Exchange Rate Dynamics and its Impact on India's Exports to USA and EU: An Assessment

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EXECUTIVE SUMMARY

An exchange rate is the price of a country's currency relative to the currencies of other countries. There are three aspects of exchange rate which can have plausible impact on exports—the level of exchange rate, fluctuation in the rates, and the direction of the movement in exchange rates.

This study analyses the directional movement of the Indian currency, estimates its volatility, and briefly discusses the misalignment of the Indian currency from its true value. The study further attempts to compare the volatility of Indian Rupee (INR) with other emerging market currencies.

The study also examines the impact of currency volatility and appreciation/ depreciation on India's exports. According to the dominant currency paradigm, bilateral trade prices and quantities depend on dominant currency rates, as against the bilateral exchange rates. Taking cognizance of this, the study evaluates the impact of INR exchange rate movement on India's exports to two of its major trading partners—the USA and the Euro Area, both of which have currencies that dominate international trade transactions.

TREND IN INDIAN RUPEE

During 2011-2013, the INR depreciated with respect to several major currencies. The Nominal Effective Exchange Rate (NEER), which is the trade weighted average of bilateral nominal exchange rate of INR in terms of currencies of 36 key trade partners, had also depreciated during this period. In fact, India was among the fragile five economies which were the worst impacted by the taper tantrum in 2013. However, from 2014 onwards, the NEER appreciated in all years except 2015.

The analysis of NEER as a measure of price competitiveness can only be of limited significance, given that competitiveness of exports is typically associated with the Real Effective Exchange Rate (REER), as it reflects the movements in relative price levels. The REER also appreciated consistently from 2014 onwards, and the magnitude of change was greater than that of NEER. Historically, higher inflation levels in India as compared to its trading partners have contributed towards the appreciation in REER.

VOLATILITY OF THE INDIAN RUPEE

Analysis indicates that the year of Global Financial Crisis (2008-09) was a volatile period for the INR. Exchange rate remained volatile till the beginning of 2014, with intermittent periods of low volatility in between. Thereafter, the INR has been relatively stable with no major spikes in volatility.

During the period under consideration (January 2006 – December 2017), maximum volatility was witnessed in 2013 on account of fears of tapering of quantitative easing (QE) by the US Fed. Early tapering of the QE triggered large selloffs by Foreign Institutional Investors, thereby increasing volatility of the INR. This was a period of volatility for other emerging market currencies as well, and emerging market economies with large current account deficits and weaker macroeconomic fundamentals were among the worst hit. Brazil, India, Indonesia, South Africa and Turkey were among the worst affected countries on account of the taper tantrum and were subsequently labelled as the 'Fragile Five'. Among these, India and Indonesia managed the problem in the shortest time and achieved macroeconomic stabilization within a short span of less than a year[1].

To stem the sharp depreciation of the Rupee and manage volatility, policy makers in India adopted a panoply of policy measures including forex market intervention, monetary tightening through reduction in banks' access to overnight Liquidity Adjustment Facility, increase in Marginal Standing Facility rate and increase in daily minimum Cash Reserve Ratio maintenance requirements. However, monetary policy mechanism alone would not have been sufficient to contain the volatility, and a host of administrative measures were also put in place, such as import restrictions on gold, opening of special dollar swap window for the public sector oil companies, special concessional swap window for attracting FCNR (B) deposits, increase in overseas borrowing limit of banks, bringing of outward FDI flows under the approval route, reduction in Liberalised Remittance Scheme entitlement, disallowing banks from carrying proprietary trading in exchange traded derivatives, etc.

The role of administrative measures in ultimately restoring stability in the INR cannot be overemphasized. According to the Reserve Bank of India (RBI), the concessional swap facility for attracting longer term FCNR (B) deposits and easing of overseas borrowing limits of banks led to forex inflows of more than USD 34 billion. This played an instrumental role in ensuring stability of the INR.

[1]M. Chatib Basri, (2017), India and Indonesia: Lessons Learned from the 2013 Taper Tantrum, Bulletin of Indonesian Economic Studies, 53:2, 137-160

The exceptional monetary and administrative measures were gradually removed once stability in the foreign exchange market was restored.

Comparison of volatility in Indian currency with that of other emerging economies indicates that the INR has shown remarkable resilience in the past few years taken into consideration in the present analysis as compared to several other currencies such as the Russian Rouble, Malaysian Ringgit, Brazilian Real, and Mexican Peso. As compared to some currencies such as the South African Rand, the INR has been historically more stable.

EXCHANGE RATE MISALIGNMENT

The IMF's real effective exchange rate gap assessment has been used in the study for analysing the appropriate level of the INR. The IMF calculates current account gap and also provides a view on the REER. The current account gap is the difference between actual current account balance and the level computed by the IMF staff which would be consistent with the prevailing fundamentals of the economy and with desirable medium term policies. The IMF also assesses the REER which is normally consistent with the assessed current account gap. A positive REER gap implies an overvalued exchange rate, while a negative value indicates undervalued exchange rate.

According to IMF estimates, several countries for which a positive current account (CA) gap has been assessed keep their currencies undervalued to boost their export competitiveness and generate trade surplus. According to IMF staff estimates, India had an overvalued exchange rate in 2015 and 2016. However, in 2017, the currency was estimated by the IMF to be undervalued.

The trade based 36-currency REER is also estimated by the RBI. The REER has consistently increased from 2014 onwards, indicative of an appreciation in the Indian currency. In recent times, however, the REER witnessed a depreciation. During 2017-18, the REER witnessed a depreciation of nearly (-) 2.4 percent. This depreciation is expected to have contributed to the undervaluation of the INR as assessed by the IMF in 2017. The depreciation has continued in the current financial year, and the monthly average change in REER during the April-August 2018 period was nearly (-) 0.4 percent[2]. The undervaluation of the INR, as assessed by the IMF, is therefore expected to persist in 2018-19 as well.

[2]Comparing REER of March 2018 with April 2017

EFFECT OF EXCHANGE RATE ON INDIA'S EXPORTS

According to the analysis carried out in the study, INR depreciation has a positive impact on exports to the USA in the long run as well as in the short run. A 1 percent depreciation of INR leads to 0.3 percent increase in exports to the USA in the long run. In case of the Euro Area, a depreciation of one unit (cost of one unit of foreign currency given in units of local currency) leads to a 3.4 percent increase in exports. The appreciation in REER and NEER is therefore expected to have a negative impact on exports.

Volatility of the INR is found to have little or no impact on exports to the USA and the Euro Area in the long run. While the impact of INR volatility on exports to the USA has been found to be positive in the long term, the magnitude of impact is very low. According to estimates of elasticity at mean, 1 percent increase in INR volatility leads to a 0.1 percent increase in bilateral exports from India to the USA. This finding could possibly be ascribed to the strong and consistent depreciation of the INR vis-à-vis the US Dollar during the period under consideration. Impact of INR volatility on exports to the Euro Area is found to be insignificant at 5 percent level, indicative of no significant impact of volatility on exports in the long run.

CONCLUSION

The INR, which was an overvalued currency in 2016, has witnessed remarkable correction since 2017 onwards. In fact, the INR continues to depreciate in the current financial year, reaching its lowest level of 74.0989 to the Dollar on 9th October 2018. The REER has also depreciated in the recent period. Analysis in the present study indicates that this depreciation is expected to bode well for exports from India to two of its major export markets, viz. the USA and the EU. The INR has also been volatile in the recent period, but its impact on exports is expected to be minimal. To this extent, it can be argued that the RBI has been prudent in not intervening in the forex market and allowing the exchange rate to depreciate. This has also reduced the currency misalignment which can impact the country's exports in its own way, an area of further research.

1. Introduction

An exchange rate is the price of a country's currency relative to the currencies of other countries. It impacts the prices of both exports from and imports into the country. It also impacts the flow of investments, and is crucial for determining the value of existing overseas investments.

Given its role in influencing key macroeconomic variables, exchange rate is an important policy variable in most economies. The exchange rate regimes and the approach to the management of overall foreign exchange reserves varies across countries, and is attuned to their respective macroeconomic conditions. The International Monetary Fund (IMF) defines 10 categories of exchange rate arrangements, which are based on four broad types—hard pegs, soft pegs, floating regimes (market-determined rates), and residual (Table 1).

Table 1: Classification of Exchange Rate Arrangements

Type	S.No.	Categories
Hard Pegs	1	Exchange arrangement with no separate legal tender
	2	Currency board arrangement
Soft Pegs	3	Conventional pegged arrangement
	4	Pegged exchange rate within horizontal bands
	5	Stabilized arrangement
	6	Crawling peg
	7	Crawl-like arrangement
Floating regimes (market determined rates)	8	Floating
	9	Free Floating
Residual	10	Other managed arrangement

Source: IMF

Soft peg is the single largest exchange rate arrangement, with nearly 42.2 percent of the IMF member countries adopting this. Capital flow volatility ever since the Global Financial Crisis may have contributed to the shift towards increased exchange rate management as a tool in many countries to alleviate the pressure on their currencies. After 2015, there has been some reduction

in the number of countries with soft peg (Table 2). India is currently following a floating exchange rate arrangement.

Table 2: Exchange Rate Arrangements of Economies

EXCHANGE RATE ARRANGEMENT	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
	(% of IMF Members as of April 30, 2018)									
HARD PEG	**12.2**	**12.2**	**13.2**	**13.2**	**13.2**	**13.1**	**13.1**	**12.6**	**13.0**	**12.5**
No separate legal tender	5.3	5.3	6.3	6.8	6.8	6.8	6.8	6.8	7.3	6.8
Currency board	6.9	6.9	6.9	6.3	6.3	6.3	6.3	5.8	5.7	5.7
SOFT PEG	**39.9**	**34.6**	**39.7**	**43.2**	**39.5**	**42.9**	**43.5**	**47.1**	**39.6**	**42.2**
Conventional peg	22.3	22.3	23.3	22.6	22.6	23.6	23	23	22.9	22.4
Stabilized arrangement	12.8	6.9	12.7	12.1	8.4	9.9	11	11.5	9.4	12.5
Crawling peg	2.7	2.7	1.6	1.6	1.6	1	1	1.6	1.6	1.6
Crawl-like arrangement	1.1	0.5	1.1	6.3	6.3	7.9	7.9	10.5	5.2	5.2
Pegged exchange rate within horizontal bands	1.1	2.1	1.1	0.5	0.5	0.5	0.5	0.5	0.5	0.5
FLOATING	**39.9**	**42**	**36**	**34.7**	**34.7**	**34**	**34**	**35.1**	**37**	**39.5**
Floating	20.2	24.5	20.1	18.9	18.4	18.3	18.8	19.4	20.8	19.8
Free Floating	19.7	17.6	15.9	15.8	16.3	15.7	15.2	15.7	16.1	16.1
RESIDUAL										
Other managed arrangement	8.0	11.2	11.1	8.9	12.6	9.9	9.4	5.2	10.4	9.4
Source: Annual Report on Exchange Arrangements and Exchange Restrictions, IMF										

EXCHANGE RATE REGIME IN INDIA

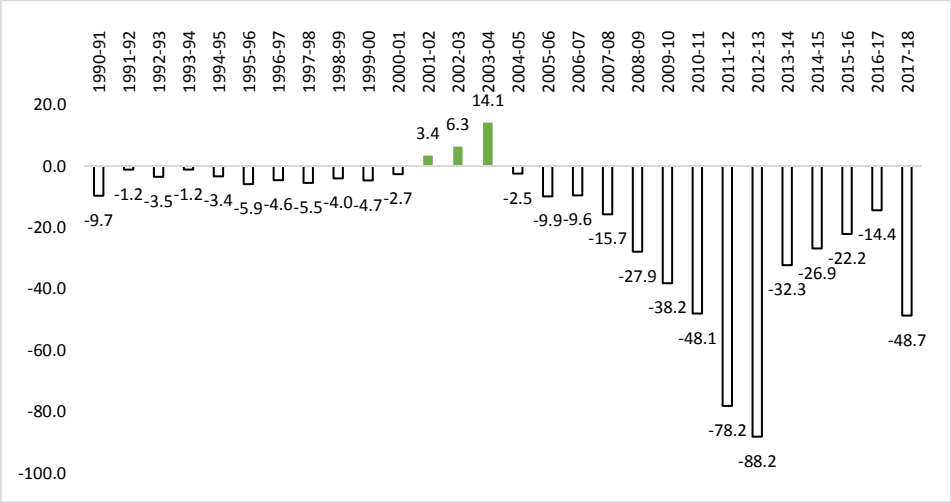
The exchange rate regime in India has changed several times since independence. During the 1950s, India followed a par value system, under which exchange rate was fixed in terms of gold with pound sterling as the reference. For maintaining stability of the exchange rate and overcoming the weaknesses associated with single currency peg, the exchange rate regime was changed to a basket peg during 1970s and 1980s, before becoming market determined during March 1992-February 1993. However, since 1993, India has maintained a managed floating exchange rate, with no fixed target (Table 3).

Table 3: Chronology of India's Exchange Rate Regime

Year	The Foreign Exchange Market and Exchange Rate
1947-1971	Par Value system of exchange rate. Rupee's external par value was fixed in terms of gold with the pound sterling as the reference currency.
1971	Breakdown of the Bretton-Woods system and floatation of major currencies. Rupee was linked to the pound sterling in December 1971.
1975	To ensure stability of the Rupee, and avoid the weaknesses associated with a single currency peg, the Rupee was pegged to a basket of currencies. Currency selection and weight assignment was left to the discretion of the RBI and not publicly announced.
1978	RBI allowed the domestic banks to undertake intra-day trading in foreign exchange.
1978-1992	Banks began quoting two-way prices against the Rupee as well as in other currencies. As trading volumes increased, the 'Guidelines for Internal Control over Foreign Exchange Business' were framed in 1981. The foreign exchange market was still highly regulated with several restrictions on external transactions, entry barriers and transactions costs. Foreign exchange transactions were controlled through the Foreign Exchange Regulations Act (FERA). These restrictions resulted in an extremely efficient unofficial parallel (hawala) market for foreign exchange.
1990-1991	Balance of Payments crisis
July 1991	To stabilize the foreign exchange market, a two-step downward exchange rate adjustment was done (9 percent and 11 percent). This was a decisive end to the pegged exchange rate regime.
March 1992	To ease the transition to a market determined exchange rate system, the Liberalized Exchange Rate Management System was put in place, which used a dual exchange rate system. This was mostly a transitional system.
March 1993	The dual rates converged, and the market determined exchange rate regime was introduced. All foreign exchange receipts could now be converted at market determined exchange rates.
Source: RBI	

The exchange rate in India is largely determined by market forces, with intervention from the Reserve Bank of India (RBI) only for managing excessive volatility. Such a regime is important from the perspective of the Indian economy on account of the characteristics of its balance of payment. India has substantial current account deficit, which peaked at USD 88.2 billion in 2012-13, and narrowed thereafter before increasing again in 2017-18 to USD 48.7 billion (Figure 1). India depends on large capital flows to fund this current account deficit which is often lumpy in nature, and makes the foreign exchange market in India subject to substantial volatility. RBI intervention prevents such undue volatility.

Figure 1: India's Current Account Balance (USD Billion)



Source: RBI, Exim Bank Research

EXCHANGE RATE AND EXPORTS

There are three aspects of exchange rate which can have plausible impact on exports—the level of exchange rate, fluctuation in the rates, and the direction of the movement in exchange rates.

