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## The difficulties of the Chinese and Indian exchange rate regimes

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### Abstract

China and India have both sought control over the exchange rate in order to maintain export competitiveness, manage current account balance, and pursue independent monetary policy. In this paper, we examine structural change in the Chinese and Indian *de facto* exchange rate regimes, focusing on the period from 1998 to 2007. With increasing capital account openness, exchange rate inflexibility has been associated with significant monetary policy distortions. In both countries, the short-term rate expressed in real terms dropped, and achieved very low values, in the unprecedented business cycle expansion of the early 2000s. In the Indian case, difficulties of sterilisation led to a modification of the exchange rate regime, moving towards greater flexibility. In China, in contrast, the exchange rate regime did not change.

JEL Classification: E52, E58

Keywords: Exchange rate regime, sterilised intervention, monetary policy, India, China.

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### 1. Introduction

China and India have both attempted distorting the exchange rate in order to foster exports-led growth. This is described as the 'Bretton Woods II' framework, where developing countries buy bonds in the US and keep undervalued exchange rates, in order to foster export-led growth.

The costs and benefits of this approach need to factor in the extent to which monetary policy is distorted by the pursuit of exchange rate policy. In this paper, we start by identifying dates of structural change, and the characteristics of the *de facto* exchange rate regime, for both countries. These results utilise recent developments in the econometrics of structural change.

We then examine business cycle conditions and the short-term rate (expressed in real terms) in both India and China. We find that through the great business cycle boom of the early 2000s, both countries followed expansionary monetary policy. This is consistent with the idea that *de facto* exchange rate pegging induces a loss of monetary policy autonomy. By following expansionary monetary policy at a time of buoyant

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<sup>1</sup> June 16, 2009

<sup>2</sup> We are grateful to two anonymous referees and the editors for criticisms of an earlier draft, based on which the paper was substantially revised. We also acknowledge the research assistance of Anmol Sethy and Vimal Balasubramaniam. This work is part of the NIPFP-DEA Research program (<http://www.nipfp.org.in/nipfp-dea-program/index.html>).

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business cycle conditions, in both countries, monetary policy contributed to exacerbating instability of GDP; it helped exacerbate both boom and bust.

Capital flows and conditions on currency markets changed profoundly from late 2007 onwards. Hence, this paper is primarily focused on the period from 1998 till 2007, the period where both countries were trying to use monetary policy to obtain exchange rate undervaluation. These difficulties need to be brought into the assessment of the 'Bretton Woods II' regime.

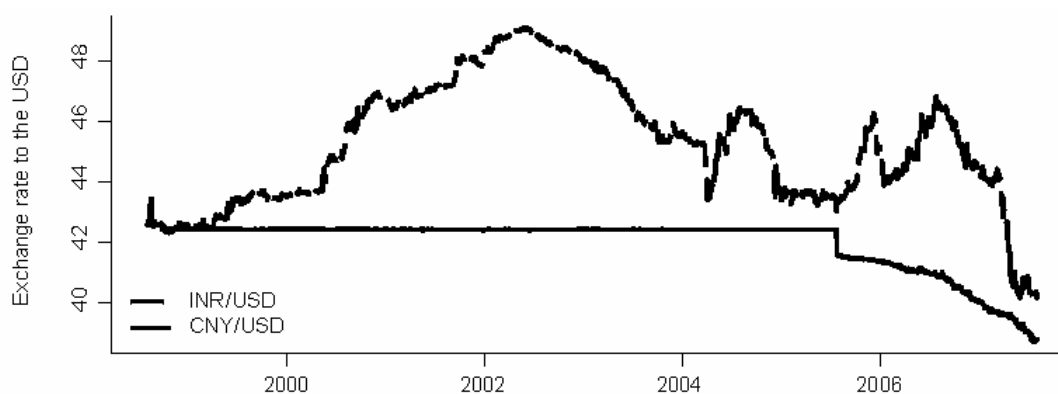
## 2. The exchange rate regime

An extensive literature suggests that both China and India have *de facto* pegged exchange rates, where policy makers desire to influence the bilateral exchange rate against the USD (Shah et al., 2005; Frankel, 2009; Patnaik, 2007).

In India, according to the RBI (the Indian central bank), the rupee is a "market determined exchange rate", in the sense that there is a currency market and the exchange rate is not administratively determined. India has clearly moved away from fixed exchange rates. However, RBI actively trades on the market, with the goal of "containing volatility", and influencing the market price.

Patnaik (2007) shows that the INR is *de facto* pegged to the USD. As is typical with such an exchange rate regime, the nominal INR/USD exchange rate has had low volatility, while all other measures of the exchange rate have been more volatile. Over the 1993-2006 period, the annualised volatility of the INR/USD was 4.2%. For a comparison, the annualised volatility of the USD/JPY rate was 11.6%.

Figure 1 Comparing Chinese and Indian exchange rate movements



China on the other hand is more open in discussing currency pegging. The objective of monetary policy "is to maintain the stability of the value of the currency and thereby promote economic growth." After being fixed to the US dollar for many years, China announced a shift away from a fixed rate to a basket peg in July 2005. However, the renminbi remained *de facto* pegged to the US dollar (Shah et al., 2005).

### 2.1 Comparison of the level of the exchange rate

We embark on our comparison of the two exchange rate regimes by examining fluctuations of the bilateral exchange rate to the US dollar. This is shown in Figure 1. In

order to directly compare fluctuations of the INR and the CNY against the USD, the Figure rescales the Chinese exchange rate to be identical to the rupee-dollar exchange rate at the starting point of the graph.

In these units (i.e., rescaled to INR/USD exchange rate levels), both trajectories were similar, other than a substantial rupee depreciation from 2001 to 2002. The graph also visually conveys the greater flexibility of the bilateral rupee-dollar rate when compared with the yuan-dollar rate.

