

## **Brief on “Forex Reserves and Exchange Rate Dynamics”**

**for the session on May 01, 2003 at RBSC, Chennai.**

Reserve adequacy and the choice of exchange rate regime have received significant policy attention in the aftermath of the South East Asian crises, against the backdrop of increasing globalisation of emerging economies, surges in capital flows, and the increasing vulnerability of emerging markets to external shocks and contagion. International institutions also place considerable emphasis on these two aspects of domestic macroeconomic policy while striving simultaneously to strengthen initiatives on crises prevention and resolution at the global level.

In India, the period 1990-2002 has been a “journey from *agony to comfort* in matters relating to forex reserves; the threat of national humiliation as well as discomfoting relations with foreign agencies obviously touched on personal pride”. Over this period, without adding much to the stock of external debt, there has been a quantum jump in forex reserves. This position needs to be contrasted with the 1980s, when external debt, especially short-term debt, mounted while the forex reserves got depleted. In fact, it is often held that, between 1956 and 1992, India faced balance of payments constraints in all but six years, while during the last ten years, there has never been a feeling of vulnerability to external crises, despite the fact that the period coincided with liberalization of external account and experienced both global currency crises and domestic political/other uncertainties.

### **What are Forex Reserves?**

According to the Balance of Payments Manual, (and Guidelines on Foreign Exchange Reserve Management, IMF, 2001) reserves are “ external assets that are readily available to and controlled by monetary authorities for direct financing of external payments imbalances, for indirectly regulating the magnitudes of such imbalances through intervention in exchange markets to affect the currency exchange rate, and/or for other purposes”.

In the aftermath of the South East Asian crises (particularly the experience of Thailand and Korea that brought to the fore the fact that net reserves could be much less than gross reserves), the standard approach for measuring international reserves takes into account the unencumbered international reserve assets of the monetary authority. Furthermore, the foreign currency and the securities held by the public - including the banks and corporate bodies - are not accounted for in the definition of official holdings of international reserves.

### **Why Hold Forex Reserves?**

Broadly, there could be three motives determining reserve demand, *i.e.*, transaction, speculative and precautionary motives. Transaction demand could arise for financing genuine underlying transactions. In a market determined exchange rate regime, a large part of such demand could be met from the market. Only day to day mismatch in market demand and supply may affect demand for official reserves, depending on the stance on

exchange rate. Uncertainties – arising from both external and internal shocks – may raise the precautionary demand in the market, which may get reflected in the form of large leads and lags. Since large fluctuations in precautionary demand can cause volatility in exchange rate, the net market demand would raise the demand for official reserves. Finally, the activities of the speculators (who can borrow from the money market at cheaper rates and take long positions in foreign exchange in anticipation of major depreciation in the exchange rate) can induce significant volatility, and therefore, such demand needs to be fully absorbed through official reserves. Official reserve demand, thus, is a mirror of exchange rate regime. In more flexible regimes, the impact of the three motives would affect the exchange rate rather than reserve levels. In managed float regimes (as is currently being practiced in India), however, changes in reserve levels would absorb the net impact of the three motives and thereby insulate the exchange rate. Thus, there is a dynamic interaction between the policies on reserves and exchange rate regime.

While the monetary authority could be the custodian of the reserves, the sovereign government - the principal – may have the right over any final decision on reserves. For the monetary authority, the reserve policy should not ideally conflict with the monetary policy objectives. In the presence of fiscal dominance (with RBI as the debt manager) and a managed float exchange rate regime (with RBI managing the exchange rate on behalf of the Govt.), both exchange rate and reserve policies have implications for monetary management.

The broad objectives guiding the policy on reserves in India include: (a) maintaining confidence in monetary and exchange rate policies, (b) enhancing capacity to intervene in forex markets, (c) limiting external vulnerability by maintaining foreign currency liquidity to absorb shocks during times of crisis including national disasters or emergencies; (d) providing confidence to the markets especially credit rating agencies that external obligations can always be met, thereby reducing the overall costs at which forex resources are available to all the market participants, (e) establishing a buffer to deal with contagion, and (g) adding to the comfort level in the market that could help in development of the market, particularly by discouraging destabilizing speculation.

