Nominal and Real Effective Exchange Rate Trends in India After Liberlisation

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Abstract
India has been operating on a managed flexible exchange rate regime from March 1993, making the start of an era of a market determined exchange rate regime of the rupee with provision for timely intervention by the central bank. With the adoption of market-determined exchange rate in 1993, the rupee has faced episodes of heightened volatility. Excessive exchange rates volatility imposes real costs on the economy through its effects on international trade and investment and could also complicate the conduct of monetary policy. This paper focuses on the volatility of effective exchange rate of INR in nominal and real terms after liberalization. The study covers the period from 1993-94 to 2018-19 . To measure the volatility of exchange rate (NEER and REER, 6-currencies and 36-currencies indices) at base year 1993-94, standard deviation and coefficient of variance are used. The study also highlights the reasons behind the volatility of exchange rate and central bank(RBI) responses to episodes of volatility in the foreign exchange market are also discussed. The analysis is based on secondary data collected from various RBI reports.
Key Words: Exchange rate, REER, NEER, RBI's Intervention Policy.

I.   Introduction

The exchange rate is a key financial variable that affects decisions made by foreign exchange investors, exporters, importers, bankers, businesses, financial institutions, policymakers and tourists in the developed as well as developing world.

Exchange rate fluctuations affect the value of international investment portfolios, competitiveness of exports and imports, value of international reserves, currency value of debt payments, and the cost to tourists in terms of the value of their currency. Movements in exchange rates thus have important implications for the economy's business cycle, trade and capital flows and are therefore crucial for understanding financial developments and changes in economic policy.

Indian foreign exchange market has gone through a process of gradual opening up of the economy as part of the broader strategy of macroeconomic reforms and liberalization since the early 1990.It has indeed come a long way since its inception in 1978 when banks in India were allowed to undertake intra-day trade in foreign exchange. Prior to the 1990s, the Indian foreign exchange t market (with a begged change rate regime) was highly regulated with restrictions on transitions, participants and use of instruments. During the period 1947 till 1971, India followed the par value system of the exchange rate whereby the rupee's external par value was fixed at 4.15 grains of fine gold. By the late eighties and the early nineties, it was recognised that both macroeconomic policy and structural factors had contributed to balance of payment difficulties. The current account deficit widened to 3.0% of GDP in 1990-91 and the foreign currency assets depleted of less than a billion dollar by July 1991. Indian faced a serious balance of payment crisis in 1991 and was forced to devalue its currency by 19% (17.90 against a dollar). It was against this backdrop that India embarked on stabilization and structural reforms of generates impulses for growth. The major changes in the exchange rate policy started with the recommendations of the high level committee on BOP (Chair-Dr. C. Rangrajan, 1993) to make exchange rate market determined. In March 1992 a dual exchange rate system was introduced in the form of the liberalized exchanged management system (LRMS). Consequently, in March 1993. India moved from the earlier dual exchange rate regime to a single, market determined exchange rate system. The deepening of the foreign exchange market has been aided by the implementation of the Sodhani committee on foreign exchange market (1995) and the Tarapore committee on capital account convertibility (1997). In the current system, exchange rate fluctuates in response to market forces, with signification short-run volatility and occasional large medium-run swings.The conduct of exchange rate policy of Reserve Bank of India (RBI) has mainly been guided by the objective of maintaining orderly conditions in the foreign exchange market, to prevent the

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imergence of destabilising and self-fulfilling speculative activities, and allowing the exchange rate to reflect the macroeconomic fundamentals.

In terms of the real effects of the exchange rate movements the appropriate indicator to examine will be the real exchange rate which measures the relative purchasing power of two currencies in the goods market. It is obtained by deflating the nominal rate by an index of relative prices between home and abroad. Therefore a decline in the REER(Real Effective Exchange Rate) reflects a reduction in the cost of producing domestic goods and an increase in export competitiveness. Keeping the real exchange rate at competitive levels and avoiding excessive volatility are important for growth. A stable and competitive real exchange rate should be thought of a facilitating condition. Keeping it at appropriate levels and avoiding excessive volatility enable a country to exploit its capacity for growth and development.