A key concern of Chinese currency policy has been about the impact of the real exchange rate on exports. In the period from 2000 to 2007, the BIS real effective exchange rate for China showed a depreciation of 5%, while India showed an appreciation of 11.5%. Combined with the size of Chinese trade surpluses, especially with the US, the movement of the real exchange rate of the yuan has created a significant literature examining the issue of the undervaluation of the Chinese yuan (Goldstein and Lardy, 2008; Roubini, 2007; Goldstein, 2007). Indian policy makers have possibly favoured exchange rate depreciation owing to concerns about competitiveness of Indian exporters who compete with Chinese firms.

**Table 1** Volatility of the bilateral rate to the USD

Year	Annualised currency	
	India	China
1998	5.568	0.856
1999	1.999	0.041
2000	2.565	0.077
2001	2.055	0.047
2002	1.079	0.137
2003	2.147	0.055
2004	5.257	0.016
2005	3.343	2.042
2006	3.518	0.749
2007	4.995	1.574

## 2.2 Comparison of volatility of the exchange rate to the US dollar

We examine the level and the time-series variation of the volatility of the exchange rate to the US dollar in Table 1. This shows the volatility of the bilateral exchange rate (to the USD), for each year, for both China and India.

In the Indian case, the volatility attained the highest values of roughly 5% per year in 1998 and 2007 with lower values seen in the intermediate years. In the Chinese case, the highest values seen were of 1.5% of 2%. This numerically restates the picture that is visible in Figure 1, of a less flexible Chinese exchange rate (expressed in US dollars).

## 2.3 Extent to which appreciation against the USD was resisted

A substantial decline in the US dollar took place from 31 January 2002 till 18 March 2008. The US Fed calculates the ‘major currencies index’, an index of the US dollar against the major international currencies, all of which are floating exchange rates. Over this period, this index fell from a value of 112.618 to a value of 69.263, a decline

of 38.4%. Ordinary market forces would have generated corresponding appreciations of other currencies, when expressed against the dollar. The extent to which countries resisted appreciation against the dollar is a key factor explaining why some countries did not have significant appreciations. Table 2 compares some major currencies by their depreciation against the USD and also offers an international comparison for the annualised volatility of the bilateral exchange rate against the USD.

**Table 2 Depreciation of various currencies against the US dollar between 31 January 2002 and 18 March 2008**

Rank	Country or area	currency	Depreciation (Percent)	Volatility (Annualised)
1	New Zealand	New Zealand Dollar	-48.44	11.94
2	Eurozone	Euro	-45.43	8.74
3	Denmark	Danish Krone	-45.22	8.76
4	Australia	Australian dollar	-45.21	10.29
5	Sweden	Swedish Krona	-43.95	10.11
6	Norway	Norwegian Krone	-43.84	11.08
7	Switzerland	Swiss franc	-42.38	9.66
8	US major currencies index		-38.40	
9	Canada	Canadian dollar	-37.53	8.00
10	South Africa	Rand	-31.21	16.76
11	Great Britain	Pound	-29.97	8.11
12	Thailand	Thai baht	-29.41	7.49
13	Brazil	Real	-29.33	15.49
14	Japan	Yen	-26.57	9.47
15	Singapore	Singapore dollar	-24.93	4.05
16	South-Korea	Won	-23.47	6.77
17	India	Indian rupee	-17.20	3.83
18	Malaysia	Ringgit	-17.01	2.48
19	China	Yuan-Renminbi	-14.46	1.19
20	Taiwan	Taiwan dollar	-12.23	3.85
21	Hong Kong	Hong Kong dollar	-0.38	0.55
22	Sri Lanka	Rupee	14.96	4.15
23	Mexico	Mexican peso	17.02	6.78
24	Venezuela	Venezuelan bolivar	179.32	19.45

While floating exchange rates had an appreciation against the dollar of 38.4%, India (ranked 17th in this list), had an appreciation of 17.19% and China (ranked 19th) had an appreciation of 14.46%. Only three currencies - from rank 22 to rank 24 - showed a depreciation against the US dollar in this period. Of these, two countries (Sri Lanka and Venezuela) were under particularly adverse political conditions.

Ranked by rigidity of the bilateral exchange rate against the USD, the Chinese Yuan is at rank 2 and the Indian rupee is at rank 4 in this list. This evidence suggests that both India and China were *de facto* pegs to the US dollar, with very low currency flexibility by international standards.

## 2.4 Fine structure of the exchange rate regime

In the last decade, the literature has revealed that the *de jure* exchange rate regime in operation in many countries that is announced by the central bank differs from the *de facto* regime in operation. This has motivated a small literature on data-driven methods for the classification of exchange rate regimes (see e.g., Reinhart and Rogoff, 2004; Levy-Yeyati and Sturzenegger, 2003; Calvo and Reinhart, 2002). This literature has attempted to create datasets identifying the exchange rate regime in operation for all countries in recent decades, using a variety of alternative algorithms. While these databases are useful for many applications, they have limited usefulness in measuring the fine structure of intermediate regimes. As an example, the Reinhart and Rogoff classification sees the Indian rupee as a single exchange rate regime from 1993 onwards. As the evidence ahead shows, there is a fine structure in the post-1993 period which yields fresh insights into the causes and consequences of the exchange rate regime and monetary policy framework.

A valuable tool for understanding the *de facto* exchange rate regime in operation is a linear regression model based on cross-currency exchange rates (with respect to a suitable numeraire). Used at least since Haldane and Hall (1991), this model was popularized by Frankel and Wei (1994) (and is hence also called Frankel-Wei model). Recent applications of this estimation strategy include B'enessy-Qu'ér'e et al. (2006), Shah et al. (2005) and Frankel and Wei (2007). In this approach, an independent currency, such as the Swiss Franc (CHF), is chosen as an arbitrary 'numeraire'. If estimation involving the Indian rupee (INR) is desired, the model estimated is:

$$d \log \frac{\text{INR}}{\text{CHF}} = \beta_1 + \beta_2 d \log \frac{\text{USD}}{\text{CHF}} + \beta_3 d \log \frac{\text{JPY}}{\text{CHF}} + \beta_4 d \log \frac{\text{DEM}}{\text{CHF}}$$

This regression picks up the extent to which the INR/CHF rate fluctuates in response to fluctuations in the USD/CHF rate. If there is pegging to the USD, then fluctuations in the JPY and DEM will be irrelevant, and we will observe  $\beta_3 = \beta_4 = 0$  while  $\beta_2 = 1$ . If there is no pegging, then all the three betas will be different from 0. The  $R^2$  of this regression is also of interest; values near 1 would suggest reduced exchange rate flexibility.