### **How large is large enough?**

Until the balance of payments crisis of 1991 India's approach to reserve adequacy was essentially based on the traditional approach, i.e., to maintain an appropriate level of import cover. The approach underwent a paradigm shift with the adoption of the recommendations of the High Level Committee on Balance of Payments (Chairman: Dr. C. Rangarajan). The Report articulated an integrated view of the issues and made specific recommendations on foreign currency reserves.

"It has traditionally been the practice to view the level of desirable reserves as a percentage of the annual imports - say reserves to meet three months imports or four months imports. However, this approach would be inadequate when a large number of transactions and payment liabilities arise in areas other than import of commodities. Thus, liabilities may arise either for discharging short-term debt

obligations or servicing of medium-term debt, both interest and principal. The Committee recommends that while determining the target level of reserve, due attention should be paid to the payment obligations in addition to the level of imports. ...(adequacy should also be guided by) the need to ensure a reasonable level of confidence in the international financial and trading communities about the capacity of the country to honour its obligations and maintain trade and financial flows; the need to take care of the seasonal factors in any balance of payments transaction with reference to the possible uncertainties in the monsoon conditions of India; the amount of foreign currency reserves required to counter speculative tendencies or anticipatory actions amongst players in the foreign exchange market; and the capacity to maintain the reserves so that the cost of carrying liquidity is minimal."

With the introduction of market determined exchange rate regime, the emphasis on import cover had to be supplemented with the objective of containing volatility in the exchange rate. As a result, intervention requirement to deal with exchange market pressure also emerged as a key determinant of reserve adequacy. The importance of this determinant increased manifold in the post Asian crises period when pure contagion was seen a serious source of volatility. Furthermore, the quality of reserves also became an issue and drawing on the lessons from Korea and Thailand the Reserve Bank's Annual Report for 1997-98 noted that unencumbered reserve assets (defined as reserve assets net of encumbrances such as forward commitments, lines of credit to domestic entities, guarantees and other contingent liabilities) must be available at any point of time to the

authorities for fulfilling various objectives assigned to reserves. Since then, the RBI's policy has been to keep forward liabilities at a relatively low level as a proportion of gross reserves. The Annual Report for 1999-2000 was emphatic that "The policy for reserve management is built upon a host of identifiable factors and other contingencies, including, *inter alia*, the size of the current account deficit and short term liabilities (including current repayment obligations on long-term loans), the possible variability in portfolio investment, and other types of capital flows, the unanticipated pressures on the balance of payments arising out of external shocks and movements in repatriable foreign currency deposits of non-resident Indians."

In the statement on Monetary and Credit Policy (April 29, 2002) a comprehensive view on the approach to reserve management was elaborated as:

"a sufficiently high level of reserves is necessary to ensure that even if there is prolonged uncertainty, reserves can cover the "liquidity at risk" on all accounts over a fairly long period. ...leaving aside short-term variations in reserves level, the quantum of reserves in the long-run is in line with the growth of the economy, the size of risk-adjusted capital flows and national security requirements. "

The Report of the Committee on Capital Account Convertibility, 1997 (Chairman: S. S. Tarapore) suggested four alternative measures to assess reserve adequacy: (i) import cover of six months; (ii) import cover of three months plus 50 per cent of annual debt service payments plus one month's imports and exports to take into account the possibility of leads and lags; (iii) ratio of short-term debt and stock of portfolio investment related non-

debt liabilities to reserves at not more than 60 per cent; and (iv) the net foreign exchange assets to currency ratio (NFA/currency ratio) at around 70 per cent with a minimum of 40 per cent for this ratio to be stipulated by the RBI Act. In recent times, Pablo Guidotti has suggested that emerging market economies must maintain usable forex reserves exceeding scheduled amortisation of foreign currency debts falling due (assuming no roll-overs) during the following year. The concept of 'usable reserves' merits particular attention in view of the developments experienced by Korea and Thailand during the 1997 crisis. A large part of the gross reserves was not available to the authorities to defend the falling exchange rates. Greenspan (1999) suggested a 'liquidity-at-risk' rule and observed that "countries could be expected to hold sufficient liquid reserves to ensure that they could avoid new borrowing for one year with a certain *ex ante* probability, such as 95 per cent of the time".

