

## NEMPIRICAL ANALYSIS OF RELATIONSHIP BETWEEN EXCHANGE RATE AND INDIAN STOCK MARKET INDEX

Dr. P. Nageswari\* & Infanita Lawrence\*\*

### ***Abstract***

*This study investigated the relationship between Exchange Rate and the Indian Stock Market Index. For the purpose the study it considered S&P CNX Nifty and Exchange rate (INR vs. US \$.) for the period of five years from April 2012 to March 2017. The study found out that S&P CNX Nifty Index returns earned high return with high risk and the Exchange rate returns recorded low return with low risk. Both returns were normally distributed during the study period. Further it found that there was no significant relationship between S&P CNX Nifty Index and Exchange rate returns. The ADF test concludes that the time series were stationary at level difference itself. The Granger Causality Test concludes that there is bidirectional relationship exists between Exchange Rate and Nifty Returns. The study also confirmed that Exchange rate returns enjoyed long run relationship with S&P CNX Nifty Index returns during the study period.*

**Key words:** Exchange Rate, Long run Relationship, S&P CNX Nifty Index

### **Introduction**

In a globalize era of the financial world, the development of any country, foreign exchange rate plays a predominant role. So its important to the researchers, market players and the policy makers to understand the working and the analysis of the dynamic linkage between stock and foreign exchange market came to the forefront because these two markets are the most sensitive segments of the financial system and are considered as the barometers of the economic growth through which the country's exposure towards the outer world is most readily felt.

---

\*Faculty, Bharathidasan School of Management, Bharathidasan University, Tiruchirappalli.

\*\*MBA Bharathidasan School of Management, Bharathidasan University, Tiruchirappalli

An investor holding foreign equities is naturally exposed to exchange rate fluctuations. Both portfolio performance and the decision regarding whether to hedge foreign exchange (FX) risk will depend, amongst other things, on the relationship between equity and currency returns. Policymakers care about this relation as valuation changes – induced by foreign exchange and equity returns – generate significant swings in international investment positions. However, while there is a vast literature on the link between interest rate differentials and exchange rates across countries, little is known about the relation between exchange rates and international equity returns (see Burnside *et al.* 2011, Lustig *et al.* 2011, and Menkhoff *et al.* 2012 for recent contributions).

There are two explanations for which variable cause the other. The flow oriented model approach as described in Dornbusch and Fischer (1980) research show that currency movements directly affect international competitiveness. In turn, currency has an effect on the balance of trade within the country. As a result, it affects the future cash flows or the stock prices of firms. The counter argument suggests that taking a portfolio-balance approach (Dornbusch, 1976), where portfolio holders should diversify to eliminate firm specific risk, requires effective investments allocation including currencies. As with other financial instruments, currencies therefore are under the rules of supply and demand for assets. In order for investors to purchase new assets they must sell off other less attractive asset in their portfolio. In other words buying and selling of domestic or foreign investments if less attractive. As countries assets become more valuable, interest rates begin to increase creating an appreciation of domestic currency. Although two valid explanations, no consensus has been made between the two. So, this study attempts to examine whether or not a causal relationship exists between exchange rates and stock market by using the Granger Causality and co-relation, relationships were determined for data between 2004 and 2012 in India.

### **Review of Literature**

The following were some of the study related to the relationship between exchange rate and stock returns. Ritesh Jayantibhai Patel (2017), this study explored the co-movement among 14 stock markets, namely BSE, BVSP, FTSE -100, Hang Seng, JKSE, KSE, KSE (Korea), MXX, NASDAQ, NIKKI, RTS, SSE, SSMI, and TSEC. The correlation analysis showed that BSE remained somewhat positively correlated with Hang Seng,