To understand the *de facto* exchange rate regime in a given country in a given time period, researchers and practitioners can easily fit this regression model to a given data window, or use rolling data windows. However, such a strategy lacks a formal inferential framework for determining changes in the regimes. This has motivated an extension of the econometrics of structural change for the purpose of analysing structural change in the Frankel-Wei model (Zeileis et al., 2008). This involves extending the familiar Perron-Bai methodology (Bai and Perron, 2003) for identifying the dates of structural change in an OLS regression. Through this, dates of structural change in the exchange rate regime are identified. We focus on the period after 1994, and utilise weekly changes in exchange rates for these estimations. Values shown in brackets are t statistics.

Table 3 China's de facto exchange rate regime

Period	USD	JPY	EUR	GBP	$\sigma_e$	R <sup>2</sup>
15 Apr '94 - 22 Jul '05	1.006 (215.9)	-0.003 (-1.0)	0.015 (1.47)	-0.008 (-1.4)	0.113	0.994
22 Jul '05 - 17 Apr '09	0.949 (56.8)	0.008 (0.6)	0.062 (2.3)	0.002 (0.1)	0.243	0.974

Table 3 shows the results of this estimation strategy for the Chinese Renminbi. It finds that the first period runs from 15 April 1994 till 22 July 2005. This is a simple USD peg, with a coefficient of 1 for the USD, zero coefficients on all other currencies, a residual standard deviation of 0.113 and an R<sup>2</sup> of 0.994. From 22 July 2005 till 17 April 2009, a single sub-period of the exchange rate regime holds.

In some respects, this result agrees with official statements and a simple visual examination of the exchange rate. The break date of 22 July 2005 that is derived from the econometrics is consistent with that announced by the authorities. In these respects, the results for China help us see that the econometric analysis is broadly on the right track.

At the same time, there is something important in the fact that after 22 July 2005, no further structural change is announced. This contradicts a variety of official claims which have been made about the evolution of the exchange rate away from dollar pegging towards a basket peg, and towards greater exchange rate flexibility.

The econometrics suggests that remarkably little has changed about the actual exchange rate regime in operation when compared with the previous regime. The USD coefficient has dropped to 0.949. A statistically significant Euro coefficient has emerged, with a small value of 0.06 where the null hypothesis of 0 can be rejected. The residual standard deviation has more than doubled to 0.243. But the R<sup>2</sup> has dropped only slightly to 0.974. While there was more exchange rate flexibility in this period, the change in the exchange rate regime was extremely small.

While the dating methodology of Zeileis et al. (2008) reports a structural break on 22 July 2005, the difference that came about in the exchange rate regime is small. The euclidian distance between the vector of slopes before and after works out to just 0.075.

In India, when the rupee began its life as a 'market determined exchange rate' in March 1993, for the first two years, the exchange rate regime was actually almost a fixed exchange rate to the USD. The USD coefficient was 0.967 and the only other statistically significant coefficient was the JPY at 0.028. The residual standard deviation was 0.164 and the R<sup>2</sup> was 0.9887. This was greater exchange rate inflexibility than that found in China after July 2005.

Table 4 India's de facto exchange rate regime

Period	USD	JPY	EUR	GBP	$\sigma_e$	$R^2$
19 Mar '93 - 3 Mar '95	0.967 (58.3)	0.028 (2.0)	0.012 (0.4)	0.028 (1.3)	0.164	0.989
10 Mar '95 - 21 Aug '98	0.943 (12.8)	0.067 (1.4)	-0.026 (-0.2)	0.042 (0.6)	0.937	0.729
28 Aug '98 - 19 Mar '04	0.993 (61.7)	0.010 (1.0)	0.098 (2.9)	-0.003 (-0.2)	0.277	0.969
26 Mar '04 - 17 Apr '09	0.734 (14.5)	0.050 (1.2)	0.440 (5.0)	0.086 (2.0)	0.853	0.721

In the period of the Asian crisis, there was a dramatic change in flexibility in the Indian exchange rate regime. The residual standard deviation rose to 0.937, and the  $R^2$  dropped to 0.729. However, the only significant coefficient in the regression was the USD with a value of 0.943 which is not much different from 1. This was, hence, a period of pegging to the USD, with significant flexibility.

After this, India returned to USD pegging. From 28 August 1998 till 19 March 2004, the USD coefficient went back to 0.993. The only other significant coefficient was for the Euro, with a value of 0.098. The residual standard deviation went back down to 0.277 and the  $R^2$  rose to 0.969. In this period, the exchange rate regime in India was similar to that found in China after July 2005.

In the last period, India returned to significant exchange rate flexibility. The USD coefficient dropped to 0.734. Coefficients for the Euro and the Pound were statistically significant, and the Euro coefficient was economically significant at 0.44. The residual standard deviation rose to 0.853 and the  $R^2$  dropped to 0.721. The change in the exchange rate regime which took place in March 2004 was both statistically significant and economically significant. The euclidian distance between the vector of slopes that prevailed before and after this date works out to 0.44, which is six times bigger than that associated with the Chinese exchange rate regime reform of July 2005.