The level of exchange rate may have an impact on exports if it is at variance from the underlying “equilibrium” value of the exchange rate. Such currency misalignments could impact a country’s trade through its impact on relative import prices. According to Frieden and Broz (2006), an undervalued currency enhances the competitiveness of exporting and import-competing firms at the

expense of consumers and non-tradable sector[3]. However, these misalignments may not lead to such outcomes if the differential is absorbed by firms, and does not reflect in the prices in destination countries. Firms may also incur irreversible sunk costs for entry into the exports market, which may deter an exit even in case of undervaluation of the importing country's currency[4]. Vertical integration of production wherein imported units have a large share in the production process can also make currency misalignments less important.

The second important aspect of exchange rate is the strengthening or weakening of the currency over time. These changes in exchange rate can impact the economic activity in countries through the trade channel or the financial channel. According to BIS (2016), the impact of fluctuations in exchange rate through the two channels— trade channel and financial channel, are contrary in nature. Under the trade channel, an exchange rate appreciation typically has a contractionary impact on domestic economic activity. This is because appreciation in exchange rate increases the cost of exports and reduces the domestic import costs, thereby leading to a reduction in export demand. On the other hand, appreciation of currency could also strengthen the balance sheets of domestic borrowers in foreign currency, thereby easing the domestic financial conditions. As a result, the financial channel may have an expansionary effect on the economic activity. An accurate assessment of the impact of exchange rate movements on economic activity is therefore difficult. Even an assessment of the impact through the trade channel is not straightforward.

Theoretically, depreciation should lead to an improvement in exports and thereby the domestic economic activity, provided certain assumptions are satisfied. One of the basic assumptions is that each country sets export prices in its own currency, and these change less frequently than exchange rates. However, in practice, evidence suggests that exporters often use US Dollar as an invoicing currency. In fact, the Dollar's share as an invoicing currency is 3.1 times the share of the USA in world exports. The overwhelming use of US Dollar in exports invoicing leads to almost no change in the destination

[3] Frieden, Jeffry, and Lawrence Broz, (2006), "The Political Economy of Exchange Rates." In Oxford Handbook of Political Economy, ed. Barry Weingast and Donald Wittman, 587-600. Oxford: Oxford University Press.

[4] Baldwin, Richard, (1988), Hysteresis in Import Prices: The Beachhead Effect. American Economic Review. 78(4), 773- 85.

currency price in case of a currency depreciation, and therefore no change in demand and in export quantities[5].

Box 1: Dominant Currency Paradigm and Impact of Depreciation on Exports

The relationship between movements in the exchange rate and other macroeconomic variables hinges critically on the currency in which prices are rigid. The New Keynesian models assumed prices to be sticky in the exporting country. Under this 'producer currency pricing' paradigm, the law of one price is applicable and a nominal depreciation increases the price of imports vis-à-vis exports (the terms-of-trade), thereby increasing the export competitiveness.

Recent empirical work indicates that there is very little evidence that the pricing in international trade follows the producer currency pricing paradigm. Instead, a large share of trade is invoiced in a small number of 'dominant currencies', the US Dollar being the most used currency. Moreover, exporters face strategic complementarities in pricing, as a result of which their mark ups vary over time and across destination markets. Finally, the rise of global value chains also impacts the working of this paradigm, as employment of imported raw materials reduces the local value added content of exports.

The 'dominant currency paradigm' is an alternative for the producer currency pricing paradigm. Under the paradigm, firms set export prices in a dominant currency such as the US Dollar and change them infrequently. They also face strategic complementarities in pricing. There is also roundabout production, with domestic and foreign inputs employed in production.

Some of the key results of the dominant currency paradigm are:

1. In both short and medium term, the terms of-trade remains stable, playing negligible role in expenditure switching.

2. The dominant currency exchange rate pass-through into export and import prices is high, regardless of the destination or origin of goods. However, the exchange rate pass-through of non-dominant currencies is negligible. According to Boz, Gopinath and Plagborg-Moller (2017), a 10 percent depreciation of an importing country's currency relative to the US Dollar raises the import prices of goods in its own currency by 7.8 percent even when there is no change in its bilateral exchange rate with its trading

[5] Dollar Dominance in Trade: Facts and Implications, Export-Import Bank of India's 33rd Commencement Day Lecture by Dr. Gita Gopinath, John Zwaanstra Professor of International Studies and of Economics Harvard University, December 2017

partner. On the other hand, 10 percent depreciation relative to its trading partners' currency raises import prices by only 1.6 percent, when its exchange rate relative to the US Dollar is unchanged.

3. While depreciations have a limited expansionary impact on exports, expenditure switching still occurs through imports, arising from fluctuations in the relative price of imported to domestic goods. These are driven by movements in a country's exchange rate relative to the dominant currency, regardless of the country of origin of the imported goods.

4. Strengthening of the dominant currency relative to non-dominant ones can negatively impact global trade.US Dollar appreciation reduces the demand for not only exports from the USA but also all those exports where US Dollar is the invoicing currency.

Source: Casas, C., D'ıez, F. J., Gopinath, G., and Gourinchas, P.-O. (2017). Dominant Currency Paradigm: A New Model for Small Open Economies. NBER Working Paper No. 22943; Dollar Dominance in Trade: Facts and Implications, Export-Import Bank of India's 33rd Commencement Day Lecture by Dr. Gita Gopinath, John Zwaanstra Professor of International Studies and of Economics, Harvard University, December 2017

The third important facet of exchange rate is its volatility. Stability of exchange rate is considered important for overall macroeconomic stability of economies. Several emerging market economies have adopted a policy of managed floating exchange rate to avoid sharp appreciation or depreciation of currencies. Emerging economies often do not possess appropriate institutional requirements to undertake effective monetary policy under pure floating exchange rates, necessitating a managed floating approach to exchange rate determination.

As far as the impact of foreign exchange volatility on exports is concerned, the literature is vast, with varying results. According to Coric and Pugh (2010), the average trade effects of exchange rate variability are not sufficiently robust to generalize across countries[6]. There are several contesting views on the

[6] Coric, Bruni and Geoffrey Pugh (2010), The Effects of Exchange Rate Variability on International Trade: A Meta-Regression Analysis, Applied Economics 42: 2631-2644.

impact of exchange rate volatility on exports, and the sensitivity of exporting firms to fluctuations in exchange rate depends on several factors including existence of hedging instruments, import intensity of exports, the presence of subsidiaries in other geographies, currency of invoicing, etc.

Exchange rate volatility can have a negative impact on exports as it creates an uncertain operational environment for firms and adversely impacts the scope of increasing profits. According to Clark (1973), in the absence of hedging facilities, rational firms reduce their output and export volumes on account of such uncertainity[7]. Vergil (2002) also argued that volatility discourages local suppliers from expanding into foreign markets on fear of being exposed to profit variability which may arise from unstable exchange rates[8]. Exporters exit the market when the environment is considered too risky and re-enter once stability is restored. Franke (1991)[9] and Seru and Vanhulle (1992)[10] further demonstrate that exporters cut exports and exit market when volatility increases, if the costs of entering or exiting the market are lower.

Some studies have also argued that exchange rate volatility in fact supports export growth. This is because some exporters abide by the principle of low-risk-low-return, tending to export more when the volatility is high[11]. The rationale behind this is that if exporters expect marginal revenue to decline with an increase in volatility, they will be induced to increase export volumes to make up for the likelihood of reduction in marginal revenue. According to some studies, exporters may also increase their trade if they expect the environment to deteriorate further on account of persistent exchange rate volatility. Under such circumstances, exporters are likely to make up for the expected decrease in future activity by increasing trade in the current period.

In contrast to this, some studies have been unable to determine any relationship between volatility and exports. This has especially been found in case of countries with good hedging facilities. In such economies, future fluctuations in the exchange rate does not affect the already pegged price and volume of exportable goods and services. Exports of developed countries is

[7] Clark, P., (1973), 'Uncertainty, exchange risk, and the level of international trade', Economic Inquiry 11(3), 302–313.
[8] Vergil, H., (2002), 'Exchange rate volatility in Turkey and its effect on trade flows', Journal of Economic and Social Research 4(1), 83–99.
[9] Franke, G., (1991), 'Exchange rate volatility and international trading strategy', Journal of International Money and Finance 10(2), 292–307.
[10] Sercu, P. & Vanhulle, C., (1992), 'Exchange rate volatility, international trade, and the value of exporting firms', Journal of Banking & Finance 16(1), 155–182
[11] Côté, A., (1994), Exchange rate volatility and trade: a survey, Working Paper Number 94-5, Bank of Canada.

therefore expected to have no relationship with exchange rate volatility. However, there is another alternate view. A study by Hall et al. (2010) found a negative relationship of volatility in case of developed countries but no significant relationship in case of emerging markets. No effect is usually on account of openness of the capital market of these countries[12].

Clearly, literature does not indicate any definite relationship between exchange rate volatility and exports performance. Volatility has both costs and benefits, and exporters respond differently to the risks posed by exchange rate volatility. Similar to theoretical literature, empirical studies have also rendered mixed results depending on a host of factors, including the measure of exchange rate volatility, the time dimension of the study (long run or short run), choice of real and nominal exchange rate, among others.

SCOPE OF THE STUDY

The current study revolves around the trinity of currency misalignment, exchange rate volatility and depreciation/ appreciation in the context of Indian exports. The empirical and theoretical studies show that their impact on international trade is truly multi-faceted, and may differ across countries. Against this background, the current study analyses the directional movement of the Indian currency, estimates its volatility, and briefly discusses the misalignment of the Indian currency from its true value. The study further attempts to compare the volatility of Indian Rupee with other emerging market currencies.

The study also examines the impact of currency volatility and appreciation/ depreciation on India's exports. According to the dominant currency paradigm, bilateral trade prices and quantities depend on dominant currency rates, as against the bilateral exchange rates. Taking cognizance of this, the current study looks at the impact on India's exports with regard to two of India's major trading partners—the USA and the Euro Area, both of which have currencies that dominate international trade transactions.

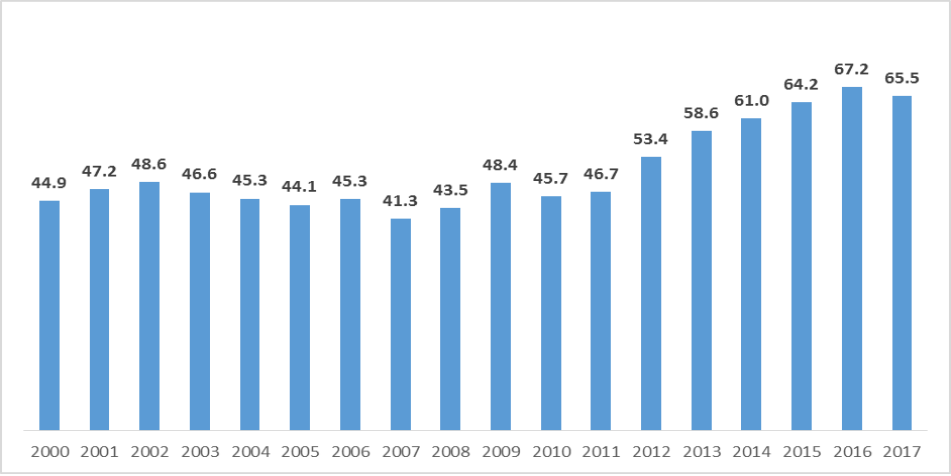
[12] Hall, S., Hondroyiannis, G., Swamy, P.A.V.B., Tavlas, G., Ulan, M., (2010), 'Exchange-rate volatility and export performance: Do emerging market economies resemble industrial countries or other developing countries?', *Economic Modelling* 27(6), 1514–1521.

2. Indian Rupee: Trends, Volatility and Level of Misalignment

TREND IN INDIAN RUPEE

The Indian currency witnessed consistent depreciation against the US Dollar during 2011-2016, before appreciating in 2017. The average annual change in the value of Indian Rupee (INR) vis-à-vis the US Dollar (USD) was around 6.7 percent during the 2011-2016 period (Figure 2). The INR also depreciated with respect to the currencies of several of its major trade partners. This can be observed from the changes in Nominal Effective Exchange Rate (NEER) (trade weighted, 36 currencies). During 2011-2016, the NEER depreciated in all years except 2015 and 2017 (Table 4). In 2017, the INR appreciated with respect to USD as well as with respect to the 36-currency trade weighted NEER of RBI[13].

Figure 2: Trend in Rupee Exchange Rate (Annual Average; INR per USD)



Source: RBI

[13] Currencies of Argentina, Australia, Bangladesh, Brazil, Canada, China, Hong Kong, Denmark, Egypt, Euro, Indonesia, Iran, Israel, Japan, Kenya, South Korea, Kuwait, Malaysia, Mexico, Myanmar, Nigeria, Pakistan, Philippines, Qatar, Russia, Saudi Arabia, Singapore, South Africa, Sri Lanka, Sweden, Switzerland, Thailand, Turkey, UAE, the UK and the USA are considered for the 36-currency

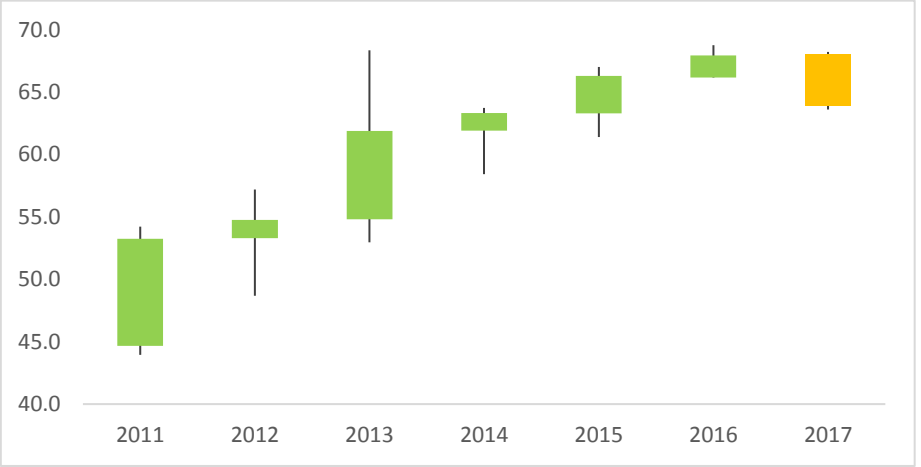
Table 4: Indices of Real Effective Exchange Rate (REER) and Nominal Effective Exchange Rate (NEER) of Indian Rupee (36 - Currency Bilateral Weights) (Calendar Year – Average; Base: 2004-05=100)

Year	Export Based Weights		Trade Based Weights	
	REER	NEER	REER	NEER
2017	121.23	78.87	119.16	77.01
2016	115.39	75.74	113.33	74.07
2015	114.63	76.86	112.21	75.27
2014	108.90	74.05	106.72	72.96
2013	107.03	75.53	104.50	74.14
2012	108.70	81.52	105.64	79.78
2011	114.47	91.09	111.61	89.41
2010	113.76	94.80	111.73	93.77
2009	101.77	90.56	101.15	90.23
2008	101.99	97.41	101.76	96.48
2007	107.90	104.39	108.05	103.73
2006	100.38	98.61	100.68	98.36
2005	101.79	101.97	101.98	101.90

Source: RBI

The Indian Rupee depreciated with respect to the USD during 2011-2016, and appreciated thereafter in 2017. During 2017, the INR was at a level of Rs. 68.0 per USD at the start of the year and reached a level of Rs. 63.9 at the end of the year. It ranged between Rs. 68.2 and Rs. 63.6 per USD during the year. Between the highest and lowest closing level, the INR registered a change of 6.7 percent in 2017, which is substantially lower than the changes of 19.0 percent, 14.9 percent and 22.5 percent during 2011, 2012 and 2013 (Figure 3).

