk is that an unwinding of global external imbalances could result in the global economy experiencing lower growth in aggregate.

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then, in mid-1995, pegged it to the US dollar at a rate that remained virtually unchanged until July 2005.<sup>5</sup>

Since 1995, therefore, movements in China's NEER have reflected movements of the US dollar against China's trading partners. The REER has generally followed the NEER, with divergences between the two series reflecting differences in inflation between China and its trading partners. Between 1994 and early 2002, appreciation of the US dollar caused China's NEER to appreciate by more than 40 per cent. This was partly offset by relative price deflation in China, so that REER appreciation was less than 30 per cent.

**Chart 1: Real and nominal exchange rates**



Source: Datastream.

Note: An upward movement in the index represents a real/nominal appreciation of the RMB. Pre-1994 measures are based on the official exchange rate (see footnote 5).

Since early 2002, the US dollar's depreciation has seen China's NEER depreciate by 10 per cent. This has been partly offset by relatively higher inflation in China, so that real depreciation has been only 2 per cent. China's REER is still close to 30 per cent above its January 1994 level, so the dollar peg has not precluded significant real effective appreciation.

5 The 1994 devaluation corresponded with the integration of the multiple exchange rates that previously existed. At the end of 1993, the official exchange rate stood at 5.8 RMB to the US dollar while the market swap rate was 8.7 RMB to the dollar. While the official exchange rate was lowered by 33 per cent, the effective devaluation was less than 7 per cent as 80 per cent of foreign exchange transactions were conducted in the swap market.

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The RMB's peg to the US dollar was formally terminated on 21 July when Chinese authorities revalued the RMB by 2 per cent against the US dollar and announced that the RMB would henceforth be managed with reference to a basket of currencies.<sup>6</sup> In practice, the RMB has continued to be tightly managed against the US dollar and the currency basket appears to have had little influence on its value to date. The RMB's daily fluctuation band against the US dollar has remained at +/- 0.3 per cent. Fluctuation bands against other currencies have been widened from +/- 1.5 per cent to +/- 3 per cent, reflecting the reality that if policymakers tightly control the RMB/USD rate their ability to control other bilateral rates is limited.

As Chart 2 indicates, the RMB has remained quite stable against the US dollar, gradually appreciating by a further 0.4 per cent over the four months since the initial revaluation. In contrast, the RMB has fluctuated widely against other currencies, broadly following the US dollar's movements. If the RMB were truly linked to a basket, it would be more stable against the NEER and variations against the US dollar would be more symmetric with variations against other currencies.<sup>7</sup>

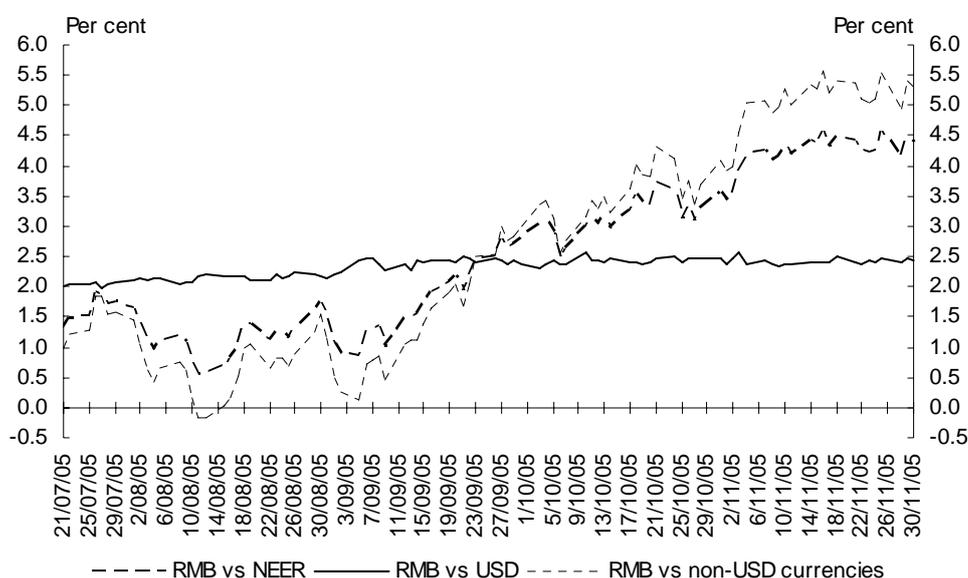
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6 The People's Bank of China has announced that the basket currencies are the US dollar, euro, Japanese yen, Korean won, Singapore dollar, Malaysian ringgit, Australian dollar, UK pound, Russian rouble, Thai baht and Canadian dollar. Basket weights have not been made public but are said to be broadly in line with trade shares.

7 Adherence to a currency basket following the 21 July revaluation would not have resulted in greater RMB appreciation than has occurred, either on a trade-weighted basis or against the US dollar. A basket based on trade weights acts to stabilise the trade-weighted exchange rate. When the US dollar appreciates against other currencies, as it has since early September, the RMB would depreciate against the dollar and appreciate against other currencies in order to keep the basket stable. The reverse occurs when the dollar depreciates, as it did in the immediate period after 20 July. Hence, the RMB would have initially appreciated against the dollar, but this would have been reversed with the dollar's subsequent appreciation.

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**Chart 2: Cumulative RMB movements since 20 July 2005<sup>8</sup>**



Source: Datastream, Treasury estimates. Note: An upward movement represents an appreciation of the RMB.

### Factors affecting China's real exchange rate in the medium term

Trends in real or nominal exchange rates cannot themselves tell us whether a currency is undervalued or overvalued. In order to make this assessment, we need to have some framework for estimating the equilibrium real exchange rate. Before looking at alternative approaches to these estimates, it is useful to consider the key factors likely to affect China's equilibrium real exchange rate over the medium term.

A commonly noted factor is *productivity catch-up* (the Balassa-Samuelson hypothesis). Lower income countries have lower productivity in traded goods production, which means lower wages, and hence, lower prices of non-traded goods. As traded goods productivity catches up to advanced economy levels, real wages throughout the economy are pushed up, increasing non-traded goods prices. Real appreciation must occur through either nominal appreciation or, failing that, higher price inflation.

The International Labour Organisation (2003) estimates that labour productivity in China grew at an average annual rate of about 5 per cent from 1980 to 2001, compared to average growth rates of 1-2 per cent for advanced economies and 3-4 per cent for other emerging Asian economies. All else being equal, this productivity catch-up

8 The NEER includes the basket currencies mentioned in footnote 6 plus the new Taiwan dollar. Weights reflect average shares of China's trade for 2002-04. Hong Kong's trade weight is included in the US dollar's weight, as its currency is pegged to the US dollar.

implies that China's equilibrium REER might have been appreciating at an average rate of around 2 to 2½ per cent over this period.