### 3. Capital controls

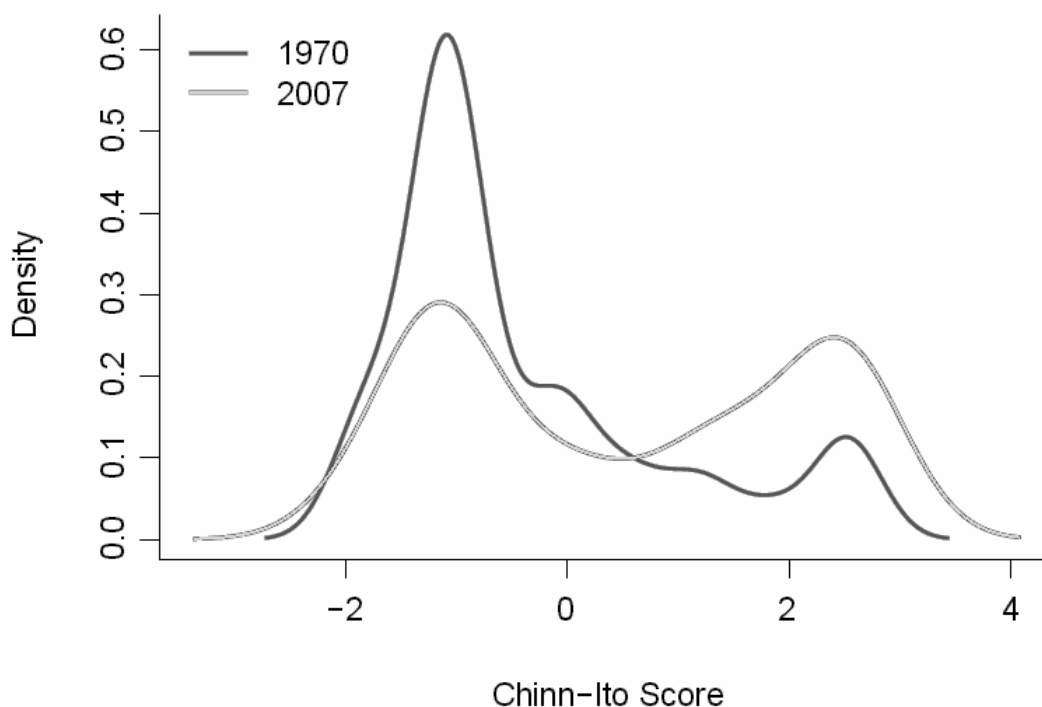
The Chinn-Ito measure of *de jure* capital controls (Chinn and Ito, 2008) shows that both countries have had substantial capital controls. For both China and India, the Chinn-Ito measure stagnated at -1.13 from 1970 till 2007.

This was in sharp contrast with the substantial scale of *de jure* capital account decontrol which took place worldwide. Figure 2 shows the kernel density plot of the Chinn-Ito measure across all countries. In both years, the density is bimodal, with a cluster of countries with largely open capital accounts and a cluster of countries with largely closed capital accounts. In 1970, the value of -1.13 was close to the mode. From 1970 to 2007, many countries migrated away from capital controls. China and India were not among these.

The world mean Chinn-Ito score went from -0.4 in 1970 to +0.5 in 2007. In Asia, the Chinn-Ito score averaged -0.32 in 1970. It went up to 0.43 in 2007. Emerging markets averaged -0.38 in 1970; this went up to 0.59 in 2007. Finally, the G-20 countries

experienced an evolution of the average Chinn-Ito score from 0.03 in 1970 to 1.52 in 2007. Hence, whether China and India are compared against the world average, against Asia, against emerging markets or against G-20 members, the lack of *de jure* capital account liberalisation in these countries stands out when compared with the developments worldwide.

Figure 2 Density of the Chinn-Ito measure: comparing 1970 vs. 2007



At first blush, a consistent monetary policy regime requires capital controls when exchange rate inflexibility is present, so as to ensure autonomy of domestic monetary policy. Hence, the exceptional use of strong *de jure* capital controls by China and India (by international standards) is consistent with the exceptional exchange rate inflexibility in these countries (by international standards).

The difficulty with this lies in the distinction between *de jure* and *de facto* capital controls. Both countries have experimented with a controlled opening of the capital account. This has brought about elements of openness. Both countries have pursued trade integration, and have witnessed a massive expansion in the size of the current account relative to GDP. Accompanying this is an enlarged set of opportunities for evading capital controls through misinvoicing. The international experience suggests that over time, the effectiveness of capital controls is diminished, as economic agents understand how to evade them.

If capital controls were binding, then both countries would enjoy a consistent monetary policy regime, with a closed capital account and exchange rate rigidity not interfering with autonomy of monetary policy. To the extent that there is *de facto* openness of the capital account, both countries would find that exchange rate distortions would yield monetary policy distortions.



#### 4. The implementation of the exchange rate regime

In both countries, currency pegging has been achieved through intervention in the foreign exchange market leading to a large buildup of reserves in both countries. To avoid the inflationary impact of this intervention, the central banks of both India and China have attempted to sterilise this intervention (Lafrance, 2008; Aizenman and Glick, 2008). However, in recent years, as is acknowledged by the central bank in China, the People's Bank of China (PBoC) and documented by a number of studies, it was becoming increasingly difficult to sterilise its intervention in China (McKinnon and Schnabl, 2008; Prasad, 2008; Kwan, 2006; Hannoun, 2007).

The People's Bank of China focussed on addressing these difficulties implemented a mix of measures such as open market operations, increase in reserve requirements and targetted issue of central bank bills there were meant to sterilise the liquidity supplied as a result of foreign exchange purchases.