II.   Research Methdology

In this paper I have adopted some statistical tecqniques. This study has collected data through secondary sources. It has used sources such as Handbook of statistics on indian Economy, RBI monthly Bulletin, Economic survey(various issues) , IMF reports and so on.

Methodology

The RBI has been constructing six currency (US dollar, Euro, Pound Sterling, Japanese Yen, Chinese renminbi(Yuan) and Hongkong dollar) and 36 currency indices of NEER and REER. The methodology of computing NEER/REER indices has explained in RBI's monthly Bulliten April 2014.

NEER:- NEER is the weighted geometric average of the bilateral nominal exchange rates of the home currency in terms of foreign currencies. In terms of Formulas.

$$NEER = \prod_{i=1}^{n} [(e/ei)] wi$$

$$REER = \prod_{i=1}^{n} [(e/ei)(P/Pi)] wi$$

Where e: Exchange rate of rupee against a numeraire (SDRs)
ei: Exchange rate of currency I against the numeraire (SDRs)
[i= US Dollar, Euro, Pound sterling, Japanese Yen, Chinese Renminbi, HongKong Dollar]
wi= Weights attached to currency/ country in the index
P= India's wholesale price index (in index form)
Pi=Consumer price index of country i (in Index form)

Objective
The objectives are as follows.
1. to study and analyze the volatility of Real Effective Exchange Rate (REER) and Nominal Effective Exchange Rate (NEER) of INR (Indian Rupee) after liberalization.
2. to study and analyze the reasons behind the volatility of INR exchange rate .
3.to study the measures made by RBI for exchange rate stability.
Exchange Rate Behaviour of INR against major currencies from 1993-94 to 2018-19

International experience has shown that the transition from a fixed to floating exchange rate regime has unambiguously been accompanied by a rise in exchange rate volatility A look at the entire period since 1993 when we moved towards market determined exchange rates reveals that the Indian Rupee has generally depreciated against the dollar during the last 27 years except during the period 2003 to 2005 , and in year 2007-08,2010-11and 2017-18 when the rupee had appreciated on account of dollar's global weakness and large capital inflows (Table 1). For the period as a whole, 1993-94 to 2018-19, the Indian Rupee has depreciated against the dollar. The rupee has also depreciated against other major international currencies. Another important feature has been the reduction in the volatility of the Indian exchange rate during last few years. The

volatility of Indian rupee remained low against the US dollar than against other major currencies as the Reserve Bank intervened mostly through purchases/sales of the US dollar. Empirical evidence in the Indian case has generally suggested that in the present day managed float regime of India, intervention has served as a potent instrument in containing the magnitude of exchange rate volatility of the rupee .

