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India's International Reserves: How Large and How Diversified?

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India's International Reserves: How Large and How Diversified?*

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Abstract

Asymmetric foreign exchange intervention by the Reserve Bank of India (RBI) has resulted in a sustained accretion of India's foreign exchange reserves. The reserve buildup in India has certainly been impressive, rising from around US\$5-6 million in 1991, to nearly US\$300 billion in mid 2008. In addition to addressing the issues of reserve adequacy, this paper examines the forms the reserves have taken (asset and currency composition), and the extent to which India's reserve holdings are diversified.

The issue of reserve adequacy was made apparent during the 1990s and early 2000 when rapid reserve depletion became a defining and determining feature of the series of currency crises that hit emerging economies. In order to assess the adequacy of India's stock of international reserves, the paper considers a few standard measures used in literature and finds that India's reserve stock is more than adequate, placing them in a much better position than many other emerging economies.

The paper goes on to examine the asset and currency composition of such reserves. More than 50 percent of India's reserve holdings have been in the form of foreign currencies and deposits as cash, followed by investments in foreign securities and gold deposits, in that order, reflecting a high degree of risk aversion by the RBI in the management of the reserves.

While data on asset composition are available, the currency composition of reserves is a well-guarded secret. Hence the paper undertakes some simulation exercises to arrive at some reasonable guesstimates of such a composition. The paper also makes use of the Treasury International Capital Reporting System (TIC) data to track India's investments in the U.S. securities, thereby assessing the weight of U.S. dollar assets in India's reserve holdings.

KEYWORDS: India, international reserves, reserve adequacy, reserve currency

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1. Introduction

Various empirical studies for the Indian rupee (INR) reveal that it is pegged softly to the US dollar and is suggestive of a desire by the Reserve Bank of India (RBI) to manage the currency vis-à-vis the US dollar (for instance, see Cavoli and Rajan, 2009, chapter 4 and Rajan, 2009, chapter 1). Similarly, Reinhart and Rogoff (2004) have classified India as a *de facto* crawling peg to the US dollar (i.e. peg with a drift).¹ To be more specific, Reinhart and Rogoff (2004) characterize India as a *de facto* crawling US dollar peg between July 1995 and December 2001 and a *de facto* peg (no crawl) between August 1991 and June 1995.² Patnaik and Shah (2009) note that the RBI maintained a tight US dollar peg between August 1995 and March 2004 with a somewhat relatively greater degree of currency flexibility, though still a heavily managed currency regime between March 2004 and April 2009.³ Pontines and Rajan (2009) find that the RBI's foreign exchange intervention can be more accurately characterized as involving asymmetric intervention of the nominal effective exchange rate (NEER), whereby there is greater intervention to prevent currency appreciations than depreciations.⁴ This asymmetry in intervention also explains the sustained reserve accretion in India.

India's reserve buildup has certainly been impressive (Figure 1), rising from around US\$ 5-6 billion in 1991 to over US\$ 155 billion by mid 2006 and touching US\$ 300 billion by mid 2008 -- among the highest in the world after China and Japan. India's reserves took a dip in mid 2008 following the capital flows reversals induced by the global financial crisis as the RBI attempted a partial defense of the Indian rupee to moderate the pace of depreciation.⁵ Once the

¹ Various exchange rate flexibility indices lead to a broadly similar conclusion (see Cavoli and Rajan, 2009).

² Reinhart and Rogoff (2004) define a *de facto* peg on the basis of whether a monthly exchange rate change remains within one percent band over a rolling five-year period with at least an 80 percent probability. If the exchange rate has a drift it is classified as a crawling peg.

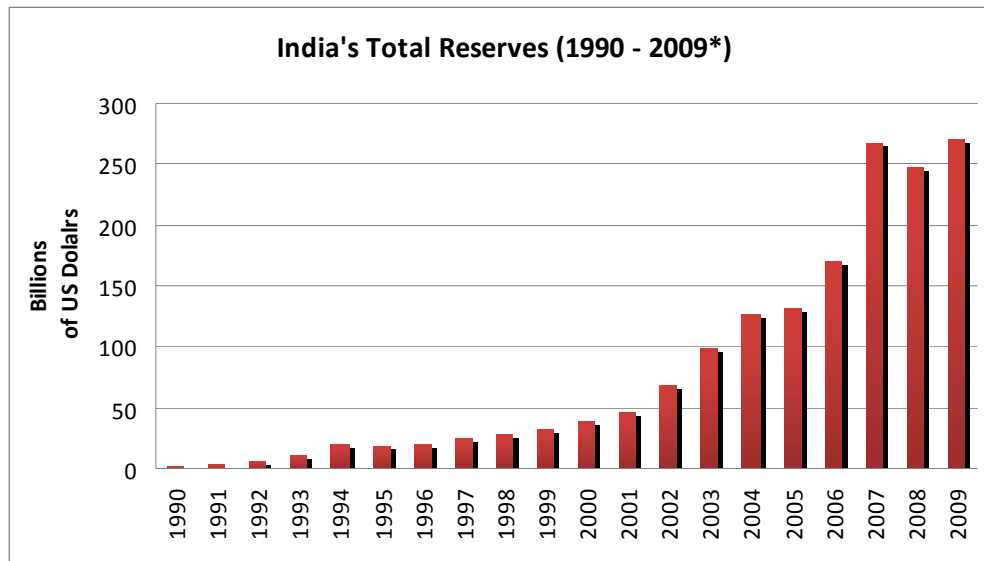
³ According to their estimates, the degree of influence of the US dollar on the Indian Rupee was well over 0.9 between March 1995 and March 2004 and this dropped to about 0.7 between March 2004 and April 2009 (Patnaik and Shah, 2009).