*Figure 3 Rising foreign exchange reserves*

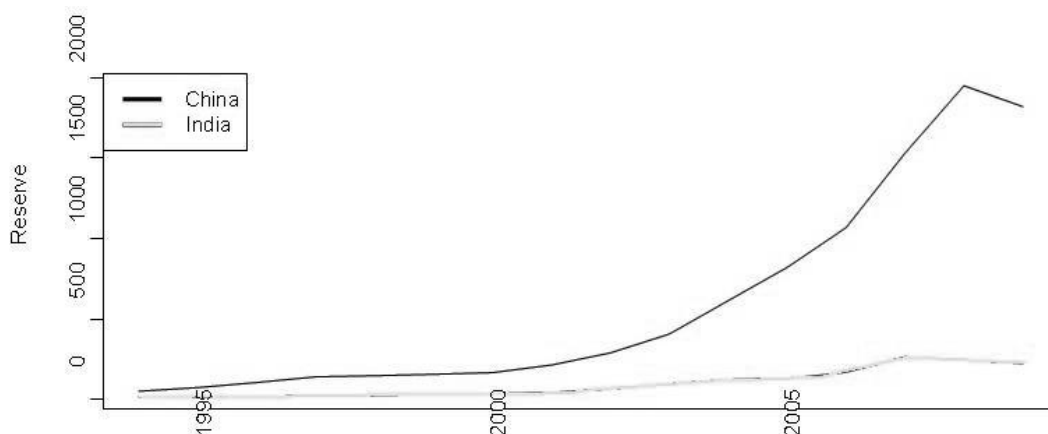


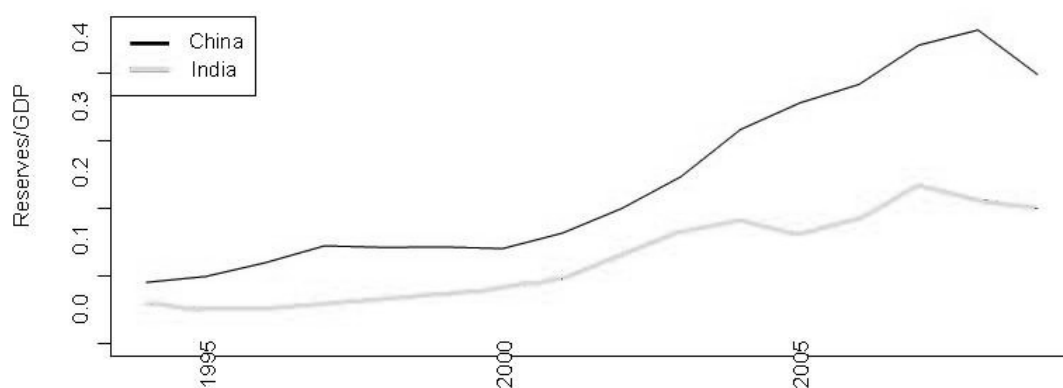
Figure 3 shows China's sharply rising reserves. As capital inflows and current account surpluses grew, currency pegging required larger intervention and hence an increasing pace of reserve accumulation. The pace of reserves accumulation steadily escalated. Reserves grew by 0.59% per month between Mar 1997 and May 2001; then they grew by 1.37% per month between Jun 2001 and Oct 2002; then they grew by more than 2.5% per month from Nov 2002 until the global financial crisis.

The size of foreign exchange reserves in China and India must be looked at in the context of the size of the economy. Chinese GDP is much bigger than Indian GDP. In both countries, sterilisation involves selling government bonds which are largely bought by banks. In China, bank deposits are 150% of GDP while in India, they are only 50% of GDP. Hence, the scale of sterilisation in China can be bigger than that seen in India.

Prasad (2007) points out that in China household and corporate savings rates are very high. Financial system repression has meant that there are few alternatives to funnelling these savings into deposits in the state-owned banking system. With the high growth rate of GDP growth and investment and fears of overheating, banks are under

pressure to reduce credit growth. This has made banks flush with liquidity. Banks hold excess reserves with the PBC even though bank reserve requirements have been raised and returns on excess reserves reduced sharply. Capital adequacy norms of the PBC also increase the incentive of banks to hold government/PBC bills as they carry zero capital requirement, while corporate bonds carry a capital requirement of hundred percent. There are thus many reasons for banks to want to hold government bills at relatively low rates.

Figure 4 Reserves to GDP ratio



In 2003, China ran out of government bonds for the purpose of sterilisation.<sup>3</sup> Their response was to initiate bills sold by the PBOC, called 'PBOC Bills', from April 2003 onwards.

This differs from the Indian setting, where the RBI Act does not permit RBI to issue bonds. Hence, when the Indian equivalent of PBOC bills was put into place in 2004, this involved sale of 'MSS bonds' by RBI as an agent of MOF. The fiscal cost of MSS bonds is clearly placed upon the exchequer in India, while in China, it only shows up as reduced dividend payments by the central bank.

In India, the extent of sterilisation changed profoundly once MSS came into play. This partly reflects the fact that once the costs of the pegged exchange rate became part of the budgeting process, they were subject to greater political scrutiny of the budget process. In contrast, in China, there has been no restraint impeding a massive scale of issuance of PBOC bills. In India, there is a link between the event of running out of bonds for sterilisation (December 2003) and the structural break in the exchange rate regime (March 2004).

Initially, PBOC bills were of three month maturity. However, the issuance shifted to one-year maturity. This involves somewhat higher costs reflecting the fact that one-year bonds have a higher rate than three-month bonds. The massive pace of issuance led to higher rates on PBOC bills. In August 2006, this rate stood at 2.796, a rise of 0.9 percentage points over the year.

As the Chinese reserves accumulation proceeded, despite the low interest rates the issuance of PBOC bills led to high fiscal costs and the difficulty that high interest rates

<sup>3</sup> Source: China in Transition by Chi Hung Kwan, August 2006.

would suck in further capital flows. From May 2006 onwards, PBOC bills have been issued under a 'targeted issue' scheme, where specific commercial banks are forced to buy specific quantities of PBOC bills at an interest rate below the market interest rate. For instance, on June 14, the PBC made a targeted issue of one-year maturity bills worth 100 billion yuan at a yield of 2.1138 per cent, 0.4 per cent lower than the then prevailing market rate. Of the PBC bills issued, 42 billion yuan were forced on China Construction Bank, 30 billion yuan on Agricultural Bank of China, 12 billion yuan on Industrial and Commercial Bank of China, 10 billion yuan on Bank of Communications, and the remaining 6 billion yuan on others.

To deal with rising difficulties PBOC raised reserve requirements by a cumulative 3 percentage points on five occasions in 2008, freezing 70 percent of the increased liquidity as a result of foreign exchange purchases PBOC (2009).

In terms of the evolution of the Indian exchange rate regime, the period of successful sterilised intervention aligns well with the sub-period of the exchange rate regime drawn from Table 4, from 28 August 1998 to 19 March 2004, where there was a tight peg to the US dollar with an  $R^2$  of 0.969.

