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Dynamic Linkages Between Cnxbank Nifty and Exchange Rates: Evidence From Indian Market

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ABSTRACT: *The present study deals with the examination of the causal relationship between foreign exchange rates and Bank stock prices in India from January 2010 to December 2013 using the information of daily closing observations of the NSE Bank Nifty and the nominal Indian Rupee per US dollar exchange rates. The exchange rate of Indian rupee and US Dollar has been taken for the study, because, US dollar is considered as a prominent currency for foreign trade. Statistical tests are applied to study the behavior and dynamics of both the series. The study also investigates the effect of both the time series mutually. The results of the study indicate both Bank Nifty returns and Exchange Rates are not normally distributed. Also it was found that, time series; Exchange rate and Bank Nifty returns are stationary at the level form itself. A negative correlation is observed between Bank Nifty returns and Exchange Rates.*

KEYWORDS*: Exchange Rate, Bank Nifty, J-B Test, Granger causality, Unit root test.*

I. INTRODUCTION

Stock market is distinguished as an extremely momentous factor of the financial sector of any economy.it plays an imperative role in the mobilization of capital in India. Stock markets are very sensitive and they get affected whenever there is any calamity in the world whether it relates to religion, politics, finance, etc. So decision in choosing the stocks for any person should be very specific. Choosing stocks should be very practical and precise and also needs to be very sure of goals in the stock market. Investors should have good idea about stock exchanges and its role in the stock market. One should also analyze the whole market before investing in any stocks because a small mistake in choosing the right stocks can leave a person bankrupt. In India there are two stock exchanges Bombay stock exchange known as BSE and National stock exchange known as NSE. BSE has 30 stocks in its group for trading whereas NSE has 50 stocks for trading. NSE stocks are also known as nifty. The record of the large companies of different sectors is maintained by Nifty which is the leading index in the Indian Stock Market. It is also known as S&P CNX Nifty, Standard & Poor's CRISIL NSE Index or simply Nifty 50. Nifty stocks consist of 23 different economic sectors.

1.1 Importance of Nifty

NSE provides trading facility across the nation for all securities of different sectors. Through the process of an appropriate technology, it ensures equal access to all investors in the world. NSE achieved its objectives in a very short duration. It deals with different market segments like equity market and capital market, futures and options or derivatives market, wholesale debt market, mutual funds, initial public offerings and so on. For short term investments, NSE provides the platform in the form of daytradingwhich is most popular nowadays among the investors. Financial market in Indiaplays prominent role on collecting money and encouraging investments, therefore, current paper is designed to find the effect of Exchange rate on Banks stock prices in India through NSE.The outcome of this study will provide investors helps to compose their individual proper investment decisions on Banks stocks.

1.2 Bank Nifty (CNX Bank Index)

CNX Bank Index developed by India Index Service and Product limited provides a benchmark of the Indian banking sector, It is the part of Nifty comprised of 12 most liquid and large capitalized stocks from the banking sector. CNX Bank Nifty provides performance of Indian Banks to investors and market intermediaries for investment. These bank stocks will trade on the National Stock Exchange. Banks have bigger role in Indian economy and it is very important to know the changes in investment pattern of investors in Bank stocks. In this regard itisan important and relevant in studying the effect of exchange rate on Bank stocks.

1.3 Exchange Rate

There are a wide variety of factors which influence the exchange rate, such as interest rates, inflation, and the state of politics and the economy in each country. The exchange rate between the U.S. dollar and the Indian rupee is the ratio at which the U.S. unit of currency may be traded for the rupee. The fluctuation of exchange rate between currencies may be attributed to the economic principle of supply and demand. Speculations of foreign exchange traders about the futures of particular currencies will decide the demand for a particular currency. At the University of California, Mr. Hal Varian, a Professor of business, economics and information management,stated "As foreign exchange speculators change their views about the future, their demand for currency changes, resulting in exchange-rate fluctuations.

II. REVIEW OF LITERATURE

Divyang Patel and Nikita Kagalwala(2013) analyzed the relationship between exchange rate($/Rs.) and Indian stock exchange like BSE,NSE etc., using monthly data and found that there is no or little impact of exchange rate (USD/INR) on Indian stock market (Nifty and Sensex). Deepti Gulati and Monika Kakhani(nov 2012),in their study, entitled "Relationship between Stock market and foreign exchange market in India" studied the existence of a causal relationship between foreign exchange rates and stock market by applying Granger causality test and correlation test.Study concluded that there is no or little impact of exchange rate on Indian stock market (NIFTY AND SENSEX).According to GauravAgrawal (Dec 2010), the Nifty return and exchange rates were non-normally distributed, an inverse relationship between Nifty returns and exchange rate. Also, based on the results of Unit root test concluded that the time series, exchange rate and Nifty return are stationary at the level form itself.