Table 1. Movements of INR against major currencies ,1993-2019

year	US$	% change	Pound Sterling	% change	DM/Euro	% change	Yen	% change
1993-94	31.366	-2.33	47.206	8.66	18.74	4.32	29.11	-18.38
1994-95	31.399	-0.105	48.821	-3.42	20.19	-7.8	31.63	-8.65
1995-96	33.449	-6.52	52.353	-7.23	23.39	-15.8	34.84	-10.14
1996-97	35.449	-5.97	56.365	-7.66	22.92	2.03	31.58	9.33
1997-98	37.165	-4.84	61.024	-8.26	20.96	8.56	30.29	4.08
1998-99	42.071	-13.2	69.551	-13.9	24.17	-15.3	33.13	-9.35
1999-00	43.333	-2.99	69.851	-0.43	44.79		39.06	-17.88
2000-01	45.684	-5.42	67.552	3.29	41.48	7.38	41.4	-6
2001-02	47.692	-4.39	68.319	-1.135	42.18	-1.68	38.17	7.79
2002-03	48.395	-1.47	74.819	-9.51	48.09	-14	39.73	-4.08
2003-04	45.952	5.79	77.739	-3.9	53.98	-12.26	40.7	-2.45
2004-05	44.932	3.39	82.864	-6.59	56.55	-4.67	41.8	-2.69
2005-06	44.273	1.46	79.047	4.6	53.91	4.6	39.14	6.36
2006-07	45.285	-2.28	85.643	-8.34	58.11	-7.78	38.79	0.87
2007-08	40.261	11.09	80.841	5.6	56.99	1.93	35.28	9.04
2008-09	45.993	-14.23	78.316	3.12	65.13	-14.28	46.05	-30.49
2009-10	47.417	-3.09	75.886	3.102	67.08	-2.99	51.12	-11.01
2010-11	45.577	3.88	70.885	6.59	60.22	10.23	53.29	-4.18
2011-12	47.923	-5.14	76.381	-7.75	65.89	-9.42	60.74	-13.98
2012-13	54.409	-13.53	85.971	-12.55	70.09	-6.33	65.85	-8.4
2013-14	60.5	-11.19	96.3	-12.0145	60.4	13.82508	81.17	-23.265
2014-15	61.14	-1.1	98.57	-2.35722	55.83	7.566225	77.52	4.496735
2015-16	65.47	-7.1	98.73	-0.16232	54.59	2.221028	72.29	6.746646
2016-17	67.07	-2.4	87.69	11.18201	62.03	-13.6289	73.61	-1.82598
2017-18	64.45	3.9	85.51	2.48603	58.18	6.206674	75.44	-2.48608
2018-19	69.92	-8.5	91.79	-7.34417	63.05	-8.37057	80.96	-7.31707

source- Handbook of Statistics on Indian Economy

1. The data on exchange rate for Japanese Yen is in ` per 100 Yen.
2. The end year rate for 1998-99 pertain to March 26, 1999 of Deutsche Mark rate.
3. Data from 1980-81 to 1991-92 are based on official exchange rates.
4. Data from 1992-93 onwards are based on FEDAI (Foreign Exchange Dealers' Association of India) indicative rates.
5. Data are based on FEDAI (Foreign Exchange Dealers' Association of India) indicative rates till April 2012. RBI reference rates are used w.e. f. May 2012.
6. The Euro replaced the Deutsche Mark w.e.f. January 1, 1999.
7. Financial Benchmarks India Private Limited (FBIL) commenced dissemination of reference rates w.e.f. July 10,2018

