VI FOREIGN EXCHANGE MARKET

6.1 Globally, operations in the foreign exchange market started in a major way after the breakdown of the Bretton Woods system in 1971, which also marked the beginning of floating exchange rate regimes in several countries. Over the years, the foreign exchange market has emerged as the largest market in the world. The decade of the 1990s witnessed a perceptible policy shift in many emerging markets towards reorientation of their financial markets in terms of new products and instruments, development of institutional and market infrastructure and realignment of regulatory structure consistent with the liberalised operational framework. The changing contours were mirrored in a rapid expansion of foreign exchange market in terms of participants, transaction volumes, decline in transaction costs and more efficient mechanisms of risk transfer.

6.2 The origin of the foreign exchange market in India could be traced to the year 1978 when banks in India were permitted to undertake intra-day trade in foreign exchange. However, it was in the 1990s that the Indian foreign exchange market witnessed far reaching changes along with the shifts in the currency regime in India. The exchange rate of the rupee, that was pegged earlier was floated partially in March 1992 and fully in March 1993 following the recommendations of the Report of the High Level Committee on Balance of Payments (Chairman: Dr.C. Rangarajan). The unification of the exchange rate was instrumental in developing a market-determined exchange rate of the rupee and an important step in the progress towards current account convertibility, which was achieved in August 1994.

6.3 A further impetus to the development of the foreign exchange market in India was provided with the setting up of an Expert Group on Foreign Exchange Markets in India (Chairman: Shri O.P. Sodhani), which submitted its report in June 1995. The Group made several recommendations for deepening and widening of the Indian foreign exchange market. Consequently, beginning from January 1996, wide-ranging reforms have been undertaken in the Indian foreign exchange market. After almost a decade, an Internal Technical Group on the Foreign Exchange Market (2005) was constituted to undertake a comprehensive review of the measures initiated by the Reserve Bank and identify areas for further liberalisation or relaxation of restrictions in a medium-term framework.

6.4 The momentous developments over the past few years are reflected in the enhanced risk-bearing capacity of banks along with rising foreign exchange trading volumes and finer margins. The foreign exchange market has acquired depth (Reddy, 2005). The conditions in the foreign exchange market have also generally remained orderly (Reddy, 2006c). While it is not possible for any country to remain completely unaffected by developments in international markets, India was able to keep the spillover effect of the Asian crisis to a minimum through constant monitoring and timely action, including recourse to strong monetary measures, when necessary, to prevent emergence of self-fulfilling speculative activities (Mohan, 2006a).

6.5 Against the above background, this chapter attempts to analyse the role of the central bank in developing the foreign exchange market. Section I provides a brief review of different exchange rate regimes being followed in emerging market economies (EMEs). Section II traces the evolution of India's foreign exchange market in line with the shifts in India's exchange rate policies in the post-independence period from the pegged to the market determined regime. Various regulatory and policy initiatives taken by the Reserve Bank and the Government of India for developing the foreign exchange market in the market determined set up have also been highlighted. Section III presents a detailed overview of the current foreign exchange market structure in India. It also analyses the available market infrastructure in terms of market players, trading platform, instruments and settlement mechanisms. Section IV assesses the performance of the Indian foreign exchange market in terms of liquidity and efficiency. The increase in turnover in both onshore and offshore markets is highlighted in this section. Empirical exercises have also been attempted to assess the behaviour of forward premia, bid-ask spreads and market turnover. Having delineated the market profile, Section V then discusses the journey of the Indian foreign exchange market since the early 1990s, especially through

periods of volatility and its management by the authorities. As central bank intervention has been an important element of managing volatility in the foreign exchange market, its need and effectiveness in a market determined exchange rate and open capital regime has been examined in Section VI. Section VII makes certain suggestions with a view to further deepening the foreign exchange market so that it can meet the challenges of an integrated world. Section VIII sums up the discussions.

I. EXCHANGE RATE REGIMES IN EMERGING MARKETS

6.6 The regulatory framework governing the foreign exchange market and the operational freedom available to market participants is, to a large extent, influenced by the exchange rate regime followed by an economy. In this section, therefore, we take a look at the exchange rate regimes that the EMEs have adopted during the 1990s.

6.7 The experience with capital flows in the 1990s has had an important bearing on the choice of the exchange rate regime by EMEs in recent years. The emphasis on corner solutions - a fixed peg *a la* the currency board without monetary policy independence or a freely floating exchange rate retaining discretionary conduct of monetary policy - is distinctly on the decline. The trend seems to be clearly in favour of intermediate regimes with country-specific features and with no fixed targets for the level of the exchange rate.

6.8 An important feature of the conduct of monetary policy in recent years has been the foreign exchange market interventions either by the central bank on its own behalf or on behalf of public sector entities to ensure orderly conditions in markets and to fight extreme market turbulence (Box VI.1). Besides, EMEs, in general, have also been accumulating foreign exchange reserves as an insurance against shocks. It is a combination of these strategies which will guide monetary authorities through the impossible trinity of a fixed exchange rate, open capital account and an independent monetary policy (Mohan, 2003). The debate on appropriate policies relating to foreign exchange markets has now converged around some generally accepted views: (i) exchange rates should be flexible and not fixed or pegged; (ii) there is continuing need for many emerging market economies to be able to intervene or manage exchange rates- to some degree - if movements are believed to be destablising in the short run; and (iii) reserves should at least be sufficient to take care of fluctuations in capital flows and liquidity at risk (Jalan, 2003).

6.9 Broadly, the overall distribution of exchange rate regimes across the globe among main categories remained more or less stable during 2001-06, though there was a tendency for some countries to shift across and within exchange regimes (Table 6.1). As at end-April 2006, there were more floating regimes (79 countries including 53 managed floats and 26 independent floats) than soft pegs (60 countries) or hard pegs (48 countries) (Exhibit VI.1). Managed floats are found in all parts of the globe, while conventional fixed pegs are mostly observed in the Middle East, the North Africa and parts of Asia. On the other hand, hard pegs are found primarily in Europe, Sub-Saharan Africa (the CFA zones) and small island economies (for instance, in the Eastern Caribbean). While 20 countries moved from a soft peg to a floating regime during the past four years, this was offset by a similar number of other countries abandoning the floating arrangements in favour of soft pegs.

6.10 The substantial movement between soft pegs and floating regimes suggests that floating is not necessarily a durable state, particularly for lower and middle-income countries, whereas there appears to be a greater state of flux between managed floating and pegged arrangements in high-income economies. The frequency with which countries fall back to pegs after a relatively short spell in floating suggests that many countries face institutional and operational constraints to floating. The preference for tighter management seems to have intensified recently as a number of countries have enjoyed strong external demand and capital inflows. Other notable trends included a shift away from currency baskets, with the US dollar remaining the currency of choice for countries with hard pegs as well as soft pegs. One third of the dollar pegs are hard pegs and the remaining are soft pegs. The choice of the US dollar for countries with soft pegs reflects its continued importance as an invoicing currency and a high share of trade with the US or other countries that peg to the US dollar. The euro is the second most important currency and serves as an exchange rate anchor for countries in Europe and the CFA franc zone in Africa.

6.11 During the last 15 years, there was a general tendency among the emerging market economies to adopt a more flexible exchange rate regime (Table 6.2). In emerging Asia, there is a broad consensus that the soft US dollar peg operated by a

Box VI.1
Exchange Rate Regimes and Monetary Policy in EMEs

Economic literature suggests that, at an aggregated level, the adoption of more flexible exchange rate regimes in Emerging Market (EM) countries has been associated with greater monetary policy independence. EM countries with exchange rate anchors are generally associated with pegged regimes. Here, the exchange rate serves as the nominal anchor or intermediate target of monetary policy. Around 27 per cent of the EM countries followed exchange rate anchors at the end of April 2006 (Table). When the exchange rate is directly targeted in order to achieve price stability, intervention operations are unsterilised with inter-bank interest rates adjusting fully. In Singapore, while pursuing a target band for the exchange rate is the major monetary policy instrument, the central bank's decision on whether to sterilise intervention is made with reference to conditions in the domestic markets[1].

In other regimes, where the exchange rate is not the monetary policy anchor, any liquidity impact of intervention that would cause a change in monetary conditions is generally avoided. Most foreign exchange operations are sterilised. Interventions may also be used in coordination with changes in monetary policy, giving the latter a greater room for manoeuvre. For example, where a change in monetary policy is unexpected, surprising the market can erode confidence or destabilise the market. Intervention may help minimise the costs of surprising financial markets, allowing monetary policy greater capacity to move ahead of market expectations.

Around 17 per cent of the EM countries have adopted monetary aggregate target, most of which are associated with managed floating exchange rate regimes. In the case of a monetary aggregate target, the monetary authority uses its instruments to achieve a target growth rate for a monetary aggregate (reserve money, M1, M2, *etc*.), and the targeted aggregate becomes the nominal anchor or intermediate target of monetary policy.

Around 43 per cent of the EM countries have adopted inflation targeting as their monetary policy regime, where changes in interest rates are the principal instruments of monetary policy. Inflation targeting involves the public announcement of medium-term numerical targets for inflation with an institutional commitment by the monetary authority to achieve these targets. Here, intervention becomes important when movements in the exchange rate inconsistent with economic fundamentals threaten to push inflation outside the target band. However, where the exchange rate is responding appropriately to a "real" shock, it may be necessary either to acknowledge the expected departure from the inflation target for some period of time or to offset the shock by altering monetary policy. Most of the countries with inflation targeting as the monetary policy regime have adopted independent floating as the exchange rate policy. Empirical evidence suggests that most emerging economies that moved to a free float, introduced full-fledged inflation targeting only after a transition. There are other EM countries, *viz.,* Algeria, India, Romania, and Russia, which have no explicitly stated nominal anchor, but rather monitor various indicators in the conduct of monetary policy. In some of the EM countries, coordinating these policies may be more difficult because foreign exchange operations are not the responsibility of the monetary authority. In such instances, the maintenance of a close dialogue between the respective authorities is important in avoiding any conflict arising between monetary and exchange rate policies.

Table: Monetary Policy Framework - April 2006

Exchange Rate Anchor	Monetary Aggregate Target	Inflation Target
Bulgaria	Argentina	Brazil
Ecuador	China	Chile
Egypt	Indonesia	Colombia
Hong Kong	Tunisia	Czech Republic
Malaysia	Uruguay	Hungary
Venezuela		Korea
Morocco		Mexico
Hungary		Peru
		Philippines
		Poland
		South Africa
		Thailand
		Turkey

Source : Annual Report on Exchange Arrangements and Exchange Restrictions, 2006, IMF.

[1] EMEAP Study on Exchange Rate Regimes, June 2001.

number of Asian countries contributed to the regional financial crisis in 1997-98. Since the Asian financial crisis, several Asian economies have adopted more flexible exchange rate regimes except for Hong Kong, which continued with its currency board arrangement, and China, which despite some adjustments, virtually maintained its exchange rate peg to the US dollar. After experiencing some

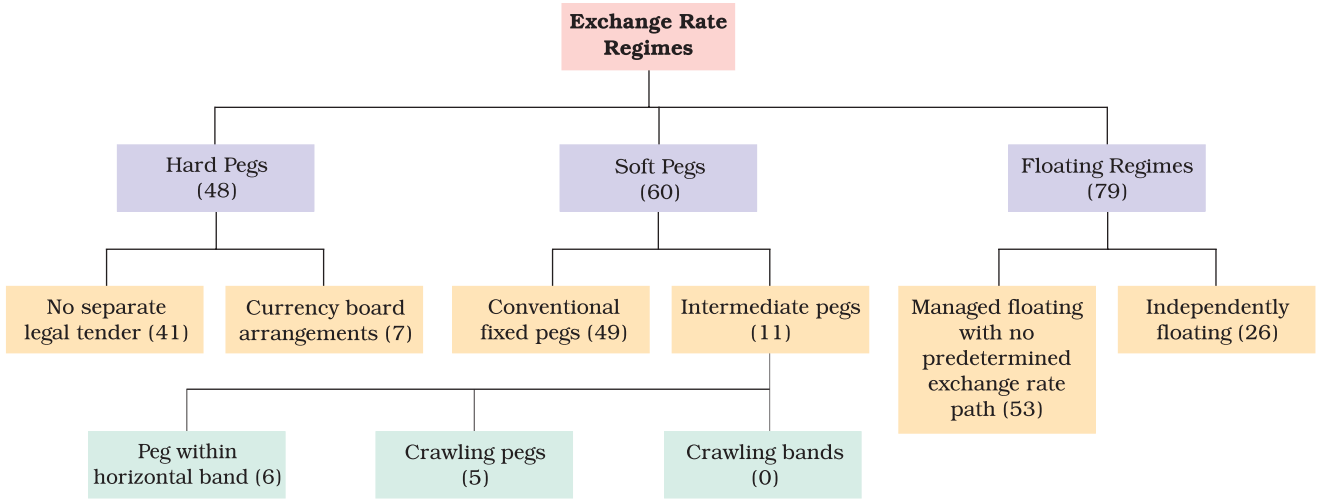
Table 6.1: Evolution of Exchange Rate Regimes, 1996 - April 2006
(Number of countries; end-December data)

Regime	1996	2001	2002	2003	2004	2005	2006 April
1	2	3	4	5	6	7	8
I. Hard Pegs	**30**	**47**	**48**	**48**	**48**	**48**	**48**
No separate legal tender	24	40	41	41	41	41	41
Currency board arrangements	6	7	7	7	7	7	7
II. Soft Pegs	**94**	**58**	**59**	**59**	**59**	**61**	**60**
a. Conventional Pegged arrangements	50	42	46	46	48	49	49
Pegs to Single Currency	36	32	36	38	40	44	44
Pegs to Composite	14	10	10	8	8	5	5
b. Intermediate Pegs	44	16	13	13	11	12	11
Pegged within horizontal bands	18	5	5	4	5	6	6
Crawling Pegs	14	6	5	6	6	6	5
Crawling Bands	12	5	3	3	0	0	0
III. Floating Regimes	**60**	**81**	**80**	**80**	**80**	**78**	**79**
Managed Floating	37	43	45	46	49	52	53
Independently Floating	23	38	35	34	31	26	26

Note : To ensure comparability, all data are based on the current *de facto* methodology applied retroactively, unless otherwise specified.
Source : Annual Report on Exchange Arrangements and Exchange Restrictions, 2006, IMF and other sources.

transitional regime, Malaysia started pegging to the US dollar on September 1, 1998, but shifted over recently (July 2005) to a managed float regime. In contrast, Thailand, Indonesia, Korea, the Philippines and Taiwan have floated their currencies since the crisis, while adopting a monetary policy strategy based on inflation targeting. The Monetary Authority of Singapore (MAS) continues to monitor the Singapore dollar against an undisclosed basket of currencies of Singapore's major trading partners and competitors. The Taiwanese government replaced its earlier managed foreign exchange rate by a floating rate in 1989, consequent to an increase in its trade surplus and the resulting rise in the foreign exchange reserves.

Exhibit VI.1: *De Facto* Exchange Rate Regime of Fund Members



Source: Annual Report on Exchange Arrangements and Exchange Restrictions, 2006, IMF.

Table 6.2: Emerging Market Countries: Transition to More Flexible Exchange Rate Regimes: 1990 - April 2006

Transition Type	Country	
1	2	
Move towards a more flexible exchange rate regime	Algeria	Korea
	Argentina	Mexico
	Brazil	Peru
	Chile	Poland
	Colombia	Romania
	Czech Republic	Russia
	Egypt	Slovakia
	India	Thailand
	Indonesia	Turkey
Move towards a less flexible exchange rate regime	China	Uruguay
	Malaysia	
	Hong Kong	
	Ecuador	
	Venezuela	
	Bulgaria	

Note : The Classification of the countries' exchange rate regimes is based on the IMF's de facto classification and does not necessarily represent the views of the authorities.

Source: Annual Report on Exchange Arrangements and Exchange Restrictions, IMF, various issues.

6.12 Most of the Latin American economies have a history of very high inflation rates. As such, inflation control has been a major objective of exchange rate policies of these countries in recent years. Starting from the end of 1994, a floating rate policy was maintained in Mexico, with the Bank of Mexico intervening in the foreign exchange market under exceptional circumstances to minimise volatility and ensure an orderly market. Chile adopted exchange rate flexibility in 1999, after experiencing an exchange rate band for the previous 17 years starting from 1982. After pursuing various forms of exchange rate pegs for more than four decades, which included occasional devaluation as also a change of the currency, Argentina had to finally move away from its currency board linked to the US dollar in January 2002. Brazil, after having a floating exchange rate regime with minor interventions in 1990s, adopted an independently floating exchange rate regime in the aftermath of its currency crisis in 1999[2].

6.13 An analysis of the complexities, challenges and vulnerabilities faced by EMEs in the conduct of exchange rate policy and managing volatilities in foreign exchange market reveal that the choice of a particular exchange rate regime alone cannot meet all the requirements. The emerging consensus is that for successful conduct of exchange rate policy, it is essential for countries to pursue sound and credible macroeconomic policies so as to avoid the build-up of major macro imbalances in the economy. Second, it is essential for EMEs to improve the flexibility of their product and factor markets in order to cope and adjust to shocks arising from the volatility of currency markets and swings in the terms of trade in world product markets. Third, it is crucial for EMEs to develop and strengthen their financial systems in order to enhance their resilience to shocks. In addition, a sound and efficient banking system together with deep and liquid capital market contributes to the efficient intermediation of financial flows. This could help prevent the emergence of vulnerabilities in the financial system by minimising unsound lending practices that lead to the build-up of excessive leveraging in the corporate sector and exposure to foreign currency borrowings. Fourth, countries would need to build regulatory and supervisory capabilities to keep pace with financial innovations and the emergence of new financial institutions' activities, and new products and services, which have complicated the conduct of exchange rate policy. Fifth, policy makers need to promote greater disclosures and transparency.

6.14 Furthermore, the perception about the volatility and flexibility in exchange rate is contextual. What may be perceived as flexible for some economies may turn out to be volatile for other economies. The level of development and preparedness of financial markets and their risk-taking ability is crucial in this context (Reddy, 2007). If the level of development and preparedness of financial markets is low, a small movement in exchange rate could be interpreted as volatile, while even large movement in exchange rate in developed foreign exchange markets may not be seen as volatile. Thus, as financial markets develop in an emerging economy, the tolerance to volatility improves and hence what was once volatility would later become flexibility. A key issue, therefore, for the authorities is where and when to make policy adjustments, including the use of official intervention

[2] Brazil had an adjustable band during 1995 to 1999 in a programme to control money creation.

to help avoid substantial volatility and serious misalignments.

6.15 With gradual liberalisation and opening up of the capital account, capital flows to EMEs, particularly to Asian economies increased significantly during the 1990s, posing new challenges for central banks. Surges in capital flows and their associated volatility have implications for the conduct of monetary policy by central banks. The challenges facing central banks pertain to liquidity management, exchange rate and foreign exchange reserve management. Central banks in these economies, thus, need to be equipped to deal with large capital flows. Since capital flows in some countries in recent years have been associated with various crises, there is also a rethinking about unfettered capital account liberalisation.

6.16 Intervention by most Asian central banks in foreign exchange markets has become necessary from time to time primarily because of the growing importance of capital flows in determining exchange rate movements in these economies as against trade deficits and economic growth, which were important in the earlier days. The latter does matter, but only over a period (Jalan, 2003). On a day-to-day basis, it is capital flows, which influence the exchange rate and interest rate arithmetic of financial markets. Capital movements have also rendered exchange rates significantly more volatile than before (Mohan, 2003). For the relatively open economies, this raises the issue of appropriate monetary policy response to sharp exchange rate movements since exchange rate volatility has had significant real effects in terms of fluctuations in employment and output and the distribution of activity between tradable and non-tradable, especially in the developing countries, which depend on export performance as a key to the health of their balance of payments. In the fiercely competitive trading environment, countries seek to expand market shares aggressively by paring down margins. In such cases even a small change in exchange rates can develop into significant and persistent real effects. Thus, in order to benefit from international capital inflows, host countries need to pursue sound macroeconomic policies, develop strong institutions, and adopt appropriate regulatory frameworks for the stability of financial systems and sustained economic progress.

6.17 To sum up, while some flexibility in foreign exchange markets and exchange rate determination is desirable, excessive volatility can have adverse impact on price discovery, export performance, sustainability of current account balance, and balance sheets in view of dollarisation. The EMEs' experience has highlighted the need for developing countries to allow greater flexibility in exchange rates. However, the authorities also need to have the capacity to intervene in foreign exchange markets in view of herd behaviour. With progressive opening of the emerging markets to financial flows, capital flows are playing an increasingly important role in exchange rate determination and are often reflected in higher exchange rate volatility. Against this backdrop, it would be appropriate to have a peep into the exchange rate regime followed in India and the evolution of foreign exchange market in the post independence period.

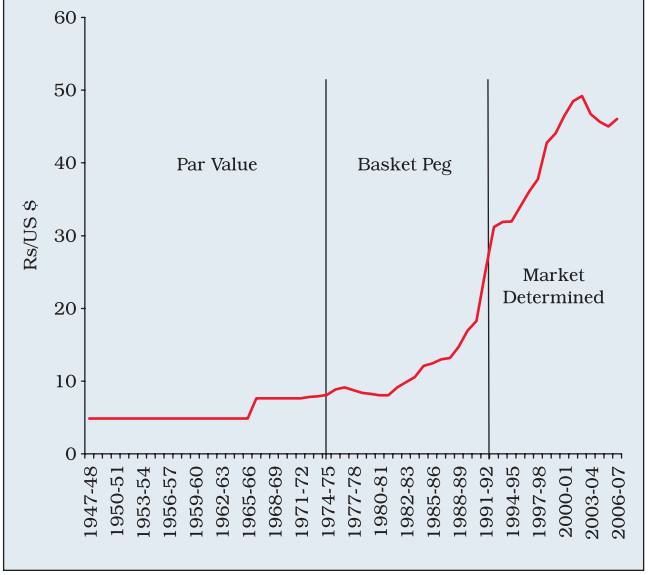
II. INDIAN FOREIGN EXCHANGE MARKET: A HISTORICAL PERSPECTIVE

Early Stages: 1947-1977

6.18 The evolution of India's foreign exchange market may be viewed in line with the shifts in India's exchange rate policies over the last few decades from a par value system to a basket-peg and further to a managed float exchange rate system. During the period from 1947 to 1971, India followed the par value system of exchange rate. Initially the rupee's external par value was fixed at 4.15 grains of fine gold. The Reserve Bank maintained the par value of the rupee within the permitted margin of ±1 per cent using pound sterling as the intervention currency. Since the sterling-dollar exchange rate was kept stable by the US monetary authority, the exchange rates of rupee in terms of gold as well as the dollar and other currencies were indirectly kept stable. The devaluation of rupee in September 1949 and June 1966 in terms of gold resulted in the reduction of the par value of rupee in terms of gold to 2.88 and 1.83 grains of fine gold, respectively. The exchange rate of the rupee remained unchanged between 1966 and 1971 (Chart VI.1).