A second factor likely to drive real appreciation over time is *accumulation of net foreign assets* as a result of continuing current account surpluses. A creditor economy cannot expand its net external assets without bound because this would be incompatible with debtor economies being able to service these assets in the long run. A higher REER is therefore needed to reduce the current account surplus to a level that at least prevents net foreign assets from continuing to rise as a share of GDP.<sup>9</sup>

It is estimated that China's net foreign assets increased from near zero in 1994 to almost 30 per cent of GDP in 2003 (Wang 2004). Recent current account trends suggest continued increases in this ratio. Last year's current account surplus was 4 per cent of GDP and trade and balance of payments data point to a much larger surplus this year. A surplus of around 3 per cent of GDP would be needed to stabilise net foreign assets at 30 per cent of GDP (assuming nominal GDP growth of around 10 per cent).

There are also factors that may work in the opposite direction, reducing the equilibrium exchange rate and, therefore, reducing real appreciation.

*Reducing trade barriers* at a faster rate than trading partners tends to induce real depreciation by shifting spending from domestic goods towards imports. China's weighted average tariff rates are estimated to have been reduced from 40.6 per cent in 1992 to 6.4 per cent in 2002 (Rumbaugh and Blancher 2004).

*China's increasing importance in international trade* may be another factor. China now accounts for 7 per cent of world exports and 6 per cent of world imports, double its shares only five years ago. China's growth is likely to be pushing down world prices of manufactures and pushing up the prices of commodity inputs. The resultant fall in China's terms of trade would tend to push down the equilibrium REER.

Note, however, that these two developments have already been impacting on China's external balance. If there is an external imbalance despite these factors then it can still be concluded that the RMB is below equilibrium, even though that equilibrium is lower than would have been the case without these factors.

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9 Abstracting from valuation effects, stabilising the ratio of net foreign assets (NFAs) to GDP requires a current account surplus no greater than the NFA ratio multiplied by the growth rate of nominal GDP. Valuation effects from RMB appreciation may reduce the NFA ratio somewhat, given that a large share of China's foreign assets is likely to be denominated in either US or Hong Kong dollars.

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Some commentators argue that *capital account liberalisation* could push down the equilibrium REER in future. China's saving rate has been averaging over 40 per cent of GDP, and Chinese residents are likely to have an unmet demand for foreign assets. The rest of the world is also likely to have unmet demand for Chinese assets, but as China's saving rate is higher, portfolio rebalancing could entail net capital outflow. This is not an immediate prospect, as China is unlikely to liberalise its capital account fully until its financial sector is stronger. This may take several years, although the process could be accelerated if controls become less effective.

## Alternative approaches to estimating the equilibrium value of the RMB

### Balassa-Samuelson relationship

The Balassa-Samuelson hypothesis suggests there should be an inverse relationship between countries' per capita incomes and their real exchange rates. That is, relative price levels measured in a common currency should be lower in lower income economies. As Chart 3 indicates, the existence of such a relationship across economies is empirically supported. The implication is that developing economies should experience real appreciation (increasing relative prices) as their per capita incomes converge toward advanced economy incomes.

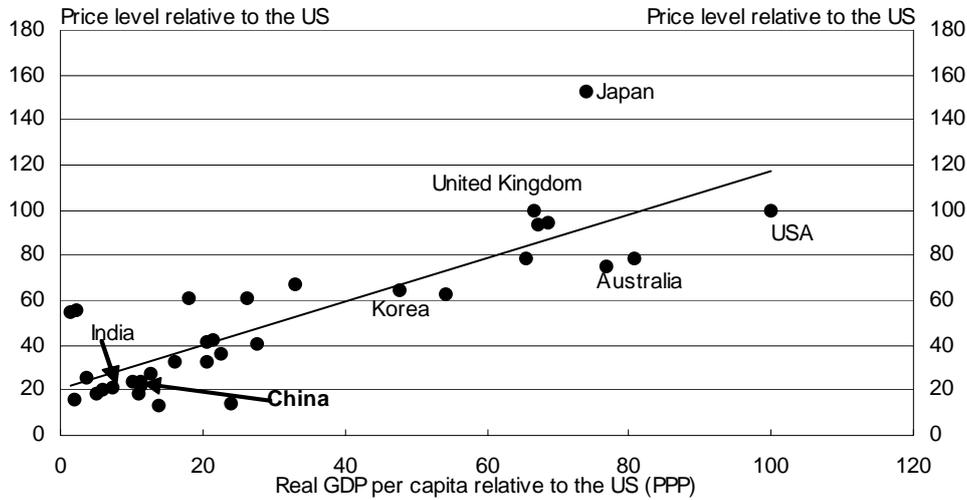
This implies that equilibrium real exchange rates might be based on the estimated relationship between real per capita incomes and relative prices, consistent with the Balassa-Samuelson effect. On this basis, the RMB appears significantly undervalued, although the degree of misalignment depends on the price index used and the point in time chosen. For example, Chart 3 suggests that China's exchange rate was undervalued by 25 per cent relative to the trend line in 2000, while Frankel (2005) estimates a 36 per cent undervaluation in the same year and Coudert and Couharde (2005) estimate an undervaluation of 43 to 50 per cent in 2003.<sup>10</sup>

The key shortcoming of the approach is that it focuses on only one factor affecting China's equilibrium REER and abstracts from the other factors discussed earlier. Many economies diverge from the real exchange rate that the Balassa-Samuelson model would imply, and China is not an extreme outlier in this regard. Hence, these estimates are not necessarily a reliable indicator of the extent of undervaluation.

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10 Chart 3 is based on indexes of consumption prices. Coudert and Couharde (2005) and Frankel (2005) both use the GDP price index. Note that this is a measure of real undervaluation relative to the US dollar, rather than on a trade-weighted basis, as prices are benchmarked against US prices. Use of US prices as the benchmark does not mean that the US real exchange rate is necessarily in equilibrium.

**Chart 3: Price levels and per capita income across countries, 2000<sup>11</sup>**



Source: Heston, A et al (2002).