Exchange Rate of INR Against US$, Pound Sterling, DM/Euro, Yen
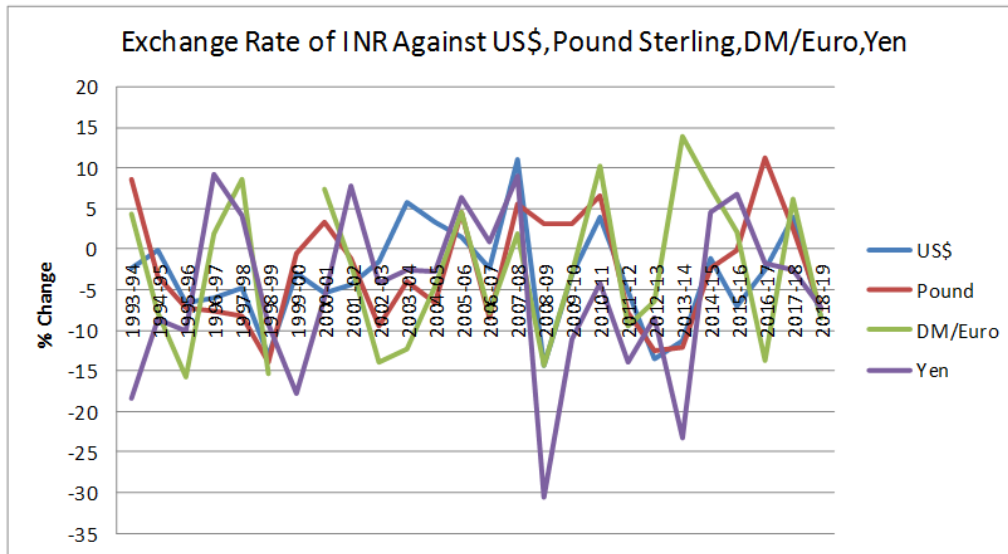
Measurement of Volatility in Nominal and Real Effective Exchange Rate of Rupee After liberlization
Effective exchange rates are summary indicators of movements in the exchange rates of home currency against a basket of currencies of trade partner countries and are considered to be an indicator of international competitiveness. Volatility in exchange rate refers to the amount of uncertainty or risk involved with the size of changes in a currency's exchange rate.
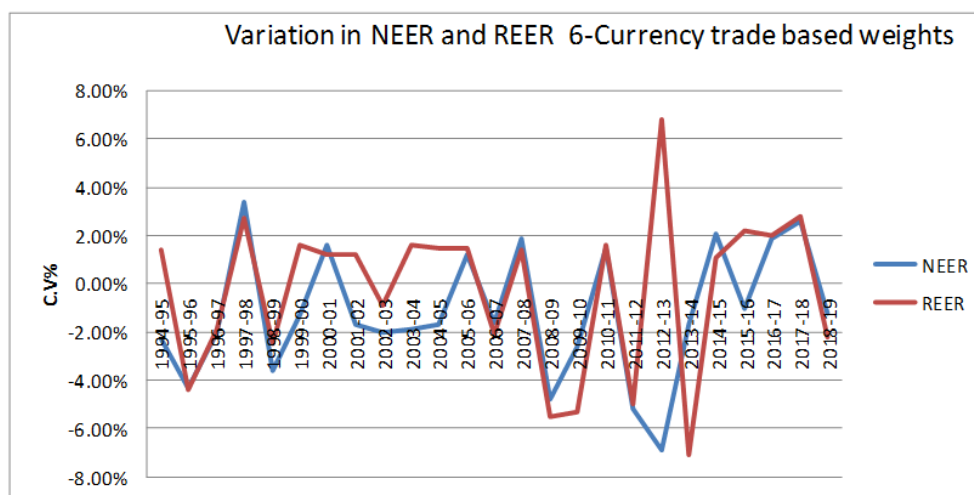
Table 2. Indices of Real Effective Exchange Rate (REER) and Nominal Effective Exchange Rate (NEER) of the Indian Rupee
(6-Currency Trade Based Weights)   Base-1993-94(Financial Year)

	NEER	STDEV	C.V%	REER	STDEV.	C.V%
1	2	3	4	3	6	7
1993-94	100			100		
1994-95	96.86	2.25	-2.3	105.71	1.48	1.4
1995-96	88.45	3.8	-4.3	101.14	4.4	-4.4
1996-97	86.73	1.76	-2.0	100.97	1.88	-1.9
1997-98	87.8	3	3.4	104.24	2.85	2.7
1998-99	77.37	2.81	-3.6	95.99	2.41	-2.5
1999-00	77.04	1.04	-1.3	97.52	1.6	1.6
2000-01	77.3	1.26	1.6	102.64	1.26	1.2
2001-02	75.89	1.26	-1.7	102.49	1.22	1.2
2002-03	71.09	1.4	-2.0	97.43	0.91	-0.9
2003-04	69.75	1.31	-1.9	98.85	1.57	1.6
2004-05	69.26	1.2	-1.7	101.35	1.52	1.5
2005-06	72.28	0.86	1.2	107.3	1.63	1.5
2006-07	69.49	1.12	-1.6	105.57	2.2	-2.1
2007-08	74.17	1.43	1.9	114.09	1.55	1.4
2008-09	64.11	3.07	-4.8	94.43	5.21	-5.5
2009-10	61.74	1.62	-2.6	90.11	4.74	-5.3
2010-11	65.25	0.98	1.5	98.44	1.6	1.6
2011-12	59.88	3.09	-5.2	95.21	4.74	-5.0

2012-13	53.57	3.7	-6.9	100.03	6.81	6.8
2013-14	48.04	0.84	-1.7	96.29	6.85	-7.1
2014-15	48.7	1.01	2.1	102.48	1.15	1.1
2015-16	48.12	0.46	-1.0	105.51	2.33	2.2
2016-17	48.13	0.83	1.9	106.82	2.13	2.0
2017-18	48.15	1.27	2.6	110.31	3.08	2.8
2018-19	44.72	0.52	-1.2	103.92	2.26	-2.2

