
Investigating the Impact of US Dollar, Pound Sterling and Yen on the Exchange Rate of the Indian Rupee

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ABSTRACT:

An exchange rate between two currencies is the rate at which one currency will be exchanged for another. Generally Exchange rates are determined in the foreign exchange market, which is open to a wide range of different types of buyers and sellers where currency trading is continuous. International trades are embellished by changes in the exchange rates and consequently it influences the Indian rupees per unit. The present paper investigates the impact of US dollar, Pound Sterling and Yen on the exchange rates of the Indian rupees per unit for the period starting from 1970-71 to 2014-15 using yearly data. The present paper has been designed with the application of unit root test, Johansen co integration test and Granger causality test. Johansen co integration test result indicates that there exists a long-term relationship among the selected variables. Granger causality test result shows that there must be either bidirectional or no causality among the variables.

Keywords: US Dollar, the Pound Sterling, Japanese Yen, unit root test; Granger causality test, Johansen co integration test.

1. INTRODUCTION

An exchange rate (also known as a foreign-exchange rate, forex rate, FX rate or Agio) between two currencies is the rate at which one currency will be exchanged for another. It is also regarded as the value of one country's currency in terms of another currency. Exchange rates are determined in the foreign exchange market, which is open to a wide range of different types of buyers and sellers where currency trading is continuous (Wikipedia). One rupee in pre-independence period is not the same as one rupee today, both in terms of appearance and purchasing power. Money keeps changing always with the society and its economic conditions. Higher demand for imported goods increases demand for foreign currencies and, thus, weakens the local currency. A country that sells more goods and services in overseas markets than it buys from them has a trade surplus. This means more foreign currency comes into the Country than what is paid for imports (Patel, 2012). This strengthens the local currency. Empirical studies point up that Indian currency counting rupee is very much discriminatory through numerous international currencies directly or indirectly. This study takes into consideration three indicators of exchange rate of the Indian rupees per unit, to be exact, US Dollar, the Pound Sterling, and Japanese Yen.

A decline of the household currency against foreign currencies increases export. But, at the same time, depreciation of domestic currency increases the cost of imports which indicates a positive

relationship between them (Arora, 2012). Hence, the relationship between the three exchange rates of Indian rupees per unit under study needs to be checked. Keeping in view of this, this paper examines the causal relationship between three exchange rates of the Indian rupees for the period starting from 1970-71 to 2014-15 using yearly data. The remainder of the paper is organized in the following sections. Section 2 provides Review of Literature. Section 3 discusses Materials and Methods. Empirical Analysis is presented in Section 4. The study is concluded in Section 5.

2. REVIEW OF LITERATURES

In the study of Samanta et al. (2012), it observed the co-movements of four macro-economic variables in terms of gold price, stock price, real exchange rate and the crude oil price based on 21 years data using econometric models for the periods from January 1989 to September 2009. The study exposes that there is a cointegration relationship between the variables. Sharma et al. (2012) has made a study to examine the long-run and short-run relationships between Sensex and four key macroeconomic variables (wholesale price index, index of industrial production, exchange rate and call money rate) of Indian economy by using monthly data from April, 2007 to March, 2012 with the application of financial econometrics. Empirical results of the study showed that there are no short-run causal relationships between Sensex and four macro-economic variables but confirmed long-run relationships between BSE Sensex with index of industrial production and call money rate. Le et al (2011) investigated the relationships between the prices of two strategic commodities, that is, gold and oil in terms of index of US dollar by using monthly data from January, 1986 to April, 2011 with the application of financial econometrics. Empirical results of the study showed that there is a long-run relationship existing between the prices of oil and gold and the oil price can be used to predict the gold price. Sharma et al (2010) estimated the long-term relationship between BSE and four macroeconomic variables consisting of exchange rates, foreign exchange reserve and inflation rate and gold price based on the secondary data between January 2008 and January 2009 using multiple regression models. Mukherjee et al. (1995) examined the relationship between stock market and exchange rate, inflation, money supply, real economic activity, long-term government bond rate, and call money rate in Japan. Their findings support a co integration relation. Keminsky et al (1998) explored the time series correlation between daily exchange rates and interest rates for six countries by using daily data during the second half of 1997. The study found the signs of unstable correlations and concluded that interest rates in those countries must not be an exogenous variable. In the study of Goldfajn et al. (1998) it observed the linkage between real interest rate and real exchange rate for the Asian countries during July 1997 to July 1998 by using Vector Auto regression (VAR) based on the impulse response function from the daily interest rates and exchange rates. They have not found any strong conclusion regarding the relationship between interest rate and exchange rate. The study divulges that exchange rate and gold price influences the stock prices in India.