6.19 Given the fixed exchange regime during this period, the foreign exchange market for all practical purposes was defunct. Banks were required to undertake only cover operations and maintain a 'square' or 'near square' position at all times. The objective of exchange controls was primarily to regulate the demand for foreign exchange for various purposes, within the limit set by the available supply. The Foreign Exchange Regulation Act initially enacted in 1947 was placed on a permanent basis

Chart VI.1: Trends in Rupee-Dollar Exchange Rate



in 1957. In terms of the provisions of the Act, the Reserve Bank, and in certain cases, the Central Government controlled and regulated the dealings in foreign exchange payments outside India, export and import of currency notes and bullion, transfers of securities between residents and non-residents, acquisition of foreign securities, etc[3].

6.20 With the breakdown of the Bretton Woods System in 1971 and the floatation of major currencies, the conduct of exchange rate policy posed a serious challenge to all central banks world wide as currency fluctuations opened up tremendous opportunities for market players to trade in currencies in a borderless market. In December 1971, the rupee was linked with pound sterling. Since sterling was fixed in terms of US dollar under the Smithsonian Agreement of 1971, the rupee also remained stable against dollar. In order to overcome the weaknesses associated with a single currency peg and to ensure stability of the exchange rate, the rupee, with effect from September 1975, was pegged to a basket of currencies. The currency selection and weights assigned were left to the discretion of the Reserve Bank. The currencies included in the basket as well as their relative weights were kept confidential in order to discourage speculation. It was around this time that banks in India became interested in trading in foreign exchange.

Formative Period: 1978-1992

6.21 The impetus to trading in the foreign exchange market in India came in 1978 when banks in India were allowed by the Reserve Bank to undertake intra-day trading in foreign exchange and were required to comply with the stipulation of maintaining 'square' or 'near square' position only at the close of business hours each day. The extent of position which could be left uncovered overnight (the open position) as well as the limits up to which dealers could trade during the day were to be decided by the management of banks. The exchange rate of the rupee during this period was officially determined by the Reserve Bank in terms of a weighted basket of currencies of India's major trading partners and the exchange rate regime was characterised by daily announcement by the Reserve Bank of its buying and selling rates to the Authorised Dealers (ADs) for undertaking merchant transactions. The spread between the buying and the selling rates was 0.5 per cent and the market began to trade actively within this range. ADs were also permitted to trade in cross currencies (one convertible foreign currency *versus* another). However, no 'position' in this regard could originate in overseas markets.

6.22 As opportunities to make profits began to emerge, major banks in India started quoting two-way prices against the rupee as well as in cross currencies and, gradually, trading volumes began to increase. This led to the adoption of widely different practices (some of them being irregular) and the need was felt for a comprehensive set of guidelines for operation of banks engaged in foreign exchange business. Accordingly, the 'Guidelines for Internal Control over Foreign Exchange Business', were framed for adoption by the banks in 1981. The foreign exchange market in India till the early 1990s, however, remained highly regulated with restrictions on external transactions, barriers to entry, low liquidity and high transaction costs. The exchange rate during this period was managed mainly for facilitating India's imports. The strict control on foreign exchange transactions through the Foreign Exchange Regulations Act (FERA) had resulted in one of the largest and most efficient parallel markets for foreign exchange in the world, *i.e.*, the hawala (unofficial) market.

6.23 By the late 1980s and the early 1990s, it was recognised that both macroeconomic policy and

[3] The Act was later replaced by a more comprehensive legislation, *i.e.*, the Foreign Exchange Regulation Act, 1973.

structural factors had contributed to balance of payments difficulties. Devaluations by India's competitors had aggravated the situation. Although exports had recorded a higher growth during the second half of the 1980s (from about 4.3 per cent of GDP in 1987-88 to about 5.8 per cent of GDP in 1990-91), trade imbalances persisted at around 3 per cent of GDP. This combined with a precipitous fall in invisible receipts in the form of private remittances, travel and tourism earnings in the year 1990-91 led to further widening of current account deficit. The weaknesses in the external sector were accentuated by the Gulf crisis of 1990-91. As a result, the current account deficit widened to 3.2 per cent of GDP in 1990-91 and the capital flows also dried up necessitating the adoption of exceptional corrective steps. It was against this backdrop that India embarked on stabilisation and structural reforms in the early 1990s.

Post-Reform Period: 1992 onwards

6.24 This phase was marked by wide ranging reform measures aimed at widening and deepening the foreign exchange market and liberalisation of exchange control regimes. A credible macroeconomic, structural and stabilisation programme encompassing trade, industry, foreign investment, exchange rate, public finance and the financial sector was put in place creating an environment conducive for the expansion of trade and investment. It was recognised that trade policies, exchange rate policies and industrial policies should form part of an integrated policy framework to improve the overall productivity, competitiveness and efficiency of the economic system, in general, and the external sector, in particular.

6.25 As a stabilsation measure, a two step downward exchange rate adjustment by 9 per cent and 11 per cent between July 1 and 3, 1991 was resorted to counter the massive drawdown in the foreign exchange reserves, to instill confidence among investors and to improve domestic competitiveness. A two-step adjustment of exchange rate in July 1991 effectively brought to close the regime of a pegged exchange rate. After the Gulf crisis in 1990-91, the broad framework for reforms in the external sector was laid out in the Report of the High Level Committee on Balance of Payments (Chairman: Dr. C. Rangarajan). Following the recommendations of the Committee to move towards the market-determined exchange rate, the Liberalised Exchange Rate Management System (LERMS) was put in place in March 1992 initially involving a dual exchange rate system. Under the LERMS, all foreign exchange receipts on current account transactions (exports, remittances, *etc*.) were required to be surrendered to the Authorised Dealers (ADs) in full. The rate of exchange for conversion of 60 per cent of the proceeds of these transactions was the market rate quoted by the ADs, while the remaining 40 per cent of the proceeds were converted at the Reserve Bank's official rate. The ADs, in turn, were required to surrender these 40 per cent of their purchase of foreign currencies to the Reserve Bank. They were free to retain the balance 60 per cent of foreign exchange for selling in the free market for permissible transactions. The LERMS was essentially a transitional mechanism and a downward adjustment in the official exchange rate took place in early December 1992 and ultimate convergence of the dual rates was made effective from March 1, 1993, leading to the introduction of a market-determined exchange rate regime.

6.26 The dual exchange rate system was replaced by a unified exchange rate system in March 1993, whereby all foreign exchange receipts could be converted at market determined exchange rates. On unification of the exchange rates, the nominal exchange rate of the rupee against both the US dollar as also against a basket of currencies got adjusted lower, which almost nullified the impact of the previous inflation differential. The restrictions on a number of other current account transactions were relaxed. The unification of the exchange rate of the Indian rupee was an important step towards current account convertibility, which was finally achieved in August 1994, when India accepted obligations under Article VIII of the Articles of Agreement of the IMF.

6.27 With the rupee becoming fully convertible on all current account transactions, the risk-bearing capacity of banks increased and foreign exchange trading volumes started rising. This was supplemented by wide-ranging reforms undertaken by the Reserve Bank in conjunction with the Government to remove market distortions and deepen the foreign exchange market. The process has been marked by 'gradualism' with measures being undertaken after extensive consultations with experts and market participants. The reform phase began with the Sodhani Committee (1994) which in its report submitted in 1995 made several recommendations to relax the regulations with a view to vitalising the foreign exchange market (Box VI.2).

Box VI.2

Recommendations of the Expert Group on Foreign Exchange Markets in India

The Expert Group on Foreign Exchange Markets in India (Chairman: Shri O.P.Sodhani), which submitted its Report in 1995, identified various regulations inhibiting the growth of the market. The Group recommended that the corporates may be permitted to take a hedge upon declaring the existence of an exposure. The Group recommended that banks should be permitted to fix their own exchange position limits such as intra-day and overnight limits, subject to ensuring that the capital is provided/earmarked to the extent of 5 per cent of this limit based on internationally accepted guidelines. The Group also favoured fixation of Aggregate Gap Limit (AGL), which would also include rupee transactions, by the managements of the banks based on capital, risk taking capacity, *etc*. It recommended that banks be allowed to initiate cross currency positions abroad and to lend or borrow short-term funds up to six months, subject to a specified ceiling. Another important suggestion related to allowing exporters to retain 100 per cent of their export earnings in any foreign currency with an Authorised Dealer (AD) in India, subject to liquidation of outstanding advances against export bills. The Group was also in favour of permitting ADs to determine the interest rates and maturity period in respect of FCNR (B) deposits. It recommended selective intervention by the Reserve Bank in the market so as to ensure greater orderliness in the market.

In addition, the Group recommended various other short-term and long-term measures to activate and facilitate functioning of markets and promote the development of a vibrant derivative market. Short-term measures recommended included exemption of domestic inter-bank borrowings from SLR/CRR requirements to facilitate development of the term money market, cancellation and re-booking of currency options, permission to offer lower cost option strategies such as the 'range forward' and 'ratio range forward' and permitting ADs to offer any derivative products on a fully covered basis which can be freely used for their own asset liability management.

As part of long-term measures, the Group suggested that the Reserve Bank should invite detailed proposals from banks for offering rupee-based derivatives, should refocus exchange control regulation and guidelines on risks rather than on products and frame a fresh set of guidelines for foreign exchange and derivatives risk management.

As regards accounting and disclosure standards, the main recommendations included reviewing of policy procedures and transactions on an on-going basis by a risk control team independent of dealing and settlement functions, ensuring of uniform documentation and market practices by the Foreign Exchange Dealers' Association of India (FEDAI) or any other body and development of accounting disclosure standards.

Reference:

Reserve Bank of India. 1995. *Report on Foreign Exchange Markets in India* (Chairman : Shri O.P Sodhani), June.

Most of the recommendations of the Sodhani Committee relating to the development of the foreign exchange market were implemented during the latter half of the 1990s.

6.28 In addition, several initiatives aimed at dismantling controls and providing an enabling environment to all entities engaged in foreign exchange transactions have been undertaken since the mid-1990s. The focus has been on developing the institutional framework and increasing the instruments for effective functioning, enhancing transparency and liberalising the conduct of foreign exchange business so as to move away from micro management of foreign exchange transactions to macro management of foreign exchange flows (Box VI.3).

6.29 An Internal Technical Group on the Foreign Exchange Markets (2005) set up by the Reserve Bank made various recommendations for further liberalisation of the extant regulations. Some of the recommendations such as freedom to cancel and rebook forward contracts of any tenor, delegation of powers to ADs for grant of permission to corporates to hedge their exposure to commodity price risk in the international commodity exchanges/markets and extension of the trading hours of the inter-bank foreign exchange market have since been implemented.

6.30 Along with these specific measures aimed at developing the foreign exchange market, measures towards liberalising the capital account were also implemented during the last decade, guided to a large extent since 1997 by the Report of the Committee on Capital Account Convertibility (Chairman: Shri S.S. Tarapore). Various reform measures since the early 1990s have had a profound effect on the market structure, depth, liquidity and efficiency of the Indian foreign exchange market as detailed in the following section.

Box VI.3

Measures Initiated to Develop the Foreign Exchange Market in India

Institutional Framework

- The Foreign Exchange Regulation Act (FERA), 1973 was replaced by the market friendly Foreign Exchange Management Act (FEMA), 1999. The Reserve Bank delegated powers to authorised dealers (ADs) to release foreign exchange for a variety of purposes.
- In pursuance of the Sodhani Committee's recommendations, the Clearing Corporation of India Limited (CCIL) was set up in 2001.
- To further the participatory process in a more holistic manner by taking into account all segments of the financial markets, the ambit of the Technical Advisory Committee (TAC) on Money and Securities Markets set up by the Reserve Bank in 1999 was expanded in 2004 to include foreign exchange markets and the Committee was rechristened as TAC on Money, Government Securities and Foreign Exchange Markets.

Increase in Instruments in the Foreign Exchange Market

- The rupee-foreign currency swap market was allowed.
- Additional hedging instruments such as foreign currency-rupee options, cross-currency options, interest rate swaps (IRS) and currency swaps, caps/ collars and forward rate agreements (FRAs) were introduced.

Liberalisation Measures

- Authorised dealers were permitted to initiate trading positions, borrow and invest in overseas market, subject to certain specifications and ratification by respective banks' Boards. Banks were also permitted to (i) fix net overnight position limits and gap limits (with the Reserve Bank formally approving the limits); (ii) determine the interest rates (subject to a ceiling) and maturity period of FCNR(B) deposits with exemption of inter-bank borrowings from statutory pre-emptions; and (iii) use derivative products for asset-liability management.
- Participants in the foreign exchange market, including exporters, Indians investing abroad, and FIIs were permitted to avail forward cover and enter into swap transactions without any limit, subject to genuine underlying exposure.
- FIIs and NRIs were permitted to trade in exchange-traded derivative contracts, subject to certain conditions.
- Foreign exchange earners were permitted to maintain foreign currency accounts. Residents were permitted to open such accounts within the general limit of US $ 25,000 per year, which was raised to US $ 50,000 per year in 2006, has further increased to US $ 1,00,000 since April 2007.

Disclosure and Transparency Initiatives

- The Reserve Bank has been taking initiatives in putting in public domain all data relating to foreign exchange market transactions and operations. The Reserve Bank disseminates: (a) daily reference rate which is an indicative rate for market observers through its website, (b) data on exchange rates of rupee against some major currencies and foreign exchange reserves on a weekly basis in the Weekly Statistical Supplement (WSS), and (c) data on purchases and sales of foreign currency by the Reserve Bank in its Monthly Bulletin. The Reserve Bank has already achieved full disclosure of information pertaining to international reserves and foreign currency liquidity position under the Special Data Dissemination Standards (SDDS) of the IMF.

Reference:

Mohan, Rakesh. 2006. "Financial Sector Reforms and Monetary Policy: The Indian Experience." *RBI Bulletin*, July.

III. FOREIGN EXCHANGE MARKET STRUCTURE

Market Segments

6.31 Foreign exchange market activity in most EMEs takes place onshore with many countries prohibiting onshore entities from undertaking the operations in offshore markets for their currencies. Spot market is the predominant form of foreign exchange market segment in developing and emerging market countries. A common feature is the tendency of importers/exporters and other end-users to look at exchange rate movements as a source of return without adopting appropriate risk management practices. This, at times, creates uneven supply-demand conditions, often based on "news and views". Though most of the emerging market countries allow operations in the forward segment of the market, it is still underdeveloped in most of these economies. The lack of forward market development reflects many factors, including limited exchange rate flexibility, the *de facto* exchange rate insurance provided by the central bank through interventions, absence of a yield

curve on which to base the forward prices and shallow money markets, in which market-making banks can hedge the maturity risks implicit in forward positions (Canales-Kriljenko, 2004).

6.32 Most foreign exchange markets in developing countries are either pure dealer markets or a combination of dealer and auction markets. In the dealer markets, some dealers become market makers and play a central role in the determination of exchange rates in flexible exchange rate regimes. Market makers set two-way exchange rates at which they are willing to deal with other dealers. The bid-offer spread reflects many factors, including the level of competition among market makers. In most of the EMEs, a code of conduct establishes the principles that guide the operations of the dealers in the foreign exchange markets. It is the central bank, or professional dealers association, which normally issues the code of conduct (Canales-Kriljenko, 2004). In auction markets, an auctioneer or auction mechanism allocates foreign exchange by matching supply and demand orders. In pure auction markets, order imbalances are cleared only by exchange rate adjustments. Pure auction market structures are, however, now rare and they generally prevail in combination with dealer markets.

6.33 The Indian foreign exchange market is a decentralised multiple dealership market comprising two segments – the spot and the derivatives market. In the spot market, currencies are traded at the prevailing rates and the settlement or value date is two business days ahead. The two-day period gives adequate time for the parties to send instructions to debit and credit the appropriate bank accounts at home and abroad. The derivatives market encompasses forwards, swaps and options. Though forward contracts exist for maturities up to one year, majority of forward contracts are for one month, three months, or six months. Forward contracts for longer periods are not as common because of the uncertainties involved and related pricing issues. A swap transaction in the foreign exchange market is a combination of a spot and a forward in the opposite direction. As in the case of other EMEs, the spot market is the dominant segment of the Indian foreign exchange market. The derivative segment of the foreign exchange market is assuming significance and the activity in this segment is gradually rising.

Market Players

6.34 Players in the Indian market include (a) ADs, mostly banks who are authorised to deal in foreign exchange, (b) foreign exchange brokers who act as intermediaries, and (c) customers – individuals, corporates, who need foreign exchange for their transactions. Though customers are major players in the foreign exchange market, for all practical purposes they depend upon ADs and brokers. In the spot foreign exchange market, foreign exchange transactions were earlier dominated by brokers. Nevertheless, the situation has changed with the evolving market conditions, as now the transactions are dominated by ADs. Brokers continue to dominate the derivatives market.

6.35 The Reserve Bank intervenes in the market essentially to ensure orderly market conditions. The Reserve Bank undertakes sales/purchases of foreign currency in periods of excess demand/supply in the market. Foreign Exchange Dealers' Association of India (FEDAI) plays a special role in the foreign exchange market for ensuring smooth and speedy growth of the foreign exchange market in all its aspects. All ADs are required to become members of the FEDAI and execute an undertaking to the effect that they would abide by the terms and conditions stipulated by the FEDAI for transacting foreign exchange business. The FEDAI is also the accrediting authority for the foreign exchange brokers in the inter-bank foreign exchange market.

6.36 The licences for ADs are issued to banks and other institutions, on their request, under Section 10(1) of the Foreign Exchange Management Act, 1999. ADs have been divided into different categories. All scheduled commercial banks, which include public sector banks, private sector banks and foreign banks operating in India, belong to category I of ADs. All upgraded full fledged money changers (FFMCs) and select regional rural banks (RRBs) and co-operative banks belong to category II of ADs. Select financial institutions such as EXIM Bank belong to category III of ADs. Currently, there are 86 (Category I) ADs operating in India out of which five are co-operative banks (Table 6.3). All merchant transactions in the foreign exchange market have to be necessarily undertaken directly through ADs. However, to provide depth and liquidity to the inter-bank segment, ADs have been permitted to utilise the services of brokers for better price discovery in their inter-bank transactions. In order to further increase the size of the foreign exchange market and enable it to handle large flows, it is generally felt that more ADs should be encouraged to participate in the market making. The number of participants who can give two-way quotes also needs to be increased.

Table 6.3: Authorised Dealers (Category-I) in the Foreign Exchange Market
(As on March 31, 2007)

Category	Number
1	2
Public Sector Banks	27
Private Sector Banks	31
Of which:	
Co-operative Banks	5
Foreign Banks	28
Total	**86**

Source : Reserve Bank of India.

6.37 The customer segment of the foreign exchange market comprises major public sector units, corporates and business entities with foreign exchange exposure. It is generally dominated by select large public sector units such as Indian Oil Corporation, ONGC, BHEL, SAIL, Maruti Udyog and also the Government of India (for defence and civil debt service) as also big private sector corporates like Reliance Group, Tata Group and Larsen and Toubro, among others. In recent years, foreign institutional investors (FIIs) have emerged as major players in the foreign exchange market.

Sources of Supply and Demand in the Foreign Exchange Market

6.38 The major sources of supply of foreign exchange in the Indian foreign exchange market are receipts on account of exports and invisibles in the current account and inflows in the capital account such as foreign direct investment (FDI), portfolio investment, external commercial borrowings (ECB) and non-resident deposits. On the other hand, the demand for foreign exchange emanates from imports and invisible payments in the current account, amortisation of ECB (including short-term trade credits) and external aid, redemption of NRI deposits and outflows on account of direct and portfolio investment. In India, the Government has no foreign currency account, and thus the external aid received by the Government comes directly to the reserves and the Reserve Bank releases the required rupee funds. Hence, this particular source of supply of foreign exchange is not routed through the market and as such does not impact the exchange rate.

6.39 During last five years, sources of supply and demand have changed significantly, with large transactions emanating from the capital account, unlike in the 1980s and the 1990s when current account transactions dominated the foreign exchange market. The behaviour as well as the incentive structure of the participants who use the market for current account transactions differ significantly from those who use the foreign exchange market for capital account transactions. Besides, the change in these traditional determinants has also reflected itself in enhanced volatility in currency markets. It now appears that expectations and even momentary reactions to the news are often more important in determining fluctuations in capital flows and hence it serves to amplify exchange rate volatility (Mohan, 2006a). On many occasions, the pressure on exchange rate through increase in demand emanates from "expectations based on certain news". Sometimes, such expectations are destabilising and often give rise to self-fulfilling speculative activities. Recognising this, increased emphasis is being placed on the management of capital account through management of foreign direct investment, portfolio investment, external commercial borrowings, non-resident deposits and capital outflows. However, there are occasions when large capital inflows as also large lumpiness in demand do take place, in spite of adhering to all the tools of management of capital account. The role of the Reserve Bank comes into focus during such times when it has to prevent the emergence of such destabilising expectations. In such cases, recourse is undertaken to direct purchase and sale of foreign currencies, sterilisation through open market operations, management of liquidity under liquidity adjustment facility (LAF), changes in reserve requirements and signaling through interest rate changes. In the last few years, despite large capital inflows, the rupee has shown two - way movements. Besides, the demand/supply situation is also affected by hedging activities through various instruments that have been made available to market participants to hedge their risks.

Derivative Market Instruments

6.40 Derivatives play a crucial role in developing the foreign exchange market as they enable market players to hedge against underlying exposures and shape the overall risk profile of participants in the market. Banks in India have been increasingly using derivatives for managing risks and have also been offering these products to corporates. In India, various informal forms of derivatives contracts have existed for a long time though the formal introduction of a variety of instruments in the foreign exchange derivatives market started only in the post-reform period, especially since the mid-1990s. Cross-

currency derivatives with the rupee as one leg were introduced with some restrictions in April 1997. Rupee-foreign exchange options were allowed in July 2003. The foreign exchange derivative products that are now available in Indian financial markets can be grouped into three broad segments, *viz*., forwards, options (foreign currency rupee options and cross currency options) and currency swaps (foreign currency rupee swaps and cross currency swaps) (Box VI.4).

