

A study on Causal Relationship between Spot Return and Future Return of EURO / INR currency pair traded in India

Dr.Velmurugan P.S^[a]

Mr. Raghavendra R.H^[b]

Abstract

The short term association between spot return and future return of EURO/INR currency pair traded in India is the subject of present study. With the objective of examining the short term relationship, we examined the short term causal relationship between Spot return and the future return of EUR/INR traded in India from the period of February 2010 to December 2012 through the Granger causality test. Before the investigation of causality, the descriptive statistical test and Unit root test for stationarity is done through ADF and PP test. The Granger causality test results revealed Spot Return does not cause the Future Return, but Future return causes the Spot return uni-directionally. The results show clearly that there is a unidirectional causal relationship between Spot return and the future return of EUR/INR currency pair traded in India.

Key words: Short term relationship, Euro, Granger causality test

^[a] **Dr.Velmurugan P.S**

^[b] **Mr. Raghavendra R.H**

Assistant Professor,

PhD Research Scholar,

Department of Commerce School of Management, Department of Commerce School of Management

Pondicherry University, Pondicherry-605 014,

Pondicherry University, Pondicherry-605 014,

India.

India.

+91 9944115566

+91 8015896437

velmuruganps@yahoo.com

raghavpondiuni@gmail.com

1. Introduction:

Each country has its own currency through which both national and international transactions are performed. All the international business transactions involve an exchange of one currency for another. The foreign exchange market of a country provides the mechanism of exchanging different currencies with one and another, and thus, facilitating transfer of purchasing power from one country to another. The price of one currency in terms of another currency is known as the exchange rate. With the multiple growths of international trade and finance all over the world, trading in foreign currencies has grown tremendously over the past several decades. Since the exchange rates are continually changing, so the firms are exposed to the risk of exchange rate movements. As a result, the assets or liability or cash flows of a firm which are denominated in foreign currencies undergo a change in value over a period of time due to variation in exchange rates (Jaitly L 2010).⁵

Foreign exchange markets serve some basic needs such as hedging, speculation and arbitrage. While the investors who take more risk are active in the spot markets not supported by futures exchange markets, the spot markets supported by the futures exchange give those who have different risk profiles the opportunity to carry out transactions in spot markets, which mean extra participation in the market. Introduction of new investors into the market would lead to price volatility due to previous excessive speculation. Later, some of the speculation will be forwarded to the futures market and thus the price volatility in the spot market will decrease. Existence of futures markets facilitates the investors to protect their securities from systematic risks when they trade in the spot market. Purchasing in spot market and selling in futures market would serve this function (Ercan Özen et al 2009)⁷. The futures are the standardized forward contracts which are traded on stock exchanges, which implies that future represent the prospective price of the underlying asset in the spot market, i.e., the futures will direct the next price move in the spot market. (Sibler and Gabrade 1983)¹¹

Having mentioned the importance of future market in price discovery and risk management, this study attempts to find out the causal relationship between spot and future prices of EUR/INR currencies traded in MCX-SX Currency exchange and reference rate of the Reserve Bank of India.

2. Review of Literature:

Somnath Sharma (2011)¹ examined the relationship between currency futures and exchange rates volatility in India. The main question was to check whether both variables have an influence on each other. Hence the data of USD/INR currency spot from RBI reference and future data from NSE had been collected from 2008 to 2010 and both were put to test for Granger causality to investigate the relationship between spot volatility and futures trading activity. The results indicate that there was a two-way causality between exchange rate volatility and futures trading activity.

Habib A, Syed and Shah (2010)³ examined the impact of futures trading on the Spot Price Volatility of Karachi stock exchange. The data of Spot Index and KSE-100 Index, were collected for the period from July, 2001 to January, 2010. It is observed that only coefficients of KSE-100 returns were found to be statistically significant showing that KSE-100 market assists in forecasting of both spot and futures markets. But futures and spot markets were not able to forecast each other and KSE-100. Thus KSE-100 market leads and futures market and spot markets follow it, and that KSE-100 returns Granger causes futures returns and spot returns. P-Values were found to be 0.00692 and 0.00322 respectively. As both P-values are less than 0.01, so the null hypothesis of no Granger causality was rejected.

