Abstract

The 1990s marked a paradigm shift in which the exchange rate policy is conducted. The shift was preceded by a serious balance of payments crisis towards the end of 1980s that culminated in depletion of foreign exchange (forex) reserves to critically low levels compelling the country to take financing support from the International Monetary Fund ([MF) in 1991. *Pari-passu,* with this development, the country effected a two-step depreciation of the Indian rupee (INR) that amounted to 17-19 percent devaluation of the domestic currency vis-à-vis the G-S currencies in mid-1991. This set the stage for far-reaching reforms in the forex market as the country effected a free float with full current account convertibility of the INR during the next two years. The forex market increased in size and sophistication in terms of volumes and number of players as well as practices and instruments.

The exchange rate policy had to be seen as much a financial policy issue as that of macroeconomics. Much of the exchange rate economics in India was based on annual and monthly data, and at best sometimes weekly data till as late as 1990. Daily data became increasingly relevant for the policy-makers in the 1990s. The forex market got increasingly integrated with money markets, at least at the short-end, in the 1990s. With exchange rate being determined in the market, rather than by monetary authorities, a new approach was necessary to the exchange rate management. This dissertation, is an effort to provide empirical evidence on select issues that may be relevant in this regard. The dissertation is not intended to address all or even most of the issues that have emerged in the conduct of exchange rate policy today. The approach has been selective, though many of these issues have been raised in *Chapter-l* of this dissertation, which provides a backdrop to contemporary reforms and attendant policy issues while providing the genesis and evolution of exchange rate policy in India. Several of these issues would find an important place in agenda for future research in this area. *Chtapter-2* is by way of survey of some recent developments in exchange rate economics today, both on select issues covered in this dissertation and on some issues that clearly lie outside the earmarked domain of this study but could still have some relevance for understanding issues relating to international macroeconomy. This chapter serves two objectives. One is to provide a link between what has been happening in India as narrated in chapter-l and the remaining core chapters. The second is to provide a good survey of some recent state of the art literature in exchange rate economics of today, as the new developments covered in this chapter are yet to find its way into the classroom teaching of exchange rates.

The three core issues which the dissertation deals with are covered in Chapters 3, 4 and 5 that follow. These chapters make a break from conventional exchange rate economics in this country that have trained its investigative scissors essentially on macroeconomics of exchange rate equilibrium through issues such as whether purchasing power parity (PPP) holds, or whether the monetary approach to balance of payment or exchange rates is validated. Research also abounds on the trade response to nominal and real exchange rate movements. Some such issues are discussed in brief in the first

chapter, mainly to provide the benefit of a survey to an uninitiated reader of exchange rate economics in this country. However, the core chapters deal with select issues which are distinctly under-researched in this country and which have become immensely important after the reforms initiated in the 1990s.

Chapter-3 deals with the issue of foreign exchange market efficiency. This is an area that is immersed with empirical evidence from developed countries that provides very nearly empirical regularity that these markets are not efficient. Yet, very little is known for India. With market play in both the spot and the forward segments of markets in the 1990s, it is useful to explore the relationship between the spot and the forward market. This is done rigorously by recourse to time-series properties of daily exchange rate and testing for co integration and long-memory characteristics of the spot and forward exchange rates. The results are inferred along with the possibility of presence of significant risk premia. *Chapter-4* deals with the issue of central bank intervention. This remains the most obfuscated area in exchange rate economics across the globe and it is well neigh impossible to provide any definitive answers to the questions raised with the available information from the central banks. Yet, the chapter attempts to see what can be known from the available information. It juxtapose statistical evidence on effectiveness of buying and selling interventions on volatility and on motives for intervention with survey responses of some practioners from the market and regulatory agencies. It also makes recommendations on the design for central bank intervention in the times to come. *Cltapter-5* covers the event episode narrative study exchange rate volatility and classifies phases of stability and of high volatility. As significant clustering of low and high volatility is found to exist, volatility is formally measured using a wide array of conditional volatility models that capture autoregressive conditional heteroscedasticity (ARCH) type effects. These models help us analyse the temporal dependence and clustering in volatility and model the behaviour of the rupee in a superior way to the models that assume constant variance over time. The effect of 'news' or the new information on exchange rate volatility is also analysed. *Cltapter-6* reviews the findings and draws some policy inferences from the findings of the core chapters in this study.

All these core chapters exploit information on past exchange rates that has hitherto not been analysed in the Indian context. The availability of daily exchange rate data for the post-liberalisation period and the market determination of exchange rate in this period has greatly enabled this study to take up issues that are of immense relevance in understanding the Indian forex markets, but have received scant attention so far and to test hypothesis that are essentially new or have been tested in a framework that have been bypassed by theoretical or empirical developments in the frontier literature. The study throws up several new findings. These include rejection of market efficiency hypothesis based on a complete range of conventional as well as new tests developed in the contemporary literature. The evidence draws added importance from the fact that the evidence is provided for the post-liberalisation period - a period in which the market mechanisms have been contemplated and put in place and where market efficiency could be considered a relevant issue. *Inter-alia,* findings are also include the existence of significant risk premia that has a bearing on the market efficiency relationship. There are two particularly interesting aspects of the negation of efficiency. First, the long memory is not present for the rupee exchange rates and second, that despite the weight of the evidence being against market efficiency, there is a possibility that forex markets may be efficient at short-horizon of I-month term for forward premia. On central bank intervention, any conclusive findings are difficult in the absence of adequate disclosures and statistical information. Nevertheless, available information indicates that possibly the selling interventions were not quite successful in decreasing volatility and central bank may have been motivated for targeting implied level of exchange rate and was not just concerned with volatility in its interventions. It also provides interesting perception differences between regulators and market participants in regard to objectives behind intervention and the general conduct of exchange rate policy by the central bank. Empirical work with ARCH type models shows strong evidence of presence of time varying conditional volatility. It also shows evidence of asymmetry in volatility in response to large and small shocks and in respect of positive and negative shocks. The most interesting of these novel findings is that conditional variance for rupee-US dollar exchange rate was much lower in phases of high volatility associated with contagion from East Asian financial crisis and imposition of sanctions as a fallout of nuclear blasts than it was in the two earlier phases of high volatility. This indicates that the central bank action was more effective in curbing volatility during these latter phases.

Several implications of these findings are discussed in the concluding chapter that provides directions for further policy actions, as also for future research in this area.