6.41 Available data indicate that the most widely used derivative instruments are the forwards and foreign exchange swaps (rupee-dollar). Options have also been in use in the market for the last four years. However, their volumes are not significant and bid-offer spreads are quite wide, indicating that the market is relatively illiquid. Another major factor hindering the development of the options market is that corporates are not permitted to write/sell options. If corporates with underlying exposures are permitted to write/sell covered options, this would lead to increase in market volume and liquidity. Further, very few banks are market makers in this product and many deals are done on a back to back basis. For the product to reach the farther segment of corporates such as small and medium enterprises (SME) sector, it is imperative that public sector banks develop the necessary infrastructure and expertise to transact in options. In view of the growing complexity, diversity and volume of derivatives used by banks, an Internal Group was constituted by the Reserve Bank to review the existing guidelines on derivatives and formulate comprehensive guidelines on derivatives for banks (Box VI.5).

6.42 With regard to forward contracts and swaps, which are relatively more popular instruments in the Indian derivatives market, cancellation and rebooking of forward contracts and swaps in India have been regulated. Gradually, however, the Reserve Bank has been taking measures towards eliminating such regulations. The objective has been to ensure that excessive cancellation and rebooking do not add to the volatility of the rupee. At present, exposures arising on account of swaps, enabling a corporate to move from rupee to foreign currency liability (derived exposures), are not permitted to be hedged. While the market participants have preferred such a hedging facility, it is generally believed that equating derived

Box VI.4
Foreign Exchange Derivative Instruments in India

Foreign Exchange Forwards

Authorised Dealers (ADs) (Category-I) are permitted to issue forward contracts to persons resident in India with crystallised foreign currency/foreign interest rate exposure and based on past performance/actual import-export turnover, as permitted by the Reserve Bank and to persons resident outside India with genuine currency exposure to the rupee, as permitted by the Reserve Bank. The residents in India generally hedge crystallised foreign currency/ foreign interest rate exposure or transform exposure from one currency to another permitted currency. Residents outside India enter into such contracts to hedge or transform permitted foreign currency exposure to the rupee, as permitted by the Reserve Bank.

Foreign Currency Rupee Swap

A person resident in India who has a long-term foreign currency or rupee liability is permitted to enter into such a swap transaction with ADs (Category-I) to hedge or transform exposure in foreign currency/foreign interest rate to rupee/rupee interest rate.

Foreign Currency Rupee Options

ADs (Category-I) approved by the Reserve Bank and ADs (Category-I) who are not market makers are allowed to sell foreign currency rupee options to their customers on a back-to-back basis, provided they have a capital to risk-weighted assets ratio (CRAR) of 9 per cent or above. These options are used by customers who have genuine foreign currency exposures, as permitted by the Reserve Bank and by ADs (Category-I) for the purpose of hedging trading books and balance sheet exposures.

Cross-Currency Options

ADs (Category-I) are permitted to issue cross-currency options to a person resident in India with crystallised foreign currency exposure, as permitted by the Reserve Bank. The clients use this instrument to hedge or transform foreign currency exposure arising out of current account transactions. ADs use this instrument to cover the risks arising out of market-making in foreign currency rupee options as well as cross currency options, as permitted by the Reserve Bank.

Cross-Currency Swaps

Entities with borrowings in foreign currency under external commercial borrowing (ECB) are permitted to use cross currency swaps for transformation of and/or hedging foreign currency and interest rate risks. Use of this product in a structured product not conforming to the specific purposes is not permitted.

Box VI.5
Derivatives Market: Comprehensive Guidelines

The draft comprehensive guidelines issued on December 11, 2006 cover broad generic principles for undertaking derivative transactions, permissible categories of derivative instruments, defining the role of market makers and users, suitability and appropriateness policies, risk management and corporate governance aspects, and internal control and audit. Subsequently, a modified version of these guidelines incorporating the comments of a wide spectrum of banks and market participants was issued by the Reserve Bank on April 20, 2007. These guidelines for accounting and valuation of derivatives, already circulated, are expected to provide a holistic framework for regulating the derivatives business of banks in future. Comprehensive guidelines contain four main modifications in the existing guidelines pertaining to instruments in foreign exchange derivatives. First, users such as importers and exporters having crystallised unhedged exposure in respect of current account transactions may write covered call and put options in both foreign currency/rupee and cross currency and receive premia. Second, market makers may write cross currency options. Third, market makers may offer plain vanilla American foreign currency rupee options. Fourthly, a person resident in India having foreign exchange or rupee liability is permitted to enter into a foreign currency rupee swap for hedging long-term exposure, *i.e.,* exposure with residual maturity of three years or more.

For risk management and corporate governance related to banks' exposure to derivatives markets, basic principles of a prudent system have been specified in the comprehensive guidelines. These basic principles mainly entail (i) appropriate oversight by the board of directors and senior management; (ii) adequate risk management process that integrates prudent risk limits, sound measurement procedures and information systems, continuous risk monitoring and frequent management reporting; and (iii) comprehensive internal controls and audit procedures.

Regarding risk management, the guidelines explain identification and accurate measurement of various types of risks, by the market makers, involved in derivative activities. Accurate measurement of derivative related risks is necessary for proper monitoring and control and, therefore, all significant risks should be measured and integrated into an entity-wide risk management system. The guidelines further elucidate various risk limits, *viz*., market risk limits, credit limits, and liquidity limits, which serve as a means to control exposures to various risks associated with derivative activities. Apart from above mentioned principles, the guidelines also include the requirement of a mechanism for an independent monitoring of each entity and controlling of various risks in derivatives. Furthermore, the guidelines cover details pertaining to internal audit, prudential norms relating to derivatives, prudential limits on derivatives, and regulatory reporting and balance sheet disclosures.

Reference:

Reserve Bank of India. 2006. *Comprehensive Guidelines on Derivatives Market*.

exposure in foreign currency with actual borrowing in foreign currency would tantamount to violation of the basic premise for accessing the forward foreign exchange market in India, *i.e.,* having an underlying foreign exchange exposure.

6.43 This feature (*i.e.*, 'the role of an underlying transaction in the booking of a forward contract') is unique to the Indian derivatives market. The insistence on this requirement of underlying exposure has to be viewed against the backdrop of the then prevailing conditions when it was imposed. Corporates in India have been permitted increasing access to foreign currency funds since 1992. They were also accorded greater freedom to undertake active hedging. However, recognising the relatively nascent stage of the foreign exchange market initially with the lack of capabilities to handle massive speculation, the 'underlying exposure' criterion was imposed as a pre-requisite. Exporters and importers were permitted to book forward contracts on the basis of a declaration of an exposure and on the basis of past performance. Eligible limits were gradually raised to enable corporates greater flexibility. The limits are computed separately for export and import contracts. Documents are required to be furnished at the time of maturity of the contract. Contracts booked in excess of 25 per cent of the eligible limit had to be on a deliverable basis and could not be cancelled. This relaxation has proved very useful to exporters of software and other services since their projects are executed on the basis of master agreements with overseas buyers, which usually do not indicate the volumes and tenor of the exports (Report of Internal Group on Foreign Exchange Markets, 2005). In order to provide greater flexibility to exporters and importers, as announced in the Mid-term review of the Annual Policy 2006-07, this limit has been enhanced to 50 per cent.

6.44 Notwithstanding the initiatives that have been taken to enhance the flexibility for the corporates, the need is felt to review the underlying exposure criteria for booking a forward contract. The underlying exposure criteria enable corporates to hedge only a

part of their exposures that arise on the basis of the physical volume of goods (exports/imports) to be delivered[4]. With the Indian economy getting increasingly globalised, corporates are also exposed to a variety of 'economic exposures' associated with the types of foreign exchange/commodity risks/ exposures arising out of exchange rate fluctuations. At present, the domestic prices of commodities such as ferrous and non-ferrous metals, basic chemicals, petro-chemicals, *etc*. are observed to exhibit world import parity. Given the two-way movement of the rupee against the US dollar and other currencies in recent years, it is necessary for the producer/ consumer of such products to hedge their economic exposures to exchange rate fluctuation. Besides, price-fix hedges are also available for traders globally. They enable importers/exporters to lock into a future price for a commodity that they plan to import/export without actually having a crystallised physical exposure to the commodity. Traders may also be affected not only because of changes in rupee-dollar exchange rates but also because of changes in cross currency exchange rates. The requirement of 'underlying criteria' is also often cited as one of the reasons for the lack of liquidity in some of the derivative products in India. Hence, a fixation on the 'underlying criteria' as India globalises may hinder the full development of the forward market. The requirement of past performance/underlying exposures should be eliminated in a phased manner. This has also been the recommendation of both the committees on capital account convertibility. It is cited that this pre-requisite has been one of the factors contributing to the shift over time towards the non-deliverable forward (NDF) market at offshore locations to hedge such exposures since such requirement is not stipulated while booking a NDF contract. An attempt has been made recently provide importers the facility to partly hedge their economic exposure by permitting them to book forward contracts for their customs duty component.

6.45 The Annual Policy Statement for 2007-08, released on April 24, 2007 announced a host of measures to expand the range of hedging tools available to market participants as also facilitate dynamic hedging by residents. To hedge economic exposures, it has been proposed that ADs (Category-I) may permit (a) domestic producers/users to hedge their price risk on aluminium, copper, lead, nickel and zinc in international commodity exchanges, based on their underlying economic exposures; and (b) actual users of aviation turbine fuel (ATF) to hedge their economic exposures in the international commodity exchanges based on their domestic purchases. Authorised dealer banks may approach the Reserve Bank for permission on behalf of customers who are exposed to systemic international price risk, not covered otherwise. In order to facilitate dynamic hedging of foreign exchange exposures of exporters and importers of goods and services, it has been proposed that forward contracts booked in excess of 75 per cent of the eligible limits have to be on a deliverable basis and cannot be cancelled as against the existing limit of 50 per cent. With a view to giving greater flexibility to corporates with overseas direct investments, the forward contracts entered into for hedging overseas direct investments have been allowed to be cancelled and rebooked. In order to enable small and medium enterprises to hedge their foreign exchange exposures, it has been proposed to permit them to book forward contracts without underlying exposures or past records of exports and imports. Such contracts may be booked through ADs with whom the SMEs have credit facilities. They have also been allowed to freely cancel and rebook these contracts. In order to enable resident individuals to manage/hedge their foreign exchange exposures, it has been proposed to permit resident individuals to book forward contracts without production of underlying documents up to an annual limit of US $ 100,000, which can be freely cancelled and rebooked.

Foreign Exchange Market Trading Platform

6.46 A variety of trading platforms are used by dealers in the EMEs for communicating and trading with one another on a bilateral basis. They conduct bilateral trades through telephones that are later confirmed by fax or telex. Some dealers also trade on electronic trading platforms that allow for bilateral conversations and dealing such as the Reuters Dealing 2000-1 and Dealing 3000 Spot systems. Bilateral conversations may also take place over networks provided by central banks and over private sector networks (Brazil, Chile, Colombia, Korea and the Philippines). Reuters' Dealing System has been the most popular trading platform in EMEs.

[4] These are generally categorised as 'transactions exposure' which is the extent to which the value of transactions already entered into is affected by exchange rate risk and 'contractual exposure' that connotes the extent of exposures associated with contractual agreements.

6.47 In the Indian foreign exchange market, spot trading takes place on four platforms, *viz.,* FX CLEAR of the CCIL set up in August 2003, FX Direct that is a foreign exchange trading platform launched by IBS Forex (P) Ltd. in 2002 in collaboration with Financial Technologies (India) Ltd., and two other platforms by the Reuters - D2 platform and the Reuters Market Data System (RMDS) trading platform that have a minimum trading amount limit of US $ 1 million. FX-CLEAR and FX Direct offer both real time order matching and negotiation modes for dealing. The Real Time Matching system enables real time matching of currency pairs for immediate and auto execution in both the spot and forward segments. In the Negotiated Dealing System, on the other hand, participant is free to choose and negotiate with his counter-party on all aspects of the transaction, thereby offering him flexibility to select the underlying currency as well as the terms of trade. These trading platforms cover the US dollar-Indian Rupee (USD-INR) transactions and transactions in major cross currencies (EUR/USD, USD/JPY, GBP/USD *etc*.), though USD-INR constitutes the most of the foreign exchange transactions in terms of value. It is the FX CLEAR of the CCIL that remains the most widely used trading platform in India. This platform has been given to members free of cost. The main advantage of this platform is its offer of straight-through processing (STP) capabilities as it is linked to CCIL's settlement platform.

6.48 In the forward segment of the Indian foreign exchange market, trading takes place both over the counter (OTC) and in an exchange traded market with brokers playing an important role. The trading platforms available include FX CLEAR of the CCIL, RMDS from Reuters and FX Direct of the IBS.

6.49 In order to enhance the efficiency and transparency of the foreign exchange market and make it comparable with the markets of other EMEs, the Committee on Fuller Capital Account Convertibility (FCAC, 2006) has proposed the introduction of an electronic trading platform for the conduct of all foreign exchange transactions. Under such an arrangement, an authorised dealer will fix certain limits for its clients for trading in foreign exchange, based on a credit assessment of each client or deposit funds or designated securities as collateral. A number of small foreign exchange brokers could also be given access to the foreign exchange trading screen by the authorised dealers. In the case of electronic transaction, the buy/sell order for foreign exchange of an authorised dealer's client first flows from the client's terminal to that of the authorised dealers' dealing system. If the client's order is within the exposure limit, the dealing system will automatically route the order to the central matching system. After the order gets matched, the relevant details of the matched order would be routed to the client's terminal through the trading system of the authorised dealer. Such a system would also have the advantage of the customer having the choice of trading with the bank quoting the best price and the Reserve Bank's intervention in the foreign exchange market could remain anonymous. For very large trades, a screen negotiated deal system has been proposed by the Committee on Fuller Capital Account Convertibility.

Risk Management and Settlement of Transactions in the Foreign Exchange Market

6.50 The foreign exchange market is characterised by constant changes and rapid innovations in trading methods and products. While the innovative products and ways of trading create new possibilities for profit, they also pose various kinds of risks to the market. Central banks all over the world, therefore, have become increasingly concerned of the scale of foreign exchange settlement risk and the importance of risk mitigation measures. Behind this growing awareness are several events in the past in which foreign exchange settlement risk might have resulted in systemic risk in global financial markets, including the failure of Bankhaus Herstatt in 1974 and the closure of BCCI SA in 1991.

6.51 The foreign exchange settlement risk arises because the delivery of the two currencies involved in a trade usually occurs in two different countries, which, in many cases are located in different time zones. This risk is of particular concern to the central banks given the large values involved in settling foreign exchange transactions and the resulting potential for systemic risk. Most of the banks in the EMEs use some form of methodology for measuring the foreign exchange settlement exposure. Many of these banks use the single day method, in which the exposure is measured as being equal to all foreign exchange receipts that are due on the day. Some institutions use a multiple day approach for measuring risk. Most of the banks in EMEs use some form of individual counterparty limit to manage their exposures. These limits are often applied to the global operations of the institution. These limits are sometimes monitored by banks on a regular basis. In certain cases, there are separate limits for foreign exchange settlement exposures, while in other cases,

limits for aggregate settlement exposures are created through a range of instruments. Bilateral obligation netting, in jurisdictions where it is legally certain, is an important way for trade counterparties to mitigate the foreign exchange settlement risk. This process allows trade counterparties to offset their gross settlement obligations to each other in the currencies they have traded and settle these obligations with the payment of a single net amount in each currency.

6.52 Several emerging markets in recent years have implemented domestic real time gross settlement (RTGS) systems for the settlement of high-value and time critical payments to settle the domestic leg of foreign exchange transactions. Apart from risk reduction, these initiatives enable participants to actively manage the time at which they irrevocably pay away when selling the domestic currency, and reconcile final receipt when purchasing the domestic currency. Participants, therefore, are able to reduce the duration of the foreign exchange settlement risk.

6.53 Recognising the systemic impact of foreign exchange settlement risk, an important element in the infrastructure for the efficient functioning of the Indian foreign exchange market has been the clearing and settlement of inter-bank USD-INR transactions. In pursuance of the recommendations of the Sodhani Committee, the Reserve Bank had set up the Clearing Corporation of India Ltd. (CCIL) in 2001 to mitigate risks in the Indian financial markets. The CCIL commenced settlement of foreign exchange operations for inter-bank USD-INR spot and forward trades from November 8, 2002 and for inter-bank USD-INR cash and tom trades from February 5, 2004. The CCIL undertakes settlement of foreign exchange trades on a multilateral net basis through a process of novation and all spot, cash and tom transactions are guaranteed for settlement from the trade date. Every eligible foreign exchange contract entered between members gets novated or replaced by two new contracts – between the CCIL and each of the two parties, respectively. Following the multilateral netting procedure, the net amount payable to, or receivable from, the CCIL in each currency is arrived at, member-wise. The Rupee leg is settled through the members' current accounts with the Reserve Bank and the USD leg through CCIL's account with the settlement bank at New York. The CCIL sets limits for each member bank on the basis of certain parameters such as member's credit rating, net worth, asset value and management quality. The CCIL settled over 900,000 deals for a gross volume of US $ 1,180 billion in 2005-06. The CCIL has consistently endeavoured to add value to the services and has gradually brought the entire gamut of foreign exchange transactions under its purview. Intermediation, by the CCIL thus, provides its members the benefits of risk mitigation, improved efficiency, lower operational cost and easier reconciliation of accounts with correspondents.

6.54 An issue related to the guaranteed settlement of transactions by the CCIL has been the extension of this facility to all forward trades as well. Member banks currently encounter problems in terms of huge outstanding foreign exchange exposures in their books and this comes in the way of their doing more trades in the market. Risks on such huge outstanding trades were found to be very high and so were the capital requirements for supporting such trades. Hence, many member banks have expressed their desire in several fora that the CCIL should extend its guarantee to these forward trades from the trade date itself which could lead to significant increase in the liquidity and depth in the forward market. The risks that banks today carry in their books on account of large outstanding forward positions will also be significantly reduced (Gopinath, 2005). This has also been one of the recommendations of the Committee on Fuller Capital Account Convertibility.

6.55 Apart from managing the foreign exchange settlement risk, participants also need to manage market risk, liquidity risk, credit risk and operational risk efficiently to avoid future losses. As per the guidelines framed by the Reserve Bank for banks to manage risk in the inter-bank foreign exchange dealings and exposure in derivative markets as market makers, the boards of directors of ADs (category-I) are required to frame an appropriate policy and fix suitable limits for operations in the foreign exchange market. The net overnight open exchange position and the aggregate gap limits need to be approved by the Reserve Bank. The open position is generally measured separately for each foreign currency consisting of the net spot position, the net forward position, and the net options position. Various limits for exposure, *viz*., overnight, daylight, stop loss, gap limit, credit limit, value at risk (VaR), *etc.,* for foreign exchange transactions by banks are fixed. Within the contour of these limits, front office of the treasury of ADs transacts in the foreign exchange market for customers and own proprietary requirements. These exposures are accounted, confirmed and settled by back office, while mid-office evaluates the profit and monitors adherence to risk limits on a continuous basis. In the case of market risk, most banks use a combination of measurement techniques including

VaR models. The credit risk is generally measured and managed by most banks on an aggregate counter-party basis so as to include all exposures in the underlying spot and derivative markets. Some banks also monitor country risk through cross-border country risk exposure limits. Liquidity risk is generally estimated by monitoring asset liability profile in various currencies in various buckets and monitoring currency-wise gaps in various buckets. Banks also track balances to be maintained on a daily basis in Nostro accounts, remittances and committed foreign currency term loans while monitoring liquidity risk.

6.56 To sum up, the foreign exchange market structure in India has undergone substantial transformation from the early 1990s. The market participants have become diversified and there are several instruments available to manage their risks. Sources of supply and demand in the foreign exchange market have also changed in line with the shifts in the relative importance in balance of payments from current to capital account. There has also been considerable improvement in the market infrastructure in terms of trading platforms and settlement mechanisms. Trading in Indian foreign exchange market is largely concentrated in the spot segment even as volumes in the derivatives segment are on the rise. Some of the issues that need attention to further improve the activity in the derivatives segment include flexibility in the use of various instruments, enhancing the knowledge and understanding the nature of risk involved in transacting the derivative products, reviewing the role of underlying in booking forward contracts and guaranteed settlements of forwards. Besides, market players would need to acquire the necessary expertise to use different kinds of instruments and manage the risks involved.

IV. FOREIGN EXCHANGE MARKET: AN ASSESSMENT

6.57 The continuous improvement in market infrastructure has had its impact in terms of enhanced depth, liquidity and efficiency of the foreign exchange market. The turnover in the Indian foreign exchange market has grown significantly in both the spot and derivatives segments in the recent past. Along with the increase in onshore turnover, activity in the offshore market has also assumed importance. With the gradual opening up of the capital account, the process of price discovery in the Indian foreign exchange market has improved as reflected in the bid-ask spread and forward premia behaviour.

Foreign Exchange Market Turnover

6.58 As per the Triennial Central Bank Survey by the Bank for International Settlements (BIS) on "Foreign Exchange and Derivatives Market Activity", global foreign exchange market activity rose markedly between 2001 and 2004 (Table 6.4). The strong growth in turnover may be attributed to two related factors. First, the presence of clear trends and higher volatility in foreign exchange markets between 2001 and 2004 led to trading momentum, where investors took large positions in currencies that followed persistent appreciating trends. Second, positive interest rate differentials encouraged the so-called "carry trading", *i.e.,* investments in high interest rate currencies financed by positions in low interest rate currencies. The growth in outright forwards between 2001 and 2004 reflects heightened interest in hedging. Within the EM countries, traditional foreign exchange trading in Asian currencies generally recorded much faster growth than the global total between 2001 and 2004. Growth rates in turnover for Chinese renminbi, Indian rupee, Indonesian rupiah, Korean won and new Taiwanese dollar exceeded 100 per cent between April 2001 and April 2004 (Table 6.5). Despite significant growth in the foreign exchange market turnover, the share of most of the EMEs in total global turnover, however, continued to remain low.

6.59 The Indian foreign exchange market has grown manifold over the last several years. The daily average turnover impressed a substantial pick up from about US $ 5 billion during 1997-98 to US $ 18 billion during 2005-06. The turnover has risen considerably to US $ 23 billion during 2006-07 (up to February 2007) with the daily turnover crossing US $ 35 billion on certain days during October and November 2006. The inter-bank to merchant turnover ratio has halved from 5.2 during 1997-98 to 2.6 during 2005-06,

Table 6.4: Global Foreign Exchange Market Turnover
(Daily averages in April, in billions of US dollars)

Item	1989	1998	2001	2004
1	2	3	4	5
Spot Transactions	317	568	387	621
Outright Forwards	27	128	131	208
Foreign Exchange Swaps	190	734	656	944
Estimated Gaps in Reporting	56	60	26	107
Total "Traditional" Turnover	590	1,490	1,200	1,880
Memo:				
Turnover at April 2004 Exchange Rates	650	1,590	1,380	1,880

Source : Triennial Central Bank Survey on "Foreign Exchange and Derivatives Market Activity", Bank for International Settlement, 2005.