Variation in NEER and REER 6-Currency trade based weights

TABLE 3 : INDICES OF REAL EFFECTIVE EXCHANGE RATE (REER) AND NOMINAL EFFECTIVE EXCHANGE RATE (NEER) OF THE INDIAN RUPEE (36- Currency Bilateral Weights) (Financial Year - Annual Average)   Trade-based Weights
Base 1993-94

Year	REER	STDEV	C.V%	NEER	STDEV	C.V%
1	2	3	4	5	6	7
1993-94	100.00	0.8	0.8	100.00	1.17	1.2
1994-95	104.32	1.29	1.2	98.91	1.61	-1.6
1995-96	98.19	4.69	-4.8	91.54	4.06	-4.4
1996-97	96.83	1.12	-1.2	89.27	1.42	-1.6
1997-98	100.77	1.49	1.5	92.04	1.29	1.4
1998-99	93.04	1.76	-1.9	89.05	2.14	-2.4
1999-00	95.99	0.98	1.0	91.02	0.88	1.0
2000-01	100.09	0.97	1.0	92.12	1.08	1.2
2001-02	100.86	1.13	1.1	91.58	1.04	-1.1
2002-03	98.18	1.03	-1.0	89.12	1.16	-1.3
2003-04	99.56	1.3	1.3	87.14	1.3	-1.5
2004-05	100.09	0.74	0.7	87.31	1.29	1.5
2005-06	102.35	1.41	1.4	89.85	1.13	1.3
2006-07	98.48	1.9	-1.9	85.89	1.25	-1.5
2007-08	104.81	6.91	6.6	93.91	5.34	5.7
2008-09	94.32	4.22	-4.5	84.66	2.86	-3.4
2009-10	92.42	3.58	-3.9	84.68	1.62	1.9
2010-11	101.00	1.36	1.3	87.41	1.27	1.5

2011-12	97.85	4.08	-4.2	81.77	3.87	-4.7
2012-13	104.19	2.25	2.3	73.09	1.15	-1.6
2013-14	101.91	2.52	-2.4	67.50	2.81	-4.2
2014-15	107.54	2.13	2.0	69.13	1.1	1.6
2015-16	110.62	1.35	1.2	69.80	0.79	1.1
2016-17	113.02	1.7	1.5	69.70	1.06	-1.5
2017-18	118.15	1.5	1.3	71.80	0.91	1.3
2018-19	112.52	1.98	-1.8	67.80	1.24	-1.8