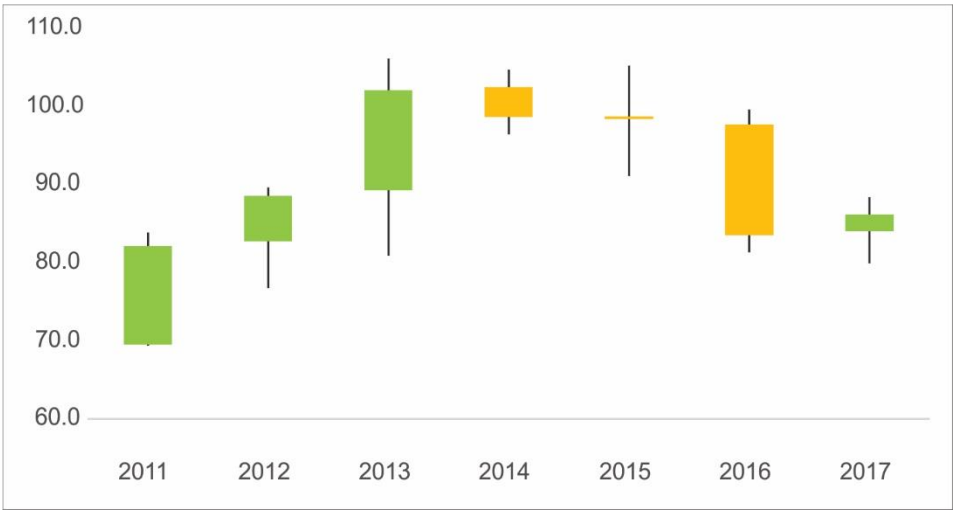
Figure 3: Movements in INR-USD Exchange Rate



Note: The bar indicates the level of exchange rate at the beginning and end of the period. Length of the line indicates the range of exchange rate movement during this period. Green indicates that rupee had depreciated during the year, while orange indicates an appreciation during the year.
Source: RBI, Exim Bank Research

Based on a comparison of the levels at the beginning and end of the period, the Indian Rupee appreciated with respect to the Pound Sterling (GBP) during 2014-2016. At the beginning of 2016, the INR-GBP rate was 97.6 which appreciated to 83.4 by the end of the year in response to the withdrawal of the United Kingdom from the European Union. The INR-GBP rate at the day of the referendum on 23rd June 2016 stood at 99.4 and had appreciated to 86.9 by 11th July 2016. Compared to 2016, the year 2017 was relatively stable and the Indian Rupee depreciated with respect to the GBP. Between the highest and lowest closing levels, the Indian Rupee registered a change of 9.6 percent in 2017, much lower than the 18.3 percent change in the previous year (Figure 4).

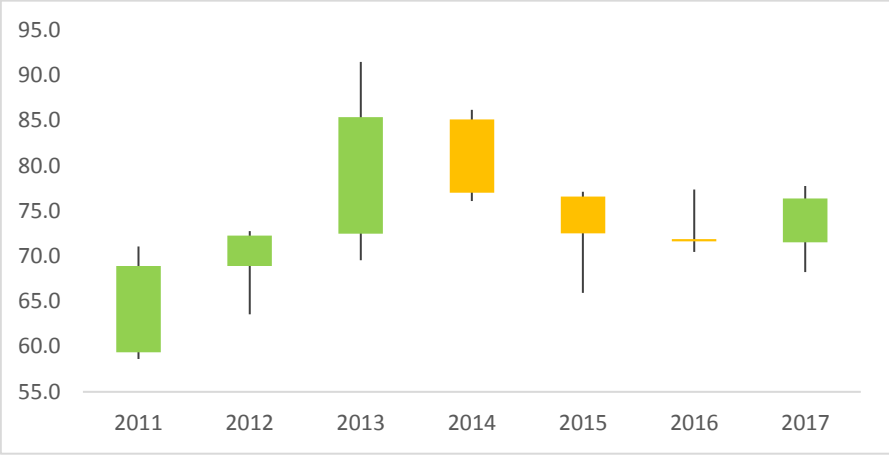
Figure 4: Movements in INR-GBP Exchange Rate



Note: The bar indicates the level of exchange rate at the beginning and end of the period. Length of the line indicates the range of exchange rate movement during this period. Green indicates that rupee had depreciated during the year, while orange indicates an appreciation during the year.
Source: RBI, Exim Bank Research

As in the case of the GBP, the Indian Rupee appreciated with respect to the Euro during 2014-2016 and depreciated thereafter in 2017, based on a comparison of the levels at the beginning and end of the period. The INR-Euro exchange rate at the beginning of 2017 was 71.5, and closed at 76.4. It ranged between Rs. 68.3 and Rs. 77.8 per Euro during 2017. Except for 2016, in all the years from 2011 to 2017, the percentage change between the highest and the lowest rate was in double-digit (Figure 6).

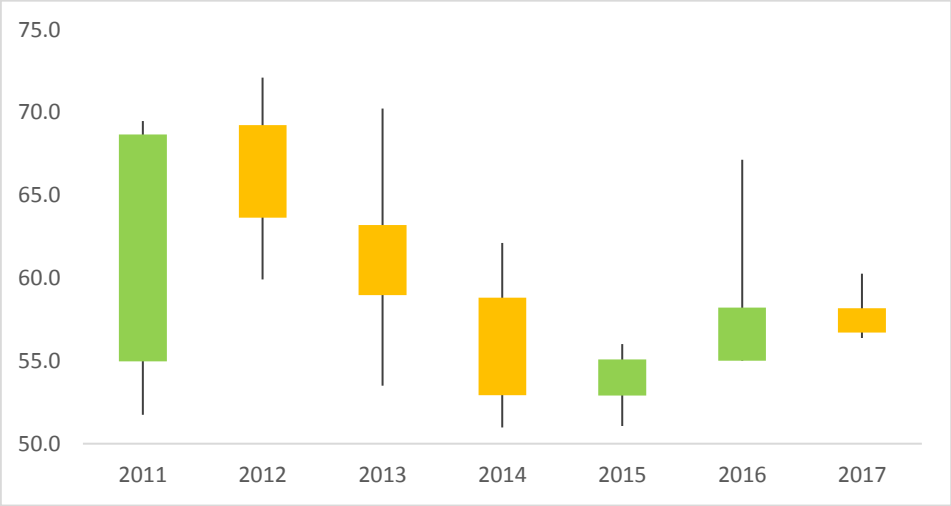
Figure 5: Movements in INR-Euro Exchange Rate



Note: The bar indicates the level of exchange rate at the beginning and end of the period. Length of the line indicates the range of exchange rate movement during this period. Green indicates that rupee had depreciated during the year, while orange indicates an appreciation during the year.
Source: RBI, Exim Bank Research

Japanese Yen had strengthened in 2011 amid Europe's debt problems and concerns over economic growth in the USA. However, Prime Minister Shinzo Abe's economic stimulus package depreciated the yen sharply from the end of 2012. Understandably, the INR-Yen exchange rate had depreciated in 2011 and appreciated during the following three years. After depreciation during 2015 and 2016, the Indian Rupee once again appreciated in 2017 with respect to the Yen. However, the percentage change between the highest and the lowest value was the smallest during 2017 (Figure 7).

Figure 6: Movements in INR-Yen Exchange Rate

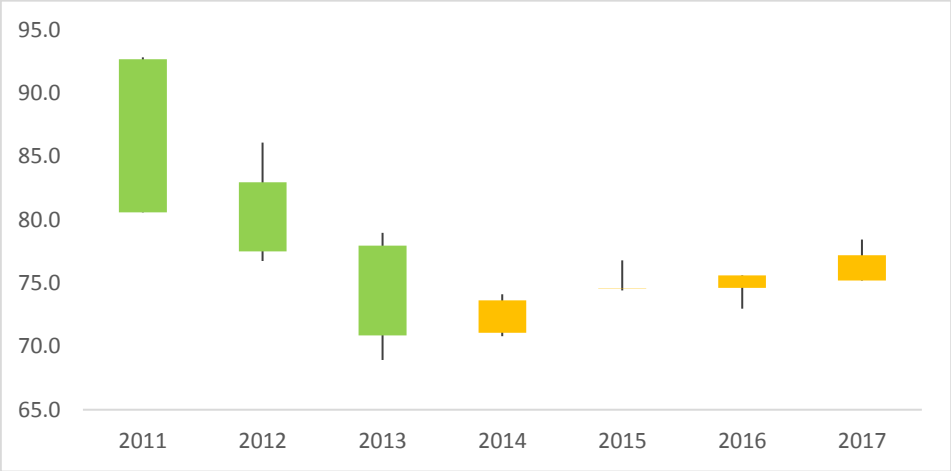


Note: The bar indicates the level of exchange rate at the beginning and end of the period. Length of the line indicates the range of exchange rate movement during this period. Green indicates that rupee had depreciated during the year, while orange indicates an appreciation during the year.
Source: RBI, Exim Bank Research

Analysis of the movement of the Indian Rupee indicates that the trends in appreciation and depreciation vary across currencies. The Indian Rupee appreciated with respect to the Yen during 2012-2014 and again in 2017. By contrast, there was depreciation with respect to the USD in all years except 2017. As expected, the movements in GBP and Euro were relatively synchronous with an appreciation recorded with respect to both during 2014-2016. In the years 2011 and 2013, the Indian Rupee witnessed substantial change vis-à-vis all these major currencies.

The depreciation of the Indian Rupee during 2011-2013 with respect to several major currencies such as the USD, GBP and Euro, was also accompanied by a depreciation of the NEER (36 currency, trade weighted). From 2014 onwards, the NEER has witnessed consistent appreciation. During 2017, the NEER appreciated in line with the appreciation in the INR-USD exchange rate. While the NEER had ranged from 80.6 to 92.8 during 2011, it ranged from 75.2 to 78.5 during 2017, indicative of substantial depreciation in the Indian Rupee during this period (Figure 7).

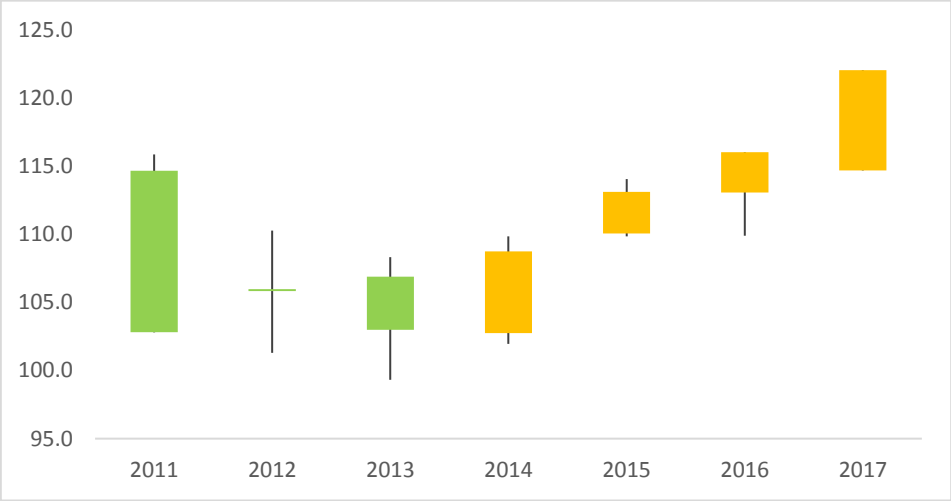
Figure 7: Movements in Monthly NEER (36 Currency, Trade Weighted, Base: 2004-05=100)



Note: The bar indicates the level of exchange rate at the beginning and end of the period. Length of the line indicates the range of exchange rate movement during this period. Green indicates that rupee had depreciated during the year, while orange indicates an appreciation during the year.
Source: RBI, Exim Bank Research

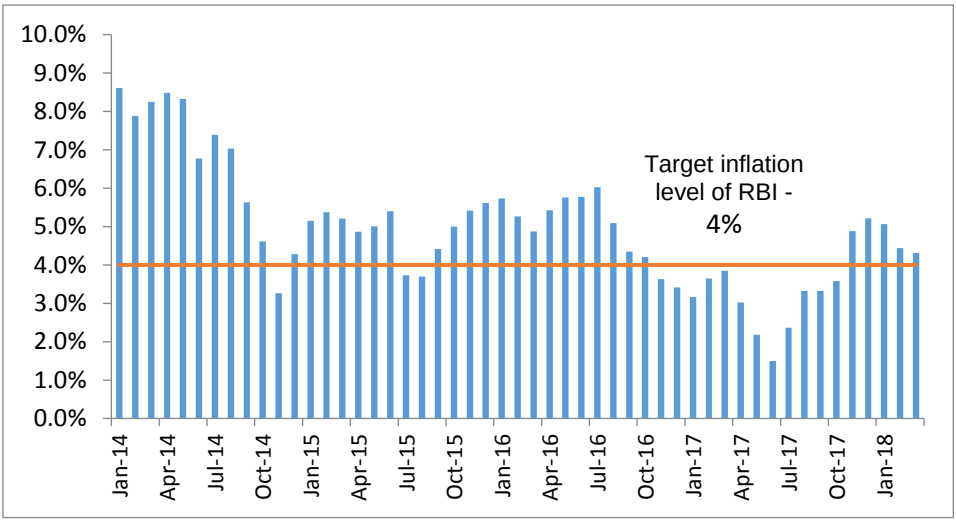
The competitiveness of exports is typically associated with the REER as it reflects the movements in relative price levels. The REER for the Indian currency has appreciated consistently from 2014 onwards and the magnitude of change has been larger than that of NEER (Figure 8). The reason for REER appreciation is India's historically higher inflation as compared to the inflation levels of its trading partners. Even in 2017, when inflation was relatively benign (Figure 9), the REER continued to appreciate.

Figure 8: Movements in Monthly REER (36 Currency, Trade Weighted, Base: 2004-05=100)



Note: The bar indicates the level of exchange rate at the beginning and end of the period. Length of the line indicates the range of exchange rate movement during this period. Green indicates that rupee had depreciated during the year, while orange indicates an appreciation during the year.
Source: RBI, Exim Bank Research

Figure 9: Trend in Retail Price Inflation (Monthly CPI, Base : 2012 = 100)



Source: RBI, Exim Bank Research

MEASURING VOLATILITY

The collapse of the Bretton Wood system of fixed exchange rates ushered an era of floating or market determined exchange rates, which are characterized by frequent fluctuations. In fact, among all financial markets, the currency market today is considered to be the most volatile.

Foreign exchange volatility can be defined as the amount of fluctuations in the foreign exchange rate. India follows a floating exchange rate system, which makes the currency vulnerable to wide fluctuations. Although these fluctuations are contained by the RBI through its intervention, there have been several bouts of volatility in the recent period. Before analysing the impact of this volatility on the Indian exports, it would be worthwhile to look at the extent of volatility of the Indian Rupee, and compare it with other emerging market currencies.