Table 6.5: Traditional Foreign Exchange Market Turnover in EM Currencies - April 2004
(Daily averages, in millions of US dollars)

	Spot	Forward	Swap	Total	Growth since 2001 (%)
1	2	3	4	5	6
Chinese renminbi	992	811	9	1,812	530
Hong Kong dollar	6,827	2,221	24,133	33,181	21
Indian rupee	2,877	1,531	1,658	6,066	114
Indonesian rupiah	760	267	1,025	2,051	283
Korean won	10,510	6,048	4,592	21,151	117
Malaysian ringgit	351	237	399	987	7
Philippine peso	345	232	188	765	52
Singapore dollar	5,177	1,242	10,591	17,010	32
New Taiwan dollar	3,607	2,798	856	7,261	129
Thai baht	1,333	490	1,669	3,492	88
Memo:					
US dollar	528,639	170,357	874,083	1,573,080	48
Euro	272,887	88,243	298,231	659,361	49
Pound sterling	82,839	31,338	185,241	299,417	93
Japanese yen	130,382	47,135	181,715	359,231	35

Source : BIS Quarterly Review, March 2005.

reflecting the growing participation in the merchant segment of the foreign exchange market (Table 6.6 and Chart VI.2). Mumbai alone accounts for almost 80 per cent of the foreign exchange turnover.

6.60 Turnover in the foreign exchange market was 6.6 times of the size of India's balance of payments during 2005-06 as compared with 5.4 times in 2000-01 (Table 6.7). With the deepening of the foreign exchange market and increased turnover, income of commercial banks through treasury operations has increased considerably. Profit from foreign exchange transactions accounted for more than 20 per cent of total profits of the scheduled commercial banks during 2004-05 and 2005-06 (Chart VI.3).

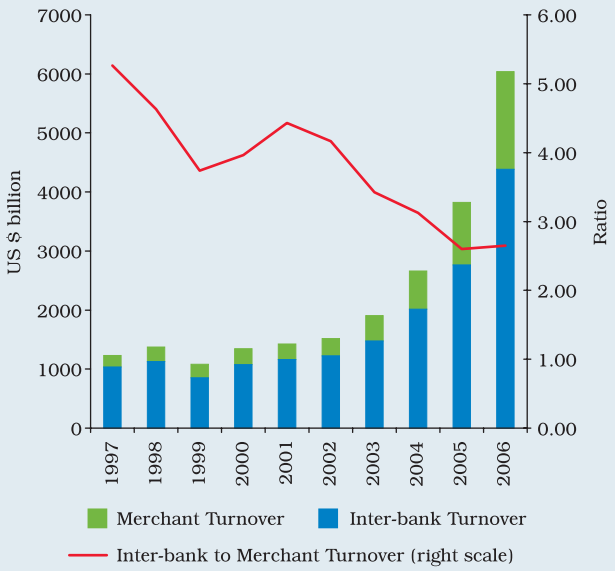
Table 6.6: Indicators of Indian Foreign Exchange Market Activity

(US $ billion)

Item	1997-1998	2005-2006	2006-2007@
1	2	3	4
Total Annual Turnover	1,306	4,413	5,734
Average Daily Turnover	5	18	23
Average Daily Merchant Turnover	1	5	7
Average Daily Inter-bank Turnover	4	13	18
Inter-bank to Merchant ratio	5.2	2.6	2.6
Spot/Total Turnover (%)	51.6	50.5	52.4
Forward/Total Turnover (%)	12.0	19.0	18.0
Swap/Total Turnover (%)	36.4	30.5	29.6

@ : April-February.
Source : Reserve Bank of India.

Chart VI.2: Turnover in Indian Foreign Exchange Market



6.61 The bank group-wise distribution of the turnover (as a proportion of the total turnover for the respective year) reveals that foreign banks account for the largest share in total turnover, though their share declined from 59 per cent in 1996-97 to 42 per cent during 2005-06 (Table 6.8). The share of public and private sector banks increased correspondingly. Turnover of some of the new private sector banks, in particular, increased sharply during this period.

6.62 The spot market remains the most important foreign exchange market segment accounting for 51 per cent of the total turnover. Its share, however, has declined marginally in recent years due to a pick up in the turnover in derivative segment (Chart VI.4).

Table 6.7: Relative Size of the Foreign Exchange Market in India

Year	Foreign Exchange Market-Annual Turnover (US $ billion)	Balance of Payment Size (US $ billion)	Foreign Currency Assets of RBI* (US $ billion)	Col. 2 over Col. 3	Col. 2 over Col. 4
1	2	3	4	5	6
2000-01	1,387	258	40	5.4	35
2001-02	1,421	237	51	6.0	28
2002-03	1,560	267	72	5.8	22
2003-04	2,118	362	107	5.9	20
2004-05	2,892	481	136	6.0	21
2005-06	4,413	664	145	6.6	30

* As at end-March.
Source : Reserve Bank of India.

Chart VI.3: Scheduled Commercial Banks - Profit from Foreign Exchange Transactions as a Proportion of Total Profit

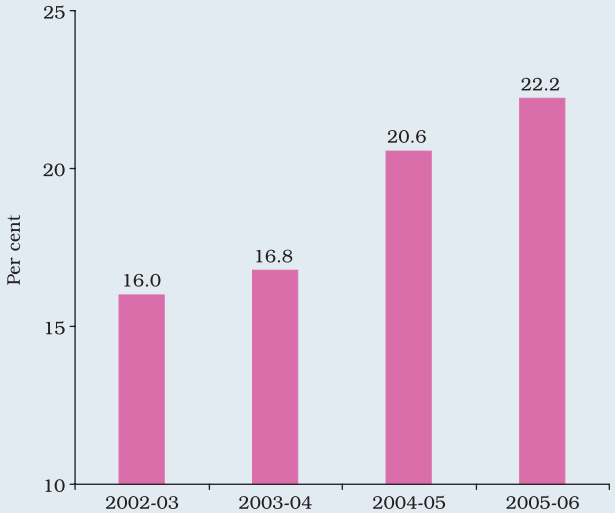
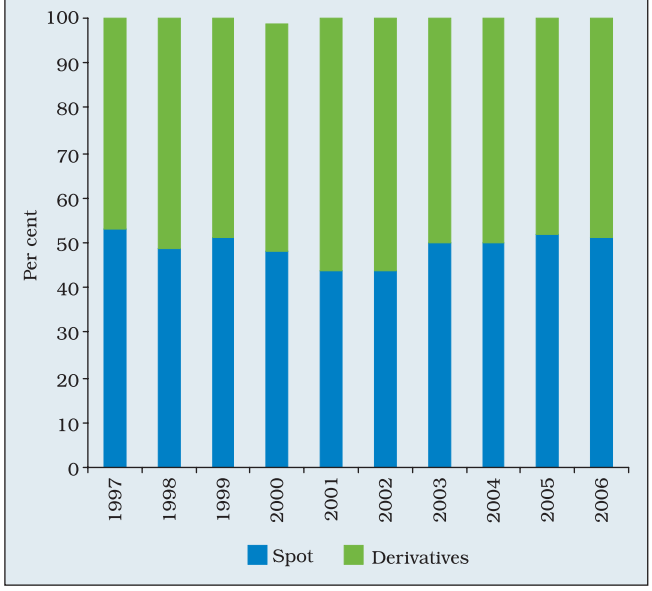


Chart VI.4: Foreign Exchange Turnover – Segment-wise



6.63 As mentioned earlier, the spot market comprises inter-bank and retail/merchant segments. It is the inter-bank transactions that dominate the spot segment. The merchant segment of the spot market is generally dominated by the Government of India, select large public sector units, such as Indian Oil Corporation (IOC), and the FIIs. As the foreign exchange demand on account of public sector units and the Government tends to be lumpy and uneven, resultant demand-supply mismatches entail occasional pressures on the foreign exchange market, warranting market interventions by the Reserve Bank. However, in recent years, a two-way movement in the exchange rate has been observed, partly on account of flows by FIIs. This, in turn, provided flexibility in the operation of ADs and suggests an increase in depth and liquidity in the market.

6.64 In the derivatives market, foreign exchange swaps account for the largest share of the total derivatives turnover in India, followed by forwards and options (Table 6.9). Options have remained insignificant despite being in existence for four years. With restrictions on the issue of foreign exchange swaps and options by corporates in India, the turnover in these segments (swap and options) essentially reflects inter-bank transactions.

6.65 The forward segment of the derivatives market has both merchant and inter-bank participants. However, unlike in the spot segment, it is the merchant turnover that accounts for the larger share in the forward market (Chart VI.5). The inter-bank to merchant turnover ratio that was close to unity till 2000, declined sharply thereafter mainly due to the faster growth of the merchant turnover, reflecting growing trade activity, robust corporate performance and increased liberalisation.

6.66 Against the backdrop of the substantial increase in turnover in the Indian foreign exchange market, it is useful to explore the factors determining

Table 6.8: Foreign Exchange Turnover – Bank Group-wise Share

(in per cent)

Category of Banks	1996-97			2005-06		
	Merchant	Inter-bank	Total	Merchant	Inter-bank	Total
1	2	3	4	5	6	7
Public Sector	8	21	29	6	26	32
Private Sector	2	10	12	9	17	26
Foreign	7	52	59	12	30	42
Total	**17**	**83**	**100**	**27**	**73**	**100**

Source : Reserve Bank of India.

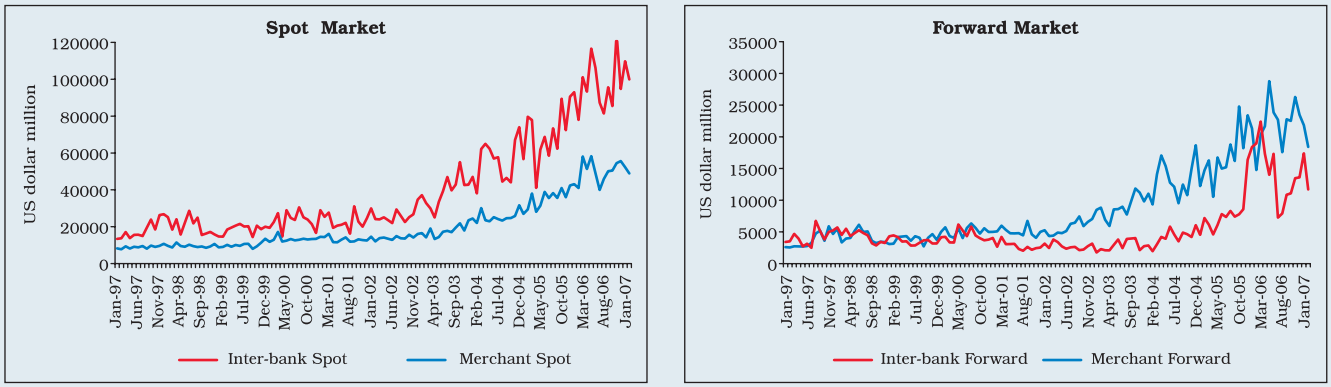
Table 6.9: Derivatives Turnover in India

(US $ billion)

Item	2000-01	2005-06	2006-07 (Up to February 2007)
1	2	3	4
Forward	163	839	1,035
Swap	565	1,344	1,695
Options@	0	11	38

@ : Rough estimate.
Source : Reserve Bank of India.

Chart VI.5: Inter-bank and Merchant Transactions in Foreign Exchange Market



the trading volume. The limited available literature suggests that the expected turnover increases with the increase in number of active traders, information flows and amount of disagreement in the market and that it may change over time (Tauchen and Pitts, 1983). Evidence in the Indian context reveals that growth in number of transactions, as expected, results in an increase in the trading volume in the foreign exchange market[5]. The coefficient is, however, low reflecting the relative stability of the market implying that large fluctuations in number of deals may not have substantial impact on market turnover. Apart from the number of trades in the market, the trading volume is also determined by a host of other factors, *viz*. - the number of instruments available to market participants, depth of the market and the increasing openness of the economy, which have not been captured in the analysis.

6.67 The information about the future trading volume is useful for determining the spread of the exchange rates so as to reduce transaction costs and enable better price discovery. An efficient price discovery mechanism necessitates the study of price volatility and trade volume relationship. Empirical analysis[6] of the relationship between the changes in the trading volume and exchange rate return reveals that the variation in trade volume could lead to increase in the flexibility in the movement of exchange rates[7], which have been observed in the last few

[5] The ARDL approach to cointegration analysis was applied on the data from Clearing Corporation of India Ltd (CCIL) for the period November 12, 2002 through December 5, 2006, since the foreign exchange volumes variable was found to be non-stationary I(1) while the number of deals variable was stationary I(0) in level form. They were found to share a long-run relationship, based on which the following error correction version of ARDL (4, 4) with lag lengths selected by Schwarz Bayesian Criterion was estimated.

$$\Delta VOL = \underset{(-3.37)}{-0.14C} - \underset{(-13.02)^*}{0.45\Delta VOL_{t-1}} - \underset{(-6.58)^*}{0.24\Delta VOL_{t-2}} - \underset{(-4.17)^*}{0.13\Delta VOL_{t-3}}$$
$$+ \underset{(11.24)^*}{0.19\Delta ND_{t-1}} + \underset{(6.08)^*}{0.10\Delta ND_{t-2}} + \underset{(3.97)^*}{0.06\Delta ND_{t-3}} + \underset{(136.49)^*}{0.44\Delta ND} - \underset{(-5.40)^*}{0.11\varepsilon_{t-1}}$$

$\bar{R}^2 = 0.97$ DW = 2.03

The figures in the brackets are t-values; *denote significance at 1 per cent level. Δ denotes the first difference of the respective variable; C is the intercept, VOL and ND are the log of foreign exchange trading volume in crore of rupees and number of deals per day respectively. Trading volume is the volume of transaction in the cash, tom, spot and forward segments.

[6] In financial market, the volatility is time variant. Therefore, to handle the behaviour of the data, it is more appropriate to apply ARCH type of model instead of any constant variance approach. GARCH (1,1) framework was used to study this relationship.

[7] The presence of ARCH effect in the exchange rate return series was tested before estimating GARCH(1,1) model. The mean equation of GARCH(1,1) is an ARMA(2,2) model where the coefficients are found significant while estimating through OLS. The GARCH(1,1) is estimated for the period November 12, 2002 to December 5, 2006 and variables are Rupees/Dollar return and total trading volume in cash, tom, spot and forward segments. The estimated equation is:

$$h_t = \underset{(5.07)^*}{0.01} + \underset{(10.29)^*}{0.01\Delta VOL} + \underset{(6.65)^*}{0.54h_{t-1}} + \underset{(4.81)^*}{0.38\varepsilon_{t-1}}$$

$\bar{R}^2 = 0.004$; DW=1.93; LM(8) = 6.28(0.62)$^{\#}$; Wald Stat = 2.23(0.14)$^{\#}$; Log likelihood = 159.15; AIC = -0.32.

h : the time-varying volatility of exchange rate return; ε represent the conditional error terms and ΔVOL is the first difference of log trading volume. Figures in the brackets are t-values; *denotes significance at 1 per cent level; # : figures in the respective brackets are p-values.

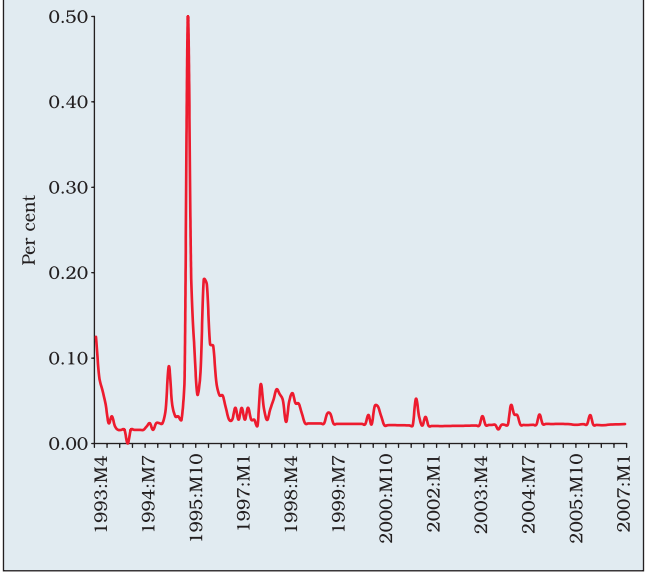
years. Thus, increase in trading volume and the consequent increase in flexibility implying two-way expectations is healthy for the development of the market.

Market Efficiency

6.68 With the exchange rate primarily getting determined by the forces of demand and supply, the issue of foreign exchange market efficiency has assumed importance in India in recent years. Markets are perceived as efficient when market prices reflect all available information, so that it is not possible for any trader to earn excess profits in a systematic manner. The efficiency/liquidity of the foreign exchange market is often gauged in terms of bid-ask spread. The bid-ask spread reflects the transaction and operating costs involved in the transaction of the currency. These costs include phone bills, cable charges, book-keeping expenses and trader salaries, among others. In the spot segment, it may also include the risks involved in holding the foreign exchange. These costs/bid-ask spread are expected to decline with the increase in the volume of transactions in the currency. The finance theory identifies three basic sources of bid-ask spreads: (a) order processing costs, (b) inventory holding costs, and (c) information costs of market making, and each one is influenced by trading volume in a particular manner (Hartmann, 1999). The low and stable bid-ask spread in the foreign exchange market, therefore, indicates that market is efficient with underlying low volatility, high liquidity and less of information asymmetry.

6.69 The spread in the Indian foreign exchange market has declined overtime and is very low at present. In India, the normal spot market quote has a spread of 0.25 of a paisa to 1 paise, while swap quotes are available at 1 to 2 paise spread. A closer look at the bid-ask spread in the rupee-US dollar spot market reveals that during the initial phase of market development (*i.e.*, till the mid-1990s), the spread was high and volatile due to a thin market with unidirectional behavior of market participants (Chart VI.6). In the subsequent period, with relatively deep and liquid markets, the bid-ask spread declined

Chart VI.6: Bid-Ask Spread (Re-USD) in the Spot Foreign Exchange Market



sharply and has remained low and stable, reflecting efficiency gains.

6.70 It was empirically observed that expected volatility of the rupee-dollar exchange rate could impact the spread which increases with the increase in volatility[8]. However, the trading volume has negligible impact on the exchange rate spread. The intercept of the estimated equation is highly significant showing the flatness of the spread in the Indian foreign exchange market. The flat and low spread can be attributed to lower volatility in the foreign exchange market.

Behaviour of Forward Premia

6.71 An important aspect of functioning of the foreign exchange market relates to the behaviour of forward premia in terms of its linkages with economic fundamentals such as interest rates and its ability to predict future spot rates. An analysis of forward premia, essentially reflects whether a currency is at a premium/discount with respect to other reserve currencies. Forward premia is particularly important for importers and exporters who need to hedge their risks to foreign currency. The forward market in India

[8] Using the rupee-dollar bid-ask absolute spread (SPD), 1 month ATM rupee-dollar option price volatility (IV) as a proxy for expected volatility and daily turnover (VOL) in the foreign exchange market (turnover in spot, forward and swap), the OLS equation is estimated for the period July 7, 2003 to August 31, 2006. The spread and turnover/trading volume are in log forms.

$$\log SPD = -4.56 - 0.01 \log VOL + 3.29\, IV$$
$$\quad\quad (-31.63)^* \quad (-0.94) \quad\quad (5.18)^*$$

$\bar{R}^2 = 0.15$; DW = 2.10

Figures in the brackets are t-values and *denotes significance at 1 per cent level.

is active up to six months where two-way quotes are available. In recent years, however, the segment up to one year maturity has also gained liquidity. The link between the forward premia and interest rate differential seems to work largely through leads and lags. The integration between the domestic market and the overseas market is more often through the forward market. The integration has been facilitated by allowing ADs to borrow from their overseas offices or correspondents and invest funds in overseas money market. The forward segment is also influenced by a number of other factors: (i) importers and exporters availing or extending credit to overseas parties (importers can move between sight payment and 180 days usance depending on the global interest rate, domestic interest rate and expectations on future spot rate); (ii) importers switching between rupee credit and foreign currency credit; (iii) the decision to hedge or not to hedge the exposure, depending on expectations and forward premia; (iv) exporters delaying payments or advance receivables, subject to conditions on repatriation and surrender, depending upon the interest on rupee credit, the premia and interest rate overseas; and (v) availing of pre/post-shipment credit in foreign exchange and switching between rupee and foreign currency credit.

6.72 With the opening up of the capital account, the forward premia is getting gradually aligned with the interest rate differential reflecting growing market efficiency. While free movement in capital account is only a necessary condition for full development of, the forward and other foreign exchange derivatives markets, the sufficient condition is provided by a deep and liquid money market with a well-defined yield curve.

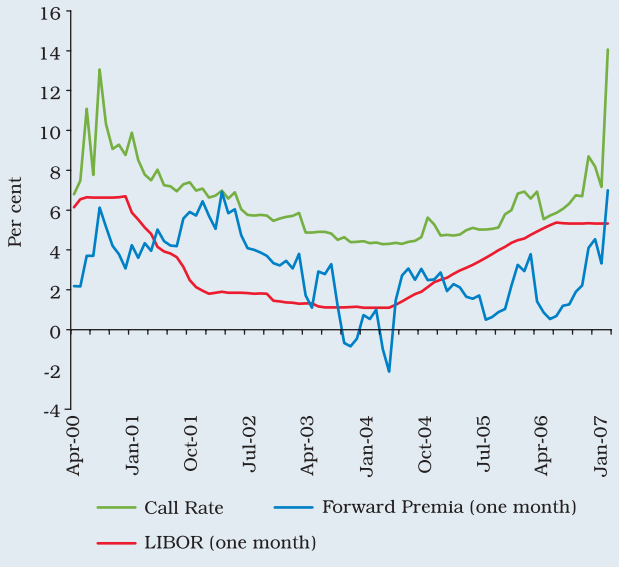
6.73 In the post-liberalisation phase, the forward premia of the US dollar *vis-à-vis* Indian rupee has generally remained high indicating that rupee was at a discount to the US dollar. In recent times, however, reflecting the build-up of foreign exchange reserves, the strong capital flows and the confidence in the Indian economy, the forward premia has come down sharply from the peak reached in 1995-96. For a short period in 2003-04, the forward premia turned negative defying the traditional theory according to which the currency of a country with higher inflation rate/interest rate should be at a discount *vis-à-vis* other country's currency. This was the period when Indian rupee was gaining strength against the US dollar, which depreciated against most other currencies. The period since 2002 has, in fact, witnessed sharp co-movement of forward premia and exchange rate with the premia

Chart VI.7: Movement of Forward Premia and Rupee-Dollar Exchange Rate

exhibiting a decline, whenever rupee appreciated (Chart VI.7).

