Research Article

IMPACT ASSESSMENT OF CHANGES IN BALANCE OF PAYMENT ON FOREIGN EXCHANGE RATES: AN USD/ INR BENCHMARK

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A R T I C L E   I N F O

A B S T R A C T

Foreign Exchange Rates is very important economic indicator for the Government and Central Bank of any country which shows the utility of the particular country's currency against the foreign currency and having an international importance of domestic economic viability. While Balance of Payment is the benchmark for economic relationship with various countries. Balance of Payments and Foreign Exchange Rates are directly economically correlated because Balance of Payments are settled in foreign exchanges which requires exchanges rates for the settlement of the transaction between two countries. This paper deals with four aspects, (i) to study the impact of changes in USD/INR on the basis of changes in Balance of Payment of India from 1970 to 2016, (ii) to analyse component(s) in respect to Current Account and Capital Account which affect the USD/INR, (iii) to examine effect of Free Float and Managed Float Regime on Exchange rate Movements and (iv) to find out relationship between Trade Deficit and USD/ INR. Findings suggest that   there is a positive relationship between changes in Balance of Payment on USD/INR in both Pre-Liberalisation Era and Post-Liberalisation Era in the Indian Economy. An appreciation in Indian currency has a positive impact on reducing Trade Deficit hence positive impact on Balance of Payment. The Study reveals that there is a negative correlation between the Current Account / Capital Account under Balance of Payment with USD in comparison to INR.

INTRODUCTION

Forecasting of foreign exchange rates is very significant in the present era as exchange rates are now set up by market forces of demand and supply. Since India also shifted to floating exchange rate regime since 1993 and with the advent of globalisation which is resulting into integration of economies has made it more important to forecast the foreign exchange rates in order to facilitate cross border trade, providing of services and movement of capital in and out of country. The forecasting of exchange rates are therefore very important for financial managers, policy makers, travellers and national economy. 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. In view of this, there is a greater interest among the policy formulators and academia in exploring the policy space available to Emerging Market Economies (EMEs) to deal with any sharp volatility in the financial markets. Particularly, central bank responses to seriesof volatility in the foreign exchange markets have come into sharper focus.

Conceptual framework of foreign exchange and balance of payment

Foreign exchange as per section 2(n) of Foreign Exchange Management Act, 1999 refers to:

Foreign currency and includes

1. deposits, credits and balances payable in any foreign currency,
2. drafts, traveller cheques, letters of credit or bills of exchange, expressed or drawn in Indian currency but payable in any foreign currency,
3. drafts, traveller cheques, letters of credit or bills of exchange drawn by banks, institutions or persons outside India, but payable in Indian currency.

Determinants of exchange rates

Exchange rates of any country is dependent on the exchange rate system it follows. These systems could be Free Float, Managed Float, Target zone, fixed rate etc.

Fixed exchange rate

Under this system the country follows a fixed exchange rate. Under the system the central bank can link its currency to gold, can peg its currency to any foreign currency or a basket of currencies. This system is usually managed by currency

intervention by central bank and through capital control methods.

Floating rate system

Under this system the exchange rate is determined through the market forces of demand and supply.

Managed Float

Under the managed float system the central bank often intervenes in order to maintain the exchange rate at some target level.

Balance of Payment as per IMF

Balance of Payment is a statistical statement that systematically summarizes, for the specific time period, the economic transaction of an economy with other economies of the world.The world is moving towards more integration of markets for movement of goods, services and financial products. International trade has become more liberalised in India also since 1991-92. International trade is settled through foreign currencies.Since international trade is facilitated through foreign currency, hence there must be some relationship between movement in foreign exchange rates and changes in balance of payment.

History of Balance of payment crisis and change in exchange rates

India has witnessed many events in the past which has significant effect on the balance of payment. These events were equivalent to balance of payment crisis. These crises were tide over by making changes in foreign exchange rates. Chronological details of these events follow:

1. Trade deficit in 1966
2. Oil crisis in 1973 and 1980
3. External payment problem in 1991
4. East Asia problem in 1997
5. Y2K problem in 2000
6. Global financial crisis in 2008

In the year 1951-52 the merchandise trade was 16 % of GDP which declined under 8% by the year 1965-66. The problem was aggravated by China India war of 1962 and India Pakistan war of 1965 followed by draught in 1965-66. As a result there was devaluation in Indian rupee in June 1966 to the tune of 36.5%.This devaluation in Indian Rupee resulted into by 1974-75.xport boost and current account deficit resulted into surplus in 1973-74.Again in 1973-74, there was increase in crude oil prices in the international markets and the crude oil import bill increased from 11% in 1972-73 to 26%. The rupee was further devalued to boost the imports and current account balance became surplus in 1976-77 and 1977-78. In 1980 also, there was an increase in the prices of oil and oil only accounted for 40% of total imports.During 1991 also, there was Gulf war and disintegration of USSR also affected India's Exports and consequently the foreign reserves affected adversely and at one point of time in 1990-91, it was under 1billion USD.This resulted into adjustment of exchange rates twice in 1991.Oil prices still continued to shock India in 2000-01 and 2011-12 also, which again experienced devaluation of Indian rupee.