⁴ Ramachandran and Srinivasan (2007) also finds the existence of foreign exchange intervention asymmetry by the RBI but only considers movements of the Indian rupee vis-à-vis the US dollar.

⁵ It is worth noting that the same story holds true for other emerging Asian economies as well, as a sharp turnaround in capital flows during the global financial crisis led to exchange rate depreciations of various magnitudes, which would have been even larger if not for some degree of foreign exchange intervention. While exchange rate depreciations were most apparent in countries with current account deficits, namely South Korea and Indonesia apart from India, even those with current account surpluses such as Singapore and Malaysia experienced exchange rate pressures as apparent from drops in their reserves (Rajan and Gopalan, 2009). Interestingly, China and Hong

crisis abated, however, foreign capital started returning to emerging Asia, particularly to India following the overwhelming mandate given to the Congress-led government in May 2009. Consequently, India once again started to rebuild its foreign exchange reserves aggressively, reaching over US\$ 270 billion by September 2009.

Figure 1
Trends in India's Total International Reserves (1990-2009*)



Note: * September 2009
Source: Compiled from CEIC data.

Are these reserves adequate for India; are they excessive; what form have these reserves taken (asset and currency composition), and how diversified are India's reserve holdings? These are the questions explored in this paper.

2. Overview of India's International Reserves: Measures of Reserve Adequacy

The issue of reserve adequacy was made apparent during the 1990s and early 2000 as a series of currency crises hit emerging economies such as Mexico, Thailand, Korea, Indonesia, Malaysia, Russia, Brazil and Argentina. Rapid reserve depletion became a defining feature of currency crises, and reserve levels

Kong were exceptions to this trend, both economies continuing to accumulate reserves even during the heights of financial crisis.

ex ante showed up as a significant variable in studies examining the predictability of crises (Bussiere and Mulder, 1999). Events in the 1990s and beyond also illustrated the deficiencies of earlier approaches to judging the adequacy of reserves.

There is no single measure of reserve adequacy; various measures of reserve adequacy have been widely used. While these measures lack strong theoretical backing and fail to explain the dynamics of reserve demand, they remain useful broad benchmarks of a country's ability to manage a balance of payments shock (Bird and Rajan, 2003). We consider a few below.

2.1 Reserves-to-Imports Ratio

International reserves are in essence an inventory held against the uncertain future course of the balance of payments. Where balance of payments instability emanates from the current account, there may appear to be some logic in judging the adequacy of reserves against the size of trade flows as proxied by the value of imports. A rule-of-thumb emerged that reserves were inadequate if they covered less than about 3 months worth of imports (Fischer, 2001). India's international reserves have steadily increased from 6 months of imports in 1995-96 to a high of 16 months of imports in 2003, declining in 2004 due largely to a spurt in imports, before reaching a very comfortable 14 months of imports by 2007 as reserves mounted sharply. As of end March 2008, the import cover of reserves stood at 14.4 months (RBI, 2009).

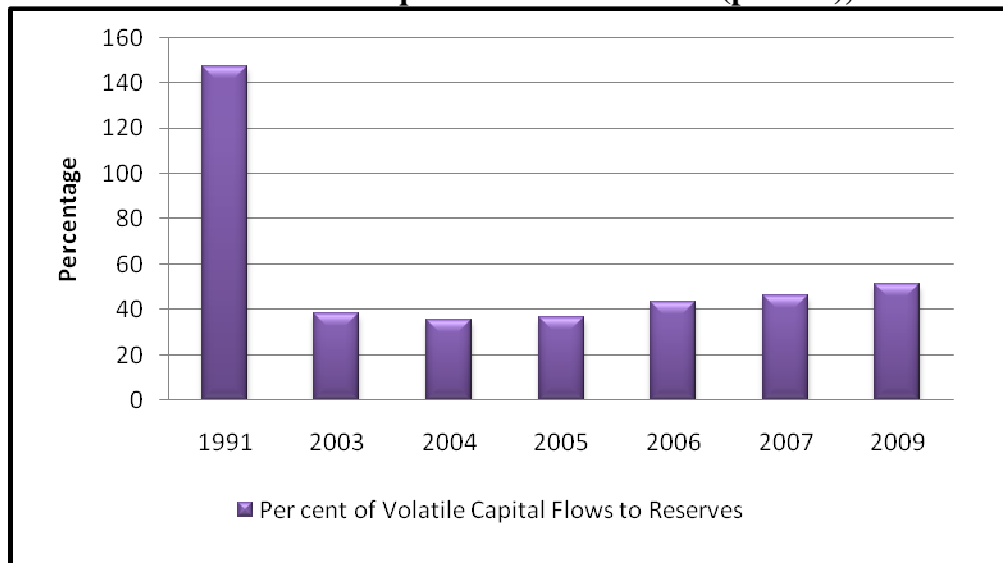
2.2 Reserves-to-Short-term External Debt Ratio