### **Reserve adequacy- an interpretation using economic theory**

Optimal reserves, according to theoretical interpretation, imply the level at which marginal social cost equals marginal social benefit. While the benefits are generally the objectives that are achieved through a policy on reserves, costs of reserve holding could be manifold. In the absence of any unique definition of the (opportunity) cost, one comes across several interpretations in the literature, the applicability of which depends on the particular economic context. When an economy is both foreign exchange and saving constrained, the opportunity cost could be the rate of return on domestic investment (assuming that the foreign exchange used to finance unsatiated investment demand would have fetched the return on domestic investment). When an economy is only foreign

exchange constrained, the opportunity cost could be in terms of foregone consumption. When an economy is not foreign exchange constrained ( *i.e.*, all productive forex demand are met before the reserves are built up), the opportunity cost would depend on the difference between the cost of borrowing and the return on reserve assets. If high cost borrowings are used to build reserves on which modest returns are obtained because of the emphasis on safety and liquidity of reserve assets, such reserve build-up policies may prove more costly. Another form of cost - often known as the quasi-fiscal cost - arises from the higher rate of return on domestic assets *vis-à-vis* foreign assets. Since sterilised intervention gives rise to an offsetting change in the domestic asset holding of a central bank when its foreign assets increase, the overall profits arising from the total asset portfolio of the central bank's balance sheet may decline. As a result, the profits transferred to the Government -which represents a major source of non-tax revenue for the Government - may decline. For countries operating with large fiscal imbalances, such a decline in non-tax revenue could prove more costly, forcing a higher mobilisation of tax revenue or a cut in expenditure that may affect growth and development.

### **Management of International Reserves**

In the management of reserves, the benefits and costs of reserve holding are constantly assessed. On the benefits, recent international financial crises have shown that holding and managing sufficient reserves and disclosing adequate information to markets helps a country to prevent external crises, especially those stemming from the capital account. The growing appreciation of the role of reserves in crises prevention and as a buffer to manage exchange market pressures has given reserve management a more central role in

national economic policies now than before. In the deployment of reserves, the primary emphasis is laid on liquidity and safety without completely disregarding the consideration of return. There is also greater informal coordination between debt management and reserve management policies. As part of the IMF's Special Data Dissemination Standards (SDDS) requirements, India has also transparently disseminated information on reserves.

### **The dynamics between reserves and exchange rates**

While operationally the level of reserves is essentially a result of sale and purchase transactions, attaining the desired level of reserves in itself is also one of the objectives of exchange rate policy. In other words, the managed float regime allows a policy of adequate reserve build-up while also The exchange rate is determined by the market, i.e. forces of demand and supply. The objectives and purposes of exchange rate management are to ensure that economic fundamentals are reflected in the external value of the rupee as evidenced in the sustainable current account deficit. Subject to this general objective, the conduct of exchange rate policy is guided by three major purposes: first, to reduce excess volatility in exchange rates, while ensuring that the movements are orderly and calibrated; second, to help maintain an adequate level of foreign exchange reserves and third, to help eliminate market constraints with a view to the development of a healthy foreign exchange market. Basically, the policy is aimed at preventing destabilizing speculation in the market while facilitating foreign exchange transactions at market rates for all permissible purposes. RBI makes sales and purchases of foreign currency in the forex market, basically to even out lumpy demand or supply in the thin forex market; large lumpiness in demand is mainly on account of oil imports, leads and lags and

external debt servicing on Government account. Such sales and purchases are not governed by a predetermined target or band around the exchange rate.

### **The forex market**

The forex market in India is skewed with a handful of public-sector banks accounting for the major share of the merchant transactions and the private and foreign banks having a greater share of inter-bank business. It is conducive for healthy market development to have much larger number of players active in the market with enhanced volumes of business. Forex derivatives have not picked up sufficiently. The development of a vibrant derivatives market in India would critically depend on the growth in the rupee based derivative products, which in turn depends on a well developed and liquid forward dollar-rupee market. This would in turn require development of a deep and liquid inter-bank term money market.