In view of above, it becomes quite clear that Balance of payment is one of the determinants of Foreign Exchange Rates in India. Current Account comprises of Trade Balance and Invisibles Net. Trade Balance is difference of Merchandise Exports and Merchandise Imports. Capital Account includes Foreign Investment, External Assistance, Commercial Borrowings, Rupee Debt Service, NRI Deposits and Other Capital. Balance of Payment (BOP) is total of Current Account and Capital Account Components. It means that whenever there is current account deficit in the balance of payment, the situation is handled by making changes in Exchange Rates. Hence a question arises whether the Exchange Rates can be predicted on the basis of changes in the balances of Balance of Payment.

Aims and Objective of the study

The aim of this study is

1. To study the impact of changes in exchange rate on the basis of changes in Balance of Payment in India from 1970 to 2016.
2. To analyse component(s) in respect to Current Account which affect the Foreign Exchange Rates
3. To examine effect of Free Float and Managed Float Regime on Exchange rate Movements.
4. To find out relationship between Trade Deficit and Foreign Exchange Rates.

REVIEW OF LITERATURE

There are several approaches for determination of exchange rates such as Dorn Busch Theory, Exchange rates as function of demand and supply, Economic Theories linking Exchange Rates with Parity Conditions and Technical Analysis based on historical rates.

But basically, there are two approaches i.e.

Elasticity Approach based on Demand and Supply

This approach establishes a link between change in exchange rates and demand of foreign goods and services i.e. more the demand of foreign goods and services more will be demand for foreign exchange and it will be expensive and will appreciate. It links current account deficit to devaluation in currency and vice versa.

Marshall Lerner Approach is also based on elasticity of price. i.e. if price elasticity of demand for exports and price elasticity for imports is greater than one, then it will improve balance of payment, if less than one it will adverse and if it is equal to one, it will not make any difference.

International Parity Conditions are also used to determine foreign exchange rates.

Monetary Approach states that foreign exchange rates depend on money supply in the countryi.e. the monetary policy alone can regulate the movements in foreign exchange. Hence the disequilibrium in the money market impacts the foreign exchange movement.

Statement of Problem and Hypothesis

This study endeavours to setup a relationship between movements in exchange rates with changes in Balance of payment in India viz. Pre-Liberalization Era (1970 to 1992) and Post-Liberalization Era (1993 to 2016). The study has relevance at the national level in the formulation of monetary and trade policy. It is also important for the multinational financial managers to take appropriate decisions as fluctuation in foreign exchange impacts all decisions of multinational

corporations and cross border business. There are many determinants of foreign exchange such as, National income, Interest rates, inflation rate, monetary policy, fiscal policy, central bank intervention, political stability, speculation, relative strength of other currencies and other technical factors. But this study focuses exclusively on the effect of changes in balance of payment on foreign exchange rates.

Limitations of the Study

1. It does not cover the study of impact of change in Exchange Rate on Balance of Payment (BOP).
2. It does not cover Other Factors in the economy which affect Exchange Rates viz. Monetary Policy, Fiscal Policy, GDP Growth Rate, Political and Economic Scenario worldwide, Demonetisation etc.
3. Period of Study has been taken from 1970 to 2016. It can be taken from 1950 onwards also as data is available on RBI Site.
4. Secondary data has been used for Research purpose. There is no use of Primary data in this Research Paper.

Research Methodology and Data

The study intends to apply regression analysis technique on the data taken for the purpose. The data for the balance of payment and foreign exchange rate has been taken w.e.f. the year 1970 to year 2016. The study intends to take Exchange Rates in India as Dependent variable and balances under various components of Balance of Payment as independent variables or explanatory variable. The regression will be done using "Microsoft Excel Tool".

Regression

It is a statistical tool which helps to set a relationship between one dependent variable(in this study Foreign Exchange Rates) with other explanatory variables which are called independent variables (Trade Balance, Invisibles Net, Foreign Investment, External Assistance Net, Commercial Borrowings Net, NRI

Deposits Net, Other Capital). The general form of regression equation is:

$$Y = a + b_1 x_1 + b_2 x_2 + \cdots b_n x_n + u$$

Where:Y= variable to be predicted (Exchange Rates), x =variables used to predict Y,a=Intercept,b=slope,u=regression residual

Correlation and Regression Analysis, T-test has been used to Study from Secondary data available from 1970 to 2016 for analysing relationship between Foreign Exchange Rates and Balance of Payments.