6.74 Forward premia is also affected by movements in call rates, reflecting the principle of interest-rate parity. Tightening of liquidity in the domestic market immediately pushes up call rates, which in turn, pushes up forward premia. Whenever liquidity in the domestic market is tightened, banks and other market players sell the US dollar in cash or spot market and buy in the forward market pushing forward premia upward (Chart VI.8).

Chart VI.8: Transmission from the Call Money Market to the Forward Market



6.75 Several studies have analysed the behaviour of forward premia and have attempted to explore the factors that determine it in the Indian foreign exchange market. Forward premia of Indian rupee is driven to a large extent by the interest rate differential in the inter-bank market of the two economies, FII flows, current account balance as well as changes in exchange rates of US dollar *vis-à-vis* Indian rupee (Sharma and Mitra, 2006). Another study has observed that the forward premia for the period 1997 to 2002 systemically exceeded rupee depreciation, implying that there has been an asymmetric advantage to sellers of dollar forwards (Ranade and Kapur, 2003).

6.76 One way of assessing market efficiency is to observe the forward rate behaviour as to whether forward rates are unbiased predictor of future spot rates. For the period April 1993 to January 1998, it was found that forward rates cannot effectively predict the future spot rates and there is no co-integration between forward rates and future spot rates (Joshi and Saggar, 1998). An analysis using the data for the more recent period during January 1995 to December 2006 reveals that the ability of forward rates in correctly predicting the future spot rates has improved over time and that there is some co-integrating relationship between the forward rate and the future spot rate[9]. This could be attributed to the gradual opening up of the Indian economy, particularly in the capital account, together with other reform initiatives undertaken to develop the forward market such as introduction of new instruments, trading platforms and more players.

Non-Deliverable Forward (NDF) Market

6.77 In addition to the onshore spot and derivatives market, another segment that is fast picking up is the offshore non deliverable forward (NDF) market. NDFs are synthetic foreign currency forward contracts on non-convertible or restricted currencies traded over the counter outside the direct jurisdiction of the respective national authorities of restricted currencies. The demand for NDFs arises principally out of regulatory and liquidity constraint issues of the underlying currencies. These derivatives allow multinational corporations, portfolio investors, hedge funds and proprietary foreign exchange accounts of commercial and investment banks to hedge or take speculative positions in local currencies. While the multinational companies deal in both the long and short end of the market, the short end of the market is particularly dominated by the hedge funds. The pricing is influenced by a combination of factors such as interest rate differential between the two currencies, supply and demand, future spot expectations, foreign exchange regime and central bank policies. The settlement of the transaction is not by delivering the underlying pair of currencies, but by making a net payment in a convertible currency equal to the difference between the agreed forward exchange rate and the subsequent spot rate. These are generally settled in US dollar. The currencies that are traded in the Asian NDF markets are Chinese yuan, Korean won, Taiwanese dollar, Philippine peso, Indonesian rupiah, Malaysian ringgit, Thai baht, Pakistani rupee and Indian rupee. The market is very liquid in Korean won, Chinese yuan and Taiwanese dollar followed by Indian rupee (Ma *et al,* 2004).

6.78 The NDF market in Indian rupee (INR NDF) has been in existence for over the last 10 years or so, reflecting onshore exchange controls and regulations. However, liquidity in the NDF market has improved since the late 1990s as foreign residents who had genuine exposure to the Indian rupee but were unable

[9] To study the relationship between future spot rate and forward rate, the following equation was estimated:

$s_{t+1} = \alpha + \beta f_t^{1m} + \varepsilon_t$

Where s_{t+1} is 1 month ahead (log) rupee-dollar future spot rate at time t, f_t^{1m} is 1 month (log) forward rate and ε_t is the residual term.

For the forward rate to be unbiased predictor of future spot rate, the hypothesis test could be $\alpha = 0$ and $\beta = 1$ and a white noise error term. The long run relationship between them is studied using cointegration between future spot rate and forward rate which states that one can predict one of them with the information of the other.

$s_{t+1} = 0.04 + 0.99\ f_t^{1m}$
$\quad\quad (1.25)\ (107.41)^*$
$\bar{R}^2 = 0.99$; DW = 1.45;
F stat (for $\alpha = 0$ and $\beta = 1$) = 1.83 (0.16)#
ADF = -8.94 (0.00)#

Figures in brackets are t-values; * denotes significance at 1 per cent level; #: figures in the respective brackets are p-values.

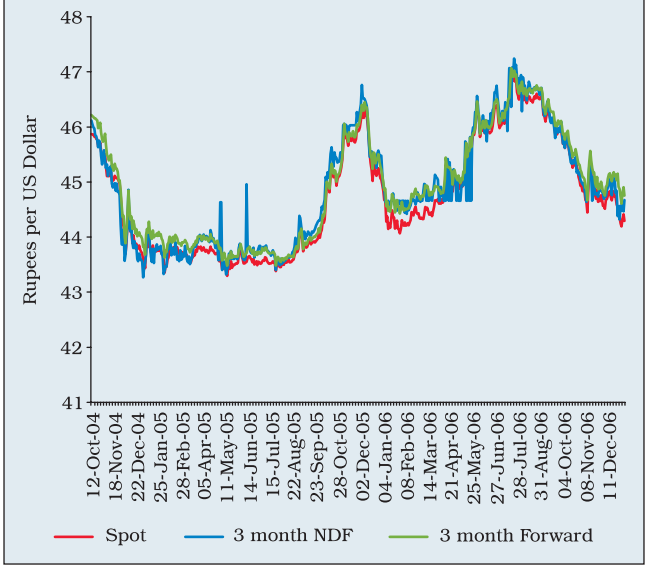
The results indicate that one month forward rate is an unbiased predictor of 1 month ahead future spot rate as the joint hypothesis of $\alpha = 0$ and $\beta = 1$ is not rejected and the error term follows first order autocorrelation. Further, both the rates are cointegrated as reflected by the ADF statistics of the error term.

to adequately hedge their exposure in the domestic market due to prevailing controls participated in the NDF market. However with the gradual relaxation of exchange controls, reasonable hedging facilities are available to offshore non-residents who have exposures to the Indian rupee, especially when compared with the hedging facilities provided by some other competing Asian countries. Besides, the INR NDF market also derives its liquidity from (i) non-residents wishing to speculate on the Indian rupee without any exposure to the country; and (ii) arbitrageurs who try to exploit the differentials in the prices in the two markets[10].

6.79 The INR NDFs have grown in volume and depth over the years. While these are largely concentrated in Singapore, they are also in existence in London and New York. In the wake of the Asian crisis, offshore implied interest rates were higher than onshore rates, reflecting ongoing depreciation pressure in the offshore trading during that period. Since 2003, however, offshore expectation of further rupee appreciation has driven offshore implied interest rates below onshore rates. Though an accurate assessment of the volumes is difficult, estimated that the daily volumes for INR NDF hovered around US $ 100 million in 2003/2004 (Ma *et al* , 2004) although reportedly NDF volumes have grown substantially in the recent period. As compared with some other Asian currencies traded in the NDF market such as the Korean won, Chinese yuan and Taiwanese dollar, turnover in INR NDF is small. While these volumes are not large enough to affect the domestic onshore market under regular market conditions, in volatile market conditions, however, these may impact the domestic spot markets. In fact, available data indicate a strong correlation between rupee-dollar spot, forward and NDF rates (Chart VI.9). As prices in the NDF market can be a useful informational tool for the authorities and investors to gauge market expectations of potential pressures on exchange rate, it may be useful from the policy angle to take cognisance of the developments in the NDF markets.

6.80 With regard to the regulatory aspects on the NDF market, there are no controls on the offshore participation in INR NDF markets. Domestic banking entities have specified open position and gap limits for their foreign exchange exposures and through these limits domestic entities could play in the NDF markets to take advantage of any arbitrage opportunity.

Chart VI.9: Movement of Indian Rupee in the Spot, Forward and NDF Markets



6.81 Some Asian authorities are now contemplating the liberalisation of their currency markets. An important issue that they face is how to facilitate the transition from offshore NDF markets to regular onshore or deliverable forward markets. Despite the benefits of NDF markets for hedging purposes in Asia, particularly for currencies of countries attracting significant foreign investment, market participants indicate a number of limitations which are likely to be relevant in a period of transition. The first and most important limitation in Asia is that only global institutions and a limited number of domestic institutions are able to use these instruments. Besides, for most markets there is limited liquidity in contracts with a maturity over one year. Lastly, there is no guarantee that the holder of the contract will actually be able to trade foreign exchange at the fixing rate. An implication of this is that when a change in the exchange rate regime is anticipated, the validity of the fixing rate as an indication of where a trade can be transacted is significantly diminished.

6.82 To sum up, with increase in depth and liquidity, the Indian foreign exchange market has evolved into a mature market over a period of time. The turnover has increased over the years. With the gradual

[10] For the Indian rupee, it is believed that arbitrage is profitable when there is difference of around 10 paise in the forwards prices. Such opportunities are not very common, but tend to occur whenever speculative actions increase.

opening up of the capital account, the forward premia is getting increasingly aligned with the interest rate differential. There is also an evidence of enhanced efficiency in the foreign exchange market as reflected in low bid-ask spreads. After having studied the development of the market structure and assessed their impact on liquidity and efficiency parameters, the next section dwells on the developments in the foreign exchange market in the post-liberalisation period, with focus on how the policy mix used by the Reserve Bank led the Indian economy to withstand several domestic as well as external shocks, including the contagion effect of the Asian crisis.

V. BEHAVIOUR OF THE FOREIGN EXCHANGE MARKET IN THE POST-UNIFICATION PERIOD

6.83 As in most other EMEs, the Indian foreign exchange market has also witnessed occasional periods of volatility in the post-1993 period. However, unlike many other EMEs where volatilities have persisted for prolonged periods resulting in severe imbalances and crises, the Indian experience reflects an effective and timely management of volatility in the foreign exchange market. The exchange rate policy is guided by the need to reduce excess volatility, prevent the emergence of destabilising speculative activities, help maintain adequate level of reserves and develop an orderly foreign exchange market. With a view to reducing the excess volatility in the foreign exchange market arising from lumpy demand and supply as well as leads and lags in merchant transactions, the Reserve Bank undertakes sale and purchase operations in the foreign exchange market. Such interventions, however, are not governed by any pre-determined target or band around the exchange rate. The experience with the market-determined exchange rate system since 1993 can be described as generally satisfactory as orderliness prevailed in the Indian market during most of the period. A few episodes of volatility that emerged were effectively managed through a combination of timely and effective monetary as well as administrative measures, which ensured return of orderliness to the market, within the shortest possible time.

First Phase of Stability: March 1993 to July 1995

6.84 In March 1993, as a precursor to current account convertibility, India moved from the dual exchange rate regime to a unified market determined exchange rate system under which the exchange rate is determined by the forces of supply and demand. On unification of the exchange rates, the nominal exchange rate of the rupee against both the US dollar as also against a basket of currencies got adjusted downwards. The Real Effective Exchange Rate (REER) of the rupee in the months following the unification represented almost an equilibrium situation. This was also borne out by the current account, which was more or less in balance in 1993-94. Exchange rate policy in the post-unification period was aimed at providing a stable environment by giving a boost to exports and foreign investment in line with the structural and stabilisation programme.

6.85 With the liberalisation in the capital account in the area of foreign direct investment and portfolio investments, capital inflows surged during 1993-94 and 1994-95. The large inflows tended to exert appreciating pressure on the rupee. In order to obviate any nominal appreciation of the rupee, which could have eroded export competitiveness, the Reserve Bank purchased a portion of such inflows and augmented the reserves. The foreign currency assets of the Reserve Bank rose from US $ 6.4 billion in March 1993 to US $ 20.8 billion in March 1995, representing over seven months of import cover. As a result, the exchange rate of the rupee reflected a prolonged period of stability and remained almost stable at Rs.31.37 per US dollar from March 1993 to July 1995. During this period, the sterilisation operations were on a lower scale, resulting in somewhat larger growth in monetary aggregates. Thus, the focus of exchange rate policy during this period was on preserving the external competitiveness at a time when the economy was undergoing a structural transformation. The Building up of the reserves was also one of the considerations.

First Phase of Volatility: August 1995 to March 1996

6.86 After a long spell of stability during 1993-95, the rupee came under some pressure in the third quarter of calendar year 1995 on account of a sudden and sharp reversal of sentiment and expectations of market participants. Slowing down of capital inflows in the wake of the Mexican crisis, a moderate widening of the current account deficit on resurgence of activity in the real sector and the rise of US dollar against other major currencies after a bearish phase were the main factors contributing to this trend. During this period, there was a sharp movement in exchange rate often resulting in overshooting. During most periods the opening rate in the foreign exchange market moved beyond the Reserve Bank buying and selling range and a distinct downward trend was seen. Some

of the structural weaknesses of the Indian inter-bank market like thinness and lack of heterogeneity of views among market participants became apparent. The bid-offer spread widened to about 20 paise; on certain days the spread was as wide as 85 paise, resulting in tremendous buying pressure in the face of meager supply. To eliminate the inconsistency of its buying rate, the Reserve Bank stopped publishing its quote on the Reuter screen with effect from October 4, 1995 offering only a buying quote to banks on specific request.

6.87 With the objective of having an active market intervention strategy, it was decided to keep a watch over day-to-day merchant demands of some large banks which handled more than 50 per cent of the import payments. As the main buying requirements of these banks were in respect of mainly public sector undertakings, a system was put in place to obtain information about their daily requirements. Market intelligence and information gathering were strengthened and the Reserve Bank started obtaining direct price quotes from leading foreign exchange broking firms. Two basic approaches on intervention were adopted. On days when there was information about large all round demand, an aggressive stance was taken with intensive selling in larger lots till the rate was brought down decisively. On other occasions, continual sale of small/moderate amounts was undertaken to prevent unduly large intra-day variations. While the first approach was aimed at absorbing excess market demand, the second at curbing one 'ratchet effect'.[11] The size of individual intervention deals was usually in the range of US $ 1-2 million, although some large size deals not exceeding US $ 5 million were also resorted to occasionally.

6.88 Direct intervention was supplemented by administrative measures such as imposition of interest surcharge on import finance and the tightening of concessions in export credit for longer periods. Consequent upon tightness in liquidity conditions due to intervention which led to soaring of call money rates, money market support was restored with the easing of CRR requirements on domestic as well as non-resident deposits from 15.0 per cent to 14.5 per cent in November 1995. With a view to discouraging the excessive use of bank credit for funding the demand for foreign exchange, interest surcharge on import finance was raised from 15 to 25 per cent. The scheme for extending Post-shipment Export Credit denominated in US dollar (PSCFC) was discontinued with effect from February 8, 1996 as it enabled exporters to earn a positive differential over the cost of funds simply by drawing credit and selling forward, thereby receiving the premia. Moreover, to curb excessive speculation in the forward market, cancellation of forward contracts booked by ADs for amounts of US $ 1,00,000 and above was required to be reported to the Reserve Bank on a weekly basis. The decisive and timely policy actions brought stability to the market and the rupee traded within the range of Rs.34.00 to Rs.35.00 per US dollar in the spot segment during the period from October 1995 to March 1996.

Second Phase of Stability: April 1996 to Mid-August 1997

6.89 The foreign exchange market witnessed remarkable stability during the period from April 1996 to mid-August 1997. During this period, the spot exchange rate remained in the range of Rs.35.50-36.00 per US dollar. The stability in the spot rate was reflected in forward premia as well. The premia, which remained within 6 to 9 per cent (six month) during the financial year 1996-97, declined further during the first five months of 1997-98 within a range of 3 to 6 per cent following easy liquidity conditions. From the second quarter of calendar year 1996 onwards, capital flows restored and the reserve loss was recouped within a short period of time.

Second Phase of Volatility: Mid-August 1997 to August 1998

6.90 The year 1997-98 and the first quarter of 1998-99 posed serious challenges to exchange rate management due to the contagion effect of the South-East Asian currency crisis and some domestic factors. There were two periods of significant volatility in the Indian foreign exchange market: (i) from mid-August 1997 to January 1998, and (ii) May 1998 till August 1998. Response to these episodes included intervention in both the spot and forward segments of the foreign exchange market and adoption of stringent monetary and administrative measures, which were rolled back immediately on restoration of orderly conditions.

6.91 During the latter part of the calendar year 1996 and early months of calendar year 1997, anticipation of stability in general and even

[11] The 'ratchet effect' means that in a bearish market situation if the rate falls even due to situational factors it does not recover easily even on reversal of those factors.

Table 6.10: REER and NEER of Select Asian Countries
(Base: 2000=100)

Country	1995	1997	2000	2001	2002	2003	2004	2005
1	2	3	4	5	6	7	8	9
Real Effective Exchange Rate (REER)								
China	84.7	100.4	100.0	104.3	101.9	95.2	92.7	92.5
India	101.7	103.0	100.0	100.9	96.9	96.6	98.4	103.7
Japan	108.2	85.3	100.0	89.0	83.0	83.6	84.5	79.4
Malaysia	122.7	122.6	100.0	104.9	105.0	99.2	94.9	95.2
Philippines	120.4	128.7	100.0	95.6	96.2	89.1	86.2	92.3
Singapore	106.2	110.2	100.0	100.5	97.9	94.3	93.3	92.1
Nominal Effective Exchange Rate (NEER)								
China	82.2	92.5	100.0	105.5	105.1	98.6	94.2	94.3
India	117.0	114.3	100.0	97.9	93.3	90.1	88.6	91.3
Japan	99.4	81.3	100.0	90.5	85.7	85.4	87.1	85.3
Malaysia	127.6	126.8	100.0	105.4	104.8	99.6	95.9	95.5
Philippines	145.8	142.5	100.0	90.9	89.7	81.3	75.7	76.9
Singapore	97.1	105.6	100.0	101.6	100.8	98.4	97.9	98.7

Note : Rise in index implies appreciation.
For India data pertain to 6 currency trade-based index.
Source : International Financial Statistics, IMF, 2006 and Reserve Bank of India.

appreciation of rupee in some quarters led many market participants to keep their oversold or short positions unhedged and substitute partly domestic debt by foreign currency borrowings to take advantage of interest arbitrage. This tendency was evident in the increased demand for loans out of FCNR(B) funds. The relatively stable exchange rates of the Asian currencies prior to this period had contributed to their appreciation in real terms (Table 6.10). In the wake of developments in the South East Asia and market perceptions of exchange rate policy, market participants rushed to cover unhedged positions. The Reserve Bank also subtly managed to talk down the rupee in August 1997.

6.92 In response to the developments in the foreign exchange market, the Reserve Bank intervened both in the spot and the forward segments of the market to prevent sharp depreciation of the rupee and to curb volatility, especially in the forward segment, which led to rise in outstanding forward liabilities by US $ 904 million in September 1997. In October 1997, the Reserve Bank allowed banks to invest and borrow abroad up to 15 per cent of unimpaired Tier I capital, which led to the resumption of capital flows and increase in volumes in the foreign exchange market, particularly in the outright forward and swap segments. In such market condition, the Reserve Bank undertook intervention in both spot and forward segment and liquidated its forward liabilities (Table 6.11).

6.93 Thereafter, however, persistent excess demand conditions combined with considerable volatility prevailed in the foreign exchange market. Market sentiment weakened sharply from November 1997 onwards in reaction to intensification of the crisis in the South-East Asia, and bearishness in domestic stock markets. Between November 1997 and January 1998, the exchange rate of the Indian rupee depreciated by around 9 per cent. The Reserve Bank undertook wide ranging and strong monetary and administrative measures on January 16, 1998 in order to curb the speculative tendencies among the market players and restore orderly conditions in the foreign exchange market (Box VI.6). As a result of monetary measures of January 16, 1998, the stability in the

Table 6.11 : Reserve Bank's Intervention in the Foreign Exchange Market

(US $ billion)

Year	Purchase	Sale	Net	Outstanding Net Forward Sales/Purchase
1	2	3	4	5
1995-96	3.6	3.9	-0.3	–
1996-97	11.2	3.4	7.8	–
1997-98	15.1	11.2	3.9	-1.8
1998-99	28.7	26.9	1.8	-0.8
1999-00	24.1	20.8	3.3	-0.7
2000-01	28.2	25.8	2.4	-1.3
2001-02	22.8	15.8	7.0	-0.4
2002-03	30.6	14.9	15.7	2.4
2003-04	55.4	24.9	30.5	1.4
2004-05	31.4	10.6	20.8	0
2005-06	15.2	7.1	8.1	0
2006-07@	24.5	0	24.5	0

@ : April-February.
Source : Reserve Bank of India.