### **Trade-offs associated with managed float regime**

In the debate on the choice of an appropriate exchange rate regime, one often comes across the impossible trinity, namely, full Capital Account Convertibility, (CAC), Monetary Independence (for achieving the objective of inflation control or output stabilisation), and a fixed/managed exchange rate. If CAC is accepted, you either have the choice of giving up monetary independence and persist with a managed regime, or go for full floating and as a result retain monetary policy independence. and setting up a Currency Board or give up the stable currency objective and let the exchange rate float freely so that monetary policy can then be directed to the objectives of inflation control.

In practice, a number of countries (including India) prefer to operate with intermediate regime characterised by elements of fixity and floating, with capital controls and sterilization being used occasionally to regain monetary policy independence. Despite the theoretical arguments justifying the relevance of corner solutions, intermediate regimes have served the requirements of countries. In fact, every regime can be vulnerable to crisis and there is no single regime that can be appropriate for all countries at all points of time.

The “fear of floating” has been a genuine concern for many emerging markets, particularly because of the financial instability that may entail large output and employment loss. Despite the growing recognition that fixed regimes are more prone to attacks and, as a result, there has been a movement in the direction of greater flexibility, fear of floating still dominates the policy perception, giving rise to preference for intermediate regimes. Furthermore, as noted by Governor, “part of the reason why countries are concerned about exchange rates is psychological, and part real. Psychological – because of headline effect of a depreciating currency – “all time low”, “weak”, “tumbling” creates a negative impact about the soundness of a country’s currency. For an ordinary man or woman on the street and the political leaders who represent them, it becomes a matter of concern as nobody wants his country’s economy or currency to be weak or tumbling. However, irrational it may be, it is a fact which has to be reckoned with by all Central Banks. It would be nice if there was a new terminology to describe movements in exchange rates which is less emotive and less sensational.”

Part of the reason for concern with exchange rates is also real, as seen in East Asia, Russia and elsewhere. The contagion effect is quick and a sharp change in the currency value can affect the real economy. Exporters may suffer if there is unanticipated sharp appreciation and debtors or other corporates may be affected badly if there is a sharp depreciation, which can also lead to bank failures and bankruptcies.

**Determinants of exchange rate- Growing importance of capital flows.**

In the literature, one comes across a host of factors which can potentially drive the exchange rate, which include inflation differentials (i.e. the PPP argument), interest rate differential (i.e. the interest parity conditions), productivity differentials (i.e. the Balassa Samuelson effect), money stock dis-equilibrium (i.e. the monetary approach to exchange rate), demand supply mismatch in the forex market, destabilizing speculation, influence of pure contagion, and windfall gains (and the associated Dutch disease effect). In developing countries, the exchange rate development is generally assessed in the context of developments in the current account, because that the size of the current account deficit represents a critical source of vulnerability. In the 1990s, as a number of emerging markets experienced surges in capital flows, the dominance of current account developments in influencing the exchange rate was taken over by capital flows. In India, the recent surge in overall balance surplus/increase in reserves and the associated appreciating pressure on the exchange rate amply demonstrate this point. Surplus in both current and capital account justify an appreciation of the exchange rate. For the long-run sustainability of the external sector (which depends on external competitiveness of exports), however, prevention of nominal appreciation appears important.

## **Exchange rate policy of India**

As noted by Governor, “India has "managed" floating with no fixed rate target. Daily movements are watched by the Reserve Bank very closely. Our markets are relatively thin, and the declared policy of the Reserve Bank is to meet temporary demand-supply imbalances which arise from time to time. For example, in the current period, because of extra-ordinary rise in oil prices, RBI has been meeting the oil import requirements of IOC directly as also debt service requirements. Our objective is to keep market movements orderly and ensure that there is no liquidity problem or rumour or panic- induced volatility.” On the choice of appropriate regime, he referred to a study by Calvo and Reinhart which concluded that *" all that we can say is that, when it comes to exchange rate policy, discretion rules the day."*

A related issue that is often debated in the context of India is the possibility of exchange rate policy being driven by some form of implicit/explicit REER target. Governor was emphatic in this context that “An issue that has figured in the literature is that if some management of the exchange rate is required, what is it that we should be monitoring – nominal or REER? From a competitive point of view and also in the medium term perspective, it is the REER which should be monitored as it reflects changes in the external value of a currency in relation to its trading partners in real terms. However, it is no good for monitoring short-term and day-to-day movements as "nominal" rates are the ones which are most sensitive of capital flows and also attract the most headlines. Thus, in the short-run, there is no option but to monitor nominal rate.”