FTSE-100, MXX, NASDAQ, and BVSP. Results of Granger causality test indicated that the returns of BSE were dependent on BVSP, FTSE - 100, and MXX only. Outcome of Johansen cointegration test indicated that there was a long run relationship among selected stock markets. The study may benefit to FIIs (foreign institutional investors), individual investors, institutional investors, public investors, and HNIs (high net worth individuals). It suggested that all these stakeholders can take their decisions for their investments in the overseas markets by looking at the short-term and long-term integration of BSE with other selected markets. Poornima. S., M.Ganeshwari (2016), they studied the relationship between the exchange rate and stock market index. It found out that unit root test, for Exchange rate and Nifty returns, were found to be stationary at the first difference itself. Correlation between Exchange Rates and NIFTY returns were found to be negative. Further, investigated into the causal relationship between the two variables using Granger Causality test, it highlighted unidirectional relationship between Exchange Rates and NIFTY returns. M. Babu , C. Hariharan, S. Srinivasan(2016), investigated the stock markets linkages between BRICS and G7 nations'. Their study found that BRICS and G7 nations' stock market indices were co-integrated and also there was long run relationship between them. VECM result showed that BRICS indices experienced short run relationship with G7 indices. Granger causality test found only one bidirectional relationship and another index recorded unidirectional relationship within them. Sachita Yadav(2016), examined the relationship between stock market returns and exchange rate. The empirical analysis showed that negative correlation existed among the stock market returns and exchange rate; however, the degree of correlation was not very significant. Co-integration test results showed that there was an absence of co-integration among the variables. The Granger causality test indicated that Nifty stock returns Granger caused the rupee-dollar exchange rates in India. This paper suggested to the investors regarding the strategies that they can opt for trading in volatile stock markets to minimize risk or fear of bearing losses. Walid Chkili and Khuong Nguyen(2015) analysed Exchange rate movements and stock market returns in a regime-switching environment for BRICS countries. Stock price and exchange rate of all BRICS countries were examined using Markovitz autoregressive model and VAR model. Stock market returns were higher than exchange return in all BRICS countries. Among BRICS countries, South Africa is less volatile and Russia is more volatile. Exchange rate changes do not affect stock market return of

BRICS countries. Inversely, the impact from stock market returns to exchange rates is significant for all BRICS countries. Waseem Aslam(2014) conducted a study on Relationship between stock market volatility and exchange rate in Pakistan. Variables used for the study is Exchange rate (represented by US \$) and KSE 100 index. This paper found a Negative correlation between PKR-USD and KSE- 100 index. Granger causal test found that there exist a relationship between KSE 100 and exchange rate.

Andrew Maredza, Courage and Kin Sibanda(2013) examined the Effects of Exchange rate Volatility on the Stock Market in South Africa. Their study found out that there was Week relationship between currency volatility and stock market performance. The author recommended that, South African stock market is not really exposed to the negative effects of currency volatility, government can use exchange rate as a policy to attract FDI. Gagan Deep Sharma, Mandeep Mahendru , Sanjeet Singh (2013), studied the interlinkages between stock markets of Brazil, Russia, India, China and South Africa (BRICS) with the help of benchmark indices of these stock exchanges. Line charts and unit-root tests were applied to check the stationary nature of the series; Regression Analysis, Granger's Causality Model, Vector Auto Regression (VAR) Model, and Variance Decomposition Analysis were performed to find out the linkages between the markets under study. The analysis revealed that the stock markets under study were influenced by each other, but not to a great extent. It implies that there exists opportunities for diversification of the investors among the stock exchanges of BRICS. The paper also observed that there are domestic factors (macro-economic variables) that influence the stock markets. Hau and Rey (2006), their study suggested that foreign exchange and equity market returns should be negatively correlated because of portfolio rebalancing. To see the mechanism, consider a US portfolio manager with money invested in Japan. When the Japanese stock market rises relative to the US, the manager is overweight with Japanese equities and, to return to a neutral position, sells Japanese stock and then sells the Japanese yen proceeds for US dollars. The sale of yen for dollars causes the yen to depreciate at the same time that the Japanese stock market is outperforming. This is the essence of the uncovered equity parity (UEP) condition whose statistical validity is assessed in various studies (e.g. Hau and Rey 2006, Melvis and Prins. 2015 and the references therein). In this above background the present study namely relationship between exchange rate and stock market returns is undertaken to fill the research gap.

### **Objectives of the study**

The study has the following objectives

- To investigate the relationship between S&P CNX Nifty Index and Exchange rate INR vs. US \$.
- To check the above time series are non-stationary.
- To identify the casual relationship between S&P CNX Nifty Index and Exchange rate INR vs. US \$.
- To examine the long run relationship between S&P CNX Nifty Index and Exchange rate INR vs. US \$.