The benchmark ratio of reserves-to-imports was derived from a trade-related approach to the balance of payments and reserve needs. However, the crises in the 1990s were more to do with the *capital account*; measures of reserve adequacy based on the *current account* were therefore largely inappropriate. Reserve adequacy benchmarks accordingly have required some modifications to allow for both imports and capital outflows as potential drains on reserves (Bird and Rajan, 2003, Fischer, 2001 and Reddy, 2002). One measure that has been suggested in this regard is the reserves-to-short-term external debt ratio (i.e. external debt that comes due within a year). In the aftermath of the East Asian crisis, the extent of short-term indebtedness has been found to be a key indicator of illiquidity and a robust predictor of financial crises.⁶ India's reserve-to-short-term-external debt ratio compares favorably in general and relative to many other developing

⁶ For instance, see Bussiere and Mulder (1999), Dadush, Dasgupta and Ratha (2000) and Rodrik and Velasco (1999).

countries (ESCAP, 2009). However, this ratio fails to capture non debt external liabilities such as portfolio flows that may also be easily reversible.

Figure 2
India's Ratio of Volatile Capital Flows to Reserves (percent), 1991-2009



Notes: Volatile capital flows defined as comprising cumulative portfolio inflows and short-term debt.

Source: Compiled from the Reserve Bank of India.

Given the large influx of portfolio inflows experienced by India until 2007 this remains a source of some concern for India as well as much of Asia. To date it is not clear how to fully account for such non-debt external liabilities when determining reserve adequacy. However, when India's reserves are compared to its short-term external debt and portfolio flows in aggregate, the country's liquidity position looks somewhat less "excessive" but by no means compromising. It appears that the RBI is sympathetic to this issue of reserve adequacy needing to be benchmarked against some measure of "mobile capital" or "volatile capital" flows as they put it, comprising cumulative portfolio inflows and short-term debt (see RBI, 2009, p.12).

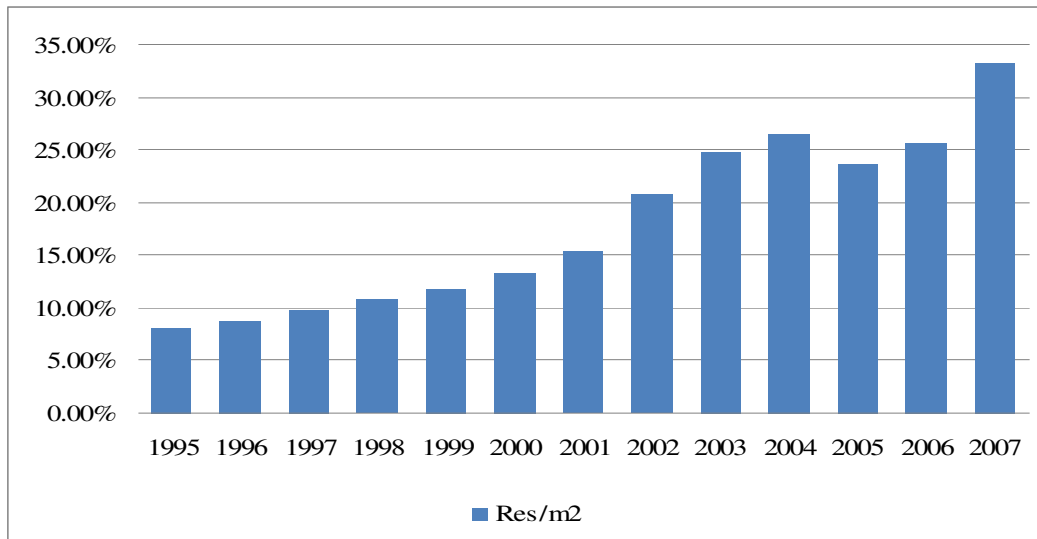
The ratio of volatile capital flows to reserves declined from just over 145 per cent as at end March 1991 to about 45 per cent at end March 2007 and stood at just over 50 per cent at end-March 2009 (Figure 2 and RBI, 2009). This decline is understandable because of the large-scale infusion of foreign institutional investments (FIIs) into India over the last decade, along with a general easing of norms regarding short-term external borrowing. While India may hold reserves equivalent to 50 percent of stock of volatile or mobile capital, unlike bank

borrowing, as noted, there is no obligation for India to have to repurchase equities held by foreigners. If the latter want to sell and flee the market during a downturn they have to find a counterparty by offering an attractive price, implying therefore that the actual market/sales price could be significantly higher than the cost price. This in turn means that the estimated volatile capital-to-reserves ratio above may be understating the actual levels of reserve adequacy measured in terms of potential capital reversals.

2.3 Reserves-to-M2 Ratio

Even a measure that incorporates other external liabilities only gives an indication of the vulnerability to an “external drain”. It fails to capture the threat of an “internal drain” associated with capital flight by residents. The latter may be best captured by some measure of broad money supply (M2).

Figure 3
India's International Reserves-to-M2 ratio (percent), 1995-2007



Source: Compiled from the Reserve Bank of India

The reserves-to-M2 ratio captures the extent to which liabilities of the banking system are backed by international reserves; a low and declining ratio is among the leading indicators of a currency crisis (for instance, see Kaminsky and Reinhart, 1999). De Beaufort Wijnholds and Kapteyn (2001) suggest that an adequate ratio of reserves-to-M2 is about 5 percent. As illustrated in Figure 3, the reserves-to-M2 ratio of India increased from 8 percent at the end of 1995 to over 33 percent at the end of 2007.