Nikola G (2010)² critically investigated the causality relationship between spot exchange rates and aggregate currency order flow in the Canada/U.S. Dollar market. In particular, by utilizing the wavelet methodology, The Granger causality was found to persistently run both ways, from order flow to Forex returns and in the reverse direction. The presence of a perverse causal relationship at all time scales could arise from a number of factors. To assess causality at different time scales, Granger causality tests are applied on wavelet details of Forex returns and total order flow (xt) series. Finally, results shows that Granger causality is found to persistently run both ways, from order flow to Forex returns and in the reverse direction.

Ercan Ö, Tunga B and Muhittin Z (2009)⁷ in their study attempted to determine whether a short term and long term relationship of causality between the İMKB 30 index and the futures transactions carried out in Izmir Derivatives Exchange (VOB) over Istanbul Stock Exchange Index 30 (İMKB30) exists or not. Based on result of the study it was identified that both futures prices and spot market prices were stationary at the same level I(1) and co-integrated. When the causality between forward quotation and spot price was investigated, a long-term causality relationship moving from VOB towards İMKB had been discovered. After 2007, a significant increase in the trading volume was observed thus affecting the analyses carried out. Hence, a bidirectional causality relationship between futures quotations and spot prices in the long term was discovered.

Christos F (2009)⁶ used the Granger-causality test to determine whether changes in one variable (futures) cause changes in another (spot). The results from the application of Granger causality tests to FTSE/JSE Top 40 spot and futures data shows that there was strong evidence of bidirectional causality between futures and spot prices in South Africa. Therefore, they proved that there was a feedback relationship between FTSE/JSE Top 40 futures and spot prices. In other words, they found that futures (spot) can help forecast spot (futures) from SAFEX. They conclude that there was a strong correlation between the current and the past values.

Young-H K and Sunghee.C (2006) in their study explored the linkages between financial markets, especially stock index futures market and foreign exchange market. Further they also investigated whether the effects of stock index futures on exchange rate are significant or not. The Granger causality test indicated that futures price has explanatory power in forecasting stock and exchange rate. Second, generalized impulse response function showed that both portfolio approach and price discovery function of stock index futures market were supported. Through this analysis, it was identified that the effects of stock index futures market on foreign exchange market were significant.

Most of the earlier studies were related to the analysis using Granger-Causality on currencies especially different foreign currency spot and future prices. The relationship between the spot and future price has been the center of attention for the above studies. It is important to point out that, on utilizing that methodology, in the sense that exchange markets have different closing times in different countries throughout the world. Most of the research based on Granger causality test found bidirectional causality between spot and futures of varied currencies other than currencies traded in India like relationship between INR and other base currency pairs. Hence based on the research gap, the present study attempts to investigate the causal relationship or short term relationship of spot and future prices of EURO/INR currency traded in MCX-SX and RBI reference in India using the tests of ADF test, PP test and Granger causality test.

3. Objectives:

The primary objective of the study is to examine the short term relationship between Spot and Future return of EURO/INR currency pair traded in India. The other objectives derived for the study are

1. To ascertain the stationarity of Spot and Future return of EURO/INR data series.
2. To analyze short term relationship between the Spot and Future return of EURO/INR.

4. Data and Methodology:

The data employed in this study comprise daily observations of the EURO/INR prices. The currency futures price of Euro (EUR)/INR is collected from MCX-Stock Exchange Ltd (MCX-SX) and Spot price of Euro/INR currency was collected from Reserve Bank of India (RBI) reference rate during the period from February 2010 to December 2012.

Step 1: Augmented Dickey Fuller (ADF) test and Phillips-Perron (PP) test

The scheduled procedure for determining the order of integration of a time series is the ADF. It is one among the several ways of testing the presence of unit root test of the data series. It controls the serial correlation by adding lagged first difference to the auto regressive equation. The equation estimated for examining the stationary of the data series is given.

$$\Delta Y_t = \alpha_0 + \beta t + \alpha_1 Y_{t-1} + \sum_{i=1}^p \alpha_i \Delta Y_{t-i} + \varepsilon_t \dots\dots\dots (1)$$

Where, α_0 is constant, t is a deterministic trend, and p is the lag differences.