## **Objectives and Purposes of Exchange Rate Management**

As noted by former DG Dr. Reddy, the main objective of India's exchange rate policy is to ensure that economic fundamentals are reflected in the external value of the rupee. Subject to this predominant objective, the conduct of exchange rate policy is guided by three major purposes.

First, to reduce excess volatility in exchange rates, while ensuring that the market correction of overvalued or undervalued exchange rate is orderly and calibrated.

Second, to help maintain an adequate level of foreign exchange reserves.

Third, to help eliminate market constraints with a view to the development of a healthy foreign exchange market.

Let us relate the above approach to the current context.

## **The path to exchange rate flexibility of the Indian Rupee**

As underscored by ED Ms. Udeshi, “In the external sector, India is marked out as a country which has opted for a gradual and measured liberalisation. I would in no way wish to be an apologist for our approach. In fact, we are now recognised internationally as a model country that has calibrated well the liberalisation of its external sector without any significant backtracking.”

The exchange rate policy has been fashioned, more specifically since 1992, to enhance the role of market forces without allowing disruptive market forces to exert major influence on the exchange rate. The major change came about in 1992 with LERMS and subsequently unified exchange rate in 1993 when RBI withdrew from fixing daily prices in currency. While the unification of exchange rates and a market determined exchange rate regime was a major step in the liberalisation process there was also progressive liberalisation of transactions both on current and capital accounts. The introduction of the direct quotation system in 1993 and the termination of RBI announcing its buying and selling rates in 1995 were important milestones in moving towards a market determined exchange rate. The dilemma posed to the policy makers since then has been to manage volatility without deviating from the path of market orientation. To contain volatility, the RBI has resorted to a combination of monetary policy and administrative measures together with intervention.

### **What role for fundamentals?**

In flexible regimes, market forces often tend to take the exchange rate level to a point where it may become highly inconsistent with the underlying fundamentals. As noted by the Bank of England Governor in 2002: "...The recent volatilities seen in the financial markets are frustrating. The movements are disjointed from the economic fundamentals."

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US Treasury Secretary had also stated in 2002 that "... The people who benefit from roiling the world currency market are speculators and as far as I am concerned they

provide not much useful value...” And finally, Greenspan had rightly highlighted the role of irrational exuberance. The RBI, therefore, has to keep in view these realities while crafting its strategy for achieving the goal of orderly markets without injuring the genuine interests of the market players.

### **Phases of exchange market pressures in India**

The experience with the market determined exchange rate regime has been satisfactory, although the exchange rate management had to occasionally contend with a few episodes of volatility. The period from March 1993 till August 1995 was a phase of significant stability. Capital inflows coupled with robust export growth exerted upward pressure on the exchange rate. However, the Reserve Bank absorbed the excess supplies of foreign exchange. In the process, the nominal exchange rate of the Rupee *vis-à-vis* the US Dollar remained virtually unchanged at around Rs.31.37 per US Dollar over the extended period from March 1993 to August 1995. The real appreciation that resulted from the positive inflation differentials prevailing during this period triggered off market expectations and resulted in a market led correction of the exchange rate of the Rupee during September 1995-February 1996. In response to the upheavals, the Reserve Bank intervened in the market and also resorted to monetary tightening so as to restore orderly conditions in the market after a phase of orderly correction for the perceived misalignment.