In late 2003, RBI ran out of bonds for sterilisation. A short while later, the exchange rate regime changed from 26 March 2004 onwards to have greater exchange rate flexibility. In contrast, in China's case, no comparable modification of the exchange rate regime took place.

## 5. The implications of the exchange rate regime for monetary policy

When the capital account is perfectly open, exchange rate policy inevitably involves distorted interest rates. In the case of China and India, while capital controls are very restrictive at a *de jure* level, there is significant openness at a *de facto* level. As a consequence, attempts at exchange rate pegging have come at the cost of monetary policy autonomy.

Capital flows generally tend to be procyclical. As a consequence, when business cycle conditions are good, capital tends to come into the country. If the central bank tries to prevent appreciation by purchasing dollars, this leads to low short term interest rate. Conversely, if exchange rate depreciation is prevented by the central bank when times are difficult, this requires an 'interest rate defence', i.e. high interest rates when times are bad.

In the Indian case, the experience is summarised by comparing Figure 5 which uses quarterly GDP growth to show business cycle conditions, and Figure 6 which shows a measure of the policy rate expressed in real terms.<sup>4</sup>

The period over which India had highly restricted exchange rate flexibility ran from August 1998 to March 2004. Late in this period, business cycle conditions improved dramatically, with quarterly GDP growth going from 2% on a year-on-year basis to over 10%. In this period, capital came into the country. Exchange rate pegging meant that dollars had to be purchased. With incomplete sterilisation, interest rates in the domestic economy dropped sharply. The real rate fell from +3% to -4%: a 700 bps monetary policy easing at a time of an unprecedented business cycle expansion. The change in the exchange rate regime in 2004 helped to improve monetary policy autonomy, and the real rate went up to 0. This was still a very low level of the real rate

<sup>4</sup> The methodology for Figure 6 is based on Bhattacharya et al. (2008).

considering that India was experiencing unprecedentedly benign business cycle conditions.

Turning to China, Figure 7 shows a measure of Chinese business cycle conditions: the quarterly GDP growth. This shows an enormous boom in GDP growth from 2002 onwards till 2007. Juxtaposing this against Figure 8, which shows the 90-day treasury bill rate (expressed in real terms), we see that from 2002 till early 2008, the real rate dropped by an enormous 800 basis points. This suggests that in good times, monetary policy was expansionary. This is consistent with the idea that exchange rate pegging converts the pro-cyclicality of capital flows into pro-cyclicality of monetary policy.

Figure 5 Indian quarterly GDP growth

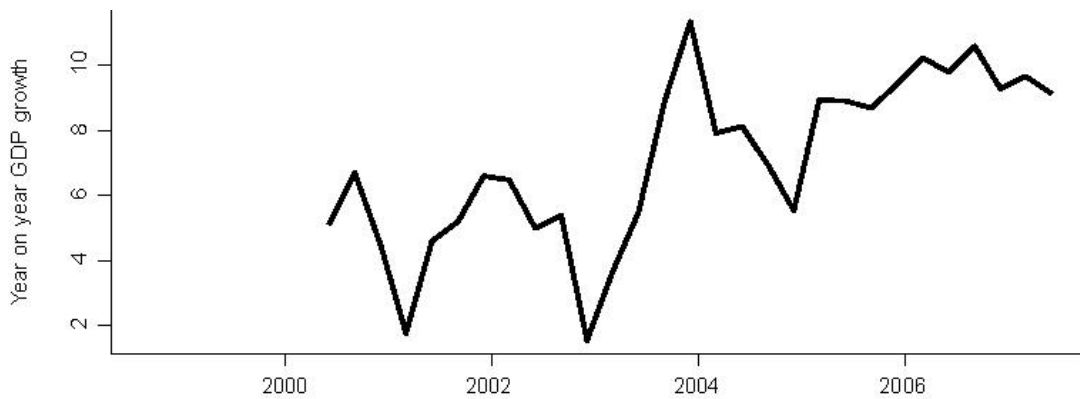
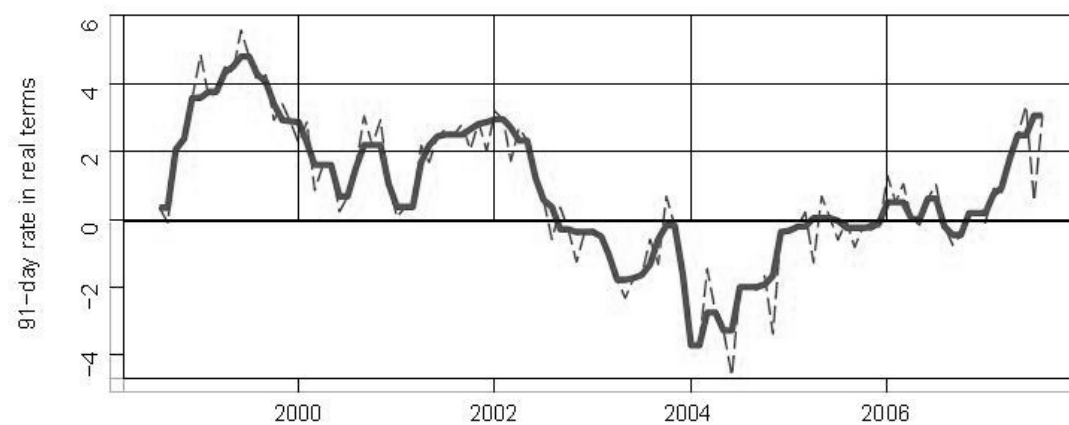
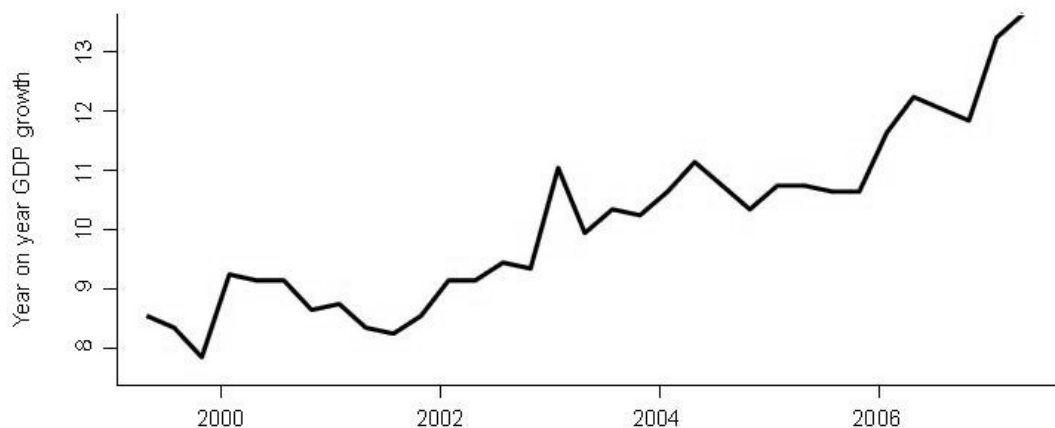