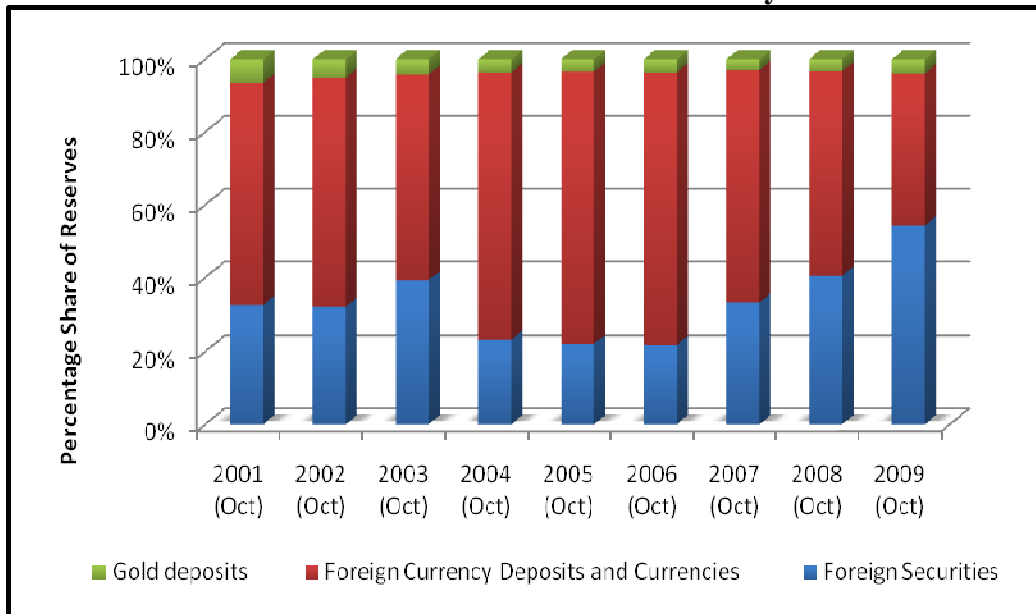
3. Composition of India's Reserves

The previous section suggests that, by most standard indicators, India's stock of international reserves is more than adequate. Certainly, given India's high dependence on gross portfolio inflows, sharp capital reversals can never be entirely discounted (as actually happened in the latter part of 2008). India's reserve position is obviously somewhat less comfortable if one also includes the stock of portfolio inflows as opposed to only short-term external debt liabilities. In any event, even if this is accounted for, India appears to be in a much better position than many other emerging economies (ESCAP, 2009).

3.1 Asset Composition of India's Reserves

Given India's large reserve levels, the next obvious issue to consider is the composition of such reserves. What kinds of assets and currencies have India's reserves been invested in?

Figure 4
India's International Reserves: Where are they Invested?



Source: Compiled from the Reserve Bank of India.

At a broad level, India's reserve assets comprise foreign securities, foreign currency deposits and currencies and gold deposits.⁷ While foreign securities primarily refer to bonds issued by foreign investors, foreign currency deposits and currencies largely consist of total currency and deposits with other national central banks, Bank of International Settlements (BIS), and the International Monetary Fund (IMF).⁸ The remainder of the reserves is invested in gold.

Available data from the RBI on India's holdings of total reserves since 2001 offers some useful insights into reserve management in India (Figure 4). On average, nearly 60 per cent of India's total reserve holdings have been in the form of foreign currencies and deposits as cash, followed by investments in foreign securities (around 30 per cent), then gold deposits (around 5 per cent), and the remainder in SDRs, in that order. The large share of reserves in cash and deposits emphasizes the high degree of risk aversion by the RBI in the management of the reserves -- liquidity management is the paramount objective regardless of the opportunity and other costs involved in such a strategy.⁹ It is interesting to note that the RBI allowed its share of reserves held in foreign securities to increase vis-à-vis currency deposits only after 2007 October (i.e. at the height of global liquidity-induced bull run just prior to the onset of the global financial crisis). The share of reserves parked in foreign securities stood at over 50 per cent in October 2009 compared to around 33 per cent in October 2007.

The share of India's reserves invested in gold has also not been very significant compared to foreign securities or foreign currency deposits and has actually declined from about 6.5 per cent in 2001 to about 3 per cent in 2007. In October 2009 India's reserve gold share stood at around 4 per cent of total reserves compared with 2 per cent for other emerging economies and close to 1 per cent for countries like China (Roman, 2009 and World Gold Council, 2009). More recently, though, India's share of gold deposits has seen a significant increase after the RBI purchased 200 metric tons of gold worth from the IMF in October 2009. According to latest available data available for November 2009, the purchase of gold -- estimated roughly at US\$ 6.7 billion -- took the existing stock of India's gold reserves to just over US\$ 18 billion. This purchase pushed the total share of gold deposits in India's total reserves to nearly 6.4 per cent, back to the 2001 level. It is unclear whether this is a one-off stock adjustment or part of

⁷ The official classification also includes IMF reserve position and Special Drawing Rights (SDRs).

⁸ India's foreign currency and deposits also include deposits with foreign commercial banks. On average over the last decade the currency and deposits with other central banks, the BIS and the IMF have been over 80 per cent of the total foreign currency and deposits.

⁹ As opposed to some other countries like China and Korea that have attempted to reduce the costs of reserve holdings by moving them into higher-yielding assets while accepting relatively greater risks (i.e. focus on wealth management in addition to liquidity management).

an ongoing strategy of diversifying into gold and raising the share of that commodity in India's reserves.