#### Fundamental equilibrium exchange rate

A more sophisticated approach to assessing currency undervaluation is the macroeconomic balance or fundamental equilibrium exchange rate (FEER) approach, which is closely related to the Swan diagram framework outlined earlier. This involves:

- determining a level of GDP consistent with internal balance;
- determining a target current account balance in line with sustainable capital account flows;
- estimating the equilibrium REER required to achieve the target current account with GDP at its internal balance level.

Inferences about *internal balance* may be drawn from the behaviour of inflation, abstracting from one-off influences. An underlying trend of rising inflation normally indicates excess demand in the economy, while falling inflation would indicate excess supply.

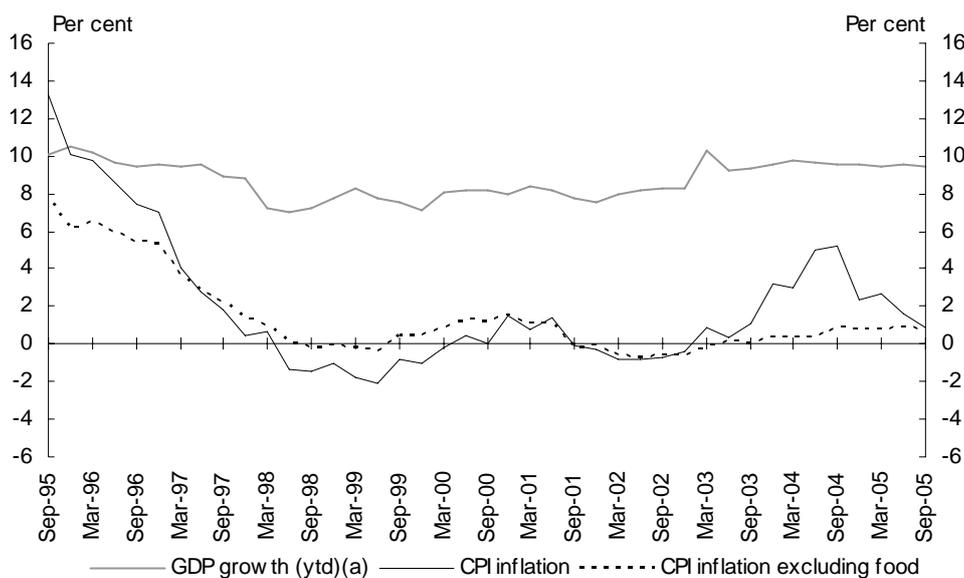
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11 The vertical axis is the ratio of price levels in domestic currency to price levels in US dollars divided by the exchange rate (national currency per US dollar), which can be interpreted as the real exchange rate. A relative price level of 100 represents purchasing power parity with the US.

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Chart 4 shows that China has returned to positive inflation levels in recent years after experiencing deflation over most of the period from 1998 to 2002. However, the increase in inflation through 2003-04 was exaggerated by a temporary spike in food price inflation. Underlying inflation has stabilised at moderate levels since late 2004. While it is difficult to be precise about the current position, it seems reasonable to conclude that the economy has recently been somewhere near full capacity.

**Chart 4: GDP growth and price inflation**



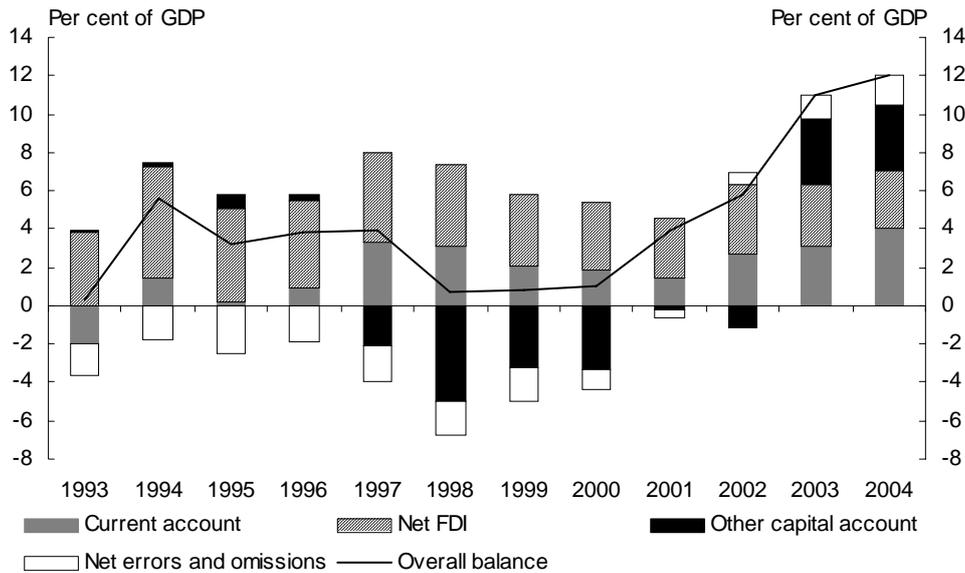
Source: CEIC, OECD Main Economic Indicators.  
(a) Year-to-date (ytd).

Some argue that China is in a chronic excess supply situation due to its high levels of surplus rural labour. This argument is central to the 'Revived Bretton Woods' hypothesis (Dooley et al 2004). In this view, China will need a low exchange rate for perhaps the next decade in order to absorb the rural labour surplus into the industrial and service sectors.

This argument does not seem consistent with recent behaviour of prices in China. An economy in chronic excess supply should be experiencing underlying disinflation or deflation. The People's Bank of China's (PBoC's) efforts to limit money and credit growth also seem inconsistent with an economy in excess supply. Supply is undoubtedly increasing rapidly, but demand appears to have been increasing just as fast. There are also constraints on the rate at which rural labour can be brought into effective supply, including internal migration barriers and the need to build factories, housing and infrastructure. These limit the rate at which supply can be expanded.

In relation to *external balance*, Chart 5 shows that China recorded a balance of payments surplus (that is, accumulated foreign reserves) of 12 per cent of GDP in 2004. This comprised a current account surplus of 4 per cent of GDP and a capital account surplus of 6 per cent of GDP, evenly divided between foreign direct investment (FDI) and other capital inflows. The remainder came from net errors and omissions. Errors and omissions have been highly correlated with non-FDI capital flows, suggesting they are likely to reflect mainly unrecorded capital flows.

**Chart 5: Composition of the balance of payments<sup>12</sup>**



Source: CEIC, OECD Main Economic Indicators.