Box VI.6
Policy Measures Undertaken in the Wake of Asian Crisis

November 26, 1997		
(i)	Export Credit	: Interest rate on post-shipment rupee export credit on usance bills for period (comprising usance period of export bills transit period as specified by the FEDAI and grace period wherever applicable) beyond 90 days and up to six months from the date of shipment was increased from 13 per cent to 15 per cent per annum.
November 28, 1997		
(i)	CRR	: Deferment of future programme of bringing about a reduction in cash reserve ratio (CRR).
(ii)	Repos	: Introduction of fixed rate repos at 4.5 per cent to absorb surplus liquidity.
(iii)	Export Credit	: With effect from December 15, 1997 interest rate on post-shipment rupee export credit of 15 per cent was to made applicable from the date of advance. Exporters were expected to take advantage of the time gap available up to December 15, 1997 by expediting realisations of their export proceeds.
December 1, 1997		
(i)	Forward Contracts	: Ban on rebooking of cancelled forward contracts on non-trade transactions for the same underlying exposure, only rollover allowed.
December 2, 1997		
(i)	CRR	: Increase in CRR by 0.5 percentage points to 10 per cent with effect from fortnight beginning December 6, 1997.
(iii)	Forward Contracts	: The facility granted to ADs in April 1997 to offer forward contracts based on past performance and declaration of exposure was suspended and forward contracts were allowed based only on documents evidencing exposure.
(iii)	NRI Deposits	: Abolition of 10 per cent incremental CRR on NRE(R)A and NR(NR)RD schemes with effect from December 6, 1997.
December 3, 1997		
(i)	Forward Contracts	: Reporting of cancellations of forward contracts beyond US $ 500,000 and merchant sales of US $ 2 million and above.
(ii)	Repos	: Interest rate on fixed rate repos was raised to 5 per cent with effect from December 3, 1997.
December 4, 1997		
(i)	Repos	: Interest rate on fixed rate repos was raised to 6.5 per cent.
December 11, 1997		
(i)	Repos	: The interest rate on fixed rate repos was raised to 7.0 per cent.
December 17, 1997		
(i)	Export Credit	: Imposition of interest rate of 20 per cent per annum (minimum) on overdue export bills from the date of advance. In case of demand bills and short-term usance bills, the higher rate of interest was not applicable where the total period of credit, including the period of overdue was less than one month from the date of bill/ negotiation.
(ii)	Surcharge on Import Finance	: Imposition of interest rate surcharge of 15 per cent of the lending rate (excluding interest tax) on import finance.
December 19, 1997		
(i)	Overseas Investments	: Overnight investments from nostro accounts were included in the 15 per cent of unimpaired Tier I capital limit for overseas investments by ADs.
December 31, 1997		
(i)	Export Credit	: Increase in the interest rate on post-shipment rupee export credit (measures undertaken on November 26 and 28, 1997) was rolled back. In other words, rate of interest on post-shipment rupee export credit (other than against overdue export bills) for period beyond 90 days and up to six months was to be 13 per cent per annum with effect from January 1, 1998. Hence, the position prevailing prior to November 26, 1997 was restored.
(ii)	Export Credit	: Imposition of interest rate of 20 per cent per annum on overdue export bills was made applicable for the overdue period and not from the date of advance and this rate was to be applicable in respect of certain chronic cases (where even six months ago, the bills were overdue).
January 6, 1998		
(i)	Overnight Position Limits	: Banks would have to square up their foreign exchange position on a daily basis.
January 16, 1998		
(i)	CRR	: Increase in CRR by 0.5 percentage points to 10.5 per cent with effect from fortnight beginning January 17, 1997.
(ii)	Repos	: Interest rate on fixed rate repos was raised to 9.0 per cent from 7.0 per cent.
(iii)	Repos	: Reverse repos facility was made available to Primary Dealers in Government Securities market at the Bank Rate on a discretionary basis and subject to stipulation of conditions relating to their operations in the call money market.
(iv)	Surcharge on Import Finance	: Interest rate surcharge on import finance was increased from 15 per cent to 30 per cent.
(v)	Overnight Position Limits	: It was decided to withdraw the across-the-board formal stipulation regarding square/near- square positions and restore to banks the freedom to run exposure within the limits approved. Banks were, however, advised to use their overnight position limits for genuine transactions.
(vi)	Overseas Investments	: To meet genuine operational requirements in foreign exchange transactions, requests of individual banks would be considered in regard to limits on nostro account balances.
(vii)	Bank Rate	: The Bank rate was increased from 9 per cent to 11 per cent with corresponding increase in the interest rate on Export Credit Refinance as well as General Refinance.
(viii)	Refinance	: Export refinance limit was reduced from 100 to 50 per cent of the increase in outstanding export credit eligible for refinance over the level of such credit as on February 16, 1996.
(ix)	Refinance	: General refinance limit was reduced from 1 per cent to 0.25 per cent of the fortnightly average outstanding aggregate deposits in 1996-97.

Note : Effective October 29, 2004, India switched over to the international usage of the term 'repo' and 'reverse repo'. Thus, 'repo' mentioned here is same as 'reverse repo' presently used.

foreign exchange market returned and more importantly, the expectations of the market participants about further depreciation in the exchange rate of rupee were somewhat contained. The volatility in the market as measured by month-wise coefficient of variation reduced from 1.26 per cent in January 1998 to 0.49 per cent in February 1998 and further to 0.08 per cent in March 1998. The exchange rate of rupee, which had depreciated to Rs. 40.36 per US dollar as on January 16, 1998, appreciated to Rs. 39.50 on March 31, 1998. The six month forward premia, which reached a peak of around 20 per cent in January 1998, came down to 7.0 per cent by end March 1998.

6.94 As normalcy returned in the foreign exchange market, the monetary measures were eased. Interest rate on fixed rate 'repos' (now 'reverse repo') was reduced to 7 per cent as on April 2, 1998 and further to 6 per cent on April 29, 1998. On April 29, 1998 the export refinance limit was also increased from 50 per cent to 100 per cent of the incremental export credit eligible for refinance. The CRR and the Bank rate were also reduced to earlier levels. India emerged relatively unscathed from the 1997 crisis due to the proactive policy responses initiated by the Reserve Bank. It acted swiftly to curb speculative activities and change market expectations. Direct interventions followed by administrative measures were undertaken, initially. However, when the volatility continued and sentiment remained unchanged, monetary measures were undertaken to reverse unidirectional expectations.

6.95 Management of the external sector continued to be a major challenge even in the post Asian crisis period, particularly during May to August 1998 as a result of bearishness in domestic stock exchanges, uncertainties created by internal developments and the strengthening of US dollar against major currencies, particularly yen. Furthermore, during this phase India was confronted with certain other developments like economic sanctions imposed by several industrial countries, suspension of fresh multilateral lending (except for certain specified sectors), downgrading of country rating by international rating agencies and reduction in investment by foreign institutional investors (FIIs). While Moody's downgraded India's sovereign rating from investment to non-investment grade, Standard & Poor's changed the non-investment grade outlook for India from stable to negative (Table 6.12). As a result of these developments, exchange rate again witnessed increased pressure during May to August 1998. The exchange rate of the rupee, which was Rs.39.73 per US dollar at end April 1998, depreciated gradually to around Rs. 42.50 per US dollar by the end-June 1998. During this phase too, apart from direct intervention, the Reserve Bank took recourse to monetary and other measures from time to time in order to bring about orderliness in the foreign exchange market.

6.96 Apart from monetary measures, important measures that were announced by the Reserve Bank on June 11 and August 20, 1998 included withdrawal of the facility of rebooking of cancelled forward contracts for trade related transactions, including imports (earlier, the restriction was only for non-trade related transactions), stoppage of the practice of some corporates to cover the forward commitment by first locking into a forward rate and thereafter covering the spot risk, and advising ADs to report their open position as well as peak intra-day positions to the Reserve Bank. Certain liberalisation measures were also taken, which included increasing the participants in the forward market by allowing FIIs to take forward cover on their equity exposure and allowing exporters to use their balances in (EEFC) accounts for all business related payments in India and abroad at their discretion.

6.97 A distinguishing aspect of the foreign exchange market interventions during the 1997-98 volatility episode was that instead of doing the transactions directly with ADs, a few select public sector banks were chosen as intermediaries for this purpose. Under this arrangement, public sector banks undertook deals in the inter-bank market at the direction of the Reserve Bank for which it provided cover at the end of the business hours each day. Care was taken to ensure that the public sector banks' own inter-bank operations were kept separate from the transactions undertaken on behalf of the Reserve Bank. Periodic on-site scrutiny of the records and arrangements of these banks by the Reserve Bank was instituted to check any malpractice or deficiency in this regard. The main reason for adopting an indirect intervention strategy in preference to a direct one was a judgmental view that this arrangement would provide a cover for Reserve Bank's operations and reduces its visibility and hence would be more effective. This view was premised on the assumption that buying/ selling by a market-maker will have a pronounced impact on market sentiment than would be the case if it does the same directly. The fact that the Reserve Bank was intervening in the market through a few other public sector banks was not disclosed, though in due course of time, it was known to the market. Besides, as a measure of abundant precaution and also to send a signal internationally regarding the

Table 6.12: India's Sovereign Credit Rating by S&P, Moody's and Fitch Ratings

Year	S & P's Rating	Grade and Outlook	Moody's Rating	Grade and Outlook	Fitch Ratings	Grade and Outlook
1990	BBB (September)	Stable	Baa1 (October)	Watch List (1-8-1990)		
1991	BBB- (March)	Credit Watch Credit Watch Removed (September)	Baa3 (March) Ba2 (June)			
1992	BB + (June)	Non-Investment Grade Stable				
1994	BB+	Non-Investment Grade	Baa3 (December)	Investment Grade		
1995	BB +	Non-Investment Grade Stable	Baa3 (October)	Investment Grade		
1996	BB + (October)	Non-Investment Grade Positive		Investment Grade		
1997	BB + (October)	Non-Investment Grade Stable	Baa3 (February)	Investment Grade Negative		
1998	BB (May) BB + (October)	Non-Investment Grade Negative Non-Investment Grade Stable	Ba2 (June)	Non-Investment Grade Stable		
2000					BB+ (March) BB+ (September)	Stable
2001	BB (August)	Non-Investment Grade Negative	Ba2 (August)	Non-Investment Grade Negative	BB+ (May) BB (November)	Negative Stable
2002	BB (September)	Non-Investment Grade Negative	Ba2	Non-Investment Grade		
2003	BB (December)	Non-Investment Grade Stable	Ba1 (February)	Non-Investment Grade		
2004	BB (August)	Non-Investment Grade Positive	Baa3 (January)	Investment Grade	BB+ (January)	Stable
2005	BB + (February) BB + (December)	Non-Investment Grade Stable Stable	Baa3 (April)			
2006	BB+ (April)	Non-Investment Grade Positive	Baa2 (May)	Investment Grade, Stable	BBB - (August)	Investment Grade Stable
2007	BBB- (January)	Investment Grade Stable	Baa2	Investment Grade, Stable	BBB -	Investment Grade Stable

Standard and Poor's		Moody's		Fitch Ratings	
Investment Grade	: AAA, AA+, AA, A+, A, BBB+, BBB, BBB-	**Investment Grade**	: Aaa, Aal,Aa2, Aa3, Al, A2, A3, Baal, Baa2, Baa3,	**Investment Grade**	: AAA, AA+, AA, A+, A, BBB+, BBB, BBB-
Non-Investment Grade	: BB+, BB, BB-, B+, B, B-	**Non-Investment Grade**	: Bal, Ba2, Ba3, Bl, B2, B3	**Non-Investment Grade**	: BB+, BB, BB-, B+, B, B-
Default Grade	: CCC+, CCC, CCC-, CC, C	**Default Grade**	: Caa, Ca, C	**Default Grade**	: CCC+, CCC, CCC-, CC, C

intrinsic strength of the economy, India floated the Resurgent India Bonds (RIBs) in August 1998, which was very well received by the Non-Resident Indians (NRIs)/ Persons of Indian Origin (PIO).

6.98 In retrospect, India was successful in containing the contagion effect of the Asian crisis due to swift policy responses to manage the crisis and favourable macro economic condition. During the period of crisis, India had a low current account deficit, comfortable foreign exchange reserves amounting to import cover of over seven months, a market-determined exchange rate, low level of short-term debt, and absence of asset price inflation or credit boom. These positive features were the result of prudent policies pursued over the years notably, cap on external commercial borrowings with restrictions on end-use, low exposure of banks to real estate and the stock market, insulation from large intermediation of overseas capital by the banking sector, close monitoring of off-balance sheet items and tight legislative, regulatory and prudential control over non-bank entities. Some capital controls also helped in insulating the economy from the contagion effect of the East Asian crisis. The ultimate result could be seen in terms of low volatility in the exchange rate of the Indian rupee, during the second half of the 1990s, when most of the Asian currencies witnessed high level of volatility (Table 6.13).

Phase of Relative Stability with Intermittent Event-Related Volatility: September 1998 - March 2003

6.99 The measures announced by the Reserve Bank earlier coupled with the success of the RIB issue, which was subscribed to the tune of US $ 4.2 billion, had a stabilising effect on the foreign exchange market, resulting in a marked improvement in the sentiment. The rupee remained stable during September 1998 to May 1999 before coming under pressure during June-October 1999 due to the nervousness in the market induced by heightened tension on the border. Besides intervention in order to reduce the temporary demand-supply mismatches, the Reserve Bank on August 23, 1999, indicated its readiness to meet fully/partly foreign exchange requirements on account of crude oil imports and debt service payments of the Government.

6.100 The period between April 2000 and March 2003 generally remained stable with intermittent periods of volatility associated with sharp increase in international crude oil prices in 1999-2000, successive interest rate increases in industrial countries, cross-currency movements of the US dollar *vis-à-vis* other major international currencies and the sharp reversals of portfolio flows in 2000. The Reserve Bank responded promptly through monetary and other measures like variations in the Bank Rate, the repo rate, cash reserve requirements, refinance to banks, surcharge on import finance and minimum interest rates on overdue export bills to curb destabilising speculative activities during these episodes of volatility, while allowing orderly corrections in the exchange rate of the rupee. Financing through India Millennium Deposits (IMDs) was resorted to as a preemptive step in the face of hardening of world petroleum prices and the consequent possible depletion of India's foreign exchange reserves. Inflows under the IMDs to the tune of US $ 5.5 billion during October-November 2000 helped in easing the market pressure.

6.101 The exchange rate pressure in the aftermath of September 11, 2001 incident in the US was tackled by the Reserve Bank through quick responses in terms of a package of measures and liquidity operations. These measures included: (i) a reiteration

Table 6.13: Daily Exchange Rate Volatility in Select Emerging Economies

(Annualised; in per cent)

Currency	1993-1995	1996-2000	2001	2003	2004	2005	2006
1	2	3	4	5	6	7	8
Indian Rupee	7.5	4.3	1.6	2.1	4.7	3.5	4.0
South Korean Won	2.6	22.2	8.1	8.3	6.5	6.8	6.9
South African Rand	5.3	11.4	20.2	20.9	21.4	15.4	16.0
Turkish New Lira	29.3	5.4	63.1	16.2	12.2	10.4	16.6
Indonesian Rupiah	2.1	43.4	21.7	6.8	7.7	9.1	8.9
Thai Baht	1.7	18.3	4.9	4.4	4.3	4.7	6.2
New Taiwan Dollar	3.7	5.3	3.6	2.7	4.9	4.9	4.9
Singapore Dollar	3.7	7.4	4.5	4.5	4.6	4.4	3.9
Philippine Peso	6.8	12.9	17.6	4.1	3.1	4.1	4.6

Note : Volatility has been calculated by taking the standard deviation of percentage change in daily exchange rates.
Source : Reserve Bank of India and IMF.

by the Reserve Bank to keep interest rates stable with adequate liquidity; (ii) assurance to sell foreign exchange to meet any unusual supply-demand gap; (iii) opening a purchase window for select government securities on an auction basis; (iv) relaxation in FII investment limits up to the sectoral cap/statutory ceiling; (v) a special financial package for large value exports of six select products; and (vi) reduction in interest rates on export credit by one percentage point.

Period with Surge in Capital Flows: 2003-04 onwards

6.102 Excess supply conditions have dominated the foreign exchange market since 2003-04 due to a surge in capital inflows. Large scale purchases by the Reserve Bank to absorb excess supplies in the foreign exchange market assuaged the strong upward pressure on the exchange rate. The Reserve Bank resorted to sterilisation operations to tackle such flows. Faced with the finite stock of Government of India securities with the Reserve Bank, market Stabilisation scheme (MSS) was introduced in April 2004 wherein the Government of India dated securities/Treasury Bills were issued to absorb liquidity. As a result, its foreign exchange reserves more than trebled during the period from US $ 54.1 billion at end-March 2002 to US $ 199.2 billion at end-March 2007 - an average increase of US $ 29.0 billion per annum. Foreign exchange reserves stood at US $ 203.1 billion as on April 13, 2007.

6.103 One instance during this period when rupee came under substantial pressure was on May 17, 2004 when it reached Rs. 45.96 per US dollar from Rs.43.45 per US dollar as at end-March 2004 on account of turbulence in the Indian equity market due to political uncertainty in the aftermath of general election results and rising global oil prices. On that day, the stock markets in India witnessed a record fall in price, which triggered the index-based circuit breaker twice during the day. The index-based circuit breaker triggered a stoppage of trades in the stock exchange for around two hours. Anticipating the possibility of a spill-over in the money, government securities and the foreign exchange markets, the Reserve Bank intervened on that day and two separate press releases were issued by the Reserve Bank indicating (a) the constitution of an Internal Task Force under the Executive Director, Financial Market Committee to monitor the developments in financial markets; and (b) its willingness to provide liquidity (Mohan, 2006d). These announcements had a salutary impact and soon orderly conditions were restored. In fact, no Reserve Bank liquidity or foreign exchange facilities announced during the day had to be used.

6.104 A look at the entire period since 1993 when India moved towards market determined exchange rates reveals that the Indian Rupee has generally depreciated against the dollar during the last 14 years, except during the period 2003 to 2005 when rupee appreciated on account of general dollar weakness against major currencies. For the period as a whole, 1993-94 to 2006-07, the Indian rupee depreciated against dollar by about 30.9 per cent on an annual average basis (Table 6.14).

Table 6.14 : Movements of Indian Rupee-US Dollar Exchange Rate : 1993-94 to 2005-06

Year	Range (Rs. per US $)	Average Exchange Rate (Rs. per US $)	Appreciation/ Depreciation (%)	Coefficient of Variation (%)	Standard Deviation
1	2	3	4	5	6
1993-94	31.21-31.49	31.37		0.1	
1994-95	31.37-31.97	31.40	-0.10	0.3	
1995-96	31.37-37.95	33.45	-6.13	5.8	1.93
1996-97	34.14-35.96	35.50	-5.77	1.3	0.48
1997-98	35.70-40.36	37.16	-4.47	4.2	1.57
1998-99	39.48-43.42	42.07	-11.67	2.1	0.90
1999-00	42.44-43.64	43.33	-2.91	0.7	0.29
2000-01	43.61-46.89	45.68	-5.14	2.3	1.07
2001-02	46.56-48.85	47.69	-4.21	1.4	0.67
2002-03	47.51-49.06	48.40	-1.47	0.9	0.45
2003-04	43.45-47.46	45.95	5.40	1.6	0.72
2004-05	43.36-46.46	44.93	2.16	2.3	1.03
2005-06	43.30-46.33	44.28	1.51	1.5	1.79
2006-07	43.14-46.97	45.28	-2.45	2.0	0.89

Source : Reserve Bank of India.

Table 6.15: Trends in External Value of Indian Rupee

	36-Currency Trade Based				6-Currency Trade Based			
	REER	% Variation	NEER	% Variation	REER	% Variation	NEER	% Variation
1	2	3	4	5	6	7	8	9
1993-94	100.00	0.0	100.00	0.0	100.00	0.0	100.00	0.0
1994-95	104.32	4.3	98.91	-1.1	105.71	5.7	96.86	-3.1
1995-96	98.19	-5.9	91.54	-7.5	101.14	-4.3	88.45	-8.7
1996-97	96.83	-1.4	89.27	-2.5	100.97	-0.2	86.73	-1.9
1997-98	100.77	4.1	92.04	3.1	104.24	3.2	87.80	1.2
1998-99	93.04	-7.7	89.05	-3.2	95.99	-7.9	77.37	-11.9
1999-00	95.99	3.2	91.02	2.2	97.52	1.6	77.04	-0.4
2000-01	100.09	4.3	92.12	1.2	102.64	5.3	77.30	0.3
2001-02	100.86	0.8	91.58	-0.6	102.49	-0.1	75.89	-1.8
2002-03	98.18	-2.7	89.12	-2.7	97.43	-4.9	71.09	-6.3
2003-04	99.56	1.4	87.14	-2.2	98.85	1.5	69.75	-1.9
2004-05	100.09	0.5	87.31	0.2	101.36	2.5	69.26	-0.7
2005-06	102.34	2.2	89.84	2.9	106.67	5.2	71.41	3.1
2006-07 P	98.07	-4.2	85.80	-4.5	104.91	-1.6	68.13	-4.6

REER : Real Effective Exchange Rate. NEER : Nominal Effective Exchange Rate. P : Provisional.
(+) indicates appreciation and (–) indicates depreciation.
Note : Both REER and NEER are bilateral trade weight-based indices with 1993-94 as the base year.
Source : Reserve Bank of India.

6.105 In terms of real effective exchange rates (REER), while the REER (6 currency trade based indices) appreciated by about 7 per cent, the REER (36 currency trade based indices) recorded an appreciation of above 2 per cent during the period 1993-94 to 2005-06 (Table 6.15).

6.106 An important feature has been the reduction in volatility of rupee exchange rate during last few years. Among all currencies worldwide, which are not on a nominal peg, and certainly among all emerging market economies, the rupee-dollar exchange rate has been less volatile. The REER of India has been relatively stable compared with other key Asian countries. The volatility measured from the effective exchange rates, *i.e.*, 6 currency NEER and REER indices for India, was also lower as compared with other countries such as the US and Japan for recent period (Table 6.16).

6.107 In the context of the behaviour of the exchange rate in the post-liberalisation period, it is worth exploring some related aspects such as the changing

Table 6.16: Volatility of Exchange Rates in the Global Foreign Exchange Market

(Per cent)

Year	NEER						REER					
	India	US	UK	Japan	Euro Area	China	India	US	UK	Japan	Euro Area	China
1	2	3	4	5	6	7	8	9	10	11	12	13
1993-94	1.2	1.0	1.0	2.6	1.8	8.2	1.3	0.8	1.1	2.8	1.9	8.2
1994-95	1.3	1.4	0.8	2.2	0.9	1.1	2.5	1.3	0.9	2.2	1.1	1.3
1995-96	2.9	1.5	0.7	3.7	0.7	1.2	2.9	1.5	0.8	3.5	0.9	1.2
1996-97	1.4	1.2	1.4	1.4	1.0	0.7	1.2	0.7	1.4	1.4	1.1	0.7
1997-98	1.7	1.3	1.8	3.0	1.5	1.8	1.8	1.4	1.7	2.8	1.7	1.6
1998-99	1.8	2.0	1.5	4.0	1.6	1.5	1.6	1.4	1.4	4.1	1.7	1.6
1999-00	1.0	1.3	0.7	2.7	1.1	0.8	1.2	0.8	0.8	2.9	1.3	1.0
2000-01	1.4	1.8	1.8	2.8	2.4	0.8	1.4	1.0	1.6	2.2	2.4	0.9
2001-02	1.0	1.1	0.7	2.1	1.2	0.9	1.0	0.7	0.6	2.0	1.6	1.1
2002-03	1.0	1.4	1.1	1.6	0.8	1.1	1.3	1.0	1.1	1.6	1.2	1.0
2003-04	1.5	2.2	1.2	1.4	1.5	1.1	1.3	1.6	1.1	1.4	1.7	1.3
2004-05	1.7	1.7	1.0	1.9	0.9	1.0	1.1	1.2	1.2	1.9	2.0	1.2
2005-06	1.1	1.4	1.1	1.4	0.9	1.3	1.1	0.9	1.1	1.4	1.0	1.5

Note : Volatility has been calculated by taking the standard deviation of percentage change in monthly REER/NEER indices.
Source : IFS, IMF, 2006 and Reserve Bank of India.

invoicing pattern of trade, the cross currency movement and the impact of global imbalances on the Indian foreign exchange market. In international trade, the pattern of currency invoicing depends on a number of factors such as historic relationships between the trading partners, established conventions, the relative bargaining strength of trading parties, as well as the extent of development of the foreign exchange market. Under a flexible exchange rate system, the exchange rate developments of major currencies also play an important role. Particularly, the expectation of the exporter/importer about the future changes in the exchange rates is a significant consideration in invoicing of exports/imports, as the invoiced amounts are received/paid with a lag of some weeks/months after the invoicing is made. The invoicing pattern of trade also has implications for exchange rate pass through (Box VI.7). With the

Box VI.7

Invoicing Pattern of Trade and Exchange Rate Pass-Through

A macroeconomic puzzle of the 1990s observed in several countries was the phenomenon of low inflation despite episodes of large currency depreciation, implying low exchange rate pass-through to domestic prices. A large volume of literature that spawned observed that exchange rate pass-through declined in several developed and developing countries. The literature suggests that some of the important determinants of pass-through are: low global inflation and its lower volatility (Taylor (2000), Choudhri and Hakura (2001) and Gagnon and Ihrig (2004)); volatility of exchange rate; share of import in the domestic consumption; trade to GDP ratio; composition of imports; trade distortions from tariffs and quantitative restrictions (Goldfajn and Werlang (2000), Campa and Goldberg (2004) and Frankel et al (2005)).