DataAnalysis and Findings: As stated above data has been collected into two periods ---

Section A: Pre- Liberalisation Period (1970 to 1992)
Section B: Post Liberalisation Period (1993 to 2016)

Section A: Pre- Liberalisation Period (1970 to 1992)

A.1 Contribution of Trade Balance to Balance of Payment during the Period 1970 to 1992

Table – 1 given below depicts that India's BOP has remain unfavourable since 1970 till 1992. It was never positive during this period. Unfavourable BOP includes Trade Balance, Other Capital and Commercial Borrowings net whereas Favourable BOP includes Invisible net, Foreign Investment, External Assistance and NRI Deposits net. Ratio of Unfavourable to Favourable BOP was more than 100% in many years. Contribution of Negative Trade balance to Favourable BOP has gone from -81% in 1970-71 to -262% in 1990-91due to instability in Political environment in India but once a stable Government was formed the ratio improved-50% in 1991-92.

A.2 Relationship between movements in exchange rates with changes in Balance payment in Indiaviz. Pre-Liberalization Era (1970 to 1992)

Table -1 Trade Balance to Balance of Payment during the Period 1970 to 1992

Year / Item	exchange rates	Invisibles, net	Foreign Investment	External assistance, net	NRI deposits, net	Total of Favourable BOP	Other capital	Trade balance	Commercial borrowing, net	Total of Unfavourable BOP	Percentage of Unfav to Fav BOP	Cont of Trade Balance to Fav BOP
1	2	3	4	5	6	7(4+5+6)	8	9	10	11(8+9+10)	12(11/7)	13(9/7)
1991-92	22.6890	42.59	3.39	73.95	10.07	130.00	-2.56	-64.94	38.06	-29.44	-23%	-50%
1990-91	17.4992	-4.33	1.84	39.65	27.56	64.72	40.96	-169.34	40.34	-88.04	-136%	-262%
1989-90	16.2238	10.26	6.83	30.90	40.00	87.99	8.86	-124.13	29.58	-85.69	-97%	-141%
1988-89	13.9147	19.76	5.17	32.10	36.36	93.39	15.72	-135.56	27.43	-92.41	-99%	-145%
1987-88	12.9552	30.06	5.63	29.45	18.40	83.54	-0.69	-92.96	12.66	-80.99	-97%	-111%
1986-87	12.6053	35.24	2.49	18.08	16.50	72.31	-4.50	-93.54	25.13	-72.91	-101%	-129%
1985-86	12.3640	36.30	0.00	16.76	17.67	70.73	9.04	-95.86	11.67	-75.15	-106%	-136%
1984-85	11.3683	38.50	0.00	14.07	8.79	61.36	3.42	-67.21	11.10	-52.69	-86%	-110%
1983-84	10.1379	36.10	0.00	11.83	7.09	55.02	0.59	-69.25	7.85	-60.81	-111%	-126%
1982-83	9.4924	34.38	0.00	11.25	3.83	49.46	-2.28	-67.19	7.32	-62.15	-126%	-136%
1981-82	8.6926	36.56	0.00	7.46	2.06	46.08	-5.13	-64.94	1.46	-68.61	-149%	-141%
1980-81	7.8800	40.00	0.00	11.12	1.78	52.90	-1.77	-62.11	1.99	-61.89	-117%	-117%
1979-80	8.1467	28.87	0.70	6.56	1.62	37.75	-0.52	-34.40	0.44	-34.48	-91%	-91%
1978-79	8.2133	19.74	0.24	4.55	1.56	26.09	5.13	-22.12	1.64	-15.35	-59%	-85%
1977-78	8.7625	17.22	-0.10	8.82	2.00	27.94	-3.96	-5.97	0.34	-9.59	-34%	-21%
1976-77	9.0017	12.04	-0.26	12.70	1.67	26.15	-7.66	-3.10	1.63	-9.13	-35%	-12%
1975-76	8.4058	10.05	-0.08	12.19	0.36	22.52	-6.88	-11.83	2.31	-16.40	-73%	-53%
1974-75	8.0375	3.31	0.69	8.54	0.00	12.54	-6.01	-12.87	1.56	-17.32	-138%	-103%
1973-74	7.6742	16.46	0.52	-12.23	0.00	4.75	-0.14	-5.10	0.72	-4.52	-95%	-107%
1972-73	7.5563	-1.44	0.30	3.77	0.00	2.63	-1.82	-1.68	0.54	-2.96	-113%	-64%
1971-72	7.5244	-0.24	0.44	5.08	0.00	5.28	-0.43	-4.75	0.10	-5.08	-96%	-90%
1970-71	7.5668	-0.37	0.36	5.04	0.00	5.03	-1.21	-4.08	0.16	-5.13	-102%	-81%

(Source: HBS Table No 144, Key components of India's Balance of Payments.www.dbie.rbi.org.in)

Table-2 Summary Output

Regression Statistics	
Multiple R	0.988514
R Square	0.97716
Adjusted R Square	0.96574
Standard Error	0.730453
Observations	22

Regression Analysis (Table -2) shows that relationship between Dependent Variable and Independent Variables is highly correlated i.e. 97.71 % change will be done in Dependent Variable if Independent Variable changes. Standard Error (S.E.) indicates variation in R Square i.e. 0.73 which again shows high correlation between Exchange Rates (Dependent Variable) and Balance of Payment (Independent Variable).