Substantial balance of payments surpluses have been the norm for China since 1994, apart from the period after the Asian crisis when capital flowed out of the country. In the past this mainly reflected surpluses on the current account and net FDI inflows. More recently, the balance of payments surplus has been driven to unusually high levels by a surge in inflows of capital other than FDI. Assuming errors and omissions mainly reflect unrecorded capital flows, non-FDI capital flows may have been 5 per cent of GDP in 2004. This has occurred despite China's extensive capital controls, suggesting that these controls are 'leaky'. Much of this inflow is likely to have been motivated by speculation on RMB appreciation, suggesting that recent levels are unlikely to be sustainable.

12 Data in this article are adjusted for the use of US\$45 billion in foreign reserves to recapitalise banks in December 2003. This transaction reduced recorded reserve accumulation and increased other capital outflows by about 3 per cent of GDP in 2003.

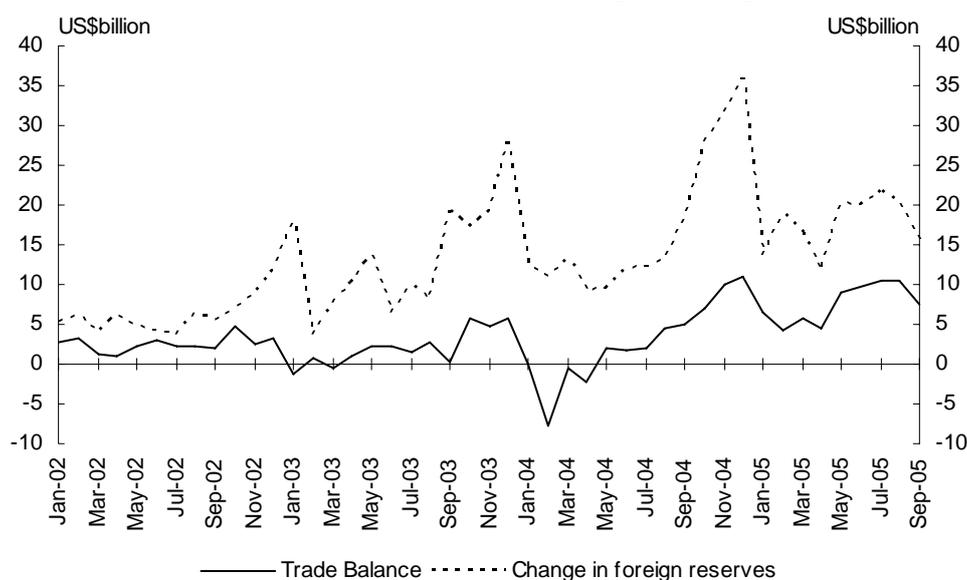
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As mentioned previously, the FEER approach requires an estimate of sustainable capital account flows in order to determine a current account target. This is difficult in current circumstances. One option is to use historical averages. Non-FDI capital flows have averaged an outflow of about 1 per cent of GDP over the past decade, with average net errors and omissions pointing to unrecorded outflows of a similar size. Speculation may also be disguised as trade flows, through leads and lags in payments, under-invoicing of imports and over-invoicing of exports.

With FDI inflows stable in recent years at around 3 to 4 per cent of GDP, this implies a sustainable capital account surplus (that is, a current account deficit) of around 1 to 2 per cent of GDP. This is similar to the current account targets suggested by others who have used the FEER approach, for instance, Goldstein (2004) and Coudert and Couharde (2005).

China's current account surplus was 4 per cent of GDP in 2004, but will be much higher this year as monthly trade surpluses have been larger than last year (Chart 6). The current account surplus to June was as large as the total surplus for 2004, while the cumulative trade surplus to October was around 2½ times the total for 2004 (1.9 per cent of GDP). Official Chinese estimates suggest the trade surplus this year will be three times its 2004 level. Capital inflows and other contributions to the balance of payments surplus (net transfers and the net income balance) appear to be running at similar levels to 2004. This implies the current account surplus this year may be 7 per cent of GDP or more and the overall balance of payments surplus could reach 15 per cent of GDP.

**Chart 6: Monthly trade balance and change in foreign reserves**



Source: CEIC.

On this basis, the current account this year might be 8 to 9 per cent of GDP above its equilibrium level. Even if this year's increase in the trade surplus is mainly due to temporary factors, this would still imply a gap of 5 to 6 per cent of GDP. Trade elasticity estimates for China suggest that a current account adjustment in this range would require a REER appreciation of something between 15 and 30 per cent.<sup>13</sup> This is consistent with the range of estimates from studies using the FEER approach in recent years (for a summary see Coudert and Couharde 2005).

#### Behavioural equilibrium exchange rate

The key problem with the FEER approach is the uncertainty surrounding estimation of internal and external balance benchmarks, particularly for a rapidly changing economy like China. An alternative approach is to estimate a behavioural equilibrium exchange rate (BEER). This approach does not explicitly define external or internal balance, but is based on modelling economic fundamentals that explain past behaviour of the REER. For example, the REER could be considered undervalued if it is significantly below the value predicted by the model.

BEER models for China have generally produced much lower estimates of RMB undervaluation than FEER approaches.<sup>14</sup> Wang (2004) estimated that China's REER was only about 5 per cent undervalued in 2003, relative to the value suggested by his estimated BEER model. Funke and Rahn (2005) conclude that the REER was undervalued by about 3 per cent at the end of 2002. An Economist article ('Precisely Wrong' 23 June 2005) reported that Stephen Jen of Morgan Stanley estimated the RMB to be only 7 per cent undervalued. Goldman Sachs economists were reported to have estimated an undervaluation of 10 per cent.

An obvious question raised by these estimates is their consistency with external balance. If the RMB is only moderately undervalued, this implies an equilibrium

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13 Estimates of exchange rate elasticity of demand for China's exports converge around -0.3 (Cerra and Dayal-Gulati 1999; Dees 2001; and Anderson 2005), while elasticity estimates for China's imports are around 0.7 (Cerra and Dayal-Gulati 1999 and Anderson 2005). This means a 10 per cent real exchange rate appreciation results in a 3 per cent decrease in exports and a 7 per cent increase in imports in the medium term. As exports and imports are each around one-third of GDP, the trade surplus would fall by 3-3½ per cent of GDP.

14 Explanatory variables in BEER models typically include relative productivity growth and net foreign assets. Other variables may include measures of trade openness and budget balances. Due to the lack of direct productivity data, relative productivity growth is normally proxied by changes in the ratio of consumer and producer price indexes relative to those of China's trading partners. Assuming that CPI and PPI reflect prices of non-traded and traded goods respectively, a relative increase in the CPI/PPI ratio implies productivity catch-up in traded goods production, consistent with the Balassa-Samuelson hypothesis.