Figure 6 Indian real rate



*Figure 7 Chinese business cycle conditions (quarterly GDP growth)*

The use of loose monetary policy at a time of an unprecedented business cycle expansion, in both countries, helped induce an acceleration of inflation and an asset price boom.

Figure 9 shows the time-series of the Indian CPI inflation. Through the decade of the 1990s, there was a prolonged effort in India to bring down inflation. By the end of the 1990s, CPI inflation had dropped to near-zero levels. The persistent use of low policy rates helped induce inflationary pressures. From 2000 onwards, CPI inflation came back, going all the way to levels like 10%.

Figure 10 shows the similar time-series of Chinese inflation. Starting from zero or somewhat deflationary conditions at the outset, the consistently expansionary stance of monetary policy from 2002 onwards helped fuel a considerable acceleration of inflation, which went to 8% by end-2007.

Loose monetary policy helped to set off dramatic asset price booms. This was more pronounced in China than in India, as seen in Figure 11, which juxtaposes stock market indexes of both countries.

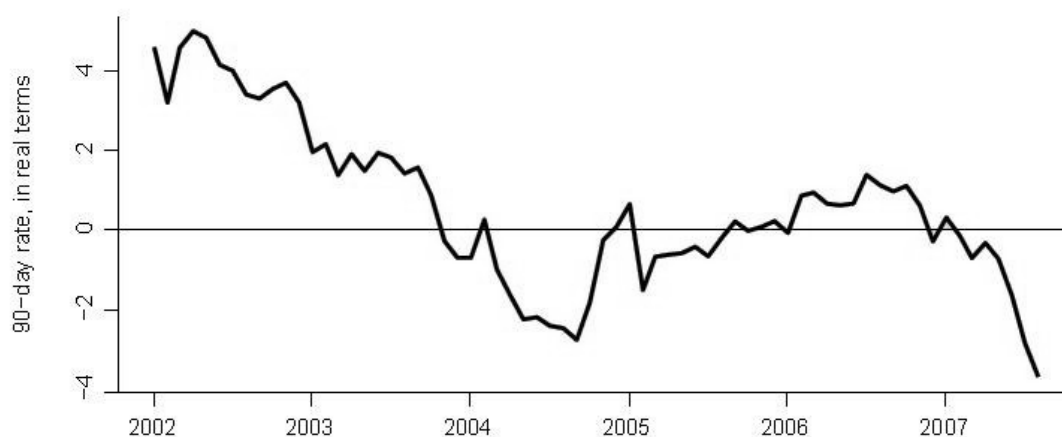
*Figure 8 Chinese real rate*

Figure 9 Indian CPI inflation (year on year)

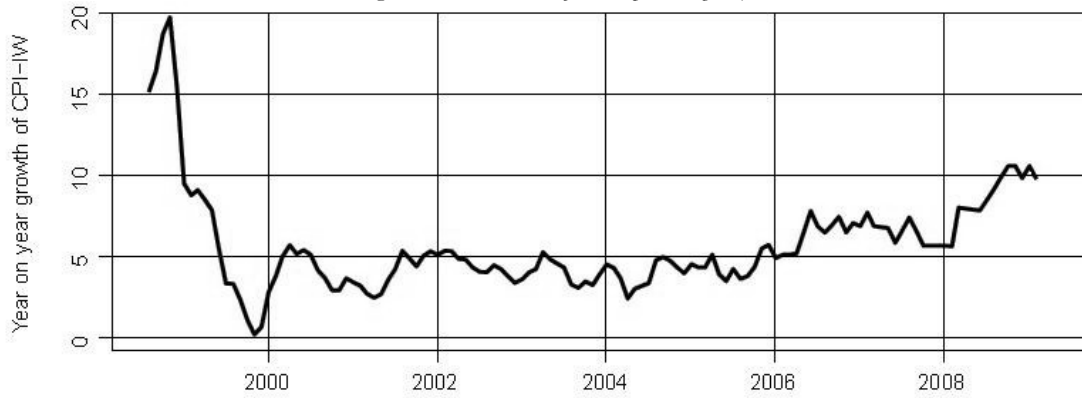


Figure 10 Chinese CPI inflation (year on year)