3.2 Currency Composition of India's Reserves

While we have some understanding of the asset composition of India's reserves, what about the currency composition? Unfortunately things become much hazier here. As with most central banks, the currency composition of India's international reserves is a closely-guarded secret and India is no exception. The only available source of information on currency composition is the IMF database on the "Currency Composition of Official Foreign Exchange Reserves" or COFER. The problem with the COFER data, however, is that the classification of countries is lumped together into advanced economies or emerging and developing economies, instead of individual countries.

The available data suggests the share of US dollar assets held by emerging and developing economies was close to 60 per cent as of end 2008.¹⁰ But there is some anecdotal evidence to suggest that India has somewhat less of its reserves invested in US dollar assets than China and its East Asian neighbors, and this makes sense in view of India's relatively more diversified trade structure.¹¹ While there is nothing concrete that anyone can point to substantiate this claim, unlike most other central banks (at least in emerging Asian economies), the RBI publishes data on valuation changes from their reserve holdings. One could try and undertake some simulation exercises to arrive at some reasonable guesstimates of the currency composition of India's non-gold reserves.

The first step is to take India as the average representation of the foreign exchange holdings by all the emerging and developing economies reported in the COFER data. Since there is no prior knowledge about the exact percentage allocation of India's holdings of reserves in US dollars, one could begin the simulation exercise by assuming that it has 50 per cent of its holdings in US dollars and the rest divided in some proportion among other major currencies such as the Euro and the Pound Sterling, say for example 30 per cent in Euros and 20 per cent in Pound Sterling. This is broadly consistent with the COFER data as of end 2008. Using this composition as a starting point we can estimate the valuation

¹⁰ We arrive at this share of 60 per cent only when the share of US dollar assets is expressed as a percentage of the "allocated reserves", viz. reserves data for which currency composition has been identified.

¹¹ Much of India's trade is with the Asian region with nearly 60 per cent of the country's exports directed towards the Asian region as of 2008 and the rest toward the advanced economies like the US and Europe. China, on the other hand depends heavily on the western markets, with the USA and EU being the leading export markets for China, followed by Japan. (Based on data from various documents from Ministry of Commerce, India and Ministry of Commerce, People's Republic of China).

gains/losses based on the actual exchange rate change of the non-US dollar part of the reserves and compare it to actual data on valuation changes. If one finds both the estimated values to be close to each other, it is fair to say that the weights initially assigned to different currencies are approximately correct. If, however, there is a large discrepancy between the estimated and actual valuations, one then needs to re-adjust the weights and undertake a re-estimation. Such an exercise, while by no means precise, does provide a reasonable indication of the relative weights attached to different currencies in India's total international reserves. It is worth noting that the simulations were carried out by comparing the valuation changes for multiple years thus making the results reasonably robust.

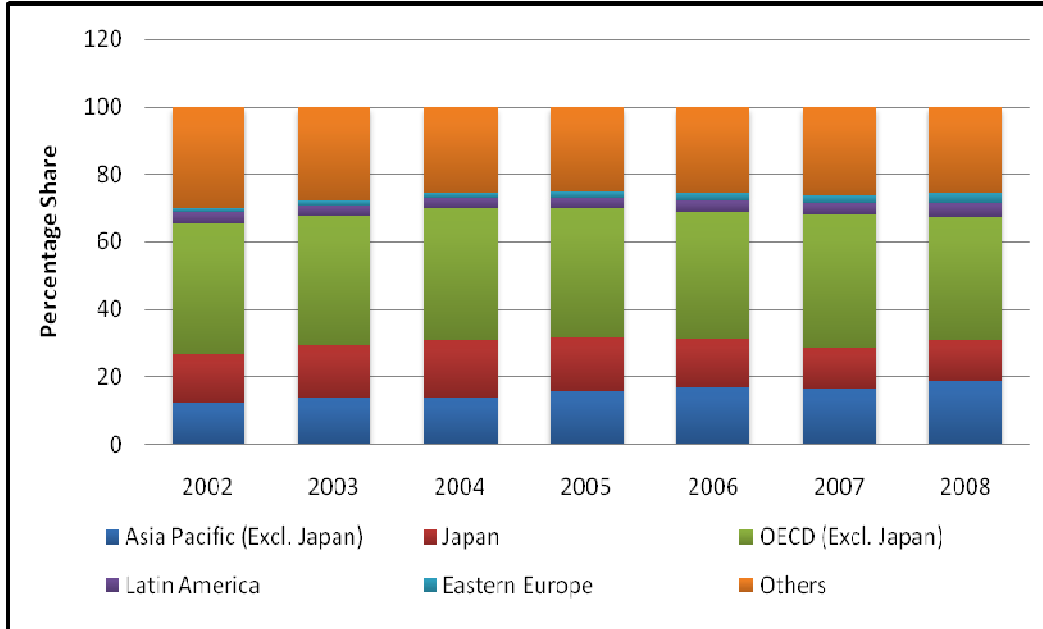
On undertaking such an exercise, the best guess that emerges is that India likely invests 40 per cent of its reserve holdings in US dollars, 25 in Euros, and the remainder in various convertible currencies including the Pound Sterling, Swiss francs, Australian dollar, Japanese yen, etc. Given that the US dollar still constitutes the majority of asset holdings (though lower than the average of other developing and emerging economies), the most recent move by the RBI to purchase gold from the IMF has been viewed by many observers as a conscious diversification strategy adopted by India to move away from US dollar-denominated assets even further (Gangopadhyay and Behrmann, 2009).