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current account surplus only moderately below its recent level. But this is only consistent with external balance if there is a matching capital outflow, which is contrary to China's experience. Since 1994, the sum of the capital account plus net errors and omissions has averaged a surplus of 2 per cent of GDP, and only went into moderate deficit in the post-Asian crisis period from 1998-2000.

This approach implicitly assumes the economy has, on average, been in balance over the period for which the model is estimated. If the economy has been in persistent disequilibrium then the BEER estimate may be biased. The previous section noted that China has run a balance of payments surplus over most of the period since 1994, implying a long-running external imbalance. A BEER model fitted over this period would therefore tend to underestimate the equilibrium REER.

### What can we conclude on undervaluation of the RMB?

Analysis of internal and external balance points to undervaluation of the RMB. The size of the undervaluation is sensitive to a range of assumptions, and cannot be determined with any precision. Given the size of the imbalance in China's external payments on any reasonable measure, however, the size of the REER undervaluation could be substantial.

This assessment is necessarily conditional on China's economic circumstances at this point in time. If circumstances change then the equilibrium value may change. For instance, it is possible (though not certain) that future capital account liberalisation could reduce the equilibrium REER. However, as mentioned, substantial capital account liberalisation is highly unlikely in the immediate future, although the effectiveness of controls may be eroded over time.

A conclusion that a currency is undervalued does not imply that its appreciation would necessarily do much in itself to correct external imbalances. Supporting shifts in saving and investment are also needed. But this does not imply that the exchange rate is irrelevant. To re-emphasise the point made earlier, exchange rate adjustment is a necessary, but not sufficient, condition for external adjustment. The exchange rate is better thought of as a mechanism for facilitating adjustment in response to shifts in saving and investment, rather than as a primary driver of adjustment in itself.

Nor does the existence of undervaluation necessarily mean that this should be immediately corrected. Rapid adjustment may be destabilising for an economy with weak financial institutions and underdeveloped financial markets. The appropriate rate of adjustment depends on the balance between the costs and risks (both internal and external) associated with maintaining an undervalued RMB and the costs and risks associated with a rapid adjustment. The following sections discuss these issues.

## RMB undervaluation and its implications for China

Many discussions of China's exchange rate present the issue in terms of China gaining an advantage at the expense of other countries. China has maintained strong economic growth, low inflation and financial stability over the past decade. It might be argued that an undervalued currency has promoted export-led growth, reserve accumulation has reduced vulnerability to external shocks, and exchange rate stability has assisted financial stability and promoted macroeconomic discipline.

Nonetheless, an undervalued exchange rate can be expected to entail significant costs for China, even if these costs are not apparent at present. Many of these costs are likely to rise over time if China resists market-based pressures for nominal appreciation. While exchange rate stability may have been beneficial in the past, the benefits of greater flexibility are likely to increase as the economy becomes more sophisticated, financial markets deepen, and policymaking and institutional capacity improves.

### Monetary policy control and inflation

One cost of maintaining an undervalued exchange rate is that it may lead to higher inflation over time. If the nominal exchange rate regime does not allow sufficient appreciation, real exchange rate adjustment can only occur through increases in the price level over time, relative to trading partners.

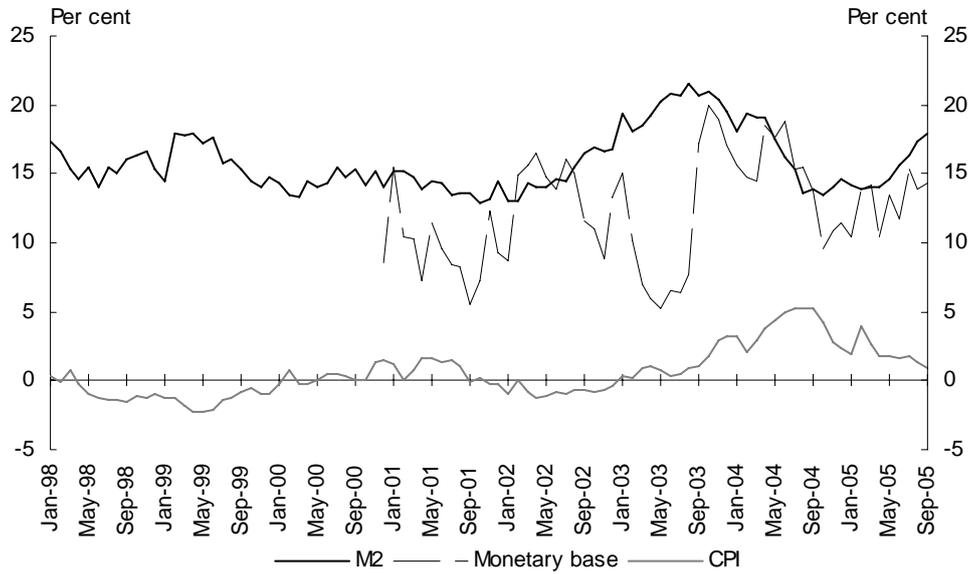
This is linked to the 'impossible trinity': when capital is mobile, policymakers cannot ultimately run an independent monetary policy while controlling the exchange rate. Accumulation of foreign reserves expands the monetary base (deposits at the central bank plus currency in circulation). While this monetary impact may be sterilised by offsetting central bank bond sales, this becomes harder to sustain over time. Eventually real appreciation occurs through higher inflation even if the nominal exchange rate is constrained.

Chart 7 suggests that inflation has not yet become a major problem for China. Indeed, for most of the period under the US dollar peg China was experiencing deflation. While inflation surged to over 5 per cent in 2004, this reflected a temporary spike in food prices, and inflation has now returned to low rates.

For most of the past 18 months, the Chinese authorities appear to have been reasonably successful in maintaining monetary control through sterilisation. The extent to which foreign reserve accumulation has been sterilised can be measured by the difference between increases in net foreign assets of the PBoC and increases in the monetary base. Chart 8 shows that the PBoC has sterilised an increasing proportion of its foreign asset purchases since late 2003.