The period from 1997 witnessed a number of adverse internal as well as external developments. The important internal developments included the economic sanctions imposed in the aftermath of nuclear tests conducted during May 1998 and the border

conflict during May-June 1999. The external developments included, *inter alia*, the contagion from the Asian crisis, the Russian crisis during 1997-98, sharp increases in international crude oil prices in the period beginning with 1999, especially May 2000 onwards, and the post-September 11, 2001 developments in the US. These developments created a large degree of uncertainty in the foreign exchange market at various points of time, leading to excess demand conditions in the market. The Reserve Bank responded through appropriate intervention supported by monetary and other administrative measures like variations in the bank rate, repo rate, cash reserve requirements, refinance to banks, surcharge on import finance and minimum interest rates on overdue export bills. These measures helped in curbing destabilising speculation, while at the same time allowing an orderly correction of the exchange rate.

#### **A critique of the RBI's policy- an external academic view**

The high reserve/ no nominal appreciation policy of the RBI has been viewed by some as a costly measure for the economy and it is, therefore, appropriate to examine in greater detail the relevance of such concerns in the context of the overall approach pursued by India for its capital account in particular and the external sector in general.

A recent paper entitled "The Growth Slowdown: Real Exchange Rate Misalignment, Fiscal Deficits and Capital Inflows" by Deepak Lal, Suman Bery and DK Pant (2003) has been particularly critical of the RBI's policies relating to the management of the exchange rate, capital account and foreign exchange reserves. In the RBI's Report on Currency and Finance for 2001-02, the response of the DEAP has been offered on each of the major issues raised in that paper.

According to the paper, India could have attained a higher growth trajectory in the absence of its high foreign exchange reserves and fiscal deficits. The policy of preventing complete market absorption of entire capital flows through high reserves and the crowding-out effects associated with fiscal deficits might have involved considerable sacrifice of growth – in the range of 1 to 6 per cent in different years in the 1990s. According to the authors, the entire foreign capital can be absorbed by allowing the real exchange rate to appreciate (which presumably would widen the current account deficit to a level where it would completely absorb the capital flows). The real appreciation could come either by allowing the nominal exchange rate to appreciate or by allowing prices to increase (*i.e.* non-sterilised reserve build-up which will increase the money supply and thereby give rise to both higher inflation and lower interest rates – both of which can increase absorption). On the basis of their findings they make the following policy recommendations: (a) instead of reserve management policy one should concentrate on appropriate monetary and exchange rate policies that could boost growth, (b) have a tighter fiscal policy (to contain the crowding out effect) and a looser monetary policy (by non-sterilisation of reserves that could increase prices and lower interest rates – both of which can raise absorption of foreign capital), (c) high reserves and low domestic inflation provide the right environment against which the rupee can be made fully convertible on the capital account, and (d) abandon the managed exchange rate regime by full float.

An informed and rational assessment of these issues would suggest the following:

- With full absorption, given the incremental capital output ratio of close to 4, additional investment of about 2 per cent of GDP made possible by capital flows could have, at best, yielded additional growth of about 0.5 per cent (not 1 to 6 per cent as has been estimated by the authors of the paper).
- The extra 0.5 per cent growth, however, would have been attained against a macroeconomic scenario characterized by no increase in reserves (since the entire inflows would have been absorbed) and a flexible exchange rate (with large real appreciation). The experience of the emerging market crises in the last one decade shows that with low reserves and appreciated real exchange rate, India would have also faced a similar (or even more severe) crisis. On an average, the crisis years witnessed a growth reversal of more than 6 to 7 per cent in all the crisis affected countries. In other words, the extra 0.5 per cent growth attained by India over several years by pursuing the policy recommended by the authors would have been more than reversed in just one year.
- One needs to recognize that even if REER appreciation is allowed to ensure full absorption of foreign capital, it is important to examine whether the full absorption (*i.e.* through a higher current account deficit) would result from an increase in imports or a major fall in exports. Given the asymmetric response of exports and imports to price changes brought about by REER appreciation, it is possible that a higher CAD would be attained more by fall in exports than the increase in imports. It needs no emphasis that the external sector

sustainability hinges critically on the performance of the export sector, and in the face of zero reserves resulting from full absorption (as recommended by the authors) weak export growth could be a strong source of vulnerability to crisis. On the other hand, even if imports increase in response to exchange rate appreciation, it is possible that import demand may just replace domestic demand, and as a result aggregate demand may remain unaltered. In other words, when imports are not driven by overall demand conditions (as is the case now) but they are encouraged through a policy of exchange rate appreciation (as recommended by the authors), imports may only compete with domestic supply and in the face of no increase in aggregate demand, the higher absorption through cheaper imports could displace some of the domestic manufacturers and thereby lower growth. Thus, growth gained through full absorption could be offset by lower growth resulting from displacement of domestic producers.