One of the most commonly used measures of exchange rate volatility has been used for analysis. It is measured as the standard deviation of the first difference of the exchange rates. Exchange rate volatility between countries *k* and *j* in time period *t* is given by:

$$ERvol_{kjt} = std.dev.[\ln(ER_{kjt,m}) - \ln(ER_{kjt,m-1})]$$

Where ER refers to the nominal exchange rate with respect to the US Dollar, and m denotes month in case volatility is calculated at the yearly level, and refers to day in case of calculation at the monthly level. A value of $ERvol_{kjt}$ equal to zero implies no volatility. Volatility measures are taken in percentage terms.

Analysis indicates that the year of Global Financial Crisis (2008-09) was a volatile period for the Indian Rupee. Exchange rate remained volatile till the beginning of 2014, with intermittent periods of low volatility in between. Thereafter, the Indian Rupee has been relatively stable with no major spikes in volatility (Figure 10). During the period under consideration, maximum volatility was witnessed in 2013 on account of fears of tapering of quantitative easing (QE) by the US Fed. Early tapering of the QE triggered large selloffs by Foreign Institutional Investors, thereby increasing volatility of the Indian Rupee. This was a period of volatility for other emerging market currencies as well, and emerging market economies with large current account deficits and weaker macroeconomic fundamentals were among the worst hit. Brazil, India, Indonesia, South Africa and Turkey were among the worst affected countries on account of the taper tantrum and were subsequently labelled as the 'Fragile

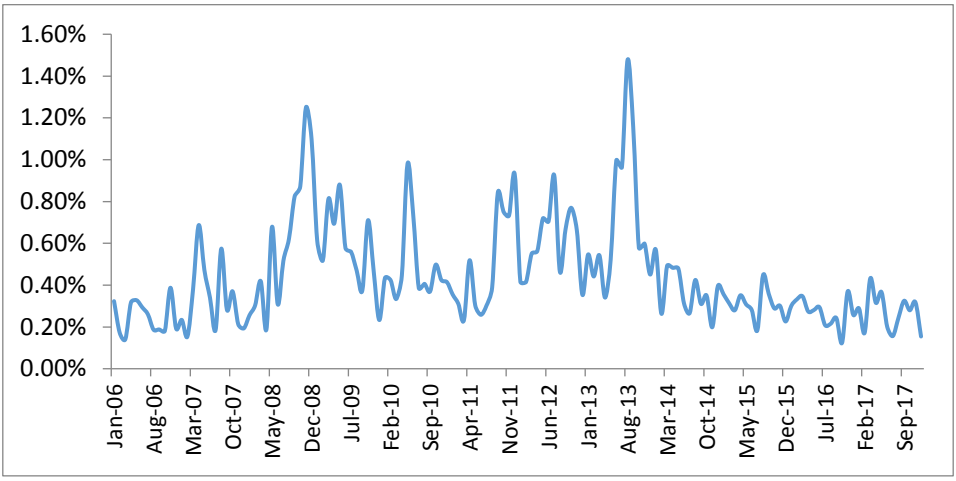
Five'. Among these, India and Indonesia managed the problem in the shortest time of nearly seven months and achieved macroeconomic stabilization[14].

To stem the sharp depreciation of the Rupee and manage volatility, policy makers in India adopted a panoply of policy measures including forex market intervention, monetary tightening through reduction in banks' access to overnight Liquidity Adjustment Facility, increase in Marginal Standing Facility rate and increase in daily minimum Cash Reserve Ratio maintenance requirements. However, monetary policy mechanism alone would not have been sufficient to contain the volatility, and a host of administrative measures were also put in place, such as, import restrictions on gold, opening of special dollar swap window for the public sector oil companies, special concessional swap window for attracting FCNR (B) deposits, increase in overseas borrowing limit of banks, bringing of outward FDI flows under the approval route, reduction in Liberalised Remittance Scheme entitlement, disallowing banks from carrying proprietary trading in exchange traded derivatives, etc.

Traditional monetary policy instruments were rendered inadequate in case of other emerging economies, and in this context, the role of administrative measures in ultimately restoring stability in the INR cannot be overemphasized. According to the RBI, the concessional swap facility for attracting longer term FCNR (B) deposits and easing of overseas borrowing limits of banks led to forex inflows of more than USD 34 billion. This played an instrumental role in ensuring stability of the Indian Rupee. The exceptional monetary and administrative measures were gradually removed once stability in the foreign exchange market was restored.

[14] M. Chatib Basri, (2017), India and Indonesia: Lessons Learned from the 2013 Taper Tantrum, Bulletin of Indonesian Economic Studies, 53:2, 137-160

Figure 10: India's Exchange Rate Volatility
(January 2006- December 2017; USD per INR)



Source: IMF, Exim Bank Research

Comparison of Volatility with other Emerging Market Economies

The Global Financial Crisis and the Euro zone debt crisis led to a period of enhanced uncertainty for the currencies of emerging market economies. As in the case of the Indian Rupee, other emerging market currencies also faced large fluctuations during these periods. In the current section, the volatility in INR is compared to that of eight other Emerging Market currencies— Brazilian Real (BRL), Chinese Yuan (CNY), Indonesian Rupiah (IDR), Malaysian Ringgit (MYR), Mexican Peso (MXN), Russian Rouble (RUB), South African Rand (ZAR), and Thai Baht (THB). Most of these currencies are floating or free floating, except Malaysia and China which are classified as 'other managed arrangement' by the IMF. Four of these countries, viz. Mexico, Indonesia, Brazil and South Africa had current account deficits in 2017. The other four — Malaysia, Russia, Thailand, and China had current account surpluses during that year (Table 5).

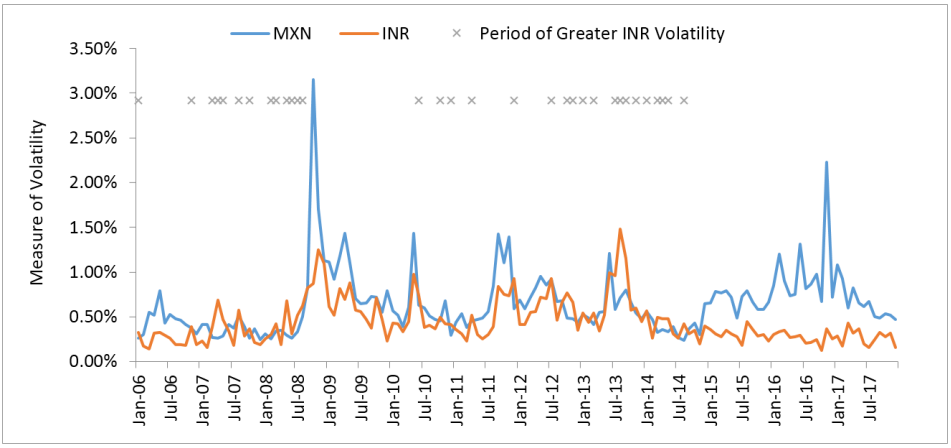
Table 5: Current Account Balance of Countries considered for Comparison

Country	Exchange Rate Regime	Current Account Balance (USD Billion)							
		2010	2011	2012	2013	2014	2015	2016	2017
India	Floating	-47.9	-78.2	-87.8	-32.3	-26.8	-22.1	-15.3	-51.2
Mexico*	Free Floating	-5.0	-12.4	-18.4	-30.9	-23.7	-29.3	-22.8	-18.8
Indonesia	Floating	5.3	1.7	-24.4	-29.1	-27.5	-17.5	-17.0	-17.3
Brazil	Floating	-75.8	-77.0	-74.2	-74.8	-104.2	-59.4	-23.5	-9.8
South Africa*	Floating	-5.6	-9.2	-20.3	-21.6	-18.7	-14.0	-9.6	-7.9
Malaysia	Other Managed Arrangement	25.7	32.5	16.2	11.3	14.8	9.0	7.0	9.4
Russia	Free Floating	67.5	97.3	71.3	33.4	57.5	68.8	25.5	40.2
Thailand	Floating	11.5	9.4	-1.7	-4.9	15.2	32.1	48.2	49.3
China	Other Managed Arrangement	237.8	136.1	215.4	148.2	236.0	304.2	202.2	164.9

*Data for 2017 are estimates
Source: IMF, World Economic Outlook Database, April 2018

The IMF classifies Mexican Peso as a free floating currency. The MXN has generally been more volatile than the INR during the period January 2006-December 2017. In fact, the INR was more volatile than the MXN in only 35 of the 144 months (22.2 percent) taken into consideration. The MXN depends significantly on the developments in the US economy. In the aftermath of the Global Financial Crisis, the MXN had witnessed substantial volatility. Strong bouts of volatility were also witnessed ahead of the US presidential elections in November 2016. After August 2014, the volatility in INR has been substantially lower than the MXN volatility (Figure 12).

Figure 11: Comparison of MXN-INR Volatility



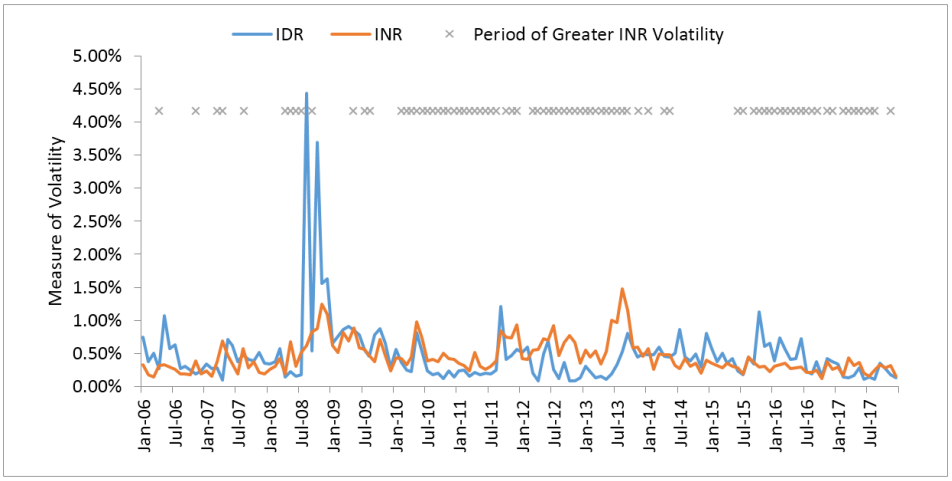
Source: IMF, Exim Bank Research

Indonesia has a current account deficit since late 2011. As seen in Table 5, the current account balance of the country turned from a surplus of USD 1.7 billion in 2011 to a deficit of USD 24.4 billion in 2012. This makes the country dependent on foreign inflows and also makes it vulnerable to capital outflows in times of economic turmoil. Like India, Indonesia was also caught in the whirlwind following the taper tantrum in 2013. Since mid-2013, Indonesia took significant steps to strengthen policy and reserve buffers which stabilized external flows by early 2014. Indonesia introduced tax incentives which were in the nature of reverse Tobin tax. While Tobin tax involves taxation on short-term inflows to minimise volatility, Indonesian Government's tax policy encouraged investors to reinvest their profits for long term[15].

During the period under consideration, the IDR has been less volatile than the INR. In 83 of the 144 months (57.6 percent), the INR was more volatile. During the taper tantrum, the INR was more volatile than the IDR, but the subsequent period from June 2014 to May 2015 was characterized by relatively greater volatility in case of IDR. Thereafter, the IDR once again had lower volatility than the INR.

[15] Ibid.

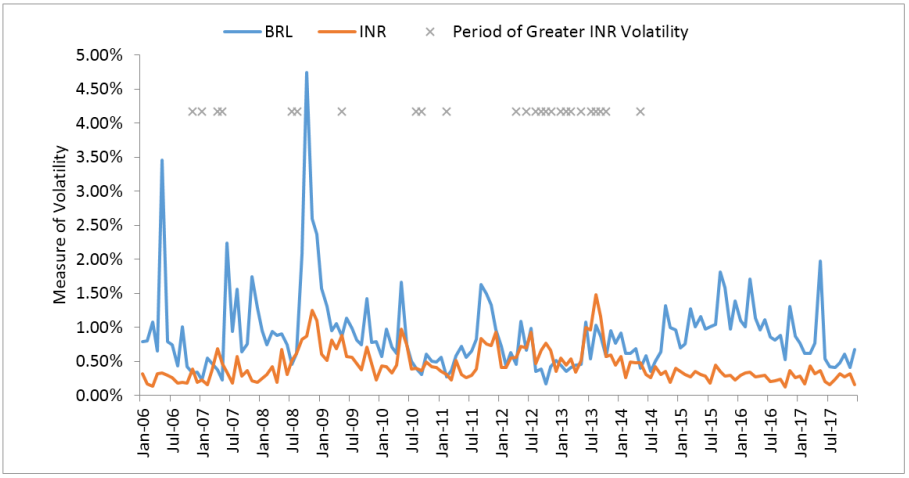
Figure 12: Comparison of IDR-INR Volatility



Source: IMF, Exim Bank Research

During January 2006- December 2017, the Brazilian Real has been more volatile than the Indian Rupee. The INR has been more volatile than the BRL in only 25 of the 144 months (17.4 percent) taken into consideration. Greater volatility was largely witnessed between 2012 and 2013. After May 2014, the INR has been remarkably stable as compared to the BRL (Figure 14). This can be attributed to the effective exchange rate management in India, as also the worsening of economic scenario in Brazil. In 2014-2015, the BRL experienced sharp depreciation on account of the severe recession plaguing the economy.

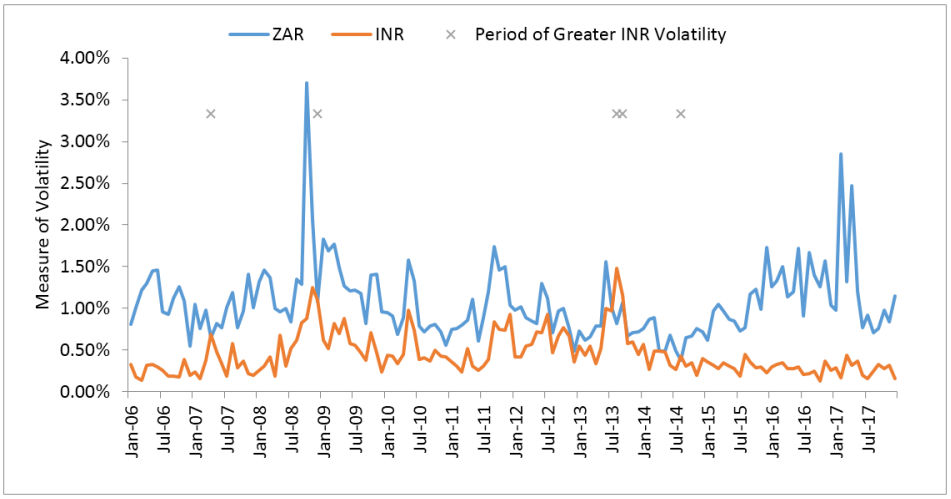
Figure 13: Comparison of BRL-INR Volatility



Source: IMF, Exim Bank Research

The South African Rand has been extremely volatile during the period under consideration. The INR has been more volatile than the ZAR only 5 times in the 144 months considered for the analysis. Heightened Rand volatility can be attributed to increased commodity price volatility of South Africa's major traded commodities, and global volatility. The rating downgrade by Moody's in 2017 also adversely impacted the ZAR, stoking the currency volatility.