A significant number of studies on the impact of exchange rates on other macroeconomic variables have already been undertaken. Though causal relationship and association between various macroeconomic variables have become most fascinating area for study but with the view of growth in economy, the importance of investigating the long-term association and pair-wise

connection between exchange rates of the Indian rupees per unit cannot be ignored. The comparative analysis between three indicators of exchange rate of the Indian rupees per unit, to be exact, US Dollar, the Pound Sterling and Japanese Yen is an area which has not yet explored. Keeping in view of this, this paper examines the impact of US dollar, Pound Sterling and Yen on the exchange rates of the Indian rupees per unit for the period starting from 1970-71 to 2014-15 using yearly data.

3. MATERIALS AND METHODS

3.1 Data source

The study is based enormously on secondary data acquired from RBI database for the period from 1970-71 to 2014-15. The data on exchange rate for Japanese Yen is based on Rupees per 100 Yen. Data from 1970-71 to 1991-92 are based on official exchange rates. Data from 1992-93 onwards are based on FEDAI (Foreign Exchange Dealers' Association of India) indicative rates. Data from 1971 to 1972-73 for the Japanese Yen are cross rates with the US Dollar.

3.2 Sample design

This study considers yearly data encircling the average yearly exchange rate of the Indian rupees per unit of US Dollar, the Pound Sterling and Japanese Yen. After appropriate fitting the data, there are 43 observations. Eviews 9 package program has been used for arranging the data and execution of econometric analyses.

3.3 Tools used

In the course of analysis of the present study, only econometric tools include Augmented Dickey Fuller (ADF) and Phillips- Perron (PP) test both at levels and 1st differences, Johansen's system of co-integration test and Granger causality test have been used.

3.4 Hypotheses taken

Hypothesis-1

H₀: Per unit exchange rate of the Indian rupees in terms of US Dollar, the Pound Sterling and Japanese Yen are not stationary.

H₁: Per unit exchange rate of the Indian rupees in terms of US Dollar, the Pound Sterling and Japanese Yen are stationary.

Hypothesis-2

H₀: Per unit exchange rate of the Indian rupees in terms of US Dollar, the Pound Sterling and Japanese Yen are not associated in the long period.

H₁: Per unit exchange rate of the Indian rupees in terms of US Dollar, the Pound Sterling and Japanese Yen are particularly associated in the long period.

Hypothesis-3

H₀: Per unit exchange rate of the Indian rupees in terms of US Dollar, the Pound Sterling and Japanese Yen are not related pairwise.

H₁: Per unit exchange rate of the Indian rupees in terms of US Dollar, the Pound Sterling and Japanese Yen are very much related pairwise.

4. EMPIRICAL RESULTS AND ANALYSIS

4.1 Unit root test results

Cointegration test technique is greatly supportive to detect the cointegration association between the two variables in the long period and it is realistic if the two variables are stationary in any case. In the present research paper, three indicators of exchange rate of the Indian rupees per unit, namely, US Dollar, the Pound Sterling and Japanese Yen may be connected in the long period on the prerequisite that they are not unpredictable or stationery. For the purpose of stationarity test, the present study use ADF and PP unit root test, both at levels and at 1st differences (intercept without trend and intercept with trend) in hopethesis-1 above.

Table-1: Unit Root Test Results

Test equation-intercept	ADF			
	at level	Prob.	at 1st difference	Prob.
LUSD	-0.320819	0.9133	-4.552590	0.0007
LPDS	-0.413284	0.8977	-3.913271	0.0042
LYEN	-1.508525	0.5198	-5.040290	0.0002
Critical values				
1%	-3.588509		-3.592462	
5%	-2.929734		-2.931404	
10%	-2.603064		-2.603944	
Test equation-intercept	PP			
	at level	Prob.	at 1st difference	Prob.
LUSD	-0.421342	0.8964	-4.51998	0.0007
LPDS	-0.150617	0.9371	-3.829816	0.0053
LYEN	-1.264622	0.6376	-5.040290	0.0002
Critical values				
1%	-3.588509		-3.592462	
5%	-2.929734		-2.931404	
10%	-2.603064		-2.603944	

*MacKinnon (1996) one-sided p-values.

Table-1 demonstrate the ADF and PP unit root test results at level and at 1st difference where it authenticates that three indicators of exchange rate of the Indian rupees per unit, to be precise, US Dollar, the Pound Sterling and Japanese Yen are not stationary at levels [I(0)] and are stationary at 1st difference [I(1)] because test statistics are less than critical value at level and are more than critical value at 1st difference at 1% level of significant both in the intercept without trend and intercept with trend. The unit root test moreover authenticates that constant variance is

seen in case of error terms that indicates statistical dependency, as supported in (Shahzadi and Chohan, 2012).