The study of dynamic linkage between exchange rate and stock price of seven East Asian Countries during 1988 to 1998, by Pan*et al.* (2007) states that before the Asian crisis, there was a bi-directional causal relationship for Hong Kong and a uni-directional causal relationship from exchange rates and stock prices for Japan, Malaysia and Thailand and from stock price to exchange rate for Korea and Singapore. Vygodina (2006) conducted empirical study for the period 1987 to 2005 to analyze the exchange rates and stock price nexus for large cap and small cap stocks in United States. The study was made using Granger causality methodology. The results of the study showed that there is causality for large cap stocks to exchange rate but, there is no causality for small cap stocks to exchange rate.Doong*et al.* (2005) conducted the study over the period 1989 to 2003 in order to investigate the dynamic relationship between stock and exchange rate for six Asian countries. From the study it is observed that financial variables are not cointegrated. The Granger Causality test was applied and the results showed the bi-directional causality between the series in Indonesia, Korea, Malaysia and Thailand. Also, a significant negative relation between the stock returns and the exchange rate for all the countries except Thailand.Kurihara, (2006)stated that apart from exchange rate, other factors, such as enterprise performance, dividends, stock prices of other countries, gross domestic product, , interest rates, current account, money supply, employment, their information etc. have an impact on daily stock prices.Prakash G.apte (2001) made study during the period 1991-2000 to study the relationship between the volatility of the stock market and the nominal exchange rate of India using the daily closing USD/INR exchange rate, BSE 30(Sensex) and Nifty-50. In their report it is revealed that there appears to be a spillover from the foreign exchange market to the stock market but not the reverse.In recent days, economists are giving importance for the study of temporal relation between stock returns and exchange rates, for theoretical as well as empirical reasons.The development of a country's economy isinfluenced by the changes in the series, exchange rate and stock price. Also, the relationship between stock returns and foreign exchange rates gives the guidelines in predicting the future trends for each other by investors.

III. RESEARCH GAP

In the earlier studies, researchers have established the impact of exchange rate on all types of stocks comes under BSE and NSE.The banking sector is significant along with other sectors in determining the overall performance and movement of Nifty index which helps the investors to choose various banks stocks for investment. Since Banks have major role in Indian economy, it is important to study various factors which influence the prices of banks stocks. One such factor is Exchange rate of Indian rupee to US dollar. The present study is carried out to know about the effectof Exchange rate only on Banks stocks

IV. OBJECTIVES OF THE STUDY

[1] To study the relationship between Exchange rate and Bank Nifty Index movement of NSE.
[2] To understand the causal relationship between Exchange rate and Bank Nifty Index movement of NSE.

HYPOTHESES

To understand the behavior of the twovariables, the following hypotheses are formed.

First Hypothesis Ho: Banks Stock returns and exchange rates are not normally distributed.

Second Hypothesis Ho: Both series Banks stocks return and exchange rates are non-stationary (i.e.) Unit root exists)

Third HypothesisHo: Banks Stock prices and Exchange rates are uncorrelated.

Fourth HypothesisHo: Causality does not exist between Banks stock returns and exchange rates.

V. ANALYSIS AND INTERPRETATION

The present study focuses on studying the movement of Bank stocks returns and exchange rates for checking the volatility. The study isconducted on Bank Nifty returns and Indian Rupee-US Dollar Exchange Rates. The data of daily stock market index and exchange rate (expressed in Indian Rupee per U.S. dollar) for India are taken for the empirical study. The stock index Bank Nifty of National Stock Exchange (NSE) is considered for this purpose. The stock Index, Bank Nifty of NSE is one of the indices available for Indian Stock market constructed with cost consideration. For study, daily data is taken from January, 2010to December 2013.The movement of exchange rates and Bank Nifty index are well understood by daily data and are more precise. Banking companies stock returns in addition to exchange rates are computed by daily closing prices with the Bank Nifty Index and Indian Rupee/US dollar ratios respectively. The daily returns and exchange rates are actually matched by calendar time frame.

