

Abstract

ESSAYS ON EXCHANGE RATE VOLATILITY IN BRICS ECONOMIES

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This thesis is a collection of essays investigating into various aspects of exchange rate volatility in BRICS economies during the period 2006 to 2018. Exchange rate is a key macro-finance variable that helps an open economy to achieve equilibrium. The stability of exchange rate is considered important in achieving high economic growth. A strong foreign exchange market has important implications for economic policies and international capital budgeting decisions as well. Currency markets are also believed to have relevance for the investors and policy makers. An unstable exchange rate, on the other hand, can adversely affect the open economy by changing the international price of goods or assets.

Exchange rate volatility can be a source of instability. Exchange rate volatility is traditionally associated with changes in exchange rate regime from a fixed to a free floating one. Exchange rate volatility has become all the more important post globalization, especially for emerging market economies including the BRICS. Through direct and indirect channels exchange rate volatility negatively affects households and firms. The extent and persistence of currency volatility adversely affects, directly or indirectly, a number of key policy variables, including interest rate, returns on investment and, hence growth. Volatility in exchange rate can arise from three possible factors: volatility in market fundamentals, changes in expectations due to new information and speculative “bandwagons”. Any misalignment in the exchange rate thus requires intervention in the foreign exchange market. Managing currency volatility, by keeping a close watch on fundamentals, is thus a major policy challenge for central bank while formulating monetary policy.

With structural changes in the global economy, the emerging market economies, the BRICS in particular, have emerged important with rising share in world GDP, trade, capital inflows, stock market capitalization, and foreign exchange market turnover. The improving economic prospects of BRICS countries attracted investors and portfolio managers to the foreign exchange markets of these countries. Despite emerging strong globally, volatility in currency markets is a possibility in these countries with them getting financially integrated and adopting a regime of more flexible exchange rates. The stylized evidence on exchange rate volatility show (Chapter 1) that the exchange rates of BRICS currencies with respect to the US\$ fluctuated during the period since 2006, with all the return series exhibiting high volatility and volatility clustering during the entire sample period, especially after the global financial crises. This finding possibly suggests that the observed volatility pattern across BRICS currencies for a large part of the sample period can be either on account of some domestic or external shocks arising out of the changes in exchange rate policy regimes, uncertainties arising out of other policy changes or the spillover effect of some crises that originated elsewhere in the global economy.

This thesis is set out as a collection of essays on three important aspects of exchange rate volatility in the BRICS economies. The first essay, using Markov switching autoregressive model, has investigated the pattern of regime switching behaviour in currency volatility in the BRICS countries. In specific, the extent and persistence of bullish and bearish regimes are looked into. An estimation of exchange market pressure (EMP) of individual BRICS currencies, in addition, reveals the pressure to appreciate or depreciate along with the need for intervention by the respective central banks to contain such EMP. The second essay deals with volatility transmission, cross-

border or otherwise, with regards to BRICS economies. A study on volatility transmission in the currency has assumed importance ever since exchange rates have become market determined and the pattern of volatility has undergone a distinct change with the possibility of volatility transmission increasing manifold. In specific, the second essay has examined the extent of return co-movement and volatility spillover between BRICS currency markets and some developed country currencies like Euro, Japanese Yen, British Pound and Australian Dollar. Finally, the last essay has explored into the factors determining currency volatility in BRICS economies. In specific, the chapter investigates into the impact of Economic Policy Uncertainty (EPU) on the volatility of BRICS currencies. Applying various Time Series Analysis to the data on daily nominal spot exchange rate for the BRICS countries availed from the Bloomberg database (<https://www.bloomberg.com>), the essays resort to analyses of three important issues on exchange rate volatility.

The research objectives of the thesis are:

- Examining the pattern of regime switching behaviour and volatility in the BRICS foreign exchange markets. Here, using a Markov switching autoregressive framework, the behaviour of the BRICS foreign exchange returns is explored in a two-state Markov regime i.e. the bullish and the bearish regimes. The shifts between the two regimes are identified along with persistence of each regime. In addition, exchange market pressure and the intervention index are estimated to analyse the pressure on individual BRICS currency to appreciate or depreciate and interventions by the respective central banks to contain such market pressure.

- Investigating into the extent of connectedness in foreign exchange markets of BRICS countries with various other countries. In specific, the thesis explores into of return co-movement and volatility spillover between BRICS currency markets and some developed country currencies whose turnover of all transactions are high.
- Exploring whether economic policy uncertainty impacts on the volatility of BRICS currencies using Heterogeneous Autoregressive model.

The first essay (Chapter 2) has investigated into the regime switching behaviour of the BRICS currencies in a Markov switching framework, and has subsequently estimated the exchange market pressure to identify the phases of appreciation and depreciation and has constructed intervention index to show the degree of intervention by the respective central banks to mitigate the EMP. It is found that Chinese Yuan is the least volatile among BRICS currencies in both bear and bull regimes, whereas South African Rand is the most volatile currency. The foreign exchange markets are affected by several crises, as evident from smoothed probability graphs. Besides, the persistence of the overall cycle across all foreign currency markets in BRICS countries is uniformly higher in the bear regime as compared to the bull regime. In this regard, the Chinese Yuan is found to have the highest number of cycles in both bear and bull regime suggesting that the currency has gone through maximum phases of appreciation and depreciation as compared to other BRICS currencies. Moreover, the EMP estimates show that the BRICS currencies had gone through a large depreciation phase during the crises periods to which the respective central banks responded with intervention, although the degree was higher for the Chinese central bank than that in other BRICS countries. On the contrary, intervention is the least by the central bank of South Africa.