4.2 Co integration test results

Since three indicators of exchange rate of the Indian rupees per unit, to be exact, US Dollar, the Pound Sterling and Japanese Yen are stationary, for that reason, multivariate co integration method in Johansen approach can be applied to identify the co integration association between the variables in the long period. Simultaneously, this method can be determined by the co integration vectors. Since we make out two likelihood ratios, specifically, the Trace Test and the Maximum Eigen Value test can decide the co integration vectors. At the time of testing, the present research study accepts linear deterministic trend unrestricted with intercepts without trends on account of using a lag of 1 to 1 at 1st differences derived from Swartz Information Criterion (SIC) for the selected indicators under the study.

Table-2 reveals the multivariate co integration test results in the course of Johansen approach that offers positivity regarding connection between US Dollar, the Pound Sterling and Japanese Yen in the long period as trace statistics is more than critical value in case of both the likelihood ratio test, to be exact, the trace test and the maximum eigen value test. Consequently, the results of the multivariate co integration test do not accept the null hypothesis (talked about in hypothesis-2 above). This test also established the number (two) of co integration vectors. Trace test and Max-eigen value test indicates 2 co integration at the 0.05 level. It is moreover indicating that two common stochastic trends or a degree of market integration are present there.

Table-2: Cointegration Test Results
Included observations: 43 after adjustments
Trend assumption: Linear deterministic trend
Series: LUSD LPDS LYEN
Lags interval (in first differences): 1 to 1
Unrestricted Cointegration Rank Test (Trace)

Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None*	0.407271	40.69760	29.79707	0.0019
At most 1*	0.298476	18.20783	15.49471	0.0190
At most 2	0.066615	2.964291	3.841466	0.0851

Trace test indicates 2 co integration at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized		Max-Eigen	0.05
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No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None*	0.407271	22.48978	21.13162	0.0320
At most 1*	0.298476	15.24354	14.26460	0.0349
At most 2	0.066615	2.964291	3.841466	0.0851

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

4.3 Pair wise causal test

To establish the causal relationship with movement of causation between three indicators of exchange rate of the Indian rupees per unit, explicitly, US Dollar, the Pound Sterling and Japanese Yen, pair wise causal (Granger) test has been utilized in the present study. Table-3 illustrates the results of pair wise causal test and point up that there is no causal relationship exist (talked about in hypothesis-3 above) between, (i) the Pound Sterling and US Dollar, (ii) the Pound Sterling and Yen, (iii) Yen and US Dollar, (iv) US Dollar and Yen because the probability is more than 0.05. Table-3 also shows that there is bi-directional causal relationship exist between (i) US Dollar and the Pound Sterling (ii) Yen and the Pound Sterling because the probability is less than 0.05. Hence, pairwise causal assertion linking three indicators of exchange rate of the Indian rupees per unit, in particular, US Dollar, the Pound Sterling and Japanese Yen indicates that trend in one indicator is not the grounds for trend in other indicator under the study. Therefore, this study may conclude that causal relationship is merely a trend of the selected data under the period of study.

Table-3: Pairwise Granger Causality Tests (Lags: 2)

Null Hypothesis	Obs	F-Statistic	Prob.	Decision	Type of Causality
US Dollar \uparrow the Pound Sterling	43	4.55918	0.0168	Reject H_0	Bi-directional causality
the Pound Sterling \uparrow US Dollar		0.03128	0.9692	DNR H_0	No causality
Yen \uparrow the Pound Sterling	43	6.75886	0.0031	Reject H_0	Bi-directional causality
the Pound Sterling \uparrow Yen		2.39784	0.1045	DNR H_0	No causality
Yen \uparrow US Dollar	43	3.00202	0.0616	DNR H_0	No causality
US Dollar \uparrow Yen		3.14994	0.0542	DNR H_0	No causality

Note: Decision rule: reject H_0 if P-value < 0.05, DNR = Do not reject; \uparrow = does not Granger cause.

5. CONCLUSIONS

The primary finding of the present study is that selected three macroeconomic variables of exchange rates of Indian rupee are stationery time series data at I(1) that is an indication of the affiliation between US Dollar, the Pound Sterling and Japanese Yen in the long period. The empirical results of co integration method in the course of Johansen approach mention that protected co integration association between the selected variables under the study are greatly present in the long period. This research moreover illustrates that there are bidirectional causal connection present between US Dollar and the Pound Sterling, Yen and the Pound Sterling.

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