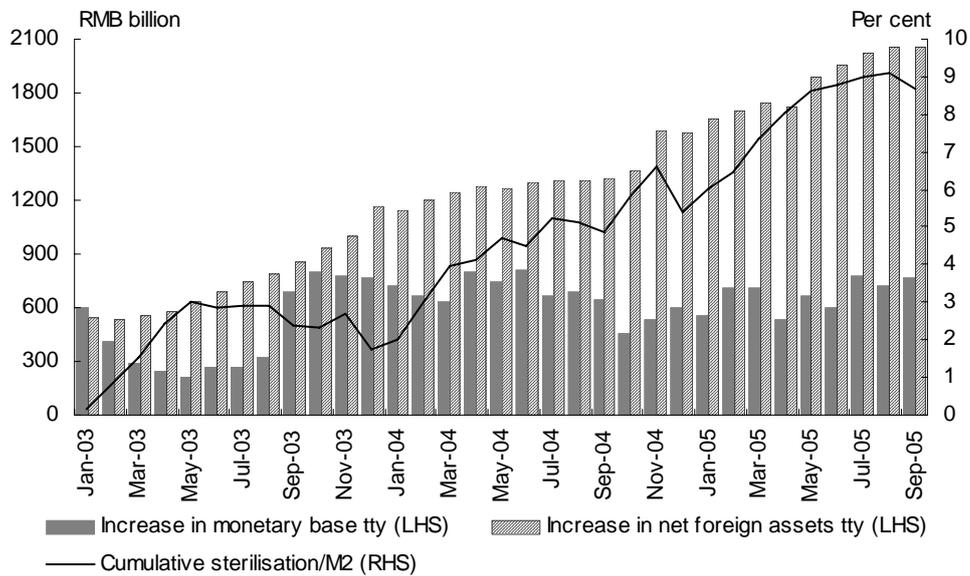
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**Chart 7: Money growth and inflation (tty)<sup>(a)</sup>**



Source: CEIC, OECD Main Economic Indicators.  
(a) Through-the-year (tty).

**Chart 8: Sterilisation of foreign reserve accumulation**



Source: CEIC.  
Note: Cumulative sterilisation is the cumulative difference between increases in net foreign assets and increases in the monetary base since January 2003.

The increase in sterilisation contributed to a reduction in broad money supply (M2) growth from a peak of 22 per cent in August 2003 to below the PBoC's target growth rate of 15 per cent from August 2004 (Chart 7). While 15 per cent may seem a high rate of monetary growth it has, in fact, been consistent with near price stability in China in recent years. The fact that M2 growth has recently increased again to above the target rate (Chart 7) is likely, however, to be a cause of concern to Chinese authorities.

This raises the question of how long China can maintain monetary control through sterilisation. The basic problem, as shown by Chart 8, is that the stock of sterilisation debt issued by the PBoC is steadily growing relative to the stock of liquid financial assets (represented by M2). If this continues it will put upward pressure on interest rates. Higher interest rates would tend, in turn, lead to more capital inflow, further increasing the sterilisation problem. Recent rates of reserve accumulation are not, therefore, indefinitely compatible with continued control over monetary growth and inflation.

### RMB undervaluation and its opportunity costs for China

Maintaining an undervalued currency means forgoing purchasing power over imports. A higher exchange rate improves a country's terms of trade, allowing consumption to increase by more than GDP. As Chinese imports are around one-third of GDP and half of these are for domestic use (according to Chinese customs data), a 20 per cent real effective appreciation could increase the purchasing power of Chinese incomes by roughly 3 per cent.

This opportunity cost is reflected partly in foregone current consumption and partly in foregone domestic investment, which reduces future consumption possibilities. In view of the widespread concerns about excessive and inefficient investment in China, the latter aspect may be less of a concern than would normally be the case. An undervalued exchange rate may, however, contribute to the problem of inefficient investment by causing over-investment in traded goods production capacity.

Opportunity costs also arise from the fact that accumulated foreign reserves could have otherwise been used to repay its foreign debt (estimated at 5 per cent of GDP). Interest rates paid by China on its external borrowing are higher than those received on its foreign reserve assets. Yields on long-term Chinese government external debt (about a quarter of the total) have recently been 60-70 basis points above US Treasury yields, and spreads on other debt are likely to be higher.

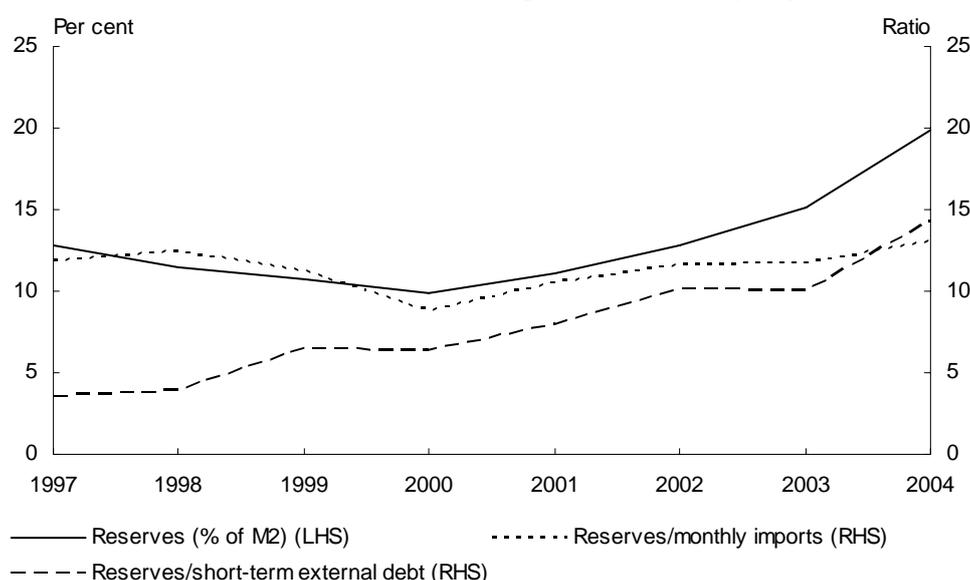
There is also a large exposure to future currency losses. China's foreign reserves were equal to 38 per cent of GDP at the end of 2004. Assuming at least 80 per cent of these reserves are dollar-denominated, each 10 per cent appreciation against the dollar

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would mean a currency loss equivalent to about 3 per cent of GDP. Potential losses increase the longer China continues to accumulate reserves to hold down the RMB.

A cost-benefit assessment must also take into account that foreign reserves provide benefits for emerging economies in reducing the risks of external payments crises. Gains from further accumulation, however, are likely to be limited beyond some point. Chart 9 shows China's foreign reserves in terms of standard measures of reserves adequacy: the ratios of foreign reserves to imports, short-term external debt and money supply (M2).

**Chart 9: Measures of foreign reserves adequacy**



Source: CEIC, OECD Main Economic Indicators, BIS-OECD-IMF-World Bank Statistics on External Debt.  
 Note: Short-term external debt is debt falling due within one year, regardless of original maturity.