The t-value for α_1 should be consistent with the hypothesis that $\alpha_1=0$. However, one of the concerns for simple Dickey-Fuller test is that it is only valid for AR (1) process. If the time series is correlated at higher lags, the Augmented Dickey-Fuller test constructs a parameter correction for higher order correlation by adding lag difference of the time series. The level of p is chosen by minimizing information criteria such as Akaike or Schearz.

Philips-Perron test:

Phillips and Perron (1988) proposed an alternative method of controlling for serial correlation when testing for a unit root. Consider the following regression model for a time series

$$X_t = \alpha X_{t-1} + u_t \dots\dots\dots (2)$$

Where, u_t is the error term. To test for a unit root test, the regression t-statistics for the null hypothesis ($H_0: \alpha=1$), denoted by t_α , is adjusted non-parametrically to account 1 for possible serial correlation in u_t . if each price series is an I (1) process, the series can be modeled by cointegration analysis (Ahmed, H. J. 2009)³. Hence for checking the stationarity of the data series, the following hypothesis were formed

H_0 : The spot and future return of EUR/INR is not stationary at level

H_1 : The spot and future return of EUR/INR is stationary at level

Step 2: Granger causality test

Granger causality has emerged as a powerful technique for investigating causal trends in multivariate time series and provides a sound methodology for modeling the short run relationship in a system. The purpose of the Granger causality test is to determine whether future price cause the spot price or vice versa and explores the short-run equilibrium relationship among the variables. Under this study, Granger causality tests have been used to assess the causal run predictability among RBI Spot reference rate and MCX-SX Future Prices of, EURO/INR, using the Granger causality test.

Empirical evidence on the Casualty relationship of Spot return and Future Return of EURO are based on the following equations. (Foresti, P. 2007)⁹

$$EISR = \sum_{i=1}^n \alpha_i EIFR_{t-i} + \sum_{j=1}^n \beta_j EISR_{t-j} + u1t \dots \dots \dots (1)$$

$$EIFR = \sum_{i=1}^n \alpha_i EISR_{t-i} + \sum_{j=1}^n \beta_j EIFR_{t-j} + u2t \dots \dots \dots (2)$$

Where EISR is EUR/INR Spot Return, EIFR is EUR/INR Future Return.

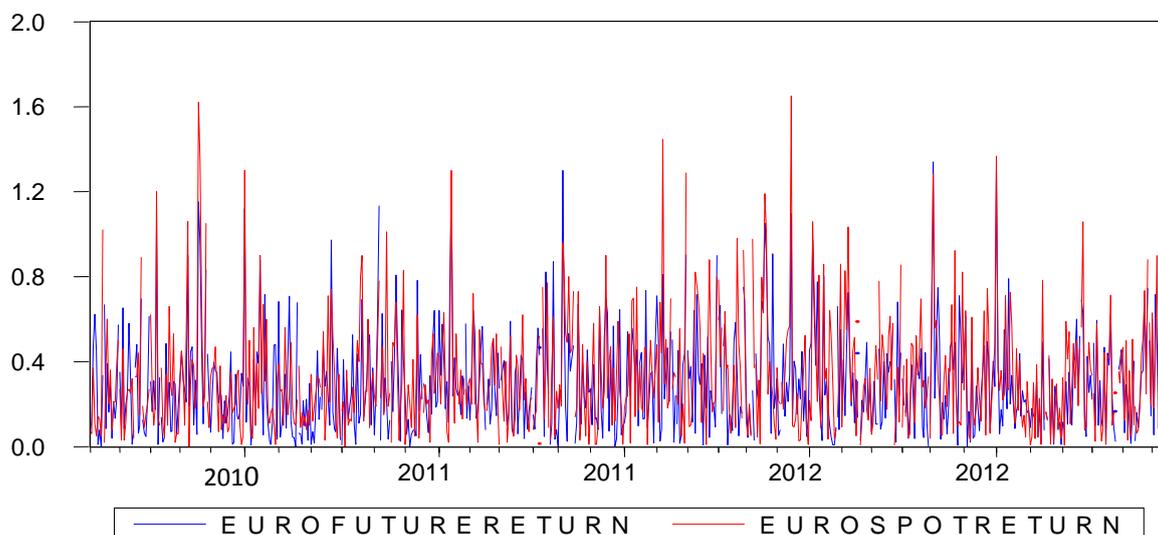
Based on the estimated equations (1) and (2) two different hypotheses about the relationship between Spot return and Future return can be formulated:

1. Ho: EUR/INR spot return does not granger cause EUR/INR future return
2. H1: EUR/INR future return does not granger cause EUR/INR spot return

Hence, by obtaining based on the equation (1) and (2) it may be possible to detect the causality relationship between Euro/INR spot return and EUR/INR future return traded in India.



Graph 1:
Daily observation of spot return and future return of EUR/INR currency traded in India



The EUR/INR spot and future returns from 1st February 2010 to 18th December 2012 is plotted with the aid of Eviews-5. By this graph we have to determine whether any causal or short term relationship between EUR/INR spot return indicated by red color line and EUR/INR future returns indicated by blue color line during the study period. By observing these both lines of future and spot return data, we could infer there will be causality between EUR/INR spot and future return.

6. Results and Findings

Table -1:

Descriptive statistics of Spot and Future EUR/INR Currency traded in India

	EUROFUTURERETURN	EUROSPOTRETURN
Mean	0.295683	0.326587
Median	0.240000	0.270000
Maximum	1.340000	1.651100
Minimum	0.000000	0.000000
Std. Dev.	0.234535	0.263768
Skewness	1.258940	1.508764
Kurtosis	5.041727	6.124022

The Table-1 of descriptive statistics shows that the mean values of Euro/INR future return and Euro/INR spot return are 0.295683 and 0.326587 respectively. It shows that the Euro/INR spot return is more than the Euro/INR future return. Standard deviation value spread from the mean to the extent of 0.234535 and 0.263768 for Euro/INR spot return and Euro/INR future return respectively. Euro/INR spot returns have a higher standard deviation than Euro/INR future return. The value of the skewness is 1.258940 and 1.508764 respectively. There is positive skewness in the study period and the distribution has a long right tail. A positive skew indicates that the tail on the right side is longer than the left side and the bulk of the value lying to the left of the mean. The kurtosis is mesokurtic relative to the normal because it exceeded 3.

Unit Root Test:

In order to determine whether the variables are stationary, Augmented Dickey Fuller (ADF) and PP test has been applied.

Table- 2
ADF and PP test for Spot Return and Future Return of EUR/INR

Currency pair EUR/INR	Augmented Dickey–Fuller (ADF) Test		Phillips-Perron (PP)Test
	Particulars	At Level	At Level
Spot return of EUR/INR	ADF stat	-24.64796*	-24.69952*
	P-Value	0.0000	0.0000
Future return of EUR/INR	ADF stat	-24.74112*	-24.73832*
	P-Value	0.0000	0.0000

*1% level significant

The table- 2 shows that the ADF and PP test results for the daily exchange rates of time series data sets. The ADF test for EURO/INR spot and future prices were -24.64796* (0.0000) and -24.74112* (0.0000) strongly reveals that Spot and Future return of EURO/INR are stationary in at Level at 1% level of significance. In order to double check the robustness of the results, Phillips and Perron (1988) test of stationarity have also been performed for the series. The results of this test were -24.69952* (0.0000) and -24.73832 (0.0000) also stationary at Level at 1% level of significance. Hence the null hypothesis are rejected and alternative hypothesis are accepted i.e., both spot and future returns of EUR/INR are stationary at 1% significance level.

Pair wise Granger Causality test:

As the series were stationary at level their causality is tested using Pair wise Granger Causality test. The aim of this test is to determine whether EUR/INR spot return causes the Future return or Future return causes the Spot return in India. The test results are presented in Table in Table no.3 below.