More the Sum of Squares better is the explanation of the Regression Analysis. In this case, Significance level is highly significant i.e. 99.99 % (Refer Table -3) among dependent and independent variables.

Table -3 Anova

	df	SS	MS	F	Significance F
Regression	7	319.5848652	45.65498	85.5664	2.09E-10
Residual	14	7.469868487	0.533562		
Total	21	327.0547337			

Intercept is the Difference between Impact of Independent Variable and other extraneous Variables on Dependent Variable. In this case, 92.70 % is the impact of Independent Variable i.e. Trade Balance, Invisibles Net, Foreign Investment, External Assistance Net, Commercial Borrowings Net, NRI Deposits Net, Other Capital on Dependent Variable i.e. Foreign exchange rates. The greater the magnitude of T (it can be either positive or negative), the greater the evidence against the null hypothesis that there is no significant difference. The closer T is to 0, (Refer Table no 4) the more likely there isn't a significant difference.

P value denotes randomness of occurrence of coefficient. Because the p-value is very low (<alpha level), we reject the null hypothesis and conclude that there's a statistically significant difference i.e. there is a significant impact of Independent Variables on Dependent Variable. There is a significant impact of Trade Balance, Invisibles Net, External Assistance, Commercial Borrowings Net, Other Capital (Independent Variables) on Exchange Rate (Dependent Variable) whereas Foreign Investment and NRI Deposits do not have much impact on Exchange Rates during Pre Liberalisation era in India.

T stat and P-Value **Table -4**

	Coefficients	Standard Error	t Stat	P-value
Intercept	7.301458	0.307033251	23.78068	1.02E-12
Trade balance	0.030008	0.012435342	2.413112	0.030103
Invisibles, net	0.048801	0.018395982	2.652822	0.018925
Foreign Investment	0.056486	0.184116123	0.306797	0.763514
External assistance, net	0.101386	0.022528514	4.500344	0.000499
Commercial borrowings, net	0.18433	0.041216539	4.472232	0.000526
NRI deposits, net	0.046462	0.04884576	0.951195	0.357639
Other capital	0.059521	0.037746022	1.576889	0.137143

Table -5 given below states that at 5 % significance level, Trade Balance, Invisibles Net, External Assistance Net, Commercial Borrowings net is having direct impact on Exchange Rate – Indian currency appreciation or vice versa vis-à-vis U.S.Dollar whereas Foreign Investment, NRI deposits and Other Capital are not having major impact on change in exchange Rates.

Dependent Variable: exchangerates

Table – 6 tells us about Collinearity Diagnostics. It implies that if any Condition Index exceeds 30 then there is a severe problem i.e. Dependent and Independent Variables are the one and same thing or strong collinearity lies or near-linear dependence. There lies no difference among variables. But here none of the variables is exceeding 30, hence our choice of dependent and independent variables is correct and true. Eigen value depicts that variance between Exchange Rate (Dependent Variable) and other Independent Variable is almost zero. Hence relation between variables is non-collinear.

A.3 Relationship between Changes in Independent Variable to Dependent Variable

Table – 7 given below implies that Trade Balance is having 70.90 per cent impact on Exchange Rates. A One Rupee change in Exchange Rate is contributed by 0.709 of Trade Balance i.e. an increase in Trade Balance by 0.709 will have positive impact of appreciation in Exchange Rates by one rupee and vice-versa. A change in Invisibles (Service Sector) will have impact of 22.89 per cent on Exchange Rates. Increase in Invisibles will have positive impact on Exchange Rates and vice versa. Foreign investment will have an impact of 66.23 per cent on Exchange Rates. An increase in Foreign Investment will appreciate Indian currency in terms of foreign currency and vice versa. External Assistance, Commercial Borrowings Net, NRI Deposits and Other Capital will have an impact of 94.77 per cent, 94.58 per cent, 70.45 per cent and 48.87 per cent on Exchange Rates. An increase or decrease in External Assistance, Commercial Borrowings Net, NRI Deposits and Other Capital will have corresponding effect on Exchange Rates.

Figure no -1 suggests Normal P-P Plot of Regression keeping Exchange Rate as Dependent variable also depicts that Expected Probability and Observed Probability are located in and around the Regression Line i.e. there is a correlation between Dependent and Independent Variables having Probability between 0 to 1.