4. Tracking India's Investments in US Assets

Another way to counter-check whether US dollar assets have been relatively underweighted in India's reserve holdings is to look at the Treasury International Capital Reporting System (TIC) data which helps give an idea of the Asian countries' gross foreign asset purchases in the US. The country coverage of the TIC data is quite extensive¹². While data are available on both monthly and annual bases, the latter is more accurate (being based on survey of holdings as opposed to transactions) and more easily compiled on a regional basis, though it is only available on a stock basis. We use the annual data in view of its accuracy.

¹² There are over 200 countries representing the different regions of the world, including over 40 countries from the Asia-Pacific region. This said, there are some important limitations that need to be borne in mind highlighted in Rajan and Gopalan (2009).

Figure 5
Foreign Holdings of US Securities as a Share of Total US Securities



Source: Authors' computations from US Treasury TIC database.

As Figure 5 reveals, the share of emerging Asia's capital inflows to the US has been growing gradually over the years and has averaged around 15 percent (slightly over 25 percent if one includes Japan). About 40 percent is due to the developed world (excluding Japan) and the remainder from oil producers, offshore financial centers, etc. It is important to bear in mind that most likely some of Asia's shares are understated because of transshipping via non-Asian intermediaries. Despite this, a substantial number of Asian countries figure prominently amongst the list of top investors in US securities led by China (Table 1).

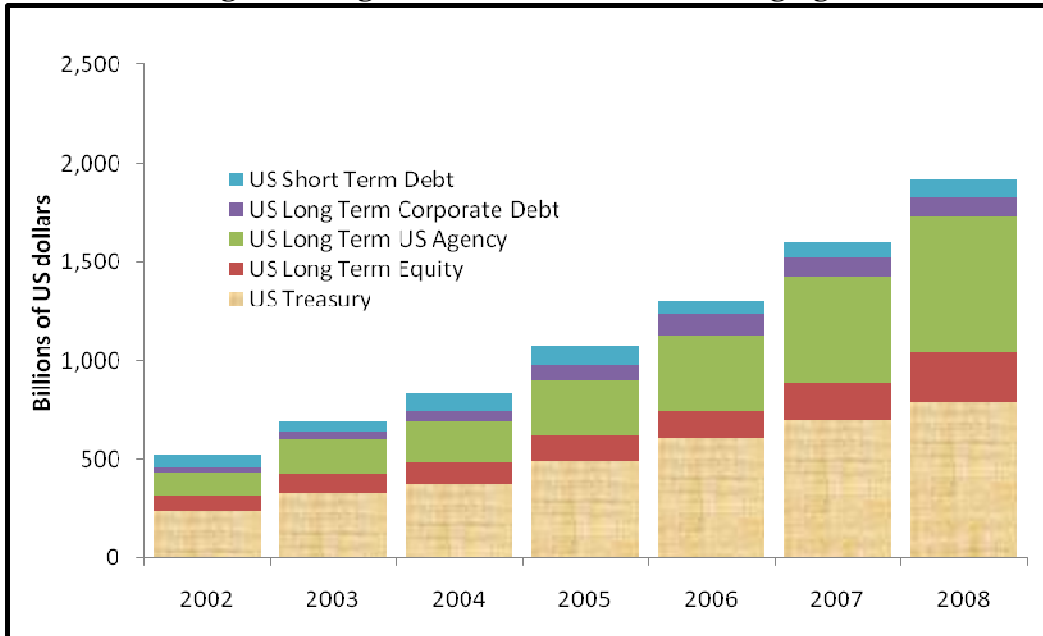
Table 1
Leading Foreign Investors in the US based on TIC data,
Average percent share of Top 15 investors and India (2006-08)

Country	Shares (Average 2006-08)
Japan	12.8
China	10.1
United Kingdom	8.7
Cayman Islands	7.4
Luxembourg	6.9
Canada	4.7
Belgium	4.3
Ireland	3.5
Middle East Oil Exporters	3.4
Netherlands	3.3
Switzerland	3.3
Germany	2.6
Bermuda	2.4
France	2.2
Singapore	1.8
India	0.2

Source: Authors' computations from US Treasury TIC database.

Figure 6 emphasizes the clear preference that Asia has for US Treasuries and agency bonds (i.e. the bonds of government sponsored entities like Fannie Mae and Freddie Mac). This suggests a degree of risk aversion among Asian investors and also points to the likelihood that a large source of funds from Asia is the central bank reserves. India's share in emerging Asia's ownership of total US assets has been relatively insignificant at less than 2 per cent on average during 2002 to 2008.