Variation in REER and NEER 36-Currency trade based weights
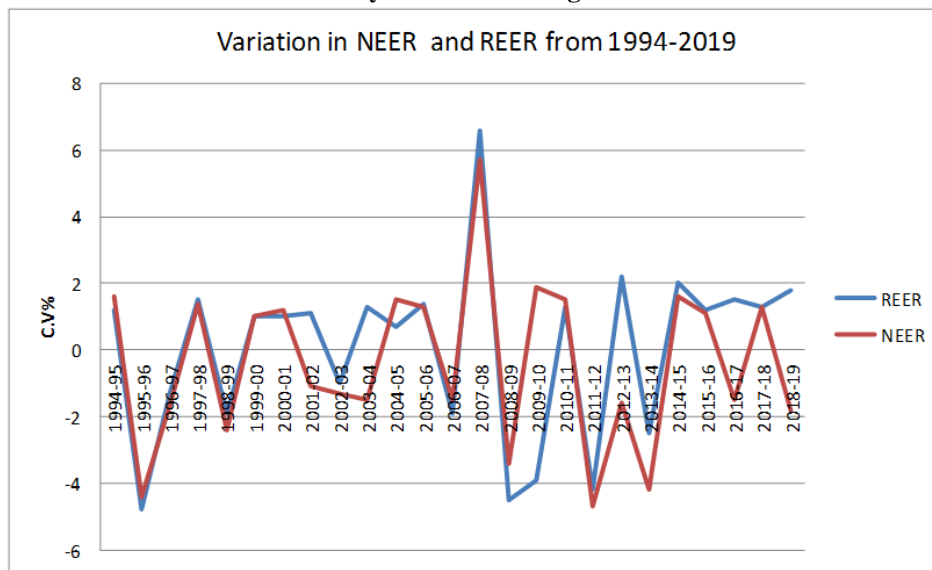
Volatility in the Nominal Effecive Exchange Rate(NEER) and Real Effective Exchange Rate(REER) during past twenty seven years have been computed using standard deviations and variance of monthly data (baseyear 1993-94),which have been annualized in financial year.. An analysis of volatility in various phases of exchange rate pressures shows that volatility in rupee-dollar exchange rate has exhibited mixed trends in the past two decades of market determined exchange rate (Table.2). Period from 1993 to 1995, was marked by a surge in capital inflows on account of liberalization in the capital account and a move to a market determined exchange rate . As against FDI and Portfolio flows , CAD increased from 0.4 per cent of GDP in 1993-94 to 1.6 percent of GDP in 1995-96, the surplus on the capital account (3.8 percent of GDP in 1993-94) on account of the large capital inflows more than compensated for the CAD, leading to large accretion to forex reserves. The focus of exchange rate policy in 1993-94 was on preserving the external competitiveness of the rupee at a time when the economy was undergoing a structural transformation coupled with building up of the forex reserves To maintain the external competitiveness of exports and stability of the rupee, which is a prerequisite for capital inflows, RBI intervened in the forex market.

Table 4		Sale and Purchase of US$ by RBI (In BIillion)		Outstanding Net Forward Sales (-) / Purchase (+) at End of Month
Year	Foreign Currency Purchase	Foreign Currency Sales	Net	
1995-96	3.6	3.9	-0.3	-
1996-97	11.2	3.4	7.8	-
1997-98	15.1	11.2	3.8	-1.8

Year				
1998-99	28.7	26.9	1.8	-0.8
1999-00	24.1	20.8	3.2	-0.7
2000-01	28.2	25.8	2.4	-1.3
2001-02	22.8	15.8	7.1	-0.4
2002-03	30.6	14.9	15.7	2.4
2003-04	55.4	24.9	30.5	1.4
2004-05	31.4	10.6	20.8	0
2005-06	15.2	7.1	8.1	0
2006-07	26.8	0	26.8	0
2007-08	79.7	1.5	78.2	14.7
2008-09	26.6	61.5	-34.9	2
2009-10	4.01	6.7	-2.6	4.6
2010-11	2.5	0.8	1.7	2
2011-12	1.7	21.8	-20.1	-9
2012-13	13.6	16.4	-2.6	-147.5
2013-14	52.4	43.4	9	-216.1
2014-15	1244.1	70.5	1173.6	-5
2016-17	71.8	59.4	12.4	6
2017-18	52.1	18.4	33.7	295.3
2018-19	40.8	56.1	-15.4	26

Note- Annual Average ,Financial Year
Source : RBI Bulletin, various issues

Year 1996 was marked by intense volatility in the forex market, which was mainly on account of the spread of the contagion of the Mexican currency crisis in 1994. However, the annual average WPI inflation rate (base 1993-94=100) was quite high at 12.6 per cent during 1994-95, which contributed significantly towards the overvaluation of the rupee in real terms, As the rupee was overvalued in REER terms, the RBI allowed the rupee to depreciate but intervened in the market to ensure that the market corrections were calibrated and orderly.

Year 1997 and 1998, posed severe challenges to exchange rate management due to the contagion effect of the South-East Asian crisis, economic sanction imposed by many industrialized nations after the nuclear explosion in Pokhran in 1998 and the downgrading of the sovereign rating of India by certain international rating agencies In order to restore stability, the RBI intervened in the spot, forward and swap markets Apart from intervention operations, the RBI also initiated stringent monetary and administrative measures to stem the unidirectional expectation of a depreciating rupee and curb speculative attacks on the currency**.** In the post-Asian crisis period, particularly after 2002-03, capital flows into India surged creating space for speculation on Indian rupee.