Coefficients[a] **Table – 5**

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations		
	B	Std. Error	Beta			Zero-order	Partial	Part
(Constant)	7.301	.307		23.781	.000			
Tradebalance	.030	.012	.372	2.413	.030	-.709	.542	.097
Invisiblesnet	.049	.018	.192	2.653	.019	.229	.578	.107
ForeignInvestment	.056	.184	.030	.307	.764	.662	.082	.012
Externalassistancenet	.101	.023	.444	4.500	.000	.948	.769	.182
Commercialborrowingsnet	.184	.041	.612	4.472	.001	.946	.767	.181
NRIdepositsnet	.046	.049	.143	.951	.358	.704	.246	.038
Othercapital	.060	.038	.157	1.577	.137	.489	.388	.064

Collinearity Diagnostics **(Table – 6)**

Dimension	Eigenvalue	Condition Index	Variance Proportions						
			(Constant)	Tradebalance	Invisibles (net)	External assistance (net)	Commercial borrowings (net)	NRI Deposits (net)	Other capital
1	4.957	1.000	.01	.00	.00	.00	.00	.00	.00
2	1.256	1.986	.03	.00	.03	.00	.00	.00	.07
3	.361	3.706	.13	.00	.01	.11	.02	.00	.09
4	.197	5.019	.31	.01	.02	.07	.00	.18	.13
5	.173	5.355	.43	.00	.26	.00	.00	.10	.12
6	.036	11.797	.04	.00	.00	.79	.92	.17	.10
7	.020	15.623	.05	.98	.67	.03	.05	.54	.48

Dependent Variable: exchange rates

Table-7 Relationship between Changes in Independent Variable to Dependent Variable

|	exchange rates	Trade balance	Invisibles, net	Foreign Investment	External assistance, net	Commercial borrowings, net	NRI deposits, net	Other capital
Exchange rates	1							
Trade balance	-0.709	1						
Invisibles, net	0.2289	-0.263	1					
Foreign Investment	0.6623	-0.617	0.00722	1				
External assistance, net	0.9477	-0.603	0.22837	0.61502	1			
Commercial borrowings, net	0.9458	-0.823	0.11483	0.68757	0.859	1		
NRI deposits, net	0.7045	-0.879	0.02202	0.82274	0.583	0.812	1	
Other capital	0.4887	-0.73	-0.25892	0.31215	0.361	0.636	0.66	1
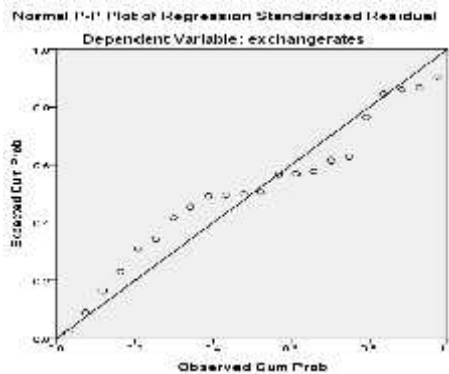
Figure No 1

Section B: Post Liberalisation Period (1993 to 2016)

B.1Contribution of Trade Balance to Balance of Payment during the Period 1993 to 2016 i.e. Post - Liberalisation Period

Table – 8 given below depicts that India's BOP has remain unfavourable since 1993 till 2016. It was never positive during this period. Ratio of Unfavourable to Favourable BOP was more than 400% in 2008-09. It was more than 200% from 2011-12 to 2016-17. Contribution of Negative Trade balance to Favourable BOP has gone from -55% in 1993-94 to -257% in 2016-17. It was -342 % in 2008-09.

B.2Relationship between movements in exchange rates with changes in Balance of payment in India viz. Post-Liberalization Era (1993 to 2016)

Regression Analysis (Refer Table -9) shows that relationship between Dependent Variable and Independent Variables is correlated i.e. 62.83 % change will be done in Dependent Variable if Independent Variable changes. Standard Error (S.E.) indicates variation in R Square i.e. 0.739 which again shows high correlation between Exchange Rates (Dependent Variable) and Balance of Payment (Independent Variable).

In this case, Significance level is highly significant i.e. 99.2% among dependent and independent variables.(Refer Table No -10)

Intercept is the Difference between Impact of Independent Variable and other extraneous Variables on Dependent Variable. In this case, 61.49 % is the impact of Independent Variable i.e. Trade Balance, Invisibles Net, Foreign Investment, External Assistance Net, Commercial Borrowings Net, NRI Deposits Net, Other Capital on Dependent Variable i.e. Foreign exchange rates. The greater the magnitude of T (it can be either positive or negative), the greater the evidence against the null hypothesis that there is no significant difference. The closer T is to 0(Refer Table no -11), the more likely there isn't a significant difference.P value denotes randomness of occurrence of coefficient.