Figure 6
Foreign Holdings of US Securities from Emerging Asia*



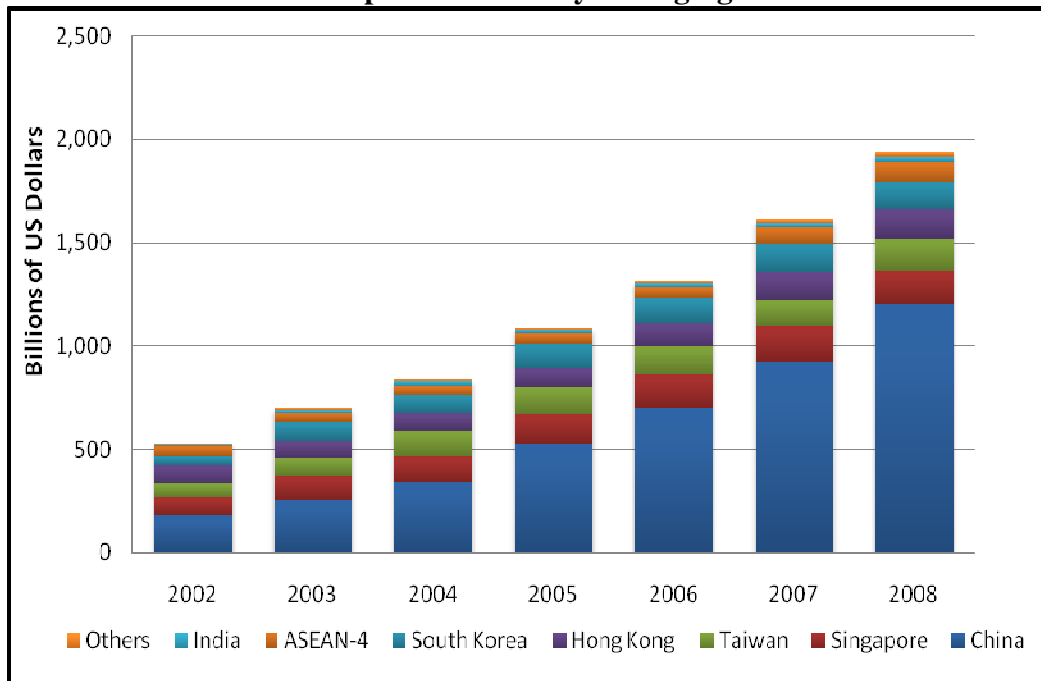
*Note: Excludes Japan.

Source: Authors' computations from US Treasury TIC database.

Though the absolute values of India's total US assets purchased has risen from about US\$ 10 billion in 2002 to over US\$ 26 billion in 2008, it is marginal when compared to the purchases made by other large countries in Asia like China (US\$ 170 billion in 2002 to over US\$ 1170 billion in 2008).¹³ By way of further comparison, the corresponding average shares of other emerging Asian economies with similar levels of reserves like India (i.e. South Korea, Taiwan, Hong Kong and Singapore) averaged 12 per cent of total purchases of US assets) (Figure 7). So the key take-away here is that India's purchases of US assets have not been that high when compared to other countries in the region and this reiterates the already-discussed point that the country's reserves appear somewhat less concentrated in US dollar-denominated assets than many of its other Asian counterparts.

¹³ Between 2002 and 2008, China made up about 45 per cent of total purchases of US assets from emerging Asia.

Figure 7
U.S. Asset Ownership Breakdown by Emerging Asian Economies



Source: Authors' computations from US Treasury TIC database.

5. Conclusion

India's international reserves have risen markedly during most of last decade and a half. Most standard indicators suggest that India's reserve stock is more than adequate. India's reserve position is obviously somewhat less comfortable if one also includes India's stock of foreign portfolio inflows. However, even if this were accounted for, India appears to be in a much better position than many other emerging economies. In addition to the possibility of "external drain", a central bank also needs to account for the possibility of "internal drain", i.e. capital flight by domestic residents. While capital controls limit this possibility (i.e. of capital flight) to some extent in the case of India, as these controls become more porous, greater attention will need to be paid to this issue.

Given India's comfortable reserve position, the question that assumes importance here is that of understanding the reasons behind the country's sustained reserve accumulation. Empirical analysis generally finds that the Indian Rupee has become quite heavily managed vis-à-vis the US dollar since the mid 1990s (though more flexible than many of its East Asian neighbors).¹⁴ Thus, the

rapid stockpiling of foreign exchange reserves implies that the RBI has been leaning-against-the-wind to keep down the value of the Indian Rupee. As India has become more export-oriented it has become keenly aware of the need to remain price competitive in the short run, particularly in view of the continued limited flexibility of the Chinese currency (Frankel, 2009). This prisoner's dilemma with regard to exchange rate policies in India and much of Asia in turn implies that there may be potential benefits from pursuing a more coordinated approach to dealing with monetary and exchange rate policies in the region.¹⁵

This notwithstanding, as the opportunity and fiscal (sterilization) costs of accumulating foreign exchange reserves have been steadily rising, it has become commonplace to hear Asian policy makers talk about channeling some part of their reserves to alternative higher yielding but non-liquid uses (Rajan, 2009, chapter 6). For instance, China found a non-liquid use for its reserves when it transferred US\$ 45 billion to recapitalize two of its state banks, the Bank of China and the China Construction Bank. Given the magnitude of non-performing loans (NPLs) in China's banking system, the Chinese government may well inject more of their reserves to recapitalize other state banks. It has also been suggested that China might also use some of its huge foreign exchange reserves to finance the purchase of oil imports for a strategic reserve the country is planning. Similarly, Korea has discussed the possibility of using some part of its reserves to help build up financial infrastructure to turn Seoul into an international financial centre. Many of the East Asian and oil-producer-based sovereign wealth funds (SWFs) have also been active investors overseas.¹⁶

There has been some discussion in India about whether it too should consider alternative uses of the country's burgeoning reserves, be it in terms of infrastructure development or the creation of a small SWF (Rajan, 2009, chapter 6). However, such moves are unlikely given the relatively risk averse policy stance of the RBI. The global financial crisis of 2008-09 has probably added to this already high degree of conservatism. The RBI is likely therefore to remain

¹⁴ Cavoli and Rajan (2008) also suggest that the Euro is gradually gaining greater importance in influencing movements in the Indian rupee, but more so at the expense of the pound and yen rather than the US dollar.