The econometric analysis has identified that the Chinese Yuan to be attractive among the BRICS currencies to the investors because of its lower volatility in both the regimes although the mean varies across regimes. On the other hand, South African Rand is observed to have a high variance in both the regimes making it unattractive for the investors. Besides, using the smoothed probability obtained from Markov switching model, it is found that there is market synchronization among the BRICS currencies, Chinese Yuan being the exception.

The second essay (Chapter 3) is set out to investigate into the extent of connectedness in foreign exchange markets of BRICS countries with various other countries. In specific, the essay has explored into return co-movement and volatility spillover between BRICS currency markets and some developed country currencies whose turnover of all transactions are high. Using Dynamic Conditional Correlation (DCC) model and Vector Autoregression (VAR) methods, the analyses show the presence of significant return co-movements and volatility spillover between the foreign exchange markets. The econometric analysis identified volatility in the foreign exchange markets of Brazil, India and South Africa have a tendency to persist whereas the foreign exchange market of Russia and China are explosive in nature as compared to the developed economies. It is also inferred from the analysis that Brazilian Real, South African Rand and Indian Rupee are influenced more by Australian Dollar, while Russian Ruble and Chinese Yuan are influenced more by Euro and British Pound. In addition, BRICS foreign exchange markets, except Brazil and Russia, are net receivers of volatility and developed markets are net transmitter of volatility. The investigation further reveals that South African Rand is the highest receiver of volatility among other BRICS foreign

exchange markets. Further, dynamic correlations and volatility spillovers show large variability, which are necessarily synchronous with extreme economic episodes including global recession. The above analysis, however, does not include identification of such movements with major turning points in global economy.

The last essay (Chapter 4) is an exploration of whether economic policy uncertainty impacts on the volatility of BRICS currencies. Using Heterogeneous Autoregressive model, the empirical analysis has shown that the exchange rate volatility of the BRICS countries are primarily dependent on recent past volatility. The Brazilian Real and Indian Rupee are mostly affected by own country EPU whereas the US EPU affects the Indian Rupee only. However, the BRICS foreign exchange markets have switched their exchange rate regimes to which the local EPU and US EPU responded differently. For instance, the local EPU affects the volatility of Brazilian Real and Indian Rupee in both the regimes while Russian Ruble in second, third and fourth regime, leaving Chinese Yuan. On the other hand, the US EPU affects the Russian Ruble in fourth regime, Indian Rupee in second regime and Chinese Yuan in both regimes. The effect of local economic policy uncertainties and the US uncertainties was low in case of Chinese Yuan which mainly points to the fact that the Chinese monetary authorities maintain a tight control on the foreign exchange market. While some previous studies find that, for emerging economies, exchange rate volatility is caused by its own country economic policy uncertainties, this essay has shown that the currency volatilities in emerging market economies such as Russia, India and China has been largely predicted by US economic policy uncertainties as well.

These results have possibly paved the way for the central banks of the BRICS economies to concentrate more on policy formulation to lower volatility in the foreign exchange markets. The individual BRICS economies have intervened in the respective currency markets to check excess volatility from time to time. Further, with greater global integration of the BRICS nations, the above evidence on return co-movements and volatility spillovers can be of use to investors to effectively participate in currency trading and manage risk through portfolio diversification as well as to policy makers in initiating effective measures to tackle crises in foreign exchange markets. However, as is evident from the market synchronization analysis, there is less opportunity for portfolio diversification as the movements in BRICS currency markets are synchronized, with Chinese Yuan being the exception.

The results further imply that the investors, the monetary authority and the policy makers in the BRICS countries are required to monitor the developments in the foreign exchange markets of the respective developed nations as volatility in the developed country currencies have an impact on the foreign exchange market of BRICS countries. For instance, Brazilian, South African and Indian monetary authority needs to keep an eye on the event taking place in the Australian foreign exchange market as variations in Australian Dollar affect the Brazilian Real, South African Rand and Indian Rupee. The central banks of Russia and China need to follow the incidents occurring in the foreign exchange markets of Euro and British Pound, as the volatility in these markets influence the volatility in the foreign exchange markets of Russia and China. Such volatility, as Ross (1989) notes, is an important source of information in the financial markets. The first channel of volatility spillover is news which affects a set of financial variables

simultaneously (Bollerslev et al. 1992), while the second channel operates through information spillover caused by cross market hedging (Ederington & Lee, 1993).

Moreover, a rise in exchange rate volatility makes it more likely and worthwhile for individuals and firms engaged in international transactions to use costly options to hedge exposures. As a result, risk averse firms may be less inclined to carry out international transactions because of the higher costs associated with trading. Thus, the policymakers are required to be aware of the fact that an increase in uncertainty in the policy arena increases volatility in financial markets and thus negatively affects the performance of the economy. Clarity in economic policy making and its timeliness, especially at the time of crisis or turmoil or recession, can lower economic policy uncertainty and lead to a more stable currency market in the emerging market economies, in general, and the BRICS, in particular.