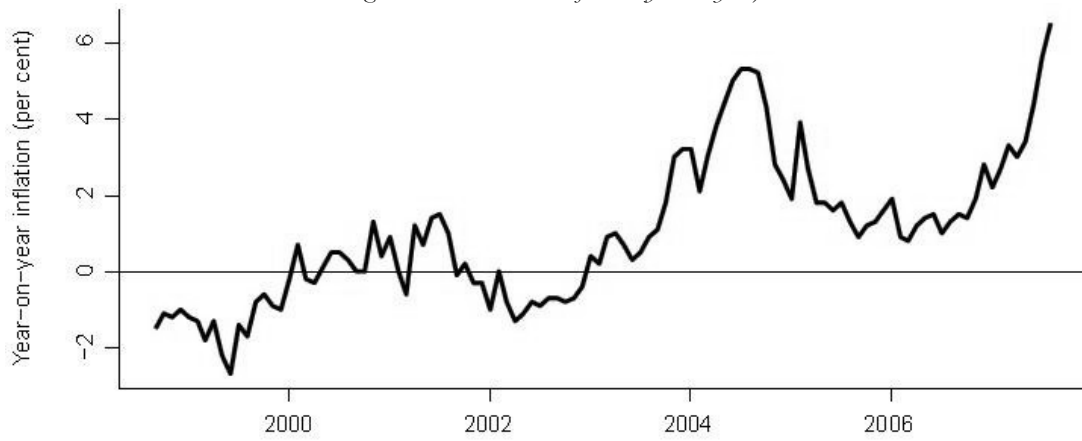
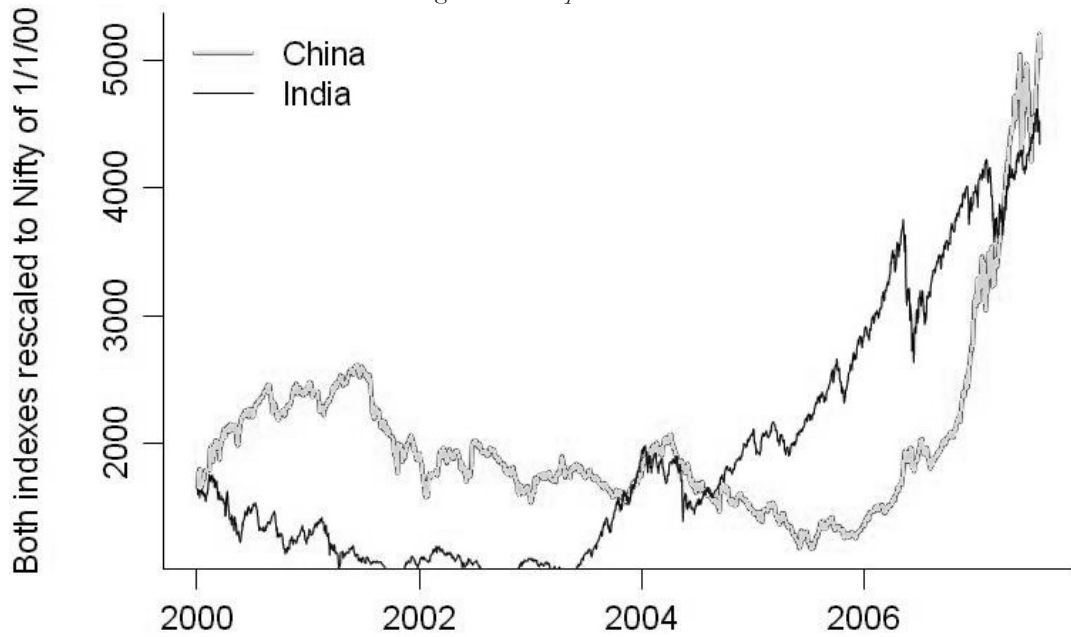


Figure 11 Asset price booms



## 6. Developments after August 2007

The global financial crisis erupted, starting with the run on Northern Rock in the UK. From August 2007 onwards, patterns of international capital flows were considerably disrupted. Dramatic changes in prices of tradeables also led to considerable changes on the current account. China and India both experienced a sea change in conditions on capital flows and the exchange rate.

Hence, the analysis of this paper is restricted to the period from 1998 till 2007, which is the 'Bretton Woods II' period where both countries attempted to have a varying extent of exchange rate rigidity with deepening *de facto* convertibility.

These results are not directly relevant for China or India of 2009. However, they illuminate our understanding of the comparative economics of the exchange rate regime, capital controls and monetary policy of emerging markets.

## 7. Conclusion

China and, to a lesser extent India, epitomise the 'Bretton Woods II' strategy of governments trying to undervalue the exchange rate so as to have export-led growth. The Chinese exchange rate regime has largely consisted of a tight peg to the US dollar. While there was a statistically significant change in the exchange rate regime in July 2005, this was not an economically significant change.

In India's case, Chinese-style pegging to the US dollar has been undertaken twice: from March 1993 to March 1995, and from August 1998 to March 2004. In other times, while there has been greater exchange rate flexibility, this has still been a period of substantial trading on the currency market by the central bank. While India appears to have greater flexibility than China, it still has a fairly inflexible exchange rate by international standards.

Both countries implemented dollar pegs through sterilised intervention in an environment of substantial restrictions against capital flows.

The key argument of this paper is that this policy framework has induced substantial difficulties, and imposed significant costs upon both economies.

The first issue is that of durability. In India's case, each episode of tight dollar pegging only lasted a short period, and gave way to greater exchange rate flexibility when the monetary policy distortions built up. Chinese-style pegging worked for a longer time period, from August 1998 to March 2004, owing to the ease with which sterilisation was achieved. When the bonds used for sterilisation ran out, this phase of pegging ended. These changes in the exchange rate regime and the stance of monetary policy have been shocks to the economy, as opposed to the stability of the monetary policy regime which would have been attainable in a consistent monetary policy framework.

The second issue is the mismatch between monetary policy and business cycle conditions. In both countries, exchange rate policy led to real interest rates being low at a time of expansionary business cycle conditions. In both countries, this kicked off increases in inflation and asset price booms. The exchange rate regime converted the procyclicality of capital flows into procyclicality of monetary policy.

A fuller assessment of the 'Bretton Woods 2' regime requires pulling together its overall costs and benefits. An examination of the extent to which exchange rate

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distortions fueled exports growth and GDP growth is beyond the scope of this paper, which has focused on understanding the consequences of the exchange rate regime for monetary policy.

The two countries have another feature in common: in neither country did these monetary policy distortions trigger off reforms of the monetary policy framework. We may hence say that while the monetary policy regime was imposing significant costs for the economy, the political leadership preferred to live with the prevailing monetary policy regime rather than undertake reform.

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