¹⁵ To mitigate the balance of payments surplus, the RBI has in recent times allowed for a gradual appreciation of the rupee from 2002 to mid 2008 (compared to a gradual depreciation the preceding decade).

¹⁶ Of course, 2008-09 was a bad period for many of these investors but over the longer horizon, many have done quite well in absolute terms. Also note that since the SWFs have invested in the US, these numbers – if done directly from their countries – will show up in the TIC data alongside investments by their central banks. However, more likely is the fact that many of these SWFs have used intermediaries in London and elsewhere to purchase equities in the US. Direct investment stakes are not reflected in the TIC data as discussed previously.

heavily invested in liquid assets (US dollar and Euro deposits and bonds) but with a conscious decision to further reduce concentration in US dollars whenever the opportunity arises. This is likely to be achieved by purchasing commodities such as gold, as the RBI attempts to protect its balance sheet from adverse valuations changes due to exchange rate movements. How aggressively they do so remains to be seen.

References

- Bird, G. and R.S. Rajan (2003). "Too Much of a Good Thing?: The Adequacy of International Reserves in the Aftermath of Crises," *The World Economy*, Vol.26, pp.873-891.
- Bussiere, M. and C. Mulder (1999). "External Vulnerability in Emerging Market Economies: How High Liquidity Can Offset Weak Fundamentals and the Effects of Contagion," Working Paper No.99/88, IMF.
- Cavoli, T. and R.S. Rajan (2008). "Extent of Exchange Rate Flexibility in India." *India Macro Economics Annual 2007*, pp. 125-140
- Cavoli, T. and R.S. Rajan (2009). *Exchange Rate Regimes and Macroeconomic Management in Asia*, Hong Kong University Press.
- Currency Composition of Official Foreign Exchange Reserves (COFER) database, International Monetary Fund, available at <http://www.imf.org/external/np/sta/cofer/eng/index.htm>
- Dadush, U., D. Dasgupta and D. Ratha (2000). "The Role of Short-term Debt in Recent Crises," *Finance and Development*, 37, pp.54-57.
- De Beaufort Wijnholds, J.A.H. and A. Kapteyn (2001). "Reserve Adequacy in Emerging Market Economies," Working Paper No.01/43, IMF.
- ESCAP (2008). "Financial Crisis," *Macroeconomic Policy Brief Series*, Vol.1, No., November.
- Fischer, S. (2001). "Opening Remarks," IMF/World Bank International Reserves: Policy Issues Forum, Washington, DC (April 28).
- Frankel, J. (2009). "New Estimation of China's Exchange Rate Regimes," Working Paper No.14700, NBER.
- Gangopadhyay, A. and E. Behrmann (2009). "India Buys 200 Tons of IMF's Gold Allotment: Move Seen as Effort to Diversity Reserves Away from the Dollar," *The Wall Street Journal*, November 4.
- Kaminsky, G. and C. Reinhart (1999). "The Twin Crises: The Causes of Banking and Balance-of-Payments Problems," *American Economic Review*, Vol.89, pp.473-500.

- Patnaik, I. and A. Shah (2009). "The Difficulties of the Chinese and Indian Exchange Rate Regimes," *The European Journal of Comparative Economics*, Vol.6, pp.157-173.
- Pontines, V. and R.S. Rajan (2009). 'Fear of Appreciation' Not 'Fear of Floating'?" *Foreign Exchange Market Intervention in Emerging Asia*," mimeo, December.
- Rajan, R.S. (2009). *Monetary, Investment and Trade Issues in India*, Oxford University Press.
- Rajan, R.S. and S. Gopalan (2009). "Crises and Capital Flows in Emerging Asia," mimeo (December).
- Ramachandran, M. and N. Srinivasan (2007). "Asymmetric Exchange Rate Intervention and International Reserve Accumulation in India," *Economics Letters*, Vol.94, pp.259-265.
- Reddy, Y.V. (2002). "India's Foreign Exchange Reserves: Policy, Status and Issues," lecture at the National Council of Applied Economic Research, New Delhi (May 10).
- Reinhart, C.M. and K. Rogoff (2004). "The Modern History of Exchange Rate Reinterpretation," *Quarterly Journal of Economics*, Vol.119, pp.1-48.
- Reserve Bank of India (RBI) (2009). *Half Yearly Report on Foreign Exchange Reserves 2008-09*. Department of External Investments and Operations, Mumbai, accessible at <http://rbidocs.rbi.org.in/rdocs/Publications/PDFs/IHYRFRMAR09.pdf>
- Rodrik, D. and A. Velasco (1999). "Short Term Capital Flows," Working Paper No.7364, NBER.
- Roman, D. (2009). "Asia Central Banks Say it with Gold," *The Wall Street Journal*, December 29.
- Treasury International Capital System Data, Office of International Affairs, Department of the Treasury, United States of America, <http://www.treas.gov/tic/>
- World Gold Council (2009), "World Official Gold Holdings," *Reserve Asset Statistics*, December 2009, available at http://www.research.gold.org/reserve_asset/