Figure 14: Comparison of ZAR-INR Volatility



Source: IMF, Exim Bank Research

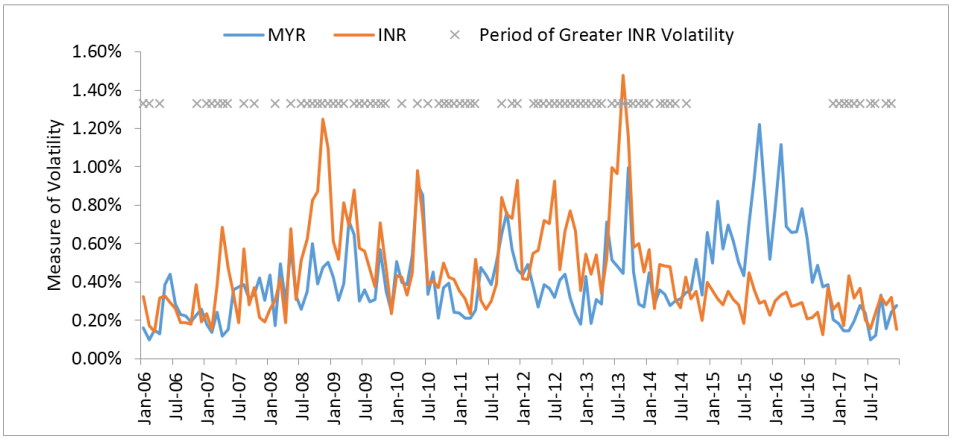
During the period under consideration, the INR has generally been more volatile than the Malaysian Ringgit, with INR volatility being higher than the MYR volatility in 80 of the 144 months taken into consideration. Part of the stability can be explained on account of the MYR being a managed float currency. In a significant departure from this trend, the MYR was more volatile than the INR during September 2014 to November 2016 period. Other than external developments, the volatility was on account of terms of trade shock after a major fall in crude oil prices, foreign bond outflows at the back of rising interest rates in the US, and market's perception of inadequate foreign exchange reserves with the country. Political challenges in the country further impacted the already elevated volatility of the Ringgit.

According to the IMF, Ringgit volatility in the latter part of 2016 was also on account of increasing demand-supply gap for foreign currencies in the onshore foreign exchange market as also the speculative activities in the

Ringgit offshore non-deliverable forward (NDF) market which also adversely impacted the Ringgit onshore market.

The role of Bank Negara Malaysia (BNM) has been important in containing the MYR volatility. In November 2016, the BNM demanded banks to commit to cease trading the Ringgit on the offshore NDF market. For easing the structural imbalances in supply and demand of foreign currencies in the onshore market, the BNM also announced that exporters must convert at least 75 percent of their export proceeds to MYR, subject to some exemptions. These measures bode well for the Ringgit, and it displayed significantly lesser volatility than the INR in 2017.

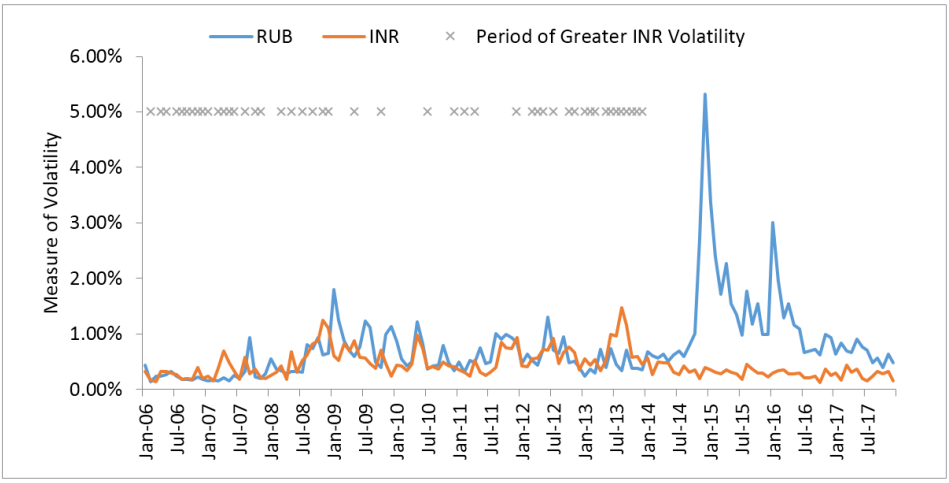
Figure 15: Comparison of MYR-INR Volatility



Source: IMF, Exim Bank Research

From January 2006 to December 2013, the Russian Rouble was more stable than the INR. However, from January 2014 onwards, the RUB has consistently been more volatile than the INR. The sanctions imposed by the USA and the EU, as also the plunging oil prices affected the RUB volatility, and the currency witnessed substantial decline in December 2014. In response to this decline, the Russian Central Bank announced a sharp increase in interest rates in a bid to encourage investments and support the RUB. While volatility in RUB has declined in recent period, it still remains higher than the INR volatility. During the period January 2006 to December 2017, the INR was more volatile than the RUB in only 47 of the 144 months (32.6 percent).

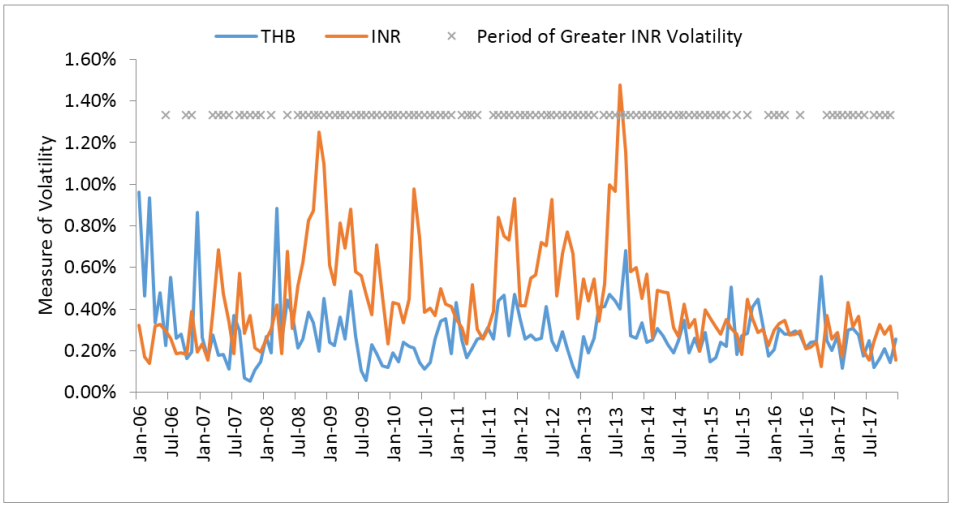
Figure 16: Comparison of RUB-INR Volatility



Source: IMF, Exim Bank Research

In spite of being a floating currency, the Thai Baht has shown remarkable resilience as compared to other emerging market currencies. In 111 of the 144 months taken into consideration, the volatility in THB was lower than that in INR. A strong tourism sector, and lesser dependence on exports of oil or other commodities has helped keep the THB relatively stable during this period (Figure 17).

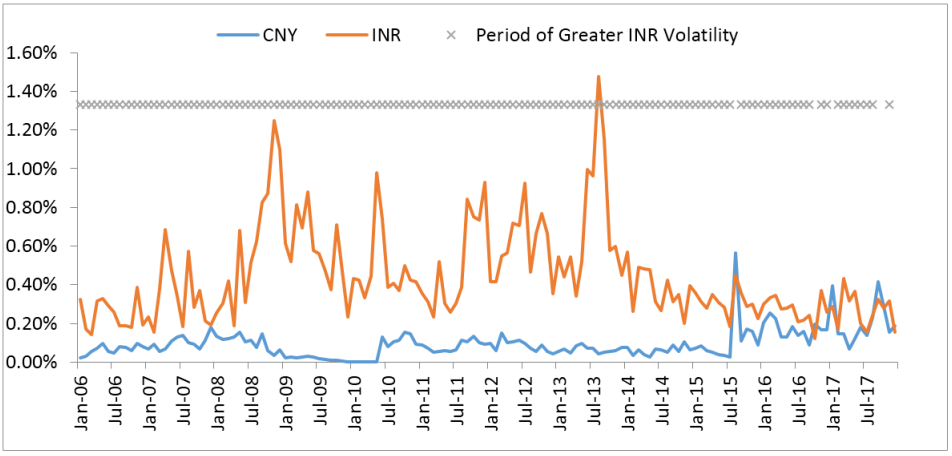
Figure 17: Comparison of THB-INR Volatility



Source: IMF, Exim Bank Research

The CNY is a relatively managed currency and therefore the volatility has always been lower than the INR, until recently. Some volatility has been witnessed in CNY in recent times on account of changes in the exchange rate management policies of the Government. From August 2015 onwards, CNY is gradually seen as moving towards a managed floating currency referenced to a basket of currencies from a de facto crawling peg against the US Dollar. The CNY was more volatile than the INR during August 2015, October 2016, January 2017, September 2017, October 2017 and December 2017.

Figure 18: Comparison of CNY-INR Volatility



Source: IMF, Exim Bank Research

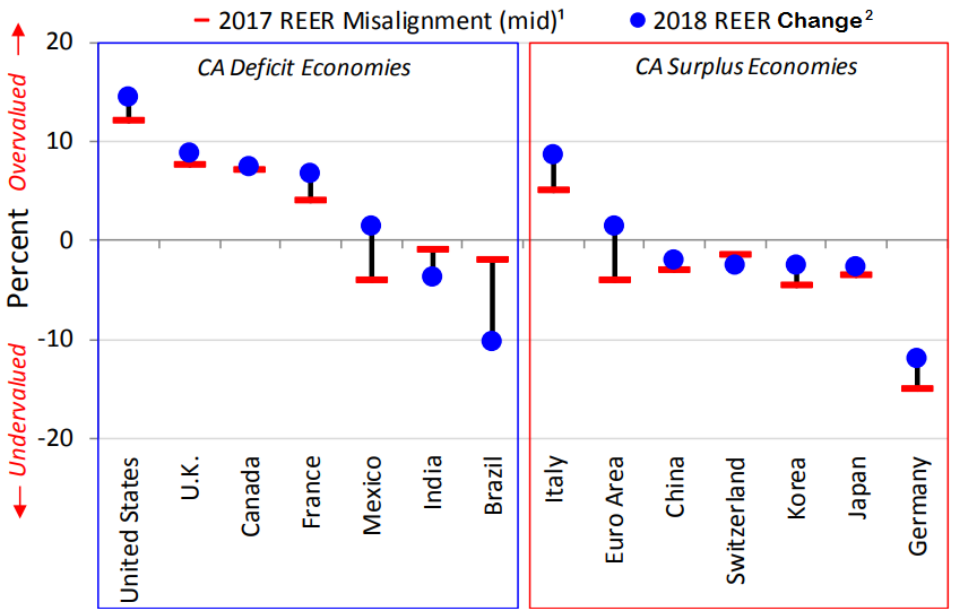
EXCHANGE RATE MISALIGNMENT

The IMF's real effective exchange rate gap assessment is used for analysing the appropriate level of the Indian Rupee. The IMF calculates current account gap and also provides a view on the REER. The current account gap is the difference between actual current account balance and the level computed by the IMF staff which would be consistent with the prevailing fundamentals of the economy and with desirable medium term policies. The IMF also assesses the REER which is normally consistent with the assessed current account gap. A positive REER gap implies an overvalued exchange rate, while a negative value indicates undervalued exchange rate.

According to IMF estimates, several countries for which a positive current account (CA) gap has been assessed keep their currencies undervalued to boost their export competitiveness and generate trade surplus. In 2017, Germany had among the highest REER gaps. Corresponding to the high

REER gap, the country also had a very high current account surplus. Interestingly, China whose currency was long held to be undervalued, had no REER gaps in 2015 and 2016, and only in 2017 there was undervaluation in the currency. Even then, the undervaluation in case of China was lesser than several other advanced economies, including the Euro region (Table 6 and Figure 19).

Figure 19: IMF Estimates of Exchange Rate Misalignment



[1]The IMF's estimate real effective exchange rate (REER) misalignment which is expressed as a range. The midpoint of the misalignment range is depicted above.

[2]Change through August 2018 versus 2017 average.

Sources: IMF 2018 External Sector Report, BIS REER Indices, and Federal Reserve Board, Report on Macroeconomic and Foreign Exchange Policies of Major Trading Partners of the United States, October 2018

Table 6: REER Gaps of Select Countries

Countries	Staff-assessed REER Gaps (Midpoint value, in %)		
	2017	2016	2015
Singapore	-10.0	-11.0	-12
Thailand	-10.5	-8.0	-4.3
The Netherlands	-10.0	-9.0	-6.0
Switzerland	-1.5	-1.5	10.0
Germany	-15.0	-15.0	-15.0
Korea	-4.5	-10.0	-8.0
Hong Kong	0.0	0.0	0.0
Japan	-3.5	-7.0	-11.0
Euro Area	-4.0	-1.0	-5.0
Sweden	-5.0	-7.5	-6.0
Malaysia	-6.8	-8.0	-8.0
Italy	5.0	9.0	5.0
Russia	5.0	5.0	0.0
Saudi Arabia	15.0	20.0	…
Spain	6.5	7.5	7.5
China	-3.0	0.0	0.0
Poland	-2.5	-5.0	-5.0
Belgium	6.0	7.5	6.0
Brazil	-2.0	5.0	10.0
France	4.0	11.0	6.0
Mexico	-4.0	-10.0	-5.0
Indonesia	-1.1	0.0	-2.5
India	***-1.0***	***2.5***	***2.5***
The USA	12.0	15.0	15.0
Australia	8.5	5.0	7.5
South Africa	5.0	5.0	5.0
Canada	7.0	6.0	2.5
The UK	7.5	7.5	12.5
Turkey	0.0	11.3	10.0

Sources: IMF World Economic Outlook, International Financial Statistics, and IMF Staff assessments

According to IMF staff estimates, the midpoint CA gap in India is 1.9 percent of GDP. Negative credit gap implying that a significant amount of additional borrowing could be done, larger-than-desirable intervention in the foreign exchange market, and a relatively closed capital account are some of the issues which contribute to the CA gap. India had an overvalued exchange rate in 2015 and 2016. However, in 2017, the currency was estimated to be undervalued, as calculate by the IMF (Table 6).

The trade based 36-currency REER is also estimated by the RBI. The REER has consistently increased from 2014 onwards, indicative of an appreciation in the Indian currency. In recent times, however, the REER witnessed a depreciation. During 2017-18, the REER witnessed a depreciation of nearly (-) 2.4 percent[16]. This depreciation is expected to have contributed to the undervaluation of the INR as assessed by the IMF in 2017. The depreciation has continued in the current financial year, and the monthly average change in REER during the April-August 2018 period was nearly (-) 0.4 percent. The undervaluation of the INR, as assessed by the IMF is therefore expected to persist in 2018-19 as well.