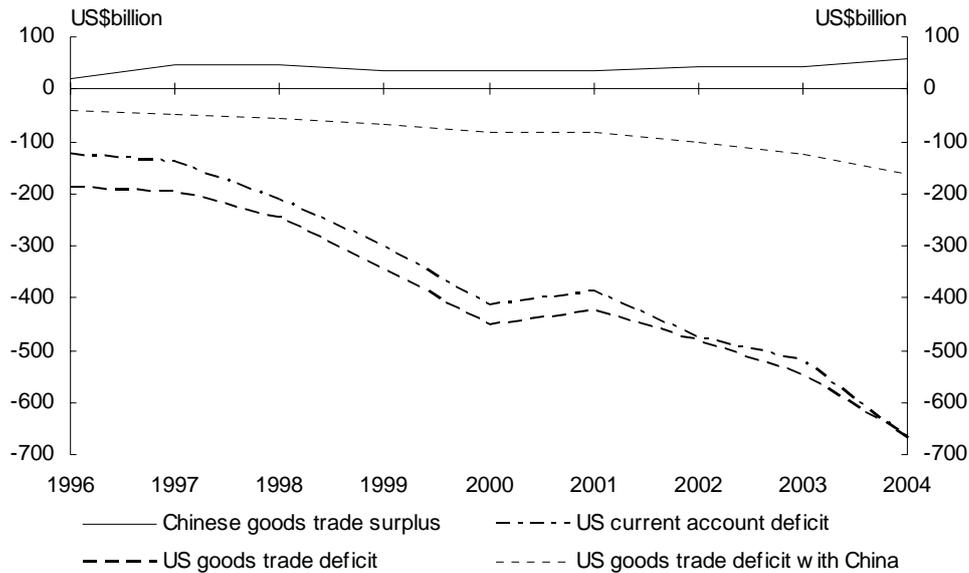
Chinese reserves are notably high relative to short-term external debt, which has been constrained by capital controls. The ratio of reserves to monthly imports is also high, with other emerging economies typically holding reserves equal to 5 to 9 months of imports (Prasad and Wei 2005).

The one measure on which China's reserves are comparatively low is the reserves to M2 ratio, which is a measure of vulnerability to capital flight by domestic residents. Most emerging economies have reserves equal to about 30 per cent of M2. Capital flight is not an immediate concern while China maintains capital controls. It may become more of an issue as China liberalises capital controls over coming years.

## RMB undervaluation and global imbalances

How important is the undervalued RMB as a contributor to the US external imbalance? Chart 10 shows that the US deficit on trade with China accounts for about a quarter of the overall US goods trade deficit, which corresponds closely to the current account deficit. This is the same as its share in 1997, so China's 'contribution' to the increase in the US trade deficit since then has not been disproportionate.

**Chart 10: China's trade surplus and the US trade deficit**



Source: CEIC, US Bureau of Economic Analysis.

China's overall surplus on goods trade is much smaller than its surplus with the US, mainly due to its trade deficits with most other Asian economies. It is the overall surplus that matters for external balance, rather than the bilateral surplus with any one economy. Accordingly, achieving external balance will not necessarily mean that the US trade deficit with China will be eliminated.

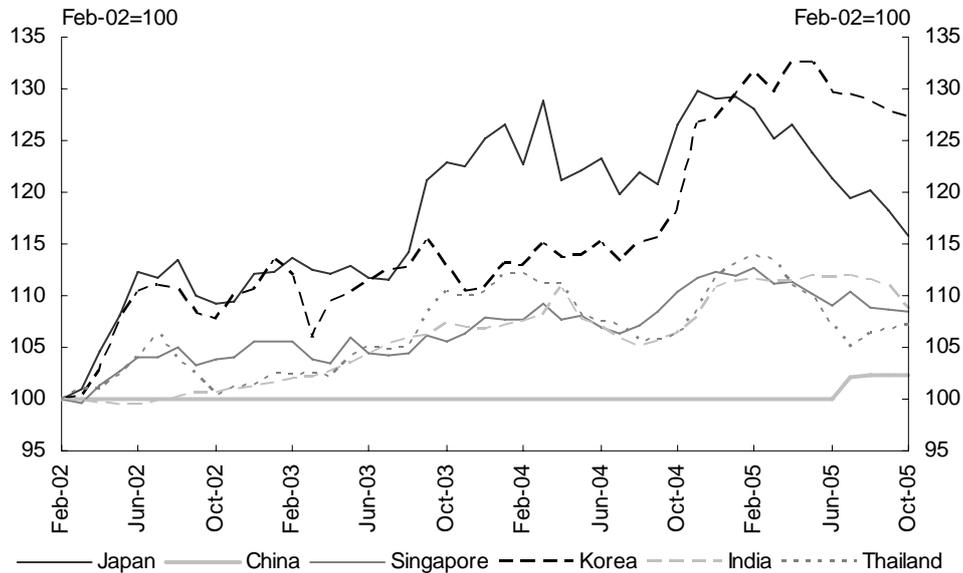
The impact of a RMB appreciation on the US trade deficit is proportional to China's share of US trade, and not to China's share of the US trade deficit. As China accounts for 11 per cent of the US TWI, a 20 per cent appreciation of the RMB against the US dollar would depreciate the US TWI by just over 2 per cent.

The effect may be larger if RMB appreciation were to induce appreciations of other Asian currencies, although the 21 July RMB revaluation has had little evident effect on the values of other Asian currencies against the dollar to date (Chart 11). Moreover, there has been very little foreign reserve accumulation by Asian economies in recent

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months, with the exception of China. Hence, recent exchange rate behaviour cannot be attributed to official intervention.

**Chart 11: US dollar exchange rates for key Asian economies**



Source: CEIC. Note: An upward movement in the index represents an appreciation of the Asian currency.

Many economists believe that a further US REER depreciation of 15 to 20 per cent may be needed if the US current account deficit is to fall to a sustainable level over the medium term (for example Obstfeld and Rogoff 2005).<sup>15</sup> Even a large RMB appreciation would provide only a fraction of this. In any case, the primary role of the exchange rate is to facilitate adjustment in response to shifts in saving and investment, rather than to drive these shifts itself. If the underlying saving-investment imbalances

<sup>15</sup> This is an estimate of depreciation needed to maintain internal balance if the current account deficit is to fall by half as a share of GDP. Assuming nominal US GDP growth averages 5 to 6 per cent, a deficit of 3 per cent of GDP would stabilise US net external liabilities at around 50 to 60 per cent of GDP. This would still be more than twice the current ratio of US external liabilities to GDP.

remain then exchange rate movements in isolation may do little to reduce external imbalances on a sustained basis. This is a standard outcome from economic modelling work on this issue.<sup>16</sup>

Hence, RMB adjustment would need to be combined with measures to expand domestic demand in China in order to have a significant impact on external imbalances. Given that Chinese investment is already very high, this will most likely take the form of measures to address factors contributing to China's high saving rate. These factors include financial underdevelopment, limited social safety nets and corporate governance shortcomings that contribute to high corporate saving. While exchange rate adjustment is important, it should not be overemphasised at the expense of other elements required to address imbalances.