Table 8 Contribution of Trade Balance to Balance of Payment during the Period 1993 to 2016 i.e. Post - Liberalisation Period (Rupees Billion)

Year / Item	exchange rates	Invisibles, net	Foreign Investment	External assistance, net	NRI deposits, net	Total of Favourable BOP	Other capital	Trade balance	Commercial borrowings, net	Total of Unfavourable BOP	Percentage of Unfav to Fav BOP	Contribution of Trade Balance to Favourable BOP
1	2	3	4	5	6	7(4+5+6)	8	9	10	11(8+9+10)	12 (11/7)	13(9/7)
2016-17	67.1983	1574.25	477.42	51.28	92.15	620.85	30.30	-1594.24	-162.68	-1726.62	-278%	-257%
2015-16	64.1519	7057.69	2704.36	130.31	1046.66	3881.33	-892.72	-8495.31	-387.93	-9775.96	-252%	-219%
2014-15	61.0295	7225.49	4736.55	126.23	861.25	5724.03	-320.44	-8858.62	13.68	-9165.39	-160%	-155%
2013-14	58.5978	6977.09	2179.33	74.00	2380.00	4633.32	-2459.67	-8848.45	661.28	-10646.83	-230%	-191%
2012-13	53.4376	5848.46	2982.05	68.82	806.51	3857.38	682.81	-10644.56	466.07	-9495.68	-246%	-276%
2011-12	46.6723	5361.57	2417.06	120.55	582.41	3120.02	-462.51	-9121.29	420.99	-9162.81	-294%	-292%
2010-11	45.7262	3608.17	2770.38	225.96	148.20	3144.54	-889.84	-5804.70	539.44	-6155.10	-196%	-185%
2009-10	48.4049	3802.66	3117.04	153.59	142.43	3413.06	-1088.91	-5599.65	119.71	-6568.85	-192%	-164%
2008-09	43.5049	4198.20	1264.49	131.39	204.30	1600.18	-1599.73	-5474.49	309.42	-6764.80	-423%	-342%
2007-08	41.3485	3041.86	2493.89	84.84	7.05	2585.78	838.70	-3676.64	912.12	-1925.82	-74%	-142%
2006-07	45.3070	2355.79	1342.82	80.27	195.74	1618.83	-270.30	-2799.62	738.89	-2331.03	-144%	-173%
2005-06	44.1000	1859.27	948.14	78.76	124.57	1151.47	-145.67	-2296.64	116.10	-2326.21	-202%	-199%
2004-05	45.3165	1395.91	683.66	89.93	-44.39	729.20	328.70	-1517.65	241.49	-947.46	-130%	-208%
2003-04	46.5819	1273.69	717.28	-125.53	168.69	760.44	189.96	-633.86	-132.74	-576.64	-76%	-83%
2002-03	48.5993	823.57	290.72	-148.63	144.24	286.33	333.13	-516.97	-82.63	-266.47	-93%	-181%
2001-02	47.1857	713.81	388.61	58.19	131.27	578.07	-76.40	-549.55	-75.43	-701.38	-121%	-95%
2000-01	44.9401	451.39	310.16	20.80	105.61	436.57	-218.50	-567.37	201.94	-583.93	-134%	-130%
1999-00	43.0485	570.28	225.01	39.15	67.09	331.25	166.75	-773.59	13.60	-593.24	-179%	-234%
1998-99	41.2677	386.89	101.69	34.84	40.59	177.12	20.72	-554.78	185.57	-348.49	-197%	-313%
1997-98	36.3194	369.22	199.61	34.63	43.25	277.49	-19.87	-578.05	145.58	-452.34	-163%	-208%
1996-97	35.4294	362.79	218.28	39.97	118.94	377.19	-46.81	-525.61	100.03	-472.39	-125%	-139%
1995-96	32.4232	184.15	163.12	33.57	38.22	234.91	-93.34	-380.61	45.49	-428.46	-182%	-162%
1994-95	31.3742	178.36	154.50	47.99	5.39	207.88	78.11	-284.19	32.39	-173.69	-84%	-137%
1993-94	31.4458	90.89	132.82	59.63	37.80	230.25	87.86	-127.23	19.04	-20.33	-9%	-55%
1992-93	25.9206	44.75	16.99	57.48	60.97	135.44	17.68	-172.39	-10.95	-165.66	-122%	-127%

(Source: HBS Table No 144, Key components of India's Balance of Payments. www.dbie.rbi.org.in)

Table - 9 Summary Output

Regression Statistics	
Multiple R	0.792674
R Square	0.628332
Adjusted R Square	0.475292
Standard Error	7.3928
Observations	25

Table- 10 ANOVA

	df	SS	MS	F	Significance F
Regression	7	1570.7279	224.3897	4.10567928	0.008178
Residual	17	929.10932	54.65349		
Total	24	2499.8372			

Because the p-value is very low (<alpha level), we reject the null hypothesis and conclude that there's a statistically significant difference i.e. there is a significant impact of Independent Variables on Dependent Variable. There is a significant impact of Trade Balance and Invisibles Net(Independent Variables) on Exchange Rate (Dependent Variable) whereas Foreign Investment, External Assistance, NRI Deposits , Commercial Borrowings Net and Other Capital do not have much impact on Exchange Rates during Post Liberalisation era in India.