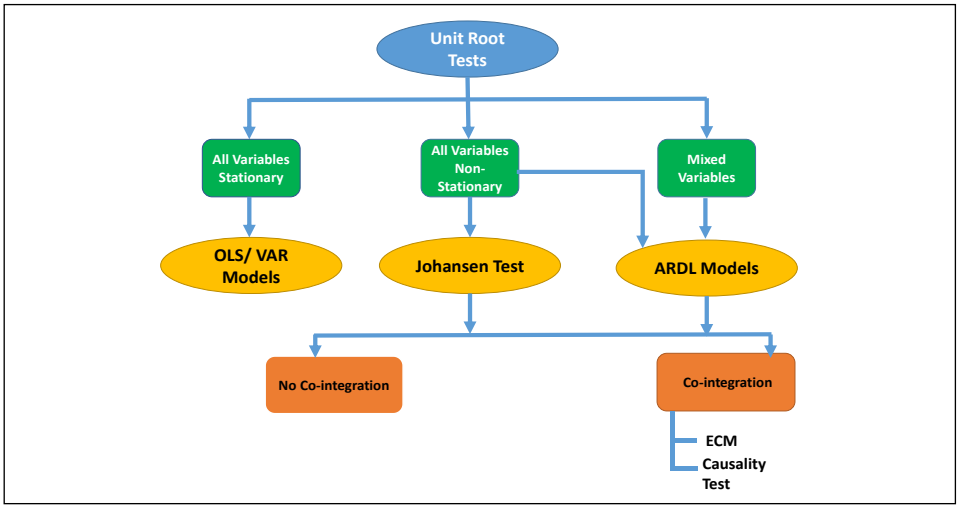
[16] Comparing REER of March 2018 with April 2017

3. Effect of Exchange Rate on India's Exports

Analysis in the previous section indicates that the Indian Rupee witnessed substantial volatility in the recent period, and India was among the fragile five countries whose currencies were worst impacted in 2013. Volatility of INR has been higher than several other emerging economies but has been fairly well managed since 2014. Analysis further indicates that there has been depreciation in the Indian currency in the recent period. The current section looks at the impact of this weakening of the currency and volatility on India's exports.

In the present study, impact of exchange rate depreciation and volatility on exports is investigated through an Autoregressive Distributed Lag (ARDL) model. The ARDL model has advantages over other co-integration tests in non-stationary variables, such as the one developed by Engle and Granger (1987), Phillips and Hansen (1990) and Johansen (1991), as also over the traditional VAR models. According to Pesaran and Shin (1999), the ARDL model applied to co-integration is more efficient in capturing long term relationship data in small samples, and they perform well irrespective of whether the variables are stationary [i.e. I(0)], non-stationary [I(1)], or even mutually co-integrated (Figure 20). Since our sample size is relatively small, and we expect some of the variables in our analysis to be I(0) while others to be I(1), the ARDL model is preferred.

Figure 20: Model Selection Criteria in Time Series Models



DATA SOURCES

The data set consists of observation on quarterly estimates of India's real exports, real Gross Domestic Product (GDP), real exchange rate, and volatility in the real exchange rate. Data on exports in volume terms, i.e. real exports has been derived by dividing the exports value with the unit value index for the corresponding year. Real exports is therefore given by

$$\text{Real Exports} = \frac{\text{Value of Exports}}{\text{Unit Value Index}}$$

Data on value of merchandise exports has been obtained from the Directorate General of Commercial Intelligence and Statistics. The unit value index has been taken from International Financial Statistics of the IMF

The real GDP data refers to the seasonally adjusted GDP at constant 2010 USD prices. This has been sourced from the Global Economic Monitor of the World Bank.

Real exchange rate compares the relative price of the consumption baskets in India and its trading partner. It measures the exchange rate between two countries adjusted for the relative price difference between the countries. This is derived as follows:

$$\text{Real Exchange Rate} = \frac{\text{Nominal Exchange Rate x Price Index (Foreign Country)}}{\text{Price Index (India)}}$$

The data for nominal exchange rate is from RBI, and the consumer price indices for respective countries (including India) are from International Financial Statistics of IMF.

The data on various parameters has been considered for the period 2004 Q4 to 2017 Q4, on account of limited availability of data.

Volatility as defined in Chapter 2 of the study has been used for the present analysis.

IMPACT ON EXPORTS TO THE UNITED STATES

The ARDL model of the following form has been taken for analysing the impact of exchange rate on exports to the USA:

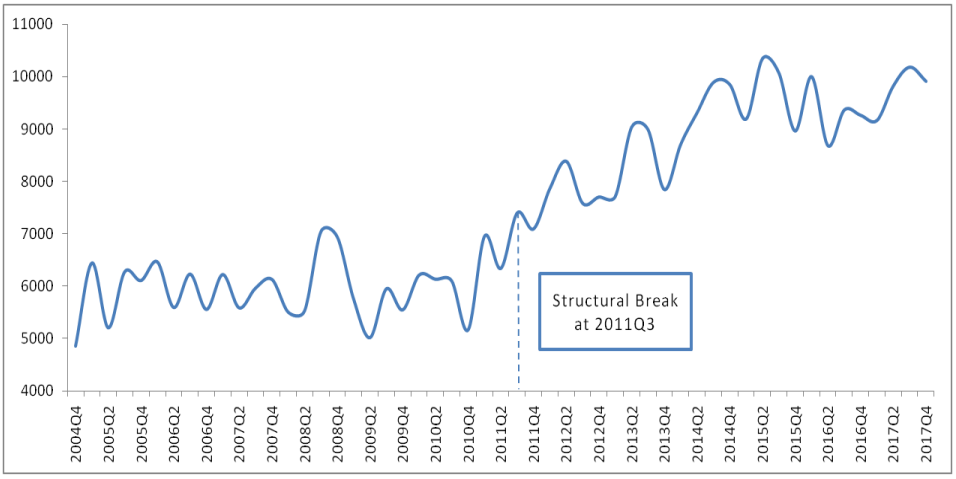
$$\Delta Exp = a_0 + \sum_{i=1}^{q} a_1 \Delta Exp + \sum_{i=1}^{m} a_2 \Delta GDP + \sum_{i=1}^{n} a_3 \Delta RER + \sum_{i=1}^{p} a_4 \Delta Vol + a_5 \Delta Dum + a_6 Exp + a_7 GDP + a_8 RER + a_9 Vol + \beta_1 Dum + \epsilon$$

…equation (1)

Where Exp represents India's real exports to the USA, RER is real exchange rate, GDP is the gross domestic product of the USA, Vol is the measure of real exchange rate volatility, Dum is a structural break dummy, q, m, n, and p are the lag length, Δ denotes a first difference operation, a_o is an intercept and ϵ denotes the white noise error term.

The dummy variable takes a value of 1 during the period 2011Q3 to 2017Q4, and 0 in rest of the quarters (Figure 21). Presence of a structural break has been confirmed from the Chow Breakpoint test. Test results for a structural break at 2011Q3 are presented in Table 7.

Figure 21: Value of Real Exports from India to USA (In USD Million)



Source: DGCIS, International Financial Statistics, IMF, Exim Bank Research

Table 7: Chow Breakpoint Test Results for USA

Chow Breakpoint Test: 2011Q3 Null Hypothesis: No breaks at specified breakpoints Varying regressors: All equation variables Equation Sample: 2004Q4 to 2017Q4			
F-statistic	188.2359	Prob. F(1,51)	0
Log likelihood ratio	81.91809	Prob. Chi-Square(1)	0
Wald Statistic	188.2359	Prob. Chi-Square(1)	0

Source: Computed using Eviews 9.5, Exim Bank Research

The first step in ARDL bounds testing approach is estimation of the aforementioned equation in order to test for existence of a long-run relationship among the variables by conducting an F-test for the joint significance of coefficients of lagged level variables. Two sets of critical bounds for F-statistics are generated by Pesaran et al (2001). If computed F-statistic is above the higher bound value, null hypothesis of no co-integration cannot be rejected, implying presence of long-run co-integration relationship among the variables taken into consideration.

Once co-integration is established, the long-run model export function can be written as:

$$Exp_t = \beta_0 + \sum_{i=1}^{q} \beta_1 Exp_{t-i} + \sum_{i=0}^{m} \beta_2 GDP_{t-i} + \sum_{i=0}^{n} \beta_3 RER_{t-i} + \sum_{i=0}^{p} \beta_4 Vol_{t-i} + \beta_5 Dum + \varepsilon_t$$

…equation (2)

The orders of the ARDL model would be selected using the Akaike Information Criteria (AIC). Finally, the short-run dynamic parameters would be selected by estimating an error correction model associated with the long-run estimates. This is specified as follows:

$$\Delta Exp_t = \delta_0 + \sum_{i=1}^{q} \delta_1 \Delta Exp_{t-i} + \sum_{i=1}^{m} \delta_2 \Delta GDP_{t-i} + \sum_{i=1}^{n} \delta_3 \Delta RER_{t-i} + \sum_{i=1}^{p} \delta_4 \Delta Vol_{t-i} + \delta_5 \Delta Dum + \varphi ECM_{t-1} + \varepsilon_t$$

…equation (3)

where δ_1, δ_2, δ_3 , δ_4 and δ_4 are the short-run dynamic coefficients of the model's convergence to equilibrium and ϕ is the error correction coefficient and measures the speed of adjustment parameter. ECM is the error correction term that is derived from estimated equilibrium relationship of equation (1). A negative and significant coefficient of ECM will be indication of cointegration.

Stationarity Tests

Both the Augmented Dickey Fuller (ADF) and Phillips Perron (PP) tests are used to check for the presence of unit roots and for determination of the order of integration of the variables. The unit root test results indicate that exports and volatility are I(0), while GDP and REER are I(1) (Table 8). Since all the variables are either I(0) or I(1), the ARDL process is used as it is a preferred model in case of mixed variables.

Table 8: Results of Unit Root Test for USA

	Augmented Dickey Fuller (ADF)		**Phillips Perron (PP)**	
	Level			
Variable	**Constant Without Trend**	**Constant With Trend**	**Constant Without Trend**	**Constant With Trend**
Exp	-0.079180 (3)	-4.134605*** (0)	-1.444385 [7]	-4.148898*** [3]
GDP	-0.734062 (1)	-1.165397 (1)	0.570711 [4]	-1.032015 [4]
REER	-2.233125 (4)	-2.846847 (2)	-1.830841 [2]	-2.165572 [2]
Vol	-3.591116*** (0)	-3.542809** (0)	-3.479351** [1]	-3.424366* [1]

	First Difference			
Exp	-6.561790*** (2)	-6.562094*** (2)	-23.88934*** [48]	-32.11507*** [50]
GDP	-4.552347*** [0]	-4.724709*** [0]	-4.539944*** [2]	-4.702838*** [2]
RER	-4.758074*** [3]	-3.969063** [7]	-5.524532*** [1]	-5.490866*** [1]
Vol	-9.929636*** (0)	-9.890419*** (0)	-14.30275*** [23]	-26.86157*** [35]

Note: ***, ** and * denote significant at 1%, 5%, and 10% significance level, respectively. The figure in parenthesis (…) represents optimum lag length selected based on Akaike Info Criterion. The figure in bracket […] represents the Bandwidth used in the KPSS test selected based on Newey-West Bandwidth criterion.

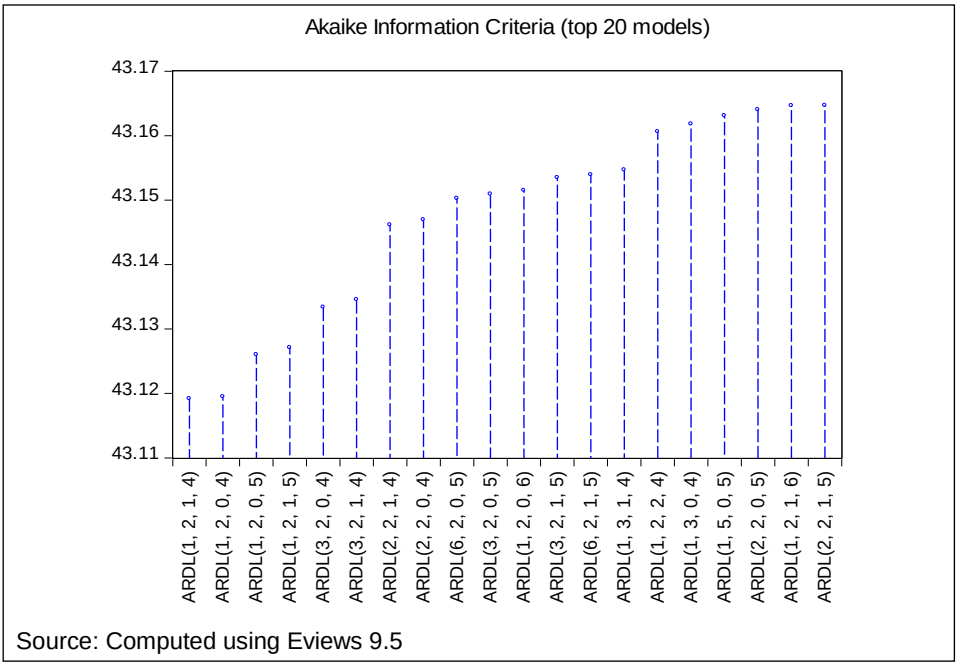
Source: Computed using Eviews 9.5, Exim Bank Research

ARDL Bounds Test- Establishment of Co-integration Relationship

For implementing the bound test for co-integration, a conditional ARDL error correction model as specified in equation (1) is estimated in Eviews with exports as the dependent variable, GDP, RER, and volatility as the dynamic regressors, and structural break dummy as the fixed regressor.

The appropriate lag has been automatically selected based on AIC, with the maximum lag set at 6. As seen from Figure 22, the AIC was lowest for ARDL (1, 2, 1, 4).

Figure 22: ARDL Lag Length Selection for USA



Source: Computed using Eviews 9.5

Table 9 presents the results of the ARDL Bounds F-test for co-integration based on equation 1. As per the results, the computed F-statistics of 8.562844 is greater than the upper bound critical value even at 1 percent level of significance. Therefore, the null hypothesis of no co-integration is rejected, indicative of a stable long-run co-integration relationship among the variables taken into consideration.

Table 9: Results of Bounds Test Approach to Co-Integration for USA

Significance Level	Critical Value	
	Lower Bound	Upper Bound
10%	2.37	3.2
5%	2.79	3.67
2.5%	3.15	4.08
1%	3.65	4.66
Computed F-Statistic	**8.562844**	
Source: Computed using Eviews 9.5, Exim Bank Research		

Analysis indicates that the variables are co-integrated among themselves and the series cannot move too far away from each other or cannot move independently of each other. Moreover, the co-integration of variables also implies that there is some adjustment in the short run which prevents the errors in the long run relationship from becoming larger.

Estimation of Long-Run and Short-Run Coefficients

Upon establishment of existence of co-integration relationship among variables, equation 2 is estimated for long-run coefficients of the selected ARDL (1,2,1,4) based on AIC. The results of estimation are presented in Table 10. The results indicate that the impact of change in GDP of the USA and the bilateral RER on India's exports to the USA is positive. Calculation of elasticity at the mean indicates that a 1 percent increase in the GDP of USA increases India's exports to the country by 2.9 percent. Elasticity at the mean also indicates that 1 percent INR depreciation leads to a 0.3 percent increase in exports to the USA. As far as the exchange rate volatility is concerned, it has a positive impact on real exports from India to the USA, which is significant at 0.5 percent level. According to estimates of the elasticity at mean, 1 percent increase in volatility leads to a 0.1 percent increase in the bilateral exports from India to the USA. This stark finding could be attributed to a strong and consistent depreciation of the Indian Rupee vis-à-vis the US Dollar during the period under consideration.