- Lessons from past crises in emerging markets suggest that foreign capital should not be allowed to either give rise to excessive consumption or excessive investment just to ensure full absorption. When foreign capital finances consumption demand (as in Mexico) or sustains an investment driven overheating (as in South East Asia), higher growth can only come at the cost of a severe financial crisis. High reserves, a managed-flexible exchange rate regime, and cautious liberalization of the capital account, together aim at preventing a crisis. In India, reserves have not been accumulated with an

intention to compress absorption, rather in the absence of adequate demand reserve accumulation has been adopted as the preferred policy.

- Sterilisation is a strong instrument to regain monetary independence, that allows a policy of reserve build-up without any adverse monetary implications. Sterilisation has been used successfully so far in India; however, there is a concern that limits to sterilization could be encountered by the RBI over time if the surplus position in the market persists (due to declining stock of domestic securities at the disposal of the RBI which could constrain open market operations). Effectively, there could be no limit to sterilization because anyone of the following alternatives can be employed by a Central Bank if the need arises.

- (a) Interest-bearing money stabilisation bonds/notes/bills issued by the Central Banks;
- (b) Acceptance of deposits from the commercial banks at the market rate of interest;
- (c) Foreign exchange swaps;
- (d) Shifting of government/public sector deposits from commercial banks to the central bank;
- (e) Higher CRR;
- (f) Unremunerated reserve requirement; and
- (g) Use of interest equalisation tax.

- Real appreciation has been prevented in India through both reserve build-up and sterilization (the former preventing nominal appreciation and the latter preventing higher inflation). Excessive consumption/investment has been prevented by maintaining the CAD within sustainable levels. Thus, both the channels through which the Dutch disease can spread have been effectively regulated and their impact on the economy has been contained. With stronger recovery in demand, the surplus condition created by strong growth in remittances and software exports as well as capital flows would be absorbed automatically, reducing the scope for any “Dutch disease” effect and the need for any larger than desirable level of reserve build-up.
- Decision on further opening of the capital account needs to be based on entrenchment of preconditions, particularly fiscal consolidation and stronger financial system, and liberalization of capital account should not be viewed as a means to deal with the problem of temporary surplus.
- Most importantly, the need for raising domestic absorption is well recognized and the Tenth Plan document already envisages a current account deficit of 2.8 per cent of GDP to attain a growth target of about 8 per cent. The Report on Currency and Finance for 2000-01 explains in detail the challenge arising from the need to raise the CAD from about 1.0 per cent of GDP in the 1990s to 2.8 per cent of GDP during the Tenth Plan period and the magnitude of capital flows that may be required to finance that order of deficit. In the context of the Tenth Plan requirements, current levels of reserves and capital flows rather

appear inadequate. Even if large capital flows materialize in future to meet the financing gap of 2.8 per cent of GDP, the flows need to be regulated so that the CAD does not expand beyond the sustainable level. Hence, even though in the short-run expanding absorption of foreign capital is a major policy challenge, the overall medium to long-run policy strategy demands that the CAD has to be necessarily maintained within the sustainable level. This has been the greatest lesson from our own crisis in early 1990s. The benefits of higher absorption in the form of growth can be sustained only up to a sustainable level of CAD, beyond which the benefits will be outweighed by costs.

#### **Some Contentious Issues- Is the market right?**

1. Through specific press releases, RBI has explained the sources of reserve accretion. However, there is a market perception that a significant part of the inflows could be hot money/arbitrage capital, which can potentially reverse suddenly.
2. The pressure on the rupee to appreciate and the RBI's policy of discouraging volatility may discourage corporate hedging, leading to large build-up of unhedged exposures. When the market comes under depreciating pressure in future, RBI may have to prevent depreciation as well due to the large impact that any depreciation may have on corporate

balance sheets in the presence of large unhedged exposures. Thus, the exchange rate is likely to become even less flexible in future.