5.1 Theoretical Framework

To find the movement and the relationship between Banks stocks prices and exchange rates, Day-to-day stock returns are calculated by having the natural logarithm from the daily closing price relatives, i.e. r= ln P(t)/P(t-1),where P(t) is the closing Bank Nifty price of the t^{th} day. Similarly, natural logarithm of the daily exchange rate relatives are computed as lnE(t)/E(t-1).

In order to test the above stated hypotheses and to draw valid conclusions from the results on the movement of two variables, views software (version 4.0) has been used. The tests which are conducted are JB Test, Correlation test, Unit root test and Granger Causality test.

5.1.1 Normality Test

This test named is after Carlos Jarque and Anil K. Beraand this is usedto check whether sample data have the skewness and kurtosis matching a normal distribution . The test statistic JB is understood to be.

$$JB = \frac{n}{6}\left(S^2 + \frac{1}{4}(K-3)^2\right)$$

Where *n* is the number of observations (or degrees of freedom in general); *S* is the sample skewness, and *K* is the sample kurtosis:

The *JB* statistic asymptotically features a chi-squared distribution with two degrees of freedom, if the data has been drawn from normal distribution. This statistic can be used to test whether the data are from a normal distribution. Samples from a normal distribution will have an expected skewness of 0 and an expected excess kurtosis of 0 (which is the same as a kurtosis of 3). To test the hypothesis for normality of data, the null hypothesis to be tested are the skewness being zero and the excess kurtosis being zero.

5.1.2 Unit Root Test (Stationarity Test)

According to Gujrati (2003), stationarity of series means the mean and variance are constant (non-changing)with the passage of time and distance, or covariance computed at the actual time is not influenced by lag between the two time periods.stationarity of series can be checked by a unit root test.The common assumptions for asymptotic analysis are not valid when the variables of the regression model will not be stationary. As a result of this, parameters of the regression model cannot be tested because; the usual "t-ratios" will not follow a t-distribution.Augmented Dickey Fuller (ADF) [Dickey and Fuller (1979, 1981) test has been used for stationarity in the current study.

5.1.3 Augmented Dickey–Fuller (ADF) Test

A augmented Dickey–Fuller test (ADF) is a test for a unit root within a time series sample. It is an augmented version on the Dickey–Fuller test for just a larger and more complicated set of time series models. The augmented Dickey–Fuller (ADF) figure, used in the test, is a negative number. The more negative value contributes to the more powerful rejection of the null hypothesis that there is a unit root at some confidence level. Higher-order correlation might be controlled by this ADF approach by having lagged difference terms of the dependent variable to the right-hand side in the regression.The Augmented Dickey-Fuller test model taken in this study is as follows.

$$\Delta Y_t = b_0 + \beta\, Y_{t-1} + \mu_1\, \Delta Y_{t-1} + \mu_2 \Delta Y_{t-2} + \ldots.. + \mu_p\, \Delta Y_{t-p} + e_t$$

$Y_t$signifies time series to get tested, b_0 is the intercept term, β is the coefficient of interest in the unit root test, μ_i is the parameter of the augmented lagged first difference of Y_t to represent the p^{th}order autoregressive process,and e_t is the white noise error term.

5.1.4 Granger Causality Test

In order to determine the influence of one time series in forecasting another series, Granger causality test can be applied. A time series X is said to Granger-cause Y if it could be shown, usually through a few t-tests and F-tests about lagged values of X (and using lagged values of Y also included), that those x values provide statistically significant details about future values of Y.the test is conducted using the level values of two (or more) variables when the time series .The Akaike information criterion or the Schwarz information criterioncan be used to find the number of lags to be included when the series are non-stationary and the test is performed using first(or higher) differences.Engle and Granger (1987) expresses that, a vector auto-regression in the first differences will beunspecified when two non-stationary variables are usually co-integrated. An error-correcting modelshould be constructed when the variables are co-integrated. In the present study, as the variables are not co-integrated,Bivariate Granger causality test is applied at the first difference of the variables. The vector auto regression (VAR) lag order selection method available in Eviews is used to determine the appropriate lag length for each pair of variables in the Granger Causality test.