The general argument is that lower average inflation and its volatility was an outcome of credible monetary policy. In such an environment, firms believe that monetary policy will be successful in stabilising prices and are less keen to alter prices of their products resulting in lower pass-through. The impact of exchange rate volatility on pass-through is less unambiguous. One view is that currencies of countries with lower exchange rate variability imply a stable monetary policy, and consequently, would be chosen as the invoice currency. Hence, the pass-through would be lower. The counter view is that greater exchange rate volatility implies common and transitory fluctuation, and makes firms wary of changing prices as they fear losing market share. Firms, are therefore, more willing to adjust profit margins. Increasing share of trade in GDP by increasing the share of imports in consumption and the participation of foreign firms in domestic economy would lead to higher pass-through. Pass-through to imports such as energy, raw materials and food with inelastic and less competitive supply are found to be higher than to manufacture products, the supply of which is elastic and more competitive. Thus, change in import composition would affect the aggregate pass-through even when the pass-through in individual components remains the same. Trade barriers such as tariffs and quantitative restrictions act as barrier to arbitrage of goods between countries and have negative impact on pass-through. Reducing these barriers would, thus, lead to higher pass-through.

These factors underwent significant transformation in the early 1990s with economic reforms. Thus, exchange rate pass-through to domestic prices in India would have undergone a change during the post-economic reforms as found in other countries. A recent study for the period August 1991 to March 2005 that estimated the pass-through coefficients found that a 10 per cent change in exchange rate leads to change in final prices by about 0.6 per cent in short run and 0.9 per cent in the long run. The statistical tests on temporal behaviour of pass-through obtained from rolling regressions show that, unlike in case of many countries, there was no evidence of decline in pass-through. This was much more evident in the long-run than in the short-run, and was observed to be the result of rise in inflation persistence.

Further, pass-through from appreciation was found to be higher than depreciation. In an increasingly open economy where foreign firms' objective would expectedly be to capture a larger market share, they would be more willing to pass on the benefit of lower prices from appreciation and avoid passing on the higher prices from depreciation that cause loss of market share. The pass-through was higher for small than large exchange rate changes. This could be explained by the invoicing of imports in India in US dollars (80-90 per cent) and the presence of menu cost in changing invoice price. For small exchange rate change, it is not worthwhile to change the invoice price of imports in its own currency due to the menu cost (a fixed cost involved in altering invoice price). Thus, the import price in local currency (domestic prices) would change by the extent of the exchange rate change, *i.e.*, a higher pass-through. The opposite will be the case for large exchange rate change, as it would be worthwhile for foreign firms to change the invoice price in their currency in order to absorb a part of the exchange rate change on import price in local currency. Invoicing pattern of trade, exchange rate movements and exchange rate pass-through to domestic prices, thus, have implications for exchange rate management and trade competitiveness.

Reference:

Khundrakpam, J.K. 2007. "Economic Reforms and Exchange Rate Pass-Through to Domestic Prices in India." *BIS Working Paper* No. 225, February.

Table 6.17: Currency-wise Invoicing of India's Exports and Imports

(Per cent)

	Imports				Exports			
Currency	1990-91	1994-95	1999-00	2005-06 P	1990-91	1994-95	1999-00	2005-06 P
1	2	3	4	5	6	7	8	9
US Dollar	59.7	73.5	85.8	88.6	57.2	78.8	87.0	85.8
Deutsche Mark	7.0	5.9	1.6	0.0	5.1	6.3	1.6	0.0
Euro	–	–	3.3	6.5	–	–	3.0	7.6
Japanese Yen	4.4	4.4	3.8	2.2	0.1	0.3	0.3	0.5
Pound Sterling	3.1	2.5	1.7	1.0	4.5	4.8	3.9	2.8
Indian Rupee	7.7	0.4	0.0	0.0	27.7	3.3	0.3	1.9
Others	18.1	13.3	3.8	1.7	5.4	6.5	3.9	1.4
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

P : Provisional.
Source : Reserve Bank of India.

growing importance of the Indian economy and its rising share in world trade, it is expected that the Indian currency would gain considerable acceptance in future. In fact, the growth of NDF market in rupee, in a way, shows the use of rupee in international transactions.

6.108 Although the invoicing of trade in rupee has been permitted, there has not been any significant growth. The substantial share of exports invoiced in rupees during 1990-91 was on account of the practice of exports invoicing in rupees to bilateral account countries (Table 6.17). The subsequent drop in the share of rupee invoicing could be attributed to discontinuance of rupee trade consequent upon agreement between the Government of India and the Russian Federation in 1992 to scrap the bilateral trade and instead invoice trade in US dollar. However, after disintegration of the USSR, rupee invoicing of exports is now confined to financing of exports through repayment of civilian and non-civilian debt to Russia. The use of rupee invoicing for trade purposes needs to be given due consideration by the importers/ exporters as India's share in world trade in goods and services expands in future.

6.109 An important feature of the Indian foreign exchange market observed in recent years has been the growing correlation between the movement in exchange rate of the Indian rupee and currencies of the Asian countries. In the last couple of years, the rupee-dollar exchange rate is increasingly getting linked to exchange rate of some of the Asian currencies such as Japanese yen *vis-a-vis* US dollar (Table 6.18). This feature of the market could be

Table 6.18: Cross Currency Correlation
(January 3, 2005 to December 4, 2006)

(Per cent)

Currency	Euro	Yen	GPB	AD	CaD	Yuan	INR	IRu	PRu	Ruble	SD	SLR	Baht
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Euro	1.00												
Yen	0.54	1.00											
GPB	0.95	0.45	1.00										
AD	0.68	0.66	0.73	1.00									
CaD	0.00	-0.74	0.04	-0.35	1.00								
Yuan	-0.12	-0.82	-0.02	-0.36	0.90	1.00							
INR	0.01	0.68	-0.06	0.39	-0.81	-0.73	1.00						
IRu	0.37	-0.02	0.31	0.06	0.25	0.20	-0.16	1.00					
PRu	0.04	0.76	-0.09	0.29	-0.83	-0.94	0.71	-0.35	1.00				
Ruble	0.70	-0.20	0.72	0.17	0.65	0.60	-0.55	0.75	-0.67	1.00			
SD	0.56	-0.28	0.57	0.08	0.69	0.64	-0.53	0.56	-0.67	0.95	1.00		
SLR	-0.02	0.72	-0.13	0.23	-0.77	-0.90	0.63	-0.23	0.89	-0.66	-0.69	1.00	
Baht	0.70	-0.12	0.71	0.19	0.55	0.48	-0.42	0.86	-0.50	0.94	0.94	-0.56	1.00

Note : GPB: Pound Sterling; AD: Australian Dollar; CaD: Canadian Dollar; Yuan: Chinese Yuan;
INR: Indian Rupee; IRu: Indonesian Rupiah; Yen : Japanese Yen PRu: Pakistan Rupee;
Ruble: Russian Ruble; SD: Singapore Dollar; SLR: Sri Lankan Rupee; Baht: Thai Baht.

ascribed to the greater integration of the Asian markets led by large trade and capital flows in the region as well as greater interdependence of financial markets within the region. Some kind of a supply chain is emerging from the Asian region with Japan at the top of the chain supplying high value technological products. China is the major supplier of intermediate products, while India, besides being a supplier of intellectual capital, is emerging as supplier of intermediate products. The financial markets, including the foreign exchange market, are increasingly taking cognisance of the growing integration of the Indian economy with the rest of the world, particularly with the Asian region. The cross currency impact on the exchange rate of the Indian rupee is observed to be particularly pronounced for Japanese yen and Singapore dollar (Ranjan and Dhal, 1999).

6.110 Recognising the growing influence of cross currencies on Indian exchange rate, an issue that is of relevance is the impact of potential disorderly adjustments in the current global imbalances on the exchange rate of major currencies and the second round impact on the Indian rupee. The current global imbalances represent the large and increasing current account deficit (CAD) of the US that has been financed by surpluses elsewhere, especially emerging Asia, oil exporting countries and Japan. As a percentage of GDP, the CAD of the US has almost doubled every 5 years since the early 1990s (Table 6.19). In contrast to the US that is dependent on the domestic demand, growth in Asia and other emerging economies since the late 1990s has been led by external demand. The current accounts of China, other East Asian EMEs (Indonesia, Malaysia, Taiwan, Thailand) and the two island economies, *viz*, Hong Kong and Singapore have recorded large surpluses, especially since 1999. Another new source contributing to the global imbalances has been the large current account surpluses of oil exporting countries. The Middle East region recorded current account surplus of 18.1 per cent of GDP in 2006 mainly associated with higher oil revenues due to both higher prices and some expansion in production. With the size of these imbalances becoming large, concerns have been raised regarding its sustainability and possible disorderly unwinding. Further historical episodes of large and sustained imbalances and their reversals suggest that a market led realignment of real exchange rates can play an important role to demand rebalancing across countries to facilitate smooth unwinding (IMF, 2007).

6.111 An issue that is of relevance to India in this regard is the likely response of different nations to global imbalances and its impact on the Indian foreign exchange market. India has not contributed either positively or negatively to large current account deficit; India's saving-investments have been by and large balanced (Table 6.20); the economy is domestic demand driven and generally India's policies, including exchange rate are market oriented. Thus, India has been following policies which have not only served it well but also contributed to global stability (Reddy, 2006b). Any large and rapid adjustments in major currencies and related interest rates or current accounts of trading partners would impact the Indian

Table 6.19: Macroeconomic Parameters of the United States

(in per cent, annual average)

Period	GDP growth	Current Account Deficit/ GDP	General Government Fiscal Balance/ GDP	Saving-Investment gap
1	2	3	4	5
1981-1985	3.3	-1.3	-2.9	-1.6
1986-1990	3.3	-2.4	-2.4	-2.2
1991-1995	2.5	-1.1	-3.1	-0.9
1996-2000	4.1	-2.6	-0.2	-2.2
2001-2005	2.4	-5.0	-3.5	-3.9
2006	3.3	-6.5	-2.6	–

Source : Bureau of Economic Analysis, US Department of Commerce; World Development Indicators, World Bank; World Economic Outlook, IMF, various issues.

Table 6.20: Savings-Investment Gap in Emerging Economies

(as % of GDP, annual average)

Country	1981-85	1986-90	1991-95	1996-2000	2001-05
1	2	3	4	5	6
China	-0.1	-0.4	1.5	3.2	2.4*
Hong Kong	3.9	9.8	3.2	1.1	8.6
India	-1.5	-2.5	-1.2	-1.1	0.2
Indonesia	2.0	1.5	1.5	5.5	6.7
Korea	-1.7	4.1	-1.1	3.7	2.6*
Malaysia	-2.7	7.6	-1.6	13.9	19.7*
Singapore	-2.9	4.6	11.8	16.4	23.6
Thailand	-4.4	-1.8	-5.3	6.4	4.5

Note : * Average for four years 2001-04.
Data for India pertain to financial year.

Source : World Bank online database, Central Statistical Organisation, Government of India.

economy, though the impact on India may be less than many other emerging market economies.

6.112 It emerges from the above analysis that flexibility and pragmatism, rather than adherence to strict theoretical rules, is the order of the day in exchange rate policy in developing countries. It also underscores the need for central banks to keep instruments/policies in hand for use in difficult situations. On the whole, the Indian approach to exchange rate management has been described as ideal for Asia (Jalan, 2003). India has been able to effectively withstand periods of volatility in the foreign exchange market associated with several unexpected external and domestic developments (Mohan, 2006a). An important aspect of policy response to these various episodes of volatility has been market intervention combined with monetary and administrative measures to meet the threats to financial stability, while complementary or parallel recourse was taken to communications (Reddy, 2006e). Some illustrations of thoughtful communication include a speech in Goa by the then Deputy Governor in August 1997 to "talk down the rupee"; reassuring statements on market developments in the context of Asian crisis combined with a package of measures in tranches in 1997 and 1998; pre-emptive measures in the mid-1998 in the context of crisis in Russia; reassuring statements issued in the context of Kargil war in 1999; a combination of liquidity injection, reassuring statements along with measures in the context of the 9/11; a combination of actions and measures at the time of sharp downward movement of Indian stock markets on May 17, 2004 coinciding with the political transition at the Centre; and to explain the impact of redemption of the India Millennium Deposits. Going forward, there will be a continuous need to adopt a combined strategy of liquidity management as well as exchange rate management for effective monetary management and short-term interest rate smoothening (Mohan, 2006a). Given the important role that foreign exchange intervention played during several earlier episodes, it would be useful to examine the effectiveness of central bank intervention in the foreign exchange market.

VI. ISSUES RELATING TO CENTRAL BANK INTERVENTION IN THE FOREIGN EXCHANGE MARKET

6.113 Official exchange rate intervention refers to sales and purchases of foreign exchange by authorities in order to affect exchange rates. Globally, the objective of intervention in the foreign exchange market has changed over the years. Under the Bretton Woods system of fixed exchange rates, interventions were used frequently to maintain the exchange rate within the prescribed margins. When the Bretton Woods system broke down in 1971, major industrial countries discontinued pegging their currencies to the US dollar, bringing in an era of floating exchange rates. In principle, freely floating exchange rates would rule out intervention by central banks. The central banks have, however, often intervened for a variety of reasons: (i) to influence trend movements in the exchange rates because they perceive long-run equilibrium values to be different from actual values; (ii) to maintain export competitiveness; (iii) to manage volatility to reduce risks in financial markets; and (iv) to protect the currency from speculative attack and crisis.

6.114 Intervention by most central banks in foreign exchange markets has become necessary is primarily because of the importance of capital flows in determining exchange rate movements as against trade balances and economic growth, which were important in the earlier days. In recent times, there has been a large increase in international capital movements. In emerging market economies, particularly, these capital flows are very volatile, and largely sentiment driven exposing financial markets to large risks. In order to reduce the risks, authorities intervene to curb volatility. Secondly, unlike trade flows, capital flows in "gross" terms, which affect exchange rate can be several times higher than "net" flows on any day. Therefore, herding becomes unavoidable (Jalan, 2003).

6.115 In 1977, the IMF Executive Board laid down some guiding principles for intervention policy by central banks of member countries. In essence, these principles stated that countries should not manipulate their exchange rates to gain unfair competitive advantage over others, or to prevent balance of payment adjustment, but they should intervene to counter 'disorderly market conditions'. It is difficult to define 'disorderly market conditions' but they are generally taken to refer to management of exchange rate volatility. While intervention by central banks in the foreign exchange market has come to be accepted as being consistent with a fully flexible exchange rate system, there is still no consensus on the effectiveness of central bank intervention.

6.116 Theoretically, intervention is categorised into sterilised and non-sterilised. Sterilised intervention occurs when the purchase or sale of foreign currency

is offset by a corresponding sale or purchase of domestic government debt to eliminate the effects on domestic money supply. Unsterilised intervention occurs when the authorities purchase or sell foreign exchange, normally against their own currency, without such offsetting actions. There are differing effects of sterilised and unsterilised intervention on the net foreign assets (NFA) and net domestic assets (NDA) of the central bank and on money supply (M) (Table 6.21).

6.117 There is near agreement that non-sterilised intervention directly influences the exchange rate through the monetary channel. Any purchase of foreign exchange (*i.e.*, intervention) if left unsterilised will impact the monetary base (rises), which, in turn, induces changes in the broader monetary aggregates, interest rates, real demand for goods and assets and ultimately the exchange rate (depreciates).

6.118 In so far as sterilised intervention is concerned, the proponents of monetary approach claim that it is ineffective. The literature, however, identifies three possible channels through which even sterilised intervention would work: (a) portfolio balance channel under which domestic and foreign bonds are assumed to be imperfect substitutes, and intervention, even though sterilised, impacts exchange rate by changing the relative supplies of bonds; (b) signalling channel where sterilised purchase of foreign currency will lead to a depreciation of the exchange rate if the foreign currency purchase is assumed to signal a more expansionary domestic monetary policy and *vice versa*[12]; and (c) more recently, the noise-trading channel, according to which, a central bank can use sterilised interventions to induce noise traders to buy or sell currency (Kortian, 1995). Even if an intervention has only a temporary effect, it can still lead to noise traders assuming that the trend has been broken and induce investors to take positions in line with the central bank's intentions[13].

Table 6.21 : Effects of Foreign Exchange Intervention

Intervention	Effects on NFA	Effects on NDA	Effects on M
1	2	3	4
Non-sterilised foreign exchange intervention (Purchase)	+	0	+
Sterilised foreign exchange intervention (Purchase)	+	–	0
Non-sterilised foreign exchange intervention (Sale)	–	0	–
Sterilised foreign exchange intervention (Sale)	–	+	0

+ : Positive Impact. – : Negative Impact. 0 : No Impact.
NFA : Net foreign assets.
NDA : Net domestic assets.
M : Money supply.

6.119 Recognising the fact that non-sterilised intervention significantly impacts exchange rates, most studies on central bank intervention have attempted to examine whether sterilised intervention has had a quantitatively significant effect on the exchange rate, *i.e.,* an effect that is predictable, sizeable, and lasting. It has also been observed that while empirical evidence on the effectiveness of central bank intervention is available in large numbers for some specific developed countries, the evidence on foreign exchange intervention in developing countries, including India is weak[14]. Most of the previous empirical studies have been inconclusive as to the validity of the different transmission mechanisms (Edison,1993 and Sarno and Taylor, 2001). While the "portfolio balance" channel has received little empirical support, the evidence in favour of the "signaling" channel is somewhat more supportive (Table 6.22).

6.120 In the Indian context, empirical evidence on the effectiveness of sterilised intervention through the portfolio balance channel has been found to be limited for the period April 1996 to March 1999 (Bhaumik and Mukhopadhyay, 2000). As regards signaling channel, studies have shown that the Reserve Bank has used intervention though not very significantly for signaling the future course of monetary policy (Sahadevan, 2002). The use of profitability analysis to gauge the success of intervention has also been inconclusive in the Indian case (Pattanaik and Sahoo, 2001).

[12] For the signalling channel to be effective, there must be asymmetric information between the market participants and the central bank.

[13] For the noise-trading to work successfully, however, the central bank must not only have up to date market intelligence and familiarity with noise-traders' reaction functions, but also must be capable of conducting intervention secretly and deftly.

[14] The major reason for the lack of empirical evidence for developing countries is that the availability of data on intervention and exchange rate expectations in the case of developing countries is very low (Edison, 1993).

Table 6.22: Major Findings of Recent Studies on Central Bank Intervention

Author(s)	Major Findings
I. Portfolio balance channel	
Frankel (1982)	No empirical support for portfolio balance model in a mean-variance optimisation framework.
Danker et al. (1987)	Mixed evidence on the impact of sterilised intervention.
Lewis (1988)	Limited support for the portfolio balance model.
Dominguez Frankel (1993)	Intervention variables were observed to have statistically significant explanatory power in a regression for risk premium. This study provides strong support in favour of a significant portfolio balance effect for the first time though the effect was quite weak.
II. Signaling channel	
Dominguez (1990)	Provides evidence towards intervention anticipating monetary policy.
Lindberg (1994)	Concludes that sterilised interventions might have effects on exchange rates through the signaling channel though the channel is fragile.
Kaminsky and Lewis (1996)	Using a regime switching model, found inconclusive evidence as to whether intervention correctly signaled changes in monetary policy.
Lewis (1995)	Examined the links between intervention, monetary policy and exchange rates and found evidence that monetary policy influenced exchange rates.
Fatum and Hutchison (1999)	Observed that dollar support intervention is not related to changes in expectations over the stance of future monetary policy proxied by federal funds futures rate.
III. Noise trading channel	
Goodhart and Hesse (1993)	Provides some supportive evidence towards impact of intervention on exchange rate via noise-trading channel.
IV. Intervention and profitability	
Christopher J Neely (2002)	Observed that high frequency evidence disapproves the hypothesis that intervention generates trading rule profits.
V. Intervention and volatility	
Baillie and Osterberg (1997)	Little support is obtained for the hypothesis that intervention can consistently influence the level of the exchange rate. Any significant effect is usually of the 'leaning against the wind' variety, with dollar purchases depreciating the dollar. Further, intervention tends to increase volatility rather than 'calm disorderly markets', with the effects differing between currencies and between the buying of US dollars as opposed to the selling of US dollars.

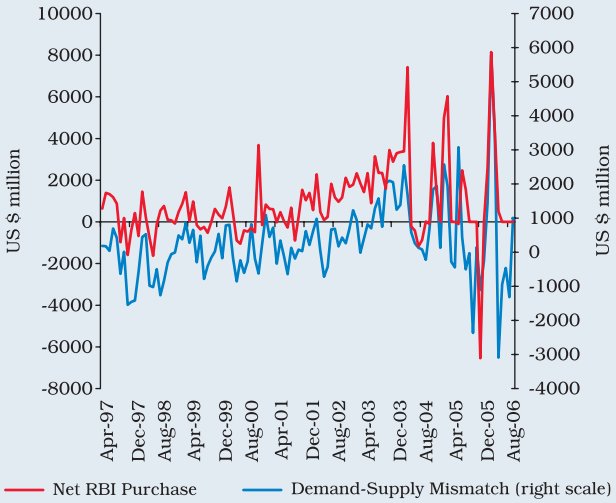
6.121 Empirical evidence in the Indian case, however, suggests that in the present day of managed float regime, intervention can serve as a potent instrument in containing the magnitude of exchange rate volatility of the rupee even though the degree of influence may not be strong (Pattanaik and Sahoo, 2001). Studies in the Indian context have observed a positive response of direct intervention activity during exchange rate volatility, with the intervention activity subsiding once a re-alignment has taken place (Kohli, 2000). Besides, significant asymmetry has been observed in the volatility response to market pressure with heightened volatility leading to depreciating pressure on the rupee (RBI, 2002-03). This underscores the importance of intervention by the central bank to manage volatility.