From 1998 onwards the forex markets generally witnessed stable conditions with brief phases of volatility caused due to certain domestic and international events like terrorist attack on the World Trade Centre, New York on September 11, 2001 and the attack on Iraq by America which resulted in a oil price shock, etc. The periods of volatility were managed mainly by intervention in the spot and swap markets, floatation of the India Millennium Deposit (IMD) in 2000, which helped in mobilizing US$ 5.5 billion, and appropriate monetary/administrative measures. Due to continuous excess supply of dollars in the period from 2002 to 2008 and intervention by RBI to maintain the stability and external competitiveness of the rupee, the foreign currency assets of the RBI rose from US$ 51.0 billion as at end-March 2002 to US$ 305 billion as at end-May 2008. Before global financial crisis in 2008, external sector developments in India were marked by strong capital flows, which resulted in the exchange rate of the Indian rupee witnessing appreciating trend up to 2007-08.   The global financial crisis and deleveraging led to reversal of capital flows, particularly FII flows, ECBs and trade credit. Large withdrawals of funds from the equity markets by the FIIs, reflecting the credit squeeze and global deleveraging, resulted in large capital outflows during the end of 2008, with concomitant pressures in the foreign exchange market across the globe, including India. With the spot exchange rates moving in a wide range, the volatility of the exchange rates increased during this period.

In financial year 2011-12, rupee depreciated in both nominal and real terms. Depreciation of the rupee, reflecting global uncertainties and domestic macro-economic weakness. The S&P's sovereign rating downgrade of the US economy, deepening euro area crisis and lack of credible resolution mechanisms led to

enhanced uncertainty and reduced risk appetite in global financial markets for EME assets, which resulted in a flight to US dollar, With US dollar appreciating as a result, most currencies, including the Indian rupee came under pressure. As a result of substantial slowdown in capital inflows, the rupee depreciated sharply in 2013. In view of increased exchange rate volatility the various measures taken by the RBI , the RBI made net sale of US$ in the forex market and also intervened in the forward market with RBI's outstanding net forward sales(Table 4.).

From year 2015 -2016 rupee appreciated in both nominal and real terms due to decline , in CPI(inflation) , Current account deficit was at comfortable levels(about 1.2% of GDP), Foreign exchange reserves have risen to US$352.1billion as on December 2015,and net FDI inflows have grown, resulting the nominal value of the rupee, measured against the basket of currencies strenghthened and rupee became the one of the best performing currencies against the US dollar. During the period 2016-2019 rupee depreciated in nominal terms. On the external front ,CAD increased from 1.9 % of GDP in 2017-18 to 2.6% in December 2018. The widening of the CAD was largely on account of a higher trade deficit driven by rise in crude oil prices. Growth in service exports and imports in US $ terms declined to5.5% and 6.7% respectively in 2018-19, from 18.8% and 22.6% respectively in 2017-18. During 2018-19, rupee traded with a depreciating trend against US$. The foreign exchange reserve in nominal terms decreased due to RBI's intervention to modulate exchange rate volatility.

III.   Conclusion

An analysis of the exchange rate of INR volatility in the Indian forex market reveals that there has been a significant increase in exchange rate volatility in the aftermath of the global financial crisis, signifying the greater influence of volatile capital flows on exchange rate movements. The various episodes of volatility of exchange rate of the rupee have been managed in a flexible and pragmatic manner. In line with the exchange rate policy, it has also been observed that the Indian rupee is moving along with the economic fundamentals in the post-reform period. Empirical evidence in the Indian case has generally suggested that in the present day managed float regime of India, intervention has served as a potent instrument in containing the magnitude of exchange rate volatility of the rupee . India was able to escape the contagion effect of various currency crises in the second half of the nineties mainly because of prudent forex and reserve management policies and also, to an extent, because of relatively closed nature of its economy on account of sound capital controls.

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