Table No.3

Pair wise Granger Causality test for Spot Return and Future Return of EUR/INR

Currency pair of EURO/INR	Hypothesis	F-Stat	Reject/Not Rejected	Direction
Spot Return of EUR/INR	Spot Return does not cause the Future Return	1.10565 (0.33158)	Not Rejected	SR \nrightarrow FR
Future Return of EUR/INR	Future Return does not cause the Spot Return	5.60127* (0.00386)	Rejected	FR \rightarrow SR

*1% level significance level

From the above table we could able to infer that the Spot Return of EURO/INR is 1.10565 (0.33158) have no direction towards future return of EUR/INR is 5.60127* (0.00386) i.e., the spot return does not cause the future return, hence the null hypothesis (H_0) accepted. Again in the second pair, it shows unidirectional or causality indicating that future return of EURO/INR is 5.60127* (0.00386) causes the spot return of EUR/INR is 1.10565 (0.33158) were (H_1) is rejected. Hence there is no bidirectional causality and only future returns Granger cause the spot return of EUR/INR at 1% significance level.

7. Conclusion

The purpose of the study is to find out short-term relationship between the Spot return and Future return of EUR/INR currency pair traded in India. The results from unit root test (ADF, PP) indicate that spot and future prices of Euro are stationary at Level, which strongly rejected the null hypotheses at 1% level significance. It examination of causality relations was tested through the Granger causality test and the results of the test indicated Spot Return does not cause the Future Return, but Future return is causes the Spot return uni-directionally. The results show clearly that there is a unidirectional causal relationship between Spot return and Future return of EUR/INR.

Reference-

- [1]. Sharma, S. (2011). An Empirical Analysis of the relationship between currency futures and exchange rates volatility in India. *RBI Working paperseries WPS(DEPR):1/2011*
- [2]. Gradojevic, N. (2010). Multiscale analysis of microstructure causality in the foreign exchange market. *International Journal of Industrial Engineering and Management (IJIEM), Vol.1 No 2 , 47-52.*
- [3]. Habib Ahmad, Syed Zulfiqar Ali Shah, Idrees Ali Shah. (2010). Impact of Futures Trading on Spot Price Volatility:Evidence from Pakistan. *International Research Journal of Finance and Economics ISSN 1450-2887 Issue 59 , 147-165.*
- [4]. Manuel Hernandez, Maximo Torero. (2010). Examining the dynamic relationship between the spot and future prices of Agricultural commodities. *IFPRI Discussion Paper 00988 , 1-52.*
- [5]. Jaitley, L. (2010). A project on Analytical study on Currency Derivatives in India. Retrieved March 15, 2013, from <http://www.scribd.com/doc/58231079/Currency-Derivatives-Project-Lavish>
- [6]. Floros, C. (2009). Price Discovery in the South African Stock Index Futures Market. *International Research Journal of Finance and Economics ISSN 1450-2887 Issue 34 , 148-159.*
- [7]. Ercan Özen, T. B. (2009). The Relationship of Causality between the Price of Futures Transactions Underlying Stock Exchange and Price of Cash Market: The Case of Turkey. *Middle Eastern Finance and Economics ISSN: 1450-2889 Issue 4 , 1-10*
- [8]. Joshua V. Rosenberg and Leah G. Traub. (2008). Price Discovery in the Foreign Currency Futures and Spot Market. *Federal Reserve Bank of New York Staff Reports, no. 262 , 1-43.*
- [9]. Foresti, P. (2007). Testing for Granger causality between stock prices and economic growth. *Munich Personal RePEc Archive (MPRA) Paper No. 2962 .*
- [10]. Karpoff, J. M. (1987). The Relation between Price Changes and Trading Volume: A Survey. *The Relation Between Price Changes and Trading Volume: A Survey , 109-126*
- [11]. Silber, K. D. (1983). Price Movements and Price Discovery in Futures and Cash Markets. *The Review of Economics and Statistics, MIT Press, vol. 65(2) , 289-97.*