UNDERSTANDING THE CAUSAL ASSOCIATION OF EXCHANGE RATE OF THE POUND STERLING AND YEN ON INDIAN RUPEE

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ABSTRACT

Indian rupee is claimed as to be a `market determined ex-change rate'. Usually, Indian rupees per unit are very much influenced by the changes in the exchange rates of yen and pound Sterling. The present paper explores the causal association between pound Sterling and yen and its impact on the Indian rupees per unit for the period starting from 1970 -71 to 2014-15 using yearly data. The present paper has been premeditated with the application of unit root test, Johansen cointegration test and Granger causality test. Two indicators of exchange rate of the Indian rupees per unit, to be exact, the Pound Sterling and yen have been used for the purpose of the study. Johansen cointegration 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: yen, the Pound Sterling, unit root test; Granger causality test, Johansen cointegration test.

1. Introduction

Indian rupee is claimed as to be a 'market determined ex-change rate'. Exchange rate is universally known as a measure of international competitiveness. Foreign exchange market is the biggest financial market with a daily turnover of over USD 2 trillion. Foreign exchange markets were primarily developed to facilitate settlement of debts arising out of international trade. But these markets have developed on their own so much so that a turnover of about 3 days in the foreign exchange market is corresponding to the enormity of world trade in goods and services. The largest foreign exchange market is London followed by New York, Tokyo, Zurich and Frankfurt (Jayachandran, 2013). The business in foreign exchange markets in India has shown a steady increase as a consequence of increase in the volume of foreign trade of the country. Still the volume of transactions in these markets amounting to about USD 2 billion per day does not compete favorably with any well developed foreign exchange market of international repute. The reasons are not far to seek.

Rupee is not an internationally traded currency and is not in great demand. Much of the external trade of the country is designated in leading currencies of the world, Viz., US dollar, pound sterling, Euro, Japanese yen and Swiss franc. Incidentally, these are the currencies that are traded actively in the foreign exchange market in India (Jayachandran, 2013). The markets are situated throughout the different time zones of the globe in such a way that when one market is closing the other is beginning its operations. Thus at any point of time one market or the other is open. Therefore, it is stated that foreign exchange market is functioning throughout 24 hours of the day. In India, the market is open for the time the banks are open for their regular banking business. In most markets, US dollar is the means of

transportation currency, Viz., the currency used to denominate international transactions (Wikipedia). This is despite the fact that with currencies like pound sterling and Yen gaining larger share, the share of US dollar in the total turn over is shrinking. Generally international trades are exaggerated by changes in the exchange rates and consequently it influences the Indian rupees per unit (Arora, 2012).

Keeping in view of this, this paper examines the causal association of exchange rates of Pound Sterling and Japanese Yen and its effects on 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

Samanta et al. (2012) 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 investigate 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) have made a study to examine 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) observes 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 cointegration 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. 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 Autoregression (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 and causal long term association between the Pound Sterling and Japanese Yen is an area which has not yet explored. Keeping in view of this, this paper examines the causal long term association and pair wise connection between the Pound Sterling and Japanese Yen and their effect on the Indian rupees 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 extremely on secondary data collected 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 to1991-92 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 is cross rates with the US Dollar.

3.2 Sample design

Average yearly exchange rates of the Indian rupees per unit of the Pound Sterling and yen have been considered in the present study. 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

H_0: Effects of exchange rate of the Pound Sterling and yen on Indian rupees per unit are not stationary.

H_1: Effects of exchange rate of the Pound Sterling and yen on Indian rupees per unit are stationary.

Hypothesis-2

H_0: Effects of exchange rate of the Pound Sterling and yen on Indian rupees per unit are not associated in the long period.

H_1: Effects of exchange rate of the Pound Sterling and yen on Indian rupees per unit are particularly associated in the long period.

Hypothesis-3

H_0: Effects of exchange rate of the Pound Sterling and yen on Indian rupees per unit are not related pair wise.

H_1: Effects of exchange rate of the Pound Sterling and yen on Indian rupees per unit are very much related pair wise.

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 stationery in any case. In the present research paper, two indicators of exchange rate of the Indian rupees per unit, namely, the Pound Sterling and 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

ADF		
Test equation-intercept	at level	at 1st difference
LPDS	-0.413284	-3.913271
	(0.8977)	(0.0042)
LYEN	-1.508525	-5.040290
	(0.5198)	(0.0002)
Critical values		
1%	-3.588509	-3.592462
5%	-2.929734	-2.931404
10%	-2.603064	-2.603944

PP		
Test equation-intercept	at level	at 1st difference
LPDS	-0.150617	-3.829816
	(0.9371)	(0.0053)
LYEN	-1.264622	-5.040290
	(0.6376)	(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 two indicators of exchange rate of the Indian rupees per unit, to be precise, the Pound Sterling and 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 Cointegration test results

Since two indicators of exchange rate of the Indian rupees per unit, to be exact, the Pound Sterling and yen are stationary, for that reason, multivariate cointegration method in Johansen approach can be applied to identify the cointegration association between the variables in the long period. Simultaneously, this method can be determined by the cointegration vectors. Since we make out two likelihood ratios, specifically, the Trace Test and the Maximum Eigen Value test can decide the cointegration 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 cointegration test results in the course of Johansen approach that offers surety regarding connection between 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 cointegration test do not accept the null hypothesis (talked about in hypothesis-2 above). This test also established the

number (one) of cointegration vectors. Trace test and Max-eigen value test indicates 1 cointegration 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: LPDS LYEN
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None*	0.305261	19.10972	15.49471	0.0136
At most 1	0.077062	3.448313	3.841466	0.0633

Trace test indicates 1 cointegration 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 No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None*	0.305261	15.66141	14.26460	0.0299
At most 1	0.077062	3.448313	3.841466	0.0633

Max-eigenvalue test indicates 1 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 Pairwise causal test

To establish the causal relationship with movement of causation between two indicators of exchange rate of the Indian rupees per unit, explicitly, the Pound Sterling and Yen, pairwise causal (Granger) test has been utilized in the present study. Table-3 illustrates the results of pairwise causal test and point up that there is no causal relationship exist (talked about in hypothesis-3 above) between the Pound Sterling and Yen because the probability is more than 0.05. Table-3 also shows that there is Uni-directional causal relationship exist between Yen and the Pound Sterling because the probability is less than 0.05. Hence, pairwise causal assertion linking two indicators of exchange rate of the Indian rupees per unit, in particular the Pound Sterling and 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
Yen ↑ the Pound Sterling	43	6.75886	0.0031	Reject H_0	Uni-directional causality
the Pound Sterling ↑ Yen		2.39784	0.1045	DNR H_0	No causality

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

5. Conclusions

The primary finding of the present study is that selected two macroeconomic variables of exchange rates of Indian rupee are stationery time series data at I (1) that is an indication of the affiliation between the Pound Sterling and Japanese Yen in the long period. The empirical results of cointegration method in the course of Johansen approach mention that protected cointegration association between the selected variables under the study are greatly present in the long period in case of Maximum Eigenvalue test as well as Trace test. This research moreover illustrates that there are unidirectional causal connection present between Yen and the Pound Sterling.

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