## The pace and sequencing of exchange rate adjustment

The rate at which China can move to a more flexible exchange rate regime is constrained by its weak banking system and underdeveloped financial markets. The pace of adjustment and its sequencing with other reforms will need to be carefully managed if the process is to be accomplished without destabilising the Chinese economy.<sup>17</sup>

Banks may be exposed to currency risk both directly and through exposures to borrowers adversely affected by currency movements. Chinese banks have a net foreign asset position, so their balance sheets would be adversely affected by RMB appreciation (Prasad et al 2005). Total exposures appear to have been limited, however, as a result of China's capital controls. Exposures on loans to the export sector are an additional source of risk, although exporters are shielded somewhat by the high import content of many exports.

Capacity to manage large currency fluctuations is also limited at this stage.<sup>18</sup> China has taken important preparatory steps in setting up a forward foreign exchange market and introducing new foreign exchange contracts and market makers. But markets are

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16 Park (2005), using the Oxford Economic Forecasting model, finds that a 20 per cent RMB appreciation would reduce the US current account deficit by 0.1 per cent of GDP after two years. Lee et al (2004), using the Asia-Pacific G-Cubed Model, find that a 10 per cent appreciation of emerging East Asian currencies would have close to zero effect on the US current account. The IMF (2005a), using its Global Economic Model, finds a larger, but still moderate impact. A 10 per cent appreciation by emerging East Asia would improve the US current account by around  $\frac{3}{4}$  of a percentage point of GDP after three years.

17 See Prasad et al (2005) and Eichengreen (2005) for comprehensive discussions of these issues.

18 The RMB has, of course, fluctuated significantly against currencies other than the US dollar. However, China's external trade and financial transactions are primarily denominated in US dollars.

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still thin and Chinese banks and other firms have little experience in managing currency risk.

In these circumstances, there are good arguments for a managed transition that limits currency fluctuations until the Chinese financial system is stronger and more developed. The rate of adjustment should balance precautionary considerations against the need to develop risk management capacity. Currency movements should not be so restricted that firms will have little incentive to hedge currency risk, otherwise efficient and liquid markets for this purpose will not develop.

The appropriate rate of adjustment will also depend on whether the PBoC can continue to sterilise the monetary impacts of reserve accumulation. If monetary control becomes more difficult, there may be an argument for a faster pace of adjustment. Excessive monetary expansion would only aggravate future financial sector problems. One of the problems associated with a gradual approach is that speculative inflows are more likely to persist because the currency is seen as a 'one way bet', which means continued high reserve accumulation.

Getting the sequencing of exchange rate and capital account liberalisation right is also important. While the two are sometimes conflated, they are distinct (though related) issues. Liberalisation of the exchange rate need not imply liberalisation of the capital account. Retaining capital controls during the transition phase can assist a phased introduction of exchange rate flexibility.<sup>19</sup> A cautious approach to capital account liberalisation is the more critical issue for financial system stability, as capital controls protect the banks from capital flight by depositors and restrict their external exposures.

There are also strong arguments for substantially increasing exchange rate flexibility before capital controls are dismantled. Experience indicates that inflexible exchange rate regimes that are seen to be misaligned are vulnerable to large flows of speculative capital that can be highly destabilising for developing economies.

Another factor that the Chinese Government may have to consider in determining the pace of adjustment is the need to keep in check protectionist pressures in the US and elsewhere. The US Administration has responded positively to the changes announced on 21 July and has so far been able to dissuade Congress from further consideration of protectionist measures. The more slowly Chinese authorities move, however, the more likely it is that political pressures for retaliatory action will mount.

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19 While capital controls are clearly not watertight, the continued ability of the Chinese authorities to control the exchange rate, domestic interest rates and (to a reasonable degree) the money supply suggests that capital mobility is still relatively restricted. Low levels of external debt also point to some controls being effective. Expectations of RMB appreciation would provide incentives to take on US dollar-denominated debt.

## Conclusion

Analysis of internal and external balance for China suggests the RMB is significantly undervalued. On any reasonable basis, China currently has a very large underlying imbalance between capital and current account flows. While the precise figure depends on the equilibrium exchange rate model used, most studies suggest a real RMB appreciation of between 15 and 30 per cent may be required for macroeconomic balance in the medium term. Other approaches that suggest a smaller undervaluation are hard to reconcile with the requirements for external balance.

Maintaining an undervalued RMB entails costs for China, including foregone purchasing power over imports, opportunity costs of reserve accumulation in excess of prudent requirements, exposure to currency losses and reduced monetary policy autonomy. These costs have not been prohibitive to date. Importantly, China has been able to limit potential inflationary effects of large-scale foreign reserve accumulation through sterilisation. It is unclear how long this can continue, however, as sterilisation at recent levels is not indefinitely sustainable. Moderation of speculative capital inflows would help, but this is unlikely while the RMB is seen as a 'one way bet'.

The contribution of an undervalued RMB to the US external imbalance is not as large as sometimes suggested. Even a large RMB appreciation would only contribute a fraction of the dollar depreciation that may be needed if the US current account is to be reduced to a sustainable level. Moreover, RMB appreciation may have little sustained impact on external imbalances unless supported by measures to reduce saving in China and increase saving in the US. This is not to deny the need for exchange rate adjustment, but this should be seen as a necessary, not sufficient, condition for external adjustment.

Given China's weak banking system and underdeveloped financial markets, the pace of adjustment and its sequencing with other reforms need to be carefully managed. That said, China should be able to move further in increasing flexibility than it has done to date without putting financial stability at risk. A wider range of RMB movement against the US dollar would help develop the capacity and markets to manage currency risk. In terms of financial stability, the more critical imperative is a cautious approach to liberalising the capital account. Experience in other emerging market economies suggests that strengthening the financial system and increasing exchange rate flexibility are both important pre-conditions for capital account liberalisation.

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