Reserve Bank's Intervention and Sterilisation

6.122 As observed during the various episodes of exchange rate volatility in India, the Reserve Bank has been intervening in the foreign exchange market

to curb volatility arising due to demand-supply mismatch in the domestic foreign exchange market. Sale of dollars in the foreign exchange market is generally guided by excess demand conditions that may arise due to several factors. Similarly, the Reserve Bank purchases dollars from the market when there is an excess supply pressure. There is some evidence of co-movement in demand-supply mismatch proxied by the difference between the purchase and sale transactions in the merchant segment of the spot market and intervention by the Reserve Bank (Chart VI.10)[15]. Thus, the Reserve Bank has been prepared to make sales and purchases of foreign currency in order to curb volatility, even out lumpy demand and supply in the foreign exchange market and to smoothen jerky movements, while allowing the rupee to move in both directions. However, such intervention is generally not governed by any pre-determined target or band around the exchange rate (Jalan, 1999).

Chart VI.10: The Relationship between Demand-Supply Mismatch and RBI Intervention



Note : Demand-Supply Mismatch is poxied by the difference between the purchase and sale transaction in the merchant segment of the spot market.

6.123 Capital movements have rendered exchange rates significantly more volatile than before. Large capital inflows have made the central bank more active in the foreign exchange market, forcing the Reserve Bank to release rupees for buying dollars. It is pertinent to note that capital flows in the recent period have been dominated by non-debt creating flows resulting in an increase in the proportion of non-debt flows (Table 6.23). An analysis of the movement of exchange rate and net purchases of the Reserve Bank shows that the intervention operation does not

Table 6.23: India's Capital Flows: Composition

(per cent to total)

Indicator\Period	Annual average			2003-04	2004-05	2005-06
	1990-91 to 1996-97	1997-98 to 2002-03	2003-04 to 2005-06			
1	2	3	4	5	6	7
1. Non-debt Creating Flows	41.9	58.3	78.1	93.7	54.6	86.1
a) Foreign Direct Investment	15.9	40.2	26.6	25.8	21.4	32.7
b) Portfolio Investment	26.0	18.1	51.5	67.9	33.2	53.7
2. Debt Creating Flows	52.4	34.8	22.1	-6.0	35.2	37.0
a) External Assistance	32.4	2.9	-0.6	-16.5	7.2	7.5
b) External Commercial Borrowings	19.1	18.3	4.8	-17.5	19.4	12.7
c) Short- term Credits	-3.1	-0.1	9.8	8.5	13.5	7.3
d) NRI Deposits	21.6	20.6	10.1	21.8	-3.4	11.9
e) Rupee Debt Service	-17.7	-6.9	-2.1	-2.2	-1.5	-2.4
3. Other Capital	5.7	6.9	-0.2	12.3	10.2	-23.1*
Total (1 to 3)	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

* : The negative share of 'other capital' during 2005-06 indicates that payments on account of India's investment abroad were more than the capital inflows through 'non NRI banking channel' and 'other capital'.

Source : Reserve Bank of India.

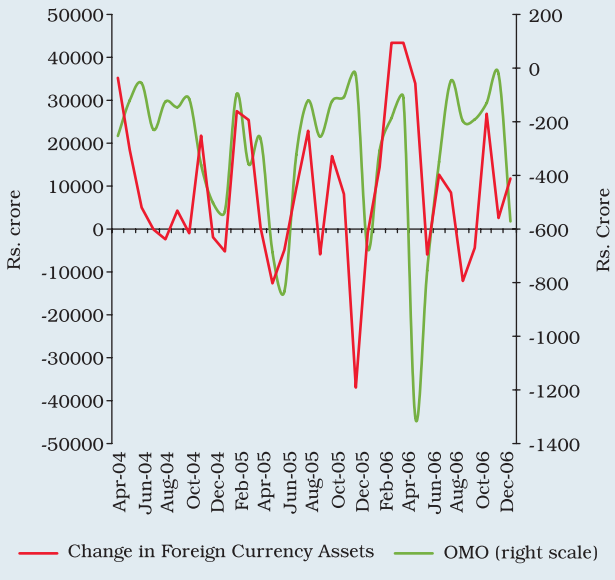
[15] A positive correlation of 0.7 is also found in the case of demand-supply mismatch and net RBI purchases.

necessarily influence so much the level of rupee. Empirical analysis, however, reveals that while FII investments have contributed towards increasing volatility, intervention by the Reserve Bank has been effective in reducing volatility in the Indian foreign exchange market[16].

6.124 Intervention by the Reserve Bank to neutralise the impact of excess foreign exchange inflows resulted in the increase in the foreign currency assets (FCA) continuously. In order to offset the effect of increase in FCA on monetary base, the Reserve Bank has been continuously mopping up the excess liquidity from the system through open market operations (Chart VI.11).

6.125 While analysing the impact of sterilisation, it is pertinent to examine whether the contraction of net domestic assets (NDA) through open market sales to sterilise initial capital flows has exerted pressure on interest rates, leading in turn, to further capital inflows.

Chart VI.11: Sterilisation Operations of the Reserve Bank



In the Indian case, empirical evidence for the period 1995-2004 suggests a unidirectional causality from changes in NFA to NDA, and more specifically from NFA to net Reserve Bank credit to the Centre, with sterilisation coefficient being 0.63, *i.e.*, Rs.100 increase in foreign currency purchases from ADs induces sterilisation operations involving sales of government securities amounting to Rs.63 from the Reserve Bank (RBI, 2003-04). Thus, the Reserve Bank, through its sterilisation operations, has been effective in offsetting the impact of foreign capital inflows and keeping the domestic monetary aggregates close to the desired trajectory for most of the period. It is, however, pertinent to note that Reserve Bank's intervention in the foreign exchange market has been relatively small in terms of volume (less than 1 per cent) during 2005-06 and 2006-07 (up to February 2007). The largest gross intervention by the Reserve Bank was in 2003-04 accounting for about 4 per cent of the turnover in the foreign exchange market (Table 6.24). The extent of intervention by the Reserve Bank in the foreign exchange market also remains low when compared

Table 6.24 : Extent of RBI Intervention in the Foreign Exchange Market

Year	RBI Intervention in Foreign Exchange Market (US $ billion)	Foreign Exchange Market Turnover (US $ billion)	Column 2 over 3 (in per cent)
1	2	3	4
2002-03	45.6	1560	2.9
2003-04	80.4	2118	3.8
2004-05	41.9	2892	1.4
2005-06	22.3	4413	0.5
2006-07 (up to February 2007)	24.5	5734	0.4

Source : Reserve Bank of India.

[16] $h_t = 0.76 - 0.00001 Invr_t + 0.00004 FII_t - 0.71 Dum_t + 0.39 \varepsilon^2_{t-1} + 0.50 h_{t-1}$
(2.46)* (-2.00)* (2.17)* (-2.42)* (2.53)* (4.12)*

$\bar{R}^2 = 0.25$; DW = 2.19; Wald Stat = 0.77 (prob.:0.38); Log likelihood =-158.99

Note: Figures in the parentheses are the t-statistics.
* denotes significance at 5 per cent level.
h_t = time varying volatility of rupee-dollar exchange rate return
ε_t = ARCH term
Invr = net purchases of the Reserve Bank of India
FII = foreign institutional investors' investments
Dum= Dummy variable to capture the 1997 crises and RBI's policy stance
0 up to July 1998 and 1 for August 1998 onwards.
Sample: June 1995 to June 2006.

with other EMEs, suggesting the predominant role of market forces in the determination of the external value of the rupee.

6.126 In general, apart from increased exchange rate flexibility, a number of steps have been taken to manage the excess capital flows, including a phased liberalisation of the policy framework in relation to current as well as capital accounts; flexibility to corporates on prepayment of external commercial borrowings; extension of foreign currency account facilities to other residents; allowing banks to liberally invest abroad in high quality instruments; liberalisation of norms for overseas investment by corporates and liberalising surrender requirements for exporter. The Annual Policy Statement for 2007-08, released on April 24, 2007 announced a host of measures to liberalise overseas investments such as (i) enhancement of the overseas investment limit for Indian companies to 300 per cent of their net worth from the existing limit of 200 per cent; (ii) introduction of a revised reporting framework on overseas investments; (iii) enhancing the limit of listed Indian companies for portfolio investment abroad in listed overseas companies to 35 per cent of net worth from 25 per cent; (iv) enhancing the aggregate ceiling on overseas investment by mutual funds to US $ 4 billion from US $ 3 billion; (v) allowing prepayment of external commercial borrowings (ECBs) up to US $ 400 million as against the existing limit of US $ 300 million by ADs without prior approval of the Reserve Bank; and (vi) enhancing the limit for individuals for any permitted current or capital account transaction from US $ 50,000 to US $ 100,000 per financial year in the liberalised remittance scheme.

6.127 A major instrument of managing capital flows in India has been sterilisation. After examining the various instruments used in India and in other countries and assessing the trade-offs involved in the choice of such instruments to deal with the emerging situation and the extent of their use, the MSS as alluded to earlier was introduced in April 2004 wherein Government of India dated securities/Treasury Bills are issued to absorb liquidity. Proceeds of the MSS are immobilised in a separate identifiable cash account maintained and operated by the Reserve Bank, which is used only for redemption and/or buyback of MSS securities. The Reserve Bank actively manages liquidity through open market operations, including market stabilisation scheme, liquidity adjustment facility and cash reserve ratio, and other policy instruments at its disposal flexibly, as and when the situation warrants.

VII. THE WAY FORWARD

6.128 The Indian foreign exchange market has undergone transformation from a closed and heavily controlled setting of the 1970s and the 1980s to a more open and market oriented regime since the mid-1990s. The foreign exchange market, which witnessed deregulation in conjunction with current account convertibility and liberalisation of capital controls in many areas, lent considerable support to the external sector reform process. The criticality of a well-functioning market with its ability to trade and settle transactions in new products and adapt itself quickly to the changing regulatory and competitive environment has been demonstrated well in the Indian context. The bid-ask spread of rupee/US dollar rate has almost converged with that of other major currencies in the international market. On some occasions, in fact, the bid-ask spread of rupee/US dollar rate was lower than that of some major currencies (Mohan, 2007). Contrary to the experience of many EMEs in this regard, the absence of a functioning market has never been a constraint in undertaking reforms in India. The Reserve Bank intervenes in the foreign exchange market primarily to prevent excessive volatility and disorderly conditions. Such intervention is not motivated by any pre-determined target or band around the exchange rate. The objective is to keep market movements orderly and ensure that there is no liquidity problem or rumour/panic-induced volatility. India's approach of market determination of the exchange rate, flexibility, combined with intervention, as felt necessary, has served it well so far (Mohan, 2006a).

6.129 Moving forward, further initiatives for developing the Indian foreign exchange market need to be aligned with the external sector reforms, particularly the move towards (a) further liberalisation of the existing capital controls, for which a fresh roadmap has been provided by the Committee on FCAC; (b) reforms in other segments of the financial market; and (c) greater integration of the economy with the outside world. These, among other things, would imply that (i) an increasing number of Indian corporates will become global players; and (ii) more and more non-resident entities operating in India will be exposed to risks related to changes in exchange rates and interest rates.

6.130 With the Indian economy progressively moving towards fuller capital account convertibility in the coming years and getting increasingly integrated with the global economy, the foreign exchange market is likely to see a significant rise in volumes and liquidity

in the spot and derivative segments. With the availability of a large pool of global capital seeking avenues to participate in economies with high growth potential, inflows into India are likely to continue in view of its stable macroeconomic conditions and positive growth outlook. The Indian foreign exchange market, therefore, will have to prepare itself to deal with such large capital inflows. This would need further deepening of the foreign exchange market. A key issue in managing the capital account is credibility and consistency in macroeconomic policies and the building up of safety nets in a gradually diminishing manner to provide comfort to the markets during the period of transition from an emerging market to a developed market.

Improvement in Market Infrastructure

6.131 Against the backdrop of corporates in India going global, it is essential that the Indian foreign exchange market is able to provide them with the same types of products and services as are available in the major markets overseas. The agenda for the future should, therefore, include introduction of more instruments, more participants and improved market infrastructure in respect of trading and settlement.

6.132 The issues that could dominate the agenda for the next phase of development in the foreign exchange market could be catalogued as: (i) introduction of more derivative products involving the rupee and more flexibility to both 'market makers' and 'users' to buy or sell these products; (ii) taking cognisance of the offshore derivative markets involving the rupee and weighing all the options in this regard (*i.e.,* permitting these products onshore and permitting onshore entities to participate in the offshore markets); and (iii) relaxation of the current restrictions imposed on the entry of non-resident entities in the domestic foreign exchange market, particularly the derivatives segment. The main guiding principles for further liberalisation on the above lines could be summed up as: (i) entrenchment of modern risk management systems, procedures and governance in banks and their corporate clients; (ii) diversification of customer base with heterogeneous expectations; and (iii) adoption of accounting and disclosure norms in respect of derivatives by banks and their corporate clients, based on international best practices. Careful assessment will need to be made of the need for making progress in these issues, their sequencing, and consistency with the need of the real economy, and maintenance of financial stability.

Accounting Standards

6.133 The Indian accounting standards relating to derivatives are still in the process of being developed. Greater clarity is required in the area of derivative accounting in the books of corporates as well as banks with regard to revenue recognition and valuation of assets and liabilities. It may be, therefore, desirable to have convergence in the accounting standards for both foreign currency and INR derivatives and between on-balance sheet and off-balance sheet items. There is also a need to eliminate incentives to drive a wedge between on-balance sheet and off-balance sheet items (Gopinath, 2005). Moreover, further liberalisation requires banks to act responsibly in order to provide confidence to corporate entities going in for derivative transactions, in addition to complying with the regulations. In this context, customer suitability and appropriateness issue has assumed considerable significance. The recently issued guidelines on the transactions in derivative instruments in India accord high priority to the observance of customer suitability and appropriateness by 'market makers'. The "appropriateness standard" ensures that banks use the same principles for taking credit decisions in respect of complex derivative transactions as they do for non-derivative transactions. Banks are expected to evaluate the purpose of the derivative transactions and make an assessment as to whether it is appropriate to the customer's needs and level of sophistication. Only some banks have an appropriateness policy in place. It is, therefore, important that all banks introduce a customer suitability and appropriateness policy.

Relaxation of the Criteria of Underlying for Transactions

6.134 The Annual Policy Statement of the Reserve Bank for 2007-08 released in April 2007 announced several measures to expand the range of hedging tools available to market participants and facilitate dynamic hedging by residents as alluded to earlier. As the foreign exchange market matures, the criteria of 'underlying' could be considered for further relaxation to include economic exposures, *i.e.,* exposures which may not relate directly to foreign exchange transactions, but are affected by movements in exchange rates.

Interest Rate Parity

6.135 To encourage interest rate parity in the forward markets, the Committee on Fuller Capital Account Convertibility (2006) recommended more

flexibility for banks to borrow and lend overseas on both short-term and long-term basis and to increase the limits. The Committee further observed that in order to ensure that banks are not exposed to additional risks because of their access to foreign markets, their access should continue to be allowed depending upon the strength of their balance sheets. Some other issues that have been highlighted by the Committee as agenda for future development of the foreign exchange market include (i) permitting FIIs the facility of cancelling and rebooking all forward contracts and other derivatives booked to hedge rupee exposures so as to minimise the influence of NDF markets abroad; and (ii) introduction of currency futures, subject to risks being contained through proper trading mechanism, design of contracts and regulatory environment. The Annual Policy Statement of the Reserve Bank for 2007-08 proposed the setting up of a Working Group on Currency Futures to suggest a suitable framework to operationalise the proposal in line with the current legal and regulatory framework.

Reserve Management

6.136 India's experience highlights the importance of managing foreign exchange reserves to take care of unforeseen contingencies, volatile capital flows and other developments, which can affect expectations adversely. As there is no international "lender of last resort" to provide additional liquidity at short notice on acceptable terms, the need for adequate reserves is unlikely to be eliminated or reduced even if exchange rates are allowed to float freely (Mohan, 2006a). Several factors such as vulnerability of the real sector to shocks, strength of the fiscal and financial sectors, current account balance, the changing composition of capital flows, a medium-term view of growth prospects encompassing business cycles and the exchange rate regime influence the comfort level of reserves. In a sense, official reserves have to reflect the balancing and comforting factors relative to external assets and liabilities in the context of a national balance sheet approach (Reddy, 2006d). Thus, the comfort level of reserves should not be viewed with respect to the current situation alone, but going forward should also reckon with the potential risks.

Customer Service

6.137 In order to provide adequate foreign exchange facilities to common persons, it is necessary that a wide range of activities are available and that there exist a number of Authorised Dealers. Accordingly, a few entities were licensed as AD (Category II), permitting them to release/remit foreign exchange for 17 non-trade related current account transactions. Existing full-fledged money changers (FFMCs), urban co-operative banks (UCBs), regional rural banks (RRBs), among others, are eligible for such license. Individuals and small enterprises may not have adequate access to competitive and efficient service relating to foreign exchange transactions. The exporters, particularly the small exporters, do need better advice on hedging their currency exposures in view of the two-way movement of the exchange rate. Banks, therefore, may have to consider devising hedging products, especially for the small and medium enterprises (SME) sector.

Implications of Global Imbalances

6.138 A significant risk arises from the large and growing global financial imbalances. The speed at which the US current account ultimately returns towards balance, the triggers that drive that adjustment, and the way in which the burden of adjustment is allocated across the rest of the world have enormous implications for the global exchange rates. Any disorderly adjustments in major currencies and rise in interest rates would impact the Indian economy, though the impact is not expected to be significant compared to many other emerging market economies (Reddy, 2006b). Any disorderly adjustment in global imbalances may have some impact on corporates, banks and households in India, though their exposures, in aggregate, to the external sector are not significant. Nevertheless, there will be a need to be alert to unforeseen domestic and global shocks and proactively manage various risks to the foreign exchange market as they evolve.

Managing Exchange Rate Volatility

6.139 As India progresses towards fuller capital account convertibility, it would have to contend with the impossible trinity of independent monetary policy, open capital account, and exchange rate regime. At best, only two out of the three would be feasible. With a more open capital account as a 'given' if a choice is made of an 'anchor' role for monetary policy, it will have to be at the expense of exchange rate objective. It needs to be recognised, however, that the impact of exchange rate changes on the real sector is significantly different for reserve currency countries and for EMEs such as India. In the reserve currency countries, which specialise in technology intensive

products, the degree of exchange rate pass-through is low, enabling exporters and importers to ignore temporary shocks and set stable product prices to maintain monopolistic positions, despite large currency fluctuations. Moreover, mature and well-developed financial markets in these countries have the wherewithal to absorb the risk associated with exchange rate fluctuations with minimal shocks to the real sector. On the other hand, for the most of developing countries, which specialise in labour-intensive and low and intermediate technology products, profit margins in the highly competitive markets for these products are very thin and vulnerable to pricing power by retail chains. Consequently, exchange rate volatility has significant employment, output and distributional consequences. In this context, managing exchange rate volatility would continue to be an issue requiring attention, even when the exchange rate becomes more flexible.

Greater Inter-linkages of Foreign Exchange Market with other Segments

6.140 Cross border flows to various market segments, *viz.,* the equity market, the money market and the government securities market are channelled through the foreign exchange market. In a regime of fuller capital account convertibility, financial flows across borders are expected to rise substantially. The effective management of these large inflows and outflows will depend considerably upon the development of not only the foreign exchange market but also on the efficient functioning of other segments of the domestic market. A pre-condition to develop proper/meaningful linkages between the foreign exchange and other domestic financial markets is to develop the term money market and a money market yield curve. This will improve the efficiency of the foreign exchange market by encouraging interest parity conditions in the forward market. The need for providing market participants with more instruments for hedging price risk by developing the interest rate futures market would also arise. Thus, with the opening up of the Indian economy, the linkages of the foreign exchange market with other segments of the financial market would need to be strengthened with better information flows (see also Chapter VIII).

VIII. SUMMING UP

6.141 The Indian foreign exchange market has operated in a liberalised environment for more than a decade. A cautious and well-calibrated approach was followed while liberalising the foreign exchange market with an emphasis on the need to safeguard against potential financial instability that could arise due to excessive speculation. The focus was on gradually dismantling controls and providing an enabling environment to all entities engaged in external transactions. The approach to liberalisation adopted by the Reserve Bank has been characterised by greater transparency, data monitoring and information dissemination and to move away from micro management of foreign exchange transactions to macro management of foreign exchange flows. The emphasis has been to ensure that procedural formalities are minimised so that individuals are able to conduct hassle free current account transactions and exporters and other users of the market are able to concentrate on their core activities rather than engage in avoidable paper work. With a view to maintaining the integrity of the market, strong know-your-customer (KYC)/anti-money laundering (AML) guidelines have also been put in place.

6.142 Banks have been given significant autonomy to undertake foreign exchange operations. In order to deepen the foreign exchange market, several products have been introduced and new players have been allowed to enter the market. Full convertibility on the current account and extensive liberalisation of the capital account have resulted in large increase in transactions in foreign currency. These have also enabled the corporates to hedge various types of risks associated with foreign currency transactions. The impact of these reform initiatives is clearly discernible in terms of depth and efficiency of the market.

6.143 Exchange rate regimes do influence the regulatory framework when it comes to the issue of providing operational freedom to market participants in respect of their foreign exchange market operations. Notwithstanding a move towards greater exchange rate flexibility by most EMEs, almost all central banks in EMEs actively participate in their foreign exchange markets to maintain orderly conditions. While the use of risk management instruments is encouraged by many emerging markets for hedging genuine exposures linked to real and financial flows, their overall approach towards risk management has remained cautious with an emphasis on the need to safeguard against potential financial instability arising due to excessive speculation in the foreign exchange market.

6.144 In the coming years, the challenge for the Reserve Bank would be to further build up on the strength of the foreign exchange market and carry forward the reform initiatives, while simultaneously

ensuring that orderly conditions prevail in the foreign exchange market. Besides, with the Indian economy moving towards further capital account liberalisation, the development of a well-integrated foreign exchange market also becomes important as it is through this market that cross-border financial inflows and outflows are channelled to other markets. Development of the foreign exchange market also need to be co-ordinated with the capital account liberalisation. Reforms in the financial markets is a dynamic process and need to be harmonised with the evolving macroeconomic developments and the level of maturity of participating financial institutions and other segments of the financial market.