Table -11 T stat and P-Value

	Coefficients	Standard Error	t Stat	P-value
Intercept	38.51144	2.3864275	16.1377	9.6529E-12
Trade balance	0.002631	0.0021036	1.250787	0.22795367
Invisibles, net	0.00816	0.004016	2.03189	0.05809595
Foreign Investment	-0.00134	0.0035968	-0.37306	0.71371365
External assistance, net	-0.01444	0.0317361	-0.45493	0.65491856
Commercial borrowings, net	-0.00587	0.0057495	-1.0202	0.32193432
NRI deposits, net	-0.001	0.0067107	-0.14901	0.88329543
Other capital	0.002023	0.003547	0.570342	0.5759074

Relationship between Changes in Independent Variable to Dependent Variable

Table – 12 given below implies that Trade Balance is having 61.47 per cent impact on Exchange Rates. A One Rupee change in Exchange Rate is contributed by 0.615 of Trade Balance i.e. an increase in Trade Balance by 0.615 will have positive impact of appreciation in Exchange Rates by one rupee and vice-versa. A change in Invisibles (Service Sector) will have impact of 69.86 per cent on Exchange Rates. Increase in Invisibles will have positive impact on Exchange Rates and vice versa. Foreign investment will have an impact of 58.31 per cent on Exchange Rates. An increase in Foreign Investment will appreciate Indian currency in terms of foreign currency and vice versa. External Assistance, Commercial Borrowings Net, NRI Deposits and Other Capital will have an impact of 15.32 per cent, 7.31 per cent, 56.50 per cent and 31.06 per cent on Exchange Rates. An increase or decrease in External Assistance, Commercial Borrowings Net, NRI Deposits and Other Capital will have corresponding effect on Exchange Rates. An increase in Trade Balance will have an positive impact on other Independent Variables.

Normal P-P Plot of Regression (Figure -2) keeping Exchange Rate as Dependent variable also depicts that Expected Probability and Observed Probability are located in and around the Regression Line i.e. there is a correlation between Dependent and Independent Variables having Probability between 0 to 1.

Table- 12 Relationship between Changes in Independent Variable to Dependent Variable

|	exchange rates	Trade balance	Invisibles, net	Foreign Investment	External assistance, net	Commercial borrowings, net	NRI deposits, net	Other capital
exchange rates	1							
Trade balance	-0.61473	1						
Invisibles, net	0.698633	-0.971641	1					
Foreign Investment	0.583179	-0.887908	0.897605	1				
External assistance, net	0.153221	-0.547502	0.506089	0.57268543	1			
Commercial borrowings, net	-0.07315	-0.341274	0.273939	0.32666624	0.34853	1		
NRI deposits, net	0.565028	-0.719275	0.770903	0.52052446	0.178633	0.204584	1	
Other capital	-0.31058	0.4648804	-0.52891	-0.32032884	-0.43616	-0.13723	-0.64362	1
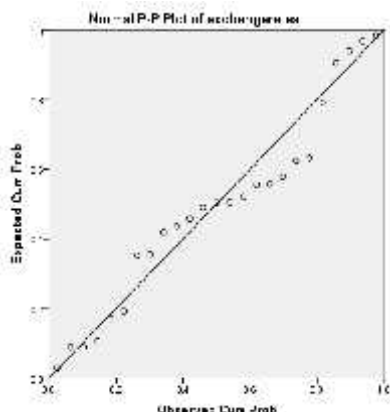
Figure -2

Table – 13 shows us that at 5 % significance level, none of the independent variable is having significant impact on dependent variable i.e. Exchange Rate. Foreign Investment, Commercial Borrowings net, External Assistance Net, NRI deposits and Other Capital are not having major impact on change in exchange Rates.

Eigen value depicts that variance between Exchange Rate (Dependent Variable) and other Independent Variable is almost zero. Hence relation between variables is non-collinear.

ANALYSIS AND CONCLUSION

Following conclusion can be made based on the above analysis

a. In year 1970 Exchange Rate for 1 USD was Rs.7.56 when Percentage of Unfavourable BOP to Favourable BOP was -102%. In the year 1971, Percentage of Unfavourable BOP to Favourable BOP was -96%, Exchange Rate improved to Rs.7.52. But then over the years India has been facing adverse BOP situation and Exchange Rate has deteriorated as against USD. It became Rs.22.68 for 1 USD in the year 1991-92. This was the Pre-Liberalisation Era. It clearly shows that negative Trade Balance has eaten away the share of Favourable BOP over these years. Government should clearly focus on increasing the Current Account share to get favourable BOP.