The Granger Causality test is performed as follows:

$$Y_t = \alpha_0 + \alpha_{11} Y_{t-1} + \alpha_{12} Y_{t-2} + \ldots. + \alpha_{1p} Y_{t-p} + \beta_{11} X_{t-1} + \beta_{12} X_{t-2} + \beta_{13} X_{t-3} + \ldots. + \beta_{1p} X_{t-p} + e_t$$

$$X_t = \beta_0 + \alpha_{21} X_{t-1} + \alpha_{21} X_{t-2} + \ldots. + \alpha_{2p} X_{t-p} + \beta_{21} Yt_{-1} + \beta_{22} Y_{t-2} + \beta_{23} Y_{t-3} + \ldots. + \beta_{2p} Y_{t-p} + u_t$$

Where p is suitably chosen positive integer; α and $\beta$are parameters; e_t and u_t are disturbances terms with zero means and finite variances.

5.2 Empirical Framework

Following are the four steps usedfor the analysis of the data as per the methodology outlined before. First, the nature of the distributions of series, Banks stocks return and exchange rates are determined by applying normality test.Jarque-Bera statistics were computed for this purpose. Table:1shows the results of the test along with descriptive statistics for the two series. For series to be normal, Skewness value to be 0 and kurtosis value to be 3.According to (Chou 1969), in excess of unity in the skewness coefficient is considered to be fairly extreme and according to(Parkinson 1987), high or low kurtosis value means extreme leptokurtic or extreme platykurtic.In the present study, theskewness values for Banks Nifty returns and exchange rates are0.112500 and -0.445008respectively and the kurtosis values are 4.492352and 12.342443respectively indicates that both the series are non-normally distributed

Table 1 JB Test for normality and Descriptive statistics

	B_NIFTY	E_RATE
Mean	0.000234	0.000289
Median	0.000708	0.000000
Maximum	0.090373	0.039116
Minimum	-0.059117	-0.056977
Std. Dev.	0.016258	0.006458
Skewness	0.112500	-0.445009
Kurtosis	4.492352	12.34244
Jarque-Bera	94.14659	3640.367

Probability	0.000000	0.000000
Sum	0.231822	0.286550
Sum Sq. Dev.	0.261944	0.041335
Observations	992	992

Second**,** the result ofnon-normality of the two series helped to check thestationarity of the two-time series. The Figures of the time series can be used for checking. Stationarityin the series in a simple manner byobservingthe trends in mean, variance and autocorrelation.Thestationarity in the time series can be observed whenthe mean and variance are constant over the passage of time. The line plots for the two series (log normal value of relatives) are shown in the following Fig. **1 and 2.**

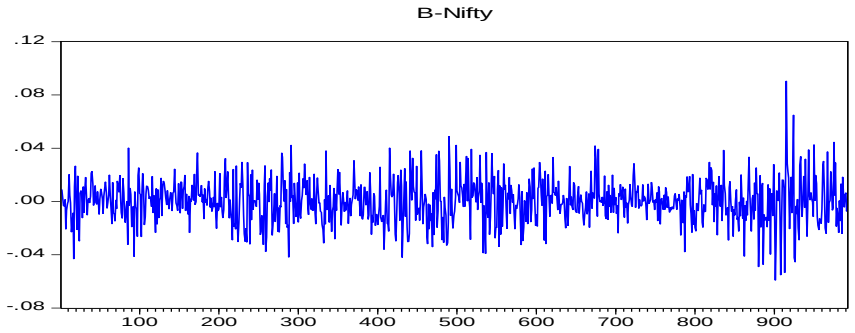

Fig:1 B-Nifty

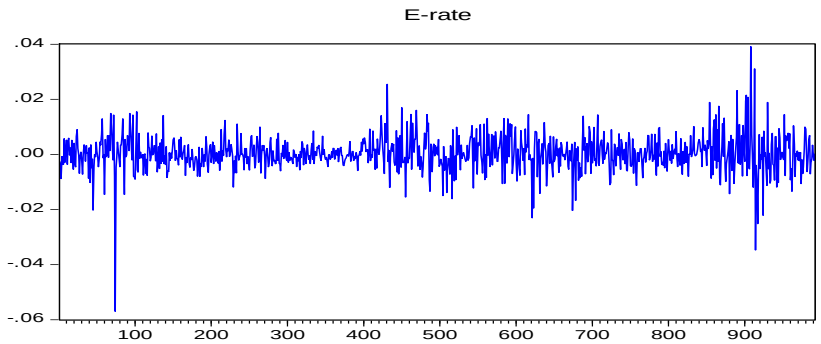

Fig: 2 Exchange Rates

Since the series show neither upward nor downward trends in the plots, for this series, the mean and variance seem to be constant. Also, the variance is not changing much as it is clear from the vertical fluctuations in the Figure. This indicates both series are stationary at their level forms.