Table 10: Long-Run Coefficients of the Selected ARDL Model for USA

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP	5.51847	0.925233	5.96441	0.0000
RER	0.051392	0.024307	2.114303	0.0415
VOLATILITY	0.162548	0.08135	1.998126	0.0533
DUM	1.107329	0.382544	2.894648	0.0064
C	-17.7475	4.379312	-4.05257	0.0003

Source: Computed using Eviews 9.5, Exim Bank Research

The results of short-run dynamic coefficients associated with the long-run relationships obtained from equation (3) are in Table 11. The negative and highly significant error correction terms further confirms the presence of a stable long run relationship. The model indicates a fairly quick adjustment back towards equilibrium following a disturbance. Following a shock, nearly

92 percent of the adjustment back to the long run equilibrium is completed after one quarter. In the short run, growth in GDP and depreciation in RER, both have a positive impact on exports. The effect of volatility on exports is also significant and negative in the short run, which suggests that higher exchange rate volatility adversely impacts India's real exports.

Table 11: Error Correction Representation for the Selected ARDL (1,2,1,4) for USA

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDP)	-2.40497	3.629368	-0.66264	0.5118
D(GDP(-1))	10.0471	3.17359	3.165847	0.0031
D(RER)	0.125103	0.053582	2.334807	0.0252
D(VOLATILITY)	0.030483	0.046727	0.652373	0.5183
D(VOLATILITY(-1))	-0.13006	0.04476	-2.90563	0.0062
D(VOLATILITY(-2))	-0.19608	0.044125	-4.44366	0.0001
D(VOLATILITY(-3))	-0.09414	0.044744	-2.10384	0.0424
D(DUM)	1.080642	0.510614	2.116359	0.0413
CointEq(-1)	-0.92199	0.136188	-6.77	0

Source: Computed using Eviews 9.5, Exim Bank Research

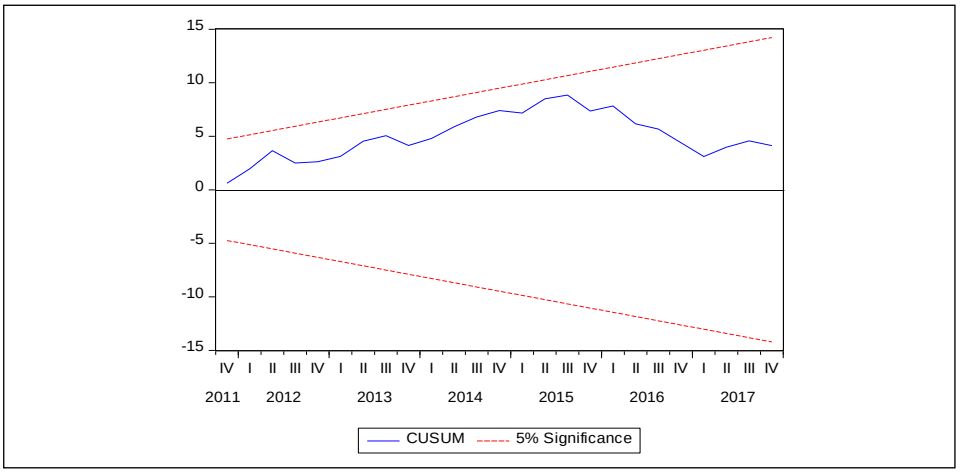
Performance on Diagnostic Tests

The model passes all diagnostic tests for usual econometric problems. The Breush-Godfrey Serial Correlation LM test was used to verify that the residuals from the model are serially uncorrelated. The residuals were also found to be homoscedastic. The Ramsey RESET test also indicates that the model is correctly specified.

The stability of long run coefficients together with the short run dynamics is also examined by applying the CUSUM (Cumulative Sum of Recursive Residuals) and CUSUMSQ (Cumulative Sum of Squares of Recursive Residuals) plots.

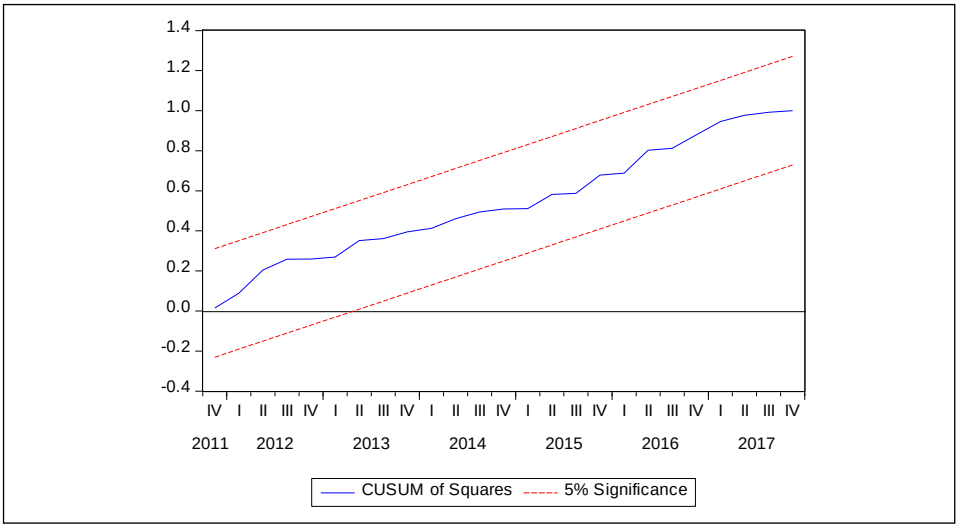
As evident from Figure 23 and Figure 24, the plots of CUSUM and CUSUMSQ are within the critical bounds of 5 percent significance level, and therefore the null hypothesis of all coefficients in the given regression being stable cannot be rejected. The short-run and long-run coefficients of the estimated model are stable.

Figure 23 : Plot of Cumulative Sum of Recursive Residuals for USA



Source: Computed using Eviews 9.5, Exim Bank Research

Figure 24: Plot of Cumulative Sum of Squares of Recursive Residuals for USA



Source: Computed using Eviews 9.5, Exim Bank Research

IMPACT ON EXPORTS TO THE EURO AREA

The ARDL model of the following form has been taken for analysing the impact of exchange rate on exports to the Euro Area:

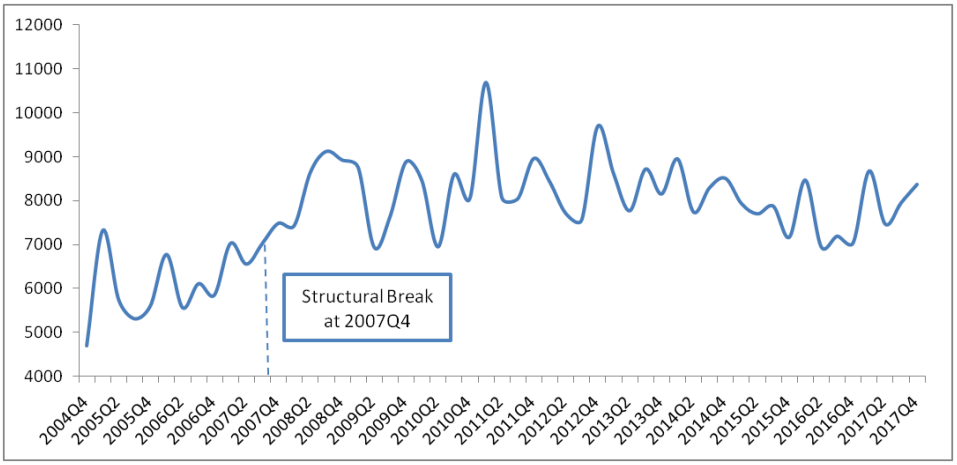
$$\Delta logExp = a_0 + \sum_{i=1}^{q} a_1 \Delta logExp + \sum_{i=1}^{m} a_2 \Delta GDP + \sum_{i=1}^{n} a_3 \Delta RER + \sum_{i=1}^{p} a_4 \Delta Vol + a_5 \Delta Dum + a_6 logExp + a_7 GDP + a_8 RER + a_9 Vol + \beta_1 Dum + \epsilon$$

…equation (4)

Where Exp represents India's real exports to the Euro Area, RER is real exchange rate, GDP is the gross domestic product of the Euro Area, Vol is the measure of real exchange rate volatility, Dum is a structural break dummy, variables q, m, n, and p are the lag length, Δ denotes a first difference operation, and ϵ denotes the white noise error term.

The dummy variable takes a value of 1 during the period from 2007Q4 to 2017Q4, and 0 in rest of the quarters (Figure 25). Presence of a structural break has been confirmed from the Chow Breakpoint test. Test Results are presented in Table 12

Figure 25: Value of Real Exports from India to the Euro Area (In USD Million)



Source: DGCIS, International Financial Statistics, IMF, Exim Bank Research

Table 12 : Chow Breakpoint Test Results for Euro Area

Chow Breakpoint Test: 2007Q4 Null Hypothesis: No breaks at specified breakpoints Varying regressors: All equation variables Equation Sample: 2004Q4 to 2017Q4			
F-statistic	71.49248	Prob. F(1,51)	0
Log likelihood ratio	46.43987	Prob. Chi-Square(1)	0
Wald Statistic	71.49248	Prob. Chi-Square(1)	0

Source: Computed using Eviews 9.5, Exim Bank Research

As before, existence of long-run co-integration relationship is tested through the ARDL bounds test. Once co-integration is established, the long-run model export function can be written as:

$$logExp_t = \beta_0 + \sum_{i=1}^{q} \beta_1 logExp_{t-i} + \sum_{i=0}^{m} \beta_2 GDP_{t-i} + \sum_{i=0}^{n} \beta_3 RER_{t-i} + \sum_{i=0}^{p} \beta_4 Vol_{t-i} + \beta_5 Dum + \varepsilon_t$$

…equation (5)

The orders of the ARDL model would be selected using the Akaike Information Criteria. Finally, the short-run dynamic parameters would be selected by estimating an error correction model associated with the long-run estimates. This is specified as follows:

$$\Delta logExp_t = \delta_0 + \sum_{i=1}^{q} \delta_1 \Delta logExp_{t-i} + \sum_{i=1}^{m} \delta_2 \Delta GDP_{t-i} + \sum_{i=1}^{n} \delta_3 \Delta RER_{t-i} + \sum_{i=1}^{p} \delta_4 \Delta Vol_{t-i} + \delta_5 \Delta Dum + \varphi ECM_{t-1} + \varepsilon_t$$

…equation (6)

where δ_1, δ_2, δ_3 , δ_4 and δ_4 are the short-run dynamic coefficients of the model's convergence to equilibrium and ϕ is the error correction coefficient

and measures the speed of adjustment parameter. ECM is the error correction term that is derived from estimated equilibrium relationship of equation (4). A negative and significant coefficient of ECM will be indication of co-integration.

Stationarity Tests

Both the Augmented Dickey Fuller and Phillips Perron tests are used to check for the presence of unit roots and for determination of the order of integration of the variables. The unit root test results indicate that exports and volatility are I(0), while GDP and RER are I(1) (Table 13). Since all the variables are either I(0) or I(1), the ARDL process is used.

Table 13: Results of Unit Root Test for Euro Area

	Augmented Dickey Fuller (ADF)		**Phillips Perron (PP)**	
	Level			
Variable	**Constant Without Trend**	**Constant With Trend**	**Constant Without Trend**	**Constant With Trend**
LogExp	-4.532475*** (0)	-4.877978*** (0)	-4.476722*** [2]	-4.927281*** [3]
GDP	-1.330039 (1)	-2.562209 (1)	-0.836638 [4]	-1.719132 [4]
RER	-1.307996 (1)	-3.662793** (2)	-1.158729 [0]	-2.545603 [1]
Vol	-3.948668*** (0)	-3.881031** (0)	-3.967154*** [1]	-3.896380** [1]
	First Difference			
LogExp	-7.692520*** (2)	-7.869360*** (2)	-31.06389*** [44]	-33.33826*** [34]
GDP	-3.059681** (0)	-3.044023 (0)	-3.129025** [1]	-3.112159 [1]

RER	-5.571118*** (0)	-5.517352*** (0)	-5.570897*** [3]	-5.519672*** [3]
Vol	-8.686545*** (0)	-5.140718*** (4)	-10.88564*** [8]	-11.91301*** [9]

Note: *** and ** denote significant at 1% and 5% significance level, respectively. The figure in parenthesis (…) represents optimum lag length selected based on Akaike Info Criterion. The figure in bracket […] represents the Bandwidth used in the KPSS test selected based on Newey-West Bandwidth criterion.

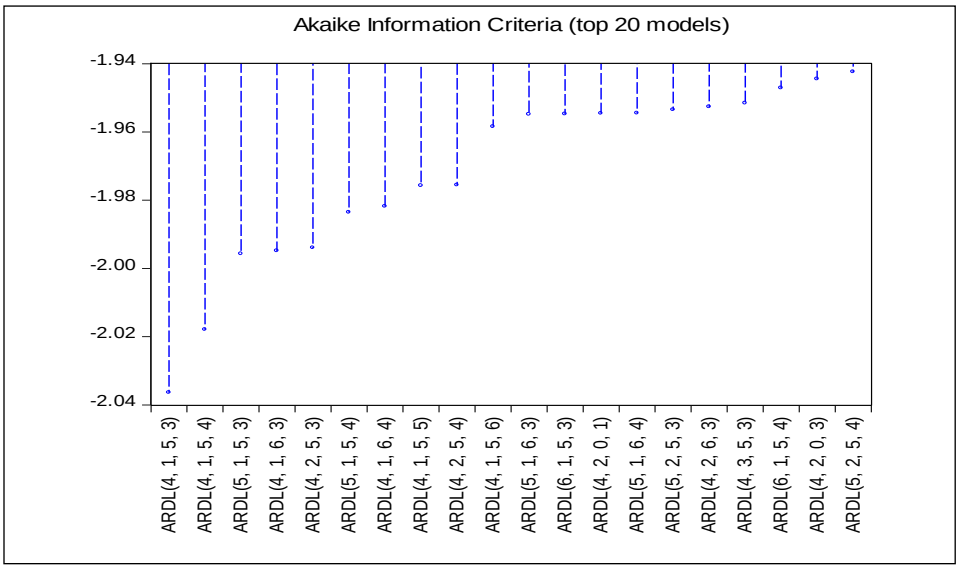
Source: Computed using Eviews 9.5, Exim Bank Research

ARDL Bounds Test- Establishment of Co-integration Relationship

For implementing the bound test for co-integration, a conditional ARDL error correction model as specified in equation (4) is estimated in Eviews with log(exports) as the dependent variable, GDP, RER, and volatility as the dynamic regressors, and structural break dummy as the fixed regressor.

The appropriate lag has been automatically selected based on AIC, with the maximum lag set at 6. As seen from Figure 26, the AIC was lowest for ARDL (4, 1, 5, 3).

Figure 26: ARDL Lag Length Selection for Euro Area



Source: Computed using Eviews 9.5

Table 14 presents the results of the ARDL Bounds F-test for co-integration based on equation 4. As per the results, the computed F-statistics of 8.114517 is greater than the upper bound critical value even at 1 percent level of significance. Therefore, the null hypothesis of no co-integration is rejected, indicative of a stable long-run co-integration relationship among the variables taken into consideration.

Table 14: Results of Bounds Test Approach to Co-Integration for Euro Area

Significance Level	Critical Value	
	Lower Bound	Upper Bound
10%	2.01	3.1
5%	2.45	3.63
2.5%	2.87	4.16
1%	3.42	4.84
Computed F-Statistic	**8.114517**	
Source: Computed using Eviews 9.5, Exim Bank Research		

The bound test confirms that the variables are co-integrated among themselves and the series cannot move too far away from each other or cannot move independently of each other. Moreover, the co-integration of variables also implies that there is some adjustment in the short run which prevents the errors in the long run relationship from becoming larger.