3. Liberalise capital account to deal with the surges in capital flows, even without the attainment of preconditions (including fiscal prudence and stronger financial system).

### **Parity conditions for empirical tests**

#### **Purchasing Power Parity (PPP)**

The simplest approach to test PPP is just a test of stationarity of the **REER**; i.e. deviations from the PPP could be temporary and over time the REER must be mean reverting.

The standard alternative framework is to study the existence of a cointegrating relationship between nominal exchange rate and relative prices; *i.e.*

$$e_t = \alpha + \beta (p_t - p_t^*) + \varepsilon_t$$

where  $\alpha = 0$ ,  $\beta = 1$  and  $\varepsilon_t$  is independently and identically distributed (IID).

Stationarity of  $\varepsilon_t$  would indicate that deviations from a linear combination of  $e_t$  and  $(p_t - p_t^*)$  will be mean reverting and, therefore,  $e_t$  and  $(p_t - p_t^*)$  are tied together in the long run.

Since for establishing co-integration all the relevant variables should be of the same order of integration, the following two alternative specifications in levels and first-difference could also be estimated :

$$e_t = \alpha + \beta_1 p_t + \beta_2 p_t^*$$

$$\Delta e_t = \alpha + \beta_1 \Delta p_t + \beta_2 \Delta p_t^*$$

with  $\beta_1 = -\beta_2 = 1$  and  $\alpha = 0$ .

### **Covered Interest Parity (CIP)**

In efficient markets, forward rates must be unbiased predictors of future spot rates and no excess returns should exist in the markets. Since at time  $t$ , the information that could be available by time  $t+1$  is not known, the best forecast of the exchange rate at time  $t+1$  has to be based on the information set available at time  $t$ . Any new information flow between time  $t$  and  $t+1$  is assumed to be random. At time  $t$ , however, the investor may know his required rate of return ( $r$ ) to hold any asset and therefore the price of an asset at time  $t+1$  must be :

$$a_{t+1} = (1+r) a_t + \varepsilon_t, \text{ where } \varepsilon_t \text{ is random and hence } E(\varepsilon_t) = 0$$

Given this efficiency condition, the relationship between  $k$ -period ahead spot exchange rate and the  $k$ -period forward rate prevailing at time  $t$  could be :

$$e_{t+k} = \beta_0 + \beta_1 f_{k,t} + u_{k,t}$$

with  $\beta_0 = 0$ ,  $\beta_1 = 1$

given  $(r_{d,t+k} - r_{f,t+k}) = a + b (fp_{k,t})$

### Uncovered Interest rate Parity (UIP)

Given the joint assumption of risk neutrality and rational expectations, according to UIP the expected change in the exchange rate should converge to the interest rate differentials.

For empirical tests, either of the following two equations could be estimated :

$$e_{t+k} = \alpha_0 + \alpha_1 e_t + \alpha_2 (i - i^*)_t + u_{t+k}$$

$$\Delta e_{t+k} = \beta_0 + \beta_1 (i - i^*)_t + v_{t+k}$$

with  $(\alpha_0, \alpha_1 \text{ and } \alpha_2) = (0, 1, -1)$  and  $(\beta_0, \beta_1) = (0, 1)$

When CIP holds, the second equation can also be written as

$$\Delta e_{t+k} = \beta_0 + \beta_1 fp_{k,t} + v_{t+k}$$

### Fisher's Real Interest Rate Parity (FRIP)

Assuming market efficiency and constant real interest rates, FRIP suggests that nominal exchange rate changes essentially reflect revisions in inflation expectations. In other words, nominal interest rates and expected inflation must exhibit a strong positive co-movement. The equation for empirical test of FRIP could be

$$i_t = \alpha + \beta \Delta p_{t+1} + u_t$$

where  $\alpha$  is the constant real interest rate and  $u_t$  is the error explaining the difference between actual interest rate and the expected inflation.

**Capital Asset Pricing Model (CAPM)**

In the above parity conditions, deviations from parity could be on account of the presence of time varying risk premiums which, in turn, must represent compensation for the systematic risk in terms of the Capital Asset Pricing Model(CAPM).