The stationarityof the time series is also checked by a formal econometric test, ADF test. The results are shown in Table 2 and Table 3.

Table: 2 ADF test for Banks Nifty returns

Variable	Coefficient	Std. Error	t-Statistic	Prob.
B_NIFTY(-1)	-0.892456	0.031625	-28.21978	0
C	0.000402	0.001029	0.390778	0.696
1	-4.08E-07	1.80E-06	-0.227201	0.8203
R-squared	0.446299	Mean dependent var		-8.40E-06
Adjusted R-squared	0.445178	S.D. dependent var		0.021729
S.E. of regression	0.016185	Akaike info criterion		-5.406415
Sum squared resid	0.258818	Schwarz criterion		-5.391585
Log likelihood	2681.879	Hannan-Quinn criter.		-5.400776
F-statistic	398.1785	Durbin-Watson stat		1.991334
Prob(F-statistic)	0			

Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=21)

Table: 3 ADF test for Exchange rates

Variable	Coefficient	Std. Error	t-Statistic	Prob.
E_RATE(-1)	-0.99613	0.031812	-31.3133	0
C	-3.07E-05	0.000411	-0.074801	0.9404
1	6.48E-07	7.18E-07	0.901944	0.3673
R-squared	0.498101	Mean dependent var		2.83E-06
Adjusted R-squared	0.497085	S.D. dependent var		0.009116
S.E. of regression	0.006465	Akaike info criterion		-7.241852
Sum squared resid	0.041293	Schwarz criterion		-7.227022
Log likelihood	3591.338	Hannan-Quinn criter.		-7.236213
F-statistic	490.2617	Durbin-Watson stat		1.999988
Prob(F-statistic)	0			

Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=21)

The obtained ADF statistics for the two variables, Banks Nifty returns and exchange rates are -28.21978and -31.31330 respectively. The null hypotheses of unit root for both the series are rejected at all levels of significance since the computed values fall behind the critical values.(i.e. giving probability values 0.00). Therefore, ADF test statistic values clearly say that Banks stock returns and exchangerates are stationary at level form. As a consequence of stationarityat level form in both the series, Johansen Co-integration test cannot be applied to the series to determinelong-term relationship between them.

Table 4: Correlation between B-Nifty and E-rate

	B_NIFTY	E_RATE
B_NIFTY	1.000000	-0.397269
E_RATE	-0.397269	1.000000

Third, a correlation test is performed to study the relationship a between Banks stock returns and exchange rates. Study indicates the existence of interdependency among time series. The results of correlation test are shown in the Table 4. The coefficient of correlation between Banks stocks return and exchange rates found to be -0.397269, a negative correlation between the two series. However, this correlation may be spurious. Therefore, the direction of influence between variables is verified by the Granger causality test.

Table 5: Pairwise Granger Causality Tests

Null Hypothesis	Obs	F-Statistic	Prob.
E_RATE does not Granger Cause B_NIFTY	990	3.61237	0.0273
B_NIFTY does not Granger Cause E_RATE		1.98258	0.1383

Fourth, the results of Granger-causality test between exchange rates and stock prices are shown in the Table5.The Null hypothesis "Exchange Rates do not Granger cause Stock returns" is rejected at 5% level of significance. However, the second null hypothesis "Banks Stock returns do not Granger cause Exchange series", cannot be rejected. The results of the Granger Causality test states that Exchange rates, clearly, Granger cause the Banks stocks where as Banks stocks prices cannot be said to direct the Exchange rates. Hence, this is the clear indication of unidirectional causality and causality running from exchange rates to Banks stock returns. It is crucial that the outcome of causality between the particular indicators does not mean that movement in one indicator essentially causes movements in another indicator.

VI. CONCLUSION

The present research paper examined the impact of Rupee-Dollar exchange rates on Banks stocks price Indices in India. By applying JB test, the Normality of data has been checked after converting the absolute values to log normal forms. From the test results, it is evident that both series are not normally distributed. Subsequently, ADF test is applied to check the stationarity of the series and the results showed stationarity at level forms for both the series. Further, coefficient of correlation indicated negative correlation between them. In order to determine the direction of influence between the two series, Granger Causality test is applied and it proved unidirectional causality running from exchange rate to Banks stock returns, that is, an increase in the exchange rate caused a decline in the Banks stocks prices.

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