Table - 13 Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	38.511	2.386		16.138	.000		
Tradebalance	.003	.002	.906	1.251	.228	.042	24.004
Invisiblesnet	.008	.004	1.948	2.032	.058	.024	42.033
ForeignInvestment	-.001	.004	-.171	-.373	.714	.105	9.557
Externalassistancenet	-.014	.032	-.108	-.455	.655	.390	2.567
Commercialborrowingsnet	-.006	.006	-.175	-1.020	.322	.746	1.340
NRIdepositsnet	-.001	.007	-.051	-.149	.883	.187	5.348
Othercapital	.002	.004	.140	.570	.576	.363	2.757
Dependent Variable: Exchange Rates							

Table – 14 CollinearityDiagnostics[a]

Model Dimension		Eigen Value	Condition Index	(Constant)	Tradebalance	Invisiblesnet	External assistance net	Commercial borrowingsnet	NRIdepositsnet	Other Deposits
						Variance Proportions				
1	1	5.503	1.000	.01	.00	.00	.01	.01	.00	.00
	2	.922	2.443	.05	.00	.00	.01	.12	.03	.15
	3	.483	3.375	.03	.00	.00	.20	.27	.06	.06
	4	.369	3.860	.71	.00	.00	.04	.00	.01	.03
	5	.103	7.323	.02	.00	.00	.63	.03	.45	.50
	6	.039	11.818	.00	.25	.02	.04	.00	.33	.01
	7	.008	26.118	.15	.74	.98	.05	.11	.11	.12

Table – 14 tells us about Condition Index is not exceeding 30, hence our choice of dependent and independent variables is correct and gives true picture.

b. When we look at the Post- Liberalisation Era from 1993 to 2016, Exchange Rates has increased 159.25% from Rs.25.92 in 1992-93 to Rs.67.198 in 2016-17.Whereas Percentage of Unfavourable BOP to Favourable BOP has increased from -9% in 1993-94 to -278% in 2016-17. In the year 2008-09 Percentage of

Unfavourable BOP to Favourable BOP was -423% and Contribution of Negative Trade Balance to Favourable BOP was -342%.

c. Exchange Rates have directly been impacted on the magnitude of adversity of BOP. Even after Liberalisation, Privatisation and Globalisation reforms were undertaken by Government of India there is not much improvement in India's Trade Balance and Favourable BOP. This requires immediate attention by Government to improve on Trade Deficit either in the way of increasing exports – merchandise goods and services, decreasing dependency on Commercial Borrowings, focus has to be given to increase Foreign Investments and NRI Deposits, increase in Exports of Services. Other monetary measures includes adoption of Exchange Depreciation, Deflation, Devaluation of Indian Currency, Exchange Control, Increase the Interest Rates in the country so that citizens will start saving the money instead of over –consuming habits. Non – Monetary measures include imposing tariffs, restrict imports by Quota System, Export Promotion, Import Substitution, Make in India (MII) Campaign, Skill India, Ease of doing Business, Sustainable Development Goals be given wide publicity, Government must try to lower the transaction cost for exports by proper fiscal management, make trade pact with Category – II countries like Switzerland, China, South Korea, Japan, Taiwan, Germany. Category – II nations are those nations with which India runs substantial Trade deficit.

d. Trade deficit has a positive correlation with Exchange rates. If Trade deficit increases then INR will depreciate in terms of USD and vice-versa. Dependency on Independent Variables w.r.t. dependent variables has decreased in Pre Liberalisation era from 97.71%) in comparison to Post-Liberalisation Era to 62.83%. This shows that other national and international factors have significant role to play in determining exchange rates of INR in comparison to USD other than discussed Independent Variables.

e. Table – 6 and Table – 14 shows that choice of Dependent and Independent Variables is correct and provides a true and fair picture and states that the variables are non – collinear. Table – 7 and Table – 12 tells us about impact of trade balance on determination of Exchange rates i.e. INR as against USD. From 1970 to 1992 it was 70.90% and from 1993 to 2016 it was 61.47%. This shows that there is a change pattern from dependency on Trade Balance to other Independent Variables like Invisibles Net, Foreign Investment and NRI Deposits.

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https://dbie.rbi.org.in/DBIE/dbie.rbi?site=publications. The data has been taken from the site of Reserve Bank of India which can be accessed by following the path - DBIE Home page>Time series publication>Handbook of statistics on Indian Economy>Annual series>Trade and Balance of Payment>Table No. 144. Exchange Rates have also taken from the site of RBI.

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