Estimation of Long-Run and Short-Run Coefficients

Upon establishment of existence of co-integration relationship among variables, equation 5 is estimated for long-run coefficients of the selected ARDL (4, 1, 5, 3) based on AIC. The results of estimation are presented in Table 15. The results indicate that impact of growth in GDP of the Euro Area and the depreciation in bilateral RER on India's exports to the Euro Area is positive, and significant even at 1 percent level of significance. Increase in the GDP of the Euro Area by USD 1 million would increase India's exports to the region by nearly 0.0002 percent. This would essentially mean that a quarterly increase of USD 25 billion in the Euro Area's GDP in the last quarter of 2017, would have, ceteris paribus, led to an increase of USD 397.9 million in the real exports from India to the region[17]. As far as the real exchange rate is concerned, a one unit increase in real exchange rate in direct quotation (cost

[17] India's real exports to the Euro Area in the third quarter stood at USD 7,958.8 million.

of one unit of foreign currency given in units of local currency) would lead to a 3.4 percent increase in exports to the Euro Area. Clearly, depreciation of the Indian currency vis-à-vis Euro has a significant positive impact on exports from India to the region. Depreciation of the Indian rupee with respect to the Euro in the last two quarters of 2017 is expected to bode well for exports. As far as the exchange rate volatility is concerned, the long-run relationship is not significant at 5 percent significance level, indicative of no significant impact of volatility on exports to the Euro Area in the long run[18].

Table 15: Long-Run Coefficients of the Selected ARDL Model for Euro Area

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP	0.000002	0.000000	9.862375	0.0000
RER	0.034213	0.010057	3.401924	0.0019
VOLATILITY	-257.431971	141.682233	-1.816967	0.0789
DUM	0.388608	0.262890	1.478213	0.1494

Source: Computed using Eviews 9.5, Exim Bank Research

The results of short-run dynamic coefficients associated with the long-run relationships obtained from equation (6) are in Table 16. The negative and highly significant error correction terms further confirms the presence of a stable long run relationship. The model indicates a rather slow adjustment back towards equilibrium following a disturbance. Following a shock, nearly 18.9 percent of the adjustment back to the long run equilibrium is completed after one quarter, and it would take more than five quarters for adjustment back to the equilibrium. In the short run, growth in GDP has a positive impact on exports. The impact of change in real exchange rate on exports in the short run is less conclusive. In the short run, the effect of volatility on exports is found to be significant and positive.

[18] Volatility is found to be significant at 10 percent level.

Table 16 : Error Correction Representation for the Selected ARDL (4,1,5,3) for Euro Area

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGEXP(-1))	-0.853030	0.102241	-8.343355	0.0000
D(LOGEXP(-2))	-0.732866	0.116712	-6.279276	0.0000
D(LOGEXP(-3))	-0.658108	0.106793	-6.162451	0.0000
D(GDP)	-0.000003	0.000001	-3.198716	0.0032
D(RER)	0.006427	0.004919	1.306603	0.2010
D(RER(-1))	-0.008954	0.004613	-1.940898	0.0614
D(RER(-2))	0.004415	0.004915	0.898230	0.3760
D(RER(-3))	-0.002382	0.005462	-0.436065	0.6658
D(RER(-4))	-0.018638	0.004597	-4.054323	0.0003
D(VOLATILITY)	-5.667591	6.398947	-0.885707	0.3826
D(VOLATILITY(-1))	27.154542	6.604174	4.111724	0.0003
D(VOLATILITY(-2))	18.084514	6.395753	2.827582	0.0081
D(DUM)	0.040177	0.079493	0.505414	0.6168
CointEq(-1)	-0.188682	0.032743	-5.762528	0.0000

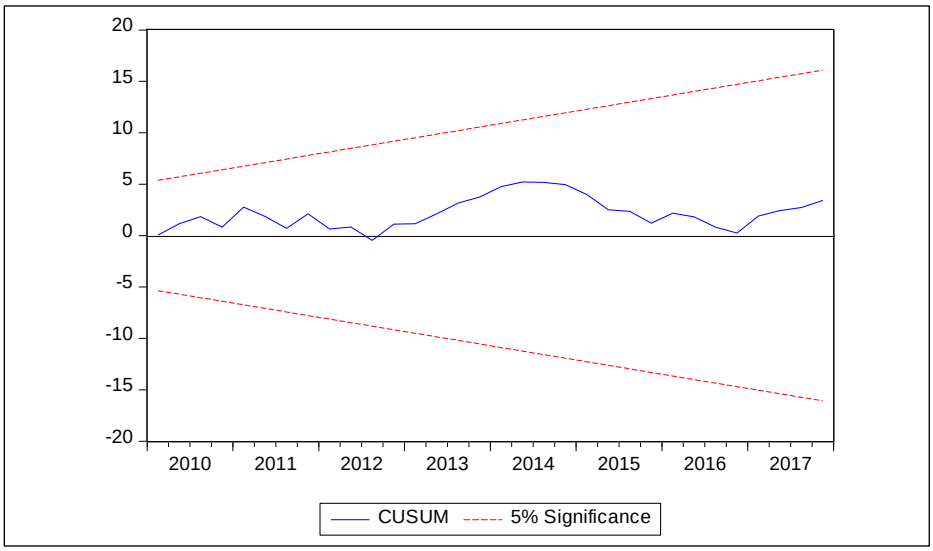
Source: Computed using Eviews 9.5, Exim Bank Research

Performance on Diagnostic Tests

The model passes all diagnostic tests for usual econometric problems. The Breush-Godfrey Serial Correlation LM test was used to verify that the residuals from the model are serially uncorrelated. The residuals were also found to be homoscedastic. The Ramsey RESET test also indicates that the model is correctly specified.

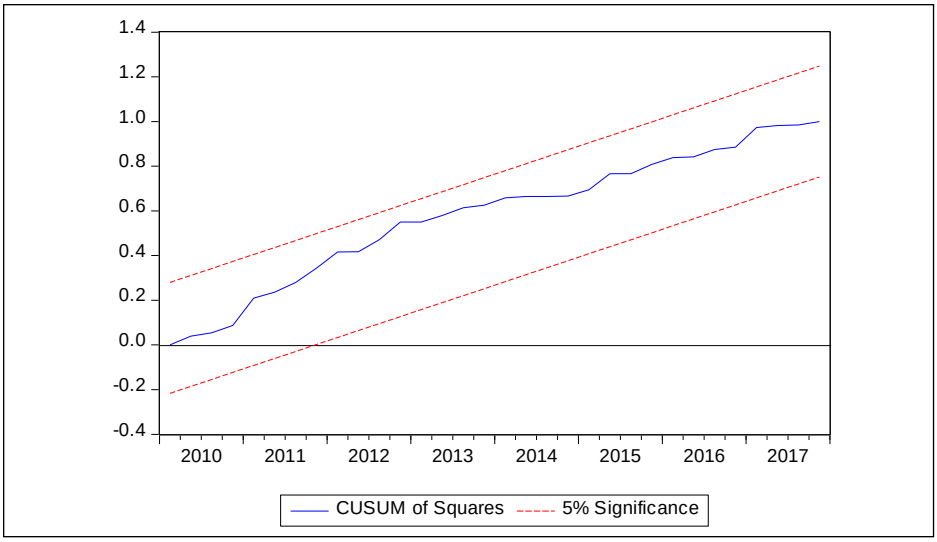
The stability of long run coefficients together with the short run dynamics is also examined by applying the CUSUM (Cumulative Sum of Recursive Residuals) and CUSUMSQ (Cumulative Sum of Squares of Recursive Residuals) plots. As evident from Figure 27 and Figure 28, the plots of CUSUM and CUSUMSQ are within the critical bounds of 5 percent significance level, and therefore the null hypothesis of all coefficients in the given regression being stable cannot be rejected. The short-run and long-run coefficients of the estimated model are stable.

Figure 27: Plot of Cumulative Sum of Recursive Residuals for Euro Area



Source: Computed using Eviews 9.5, Exim Bank Research

Figure 28: Plot of Cumulative Sum of Squares of Recursive Residuals for Euro Area



Source: Computed using Eviews 9.5, Exim Bank Research

4. Conclusion

Exchange rate is an important indicator of international competitiveness. Empirical literature provides mixed evidence for the impact of the various facets of exchange rate on exports. Three major facets of exchange rate—currency misalignment, exchange rate volatility and depreciation/ appreciation have been analysed in the current study. The impact of the latter two on bilateral exports from the country has also been analysed. From the results obtained, it emerges that depreciation of the INR has a positive impact on exports from India, while volatility is found to have little to no impact on exports.

Analysis in the study also indicates that the INR has become an undervalued currency in 2017, after being overvalued for the previous two years. REER estimates of RBI indicate a depreciation of the REER in 2018, which, ceteris paribus, is expected to lead to a further undervaluation of the currency in 2018.

DEPRECIATION OF THE RUPEE

During 2011-2013, the Indian Rupee depreciated with respect to several major currencies, as also the NEER (36 currency, trade weighted). In fact, India was among the fragile five economies which were the worst impacted by the taper tantrum in 2013. From 2014 onwards, the NEER has appreciated in all years except 2015. The REER has also appreciated consistently from 2014 onwards, and the magnitude of change has been greater than that in NEER. Historically higher inflation levels in India as compared to its trading partners have contributed towards the appreciation in REER.

Depreciation has a positive impact on exports to the USA in long run as well as in the short run. A 1 percent depreciation leads to 0.3 percent increase in exports to the USA in the long run. In case of the Euro Area, depreciation of one unit (cost of one unit of foreign currency given in units of local currency) leads to a 3.4 percent increase in exports. The appreciation in REER and NEER is therefore expected to have a negative impact on exports.

EXCHANGE RATE VOLATILITY

Comparison of volatility in Indian currency with that of other emerging economies indicates that the INR has shown remarkable resilience in the past

few years as compared to several other currencies such as the RUB, MYR, BRL, and MXN. As compared to some currencies such as ZAR, the INR has been historically more stable.

Impact of volatility of the INR on exports to the USA and the Euro Area is found to have little or no impact in the long run. While the impact of volatility on exports to the USA has been found to be positive in the long term, the magnitude of impact is very low. According to estimates of elasticity at mean, 1 percent increase in volatility leads to a 0.1 percent increase in bilateral exports from India to the USA. This finding could possibly be ascribed to the strong and consistent depreciation of the INR vis-à-vis the US Dollar during the period under consideration. Impact of volatility on exports to the Euro Area is found to be insignificant at 5 percent level, indicative of no significant impact of volatility on exports in the long run.

LIMITATIONS

It may be noted that the study only analyses the impact of exchange rate movements on India's bilateral exports to key destinations of the USA and the EU. These countries account for only one-third of India's exports basket. Further, the study only looks at the impact of exchange rate movements on exports, which is only a small element in the mosaic of macroeconomic variables impacted by such movements. The study also does not look at the impact of INR misalignment on India's exports.

CONCLUSION

The INR, which was an overvalued currency up in 2016, has witnessed remarkable correction since 2017 onwards. In fact, the INR continues to depreciate in the current financial year, reaching a level of 74.0989 on 9th October 2018. The REER has also depreciated in the recent period. Analysis in the present study indicates that this depreciation is expected to bode well for exports from the country to two of its major export markets, viz. the USA and the EU. The INR has also been volatile in the recent period, but its impact on exports is expected to be minimal. To this extent, it can be argued that RBI has been prudent in not intervening in the forex market and allowing the exchange rate to depreciate. This has also reduced the currency misalignment which can impact the country's exports in its own way, an area of further research.

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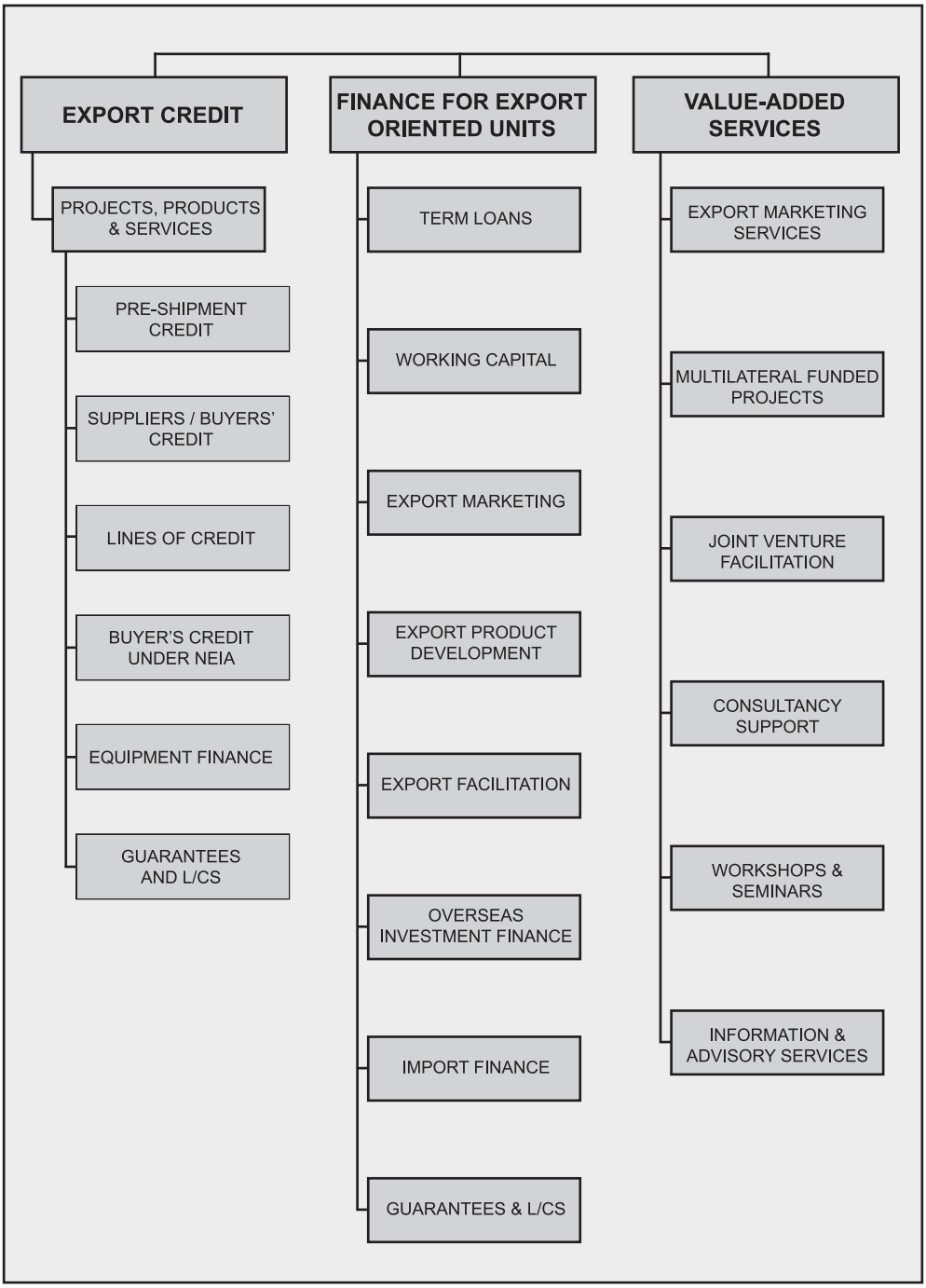

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