### **Hypotheses of the Study**

For the above objectives the following null hypotheses were analyzed.

- Nh1: There is no significant relationship between the S&P CNX Nifty Index Returns and Exchange rate Returns of INR vs. US \$.
- NH2: There is non stationery of the Nifty Index Returns and Exchange rate (INR vs. US \$) returns.
- NH3: There is no significant casual relationship between the S&P CNX Nifty Index Returns and Exchange rate Returns of INR vs. US \$.
- NH4: There is no long run relationship between S&P CNX Nifty Index Returns and Exchange rate Returns of INR vs. US \$.

### **Methodology of the study**

#### **Period of the study**

The study covers a period of five years from 1<sup>st</sup> April 2012 to 31<sup>st</sup> March 2017.

#### **Sources of Data.**

For the purpose of the study it requires the Index returns and Exchange Rate data (INR vs. US \$.). In Indian stock market NSE plays a vital role of development of our economy. So the taken the S&P CNX Nifty Index from NSE websites. Exchange rate INR vs USD collected from [www.oanda.com](http://www.oanda.com).

## Results and Analysis of the Study

### 1. Analysis of Descriptive statistics for S&P CNX Nifty Returns and Exchange Rate Returns.

Descriptive Statistics for the Nifty Index Returns and Exchange Rate returns during the study period from 01-04-2012 to 31-03-2017 shows in Table – 2. It is to be noted that the summary statistics, namely, mean, minimum, maximum, median, standard deviation (SD), skewness, kurtosis and the Jarque- Bera were used to analyse the sample indices return during the study period. It is clear from the Table that during the study period, the Nifty Index returns earned high mean value of 0.0494 with high risk of 0.957. The exchange rate returns recorded low returns (0.013) with low risk (0.36). The Skewness of the Nifty Index Returns Distribution was negatively skewed and Exchange rate returns positively skewed.

The Peak of the Return Distribution shows that it was Platykurtic in both Nifty and Exchange rate returns during the study period. For testing the normality of the return series, the Jarque Bera Test was used. The J.B Test shows that Daily Returns were distributed normally for Nifty Index Returns as well as Exchange rate returns.

**Table- 1**  
**The Results of Descriptive Statistics for S&P CNX Nifty Index Daily Returns and Exchange Rate Returns from April 2012 to March 2017**

Statistics	Nifty Returns	EX. Rate Returns
Mean	0.0494	0.0135
Median	0.0588	0.0000
Maximum	3.8087	2.6682
Minimum	-5.9151	-2.3276
Std. Dev.	0.9572	0.3615
Skewness	-0.3571	0.2164
Kurtosis	5.7607	9.7389
Jarque-Bera	412.3310	3467.5220
Probability	0	0
Observations	1217	1825

Source: Computed using E-views

**Analysis of Cross Correlation Test for S&P CNX Nifty Index and Exchange Rate Returns.**

**Table.2** reveals the Results of Cross Correlation Test for S&P CNX Nifty Index and Exchange Rate Returns. From the analysis of the above Table, it is clearly understood that there was Negative Correlation Coefficient Value between Nifty and Exchange rate returns during the study period. It also understood that there was no significant relationship between Nifty and Exchange rate returns. So the null hypothesis NH1 is accepted.

**Table - 2**  
**The Results of Cross Correlation Test for S&P CNX Nifty Index Daily Returns for the period from April 2012 to March 2017**

<b>Variables</b>	<b>Pearson Correlation</b>	<b>Ex.rate Returns</b>	<b>Nifty Returns</b>
Ex.rate Returns	Pearson Correlation	1	
	Sig. (2-tailed)		
Nifty Returns	Pearson Correlation	-0.048	1
	Sig. (2-tailed)	0.094	

Source: Computed using SPSS

**Analysis of Unit Root Test for S&P CNX Nifty Index and Exchange Rate**

The Results of Unit Root Test for the daily returns of S&P CNX Nifty Index and Exchange Rate from April 2012 to March 2017 are exhibited in **Table-3**. The analysis clearly reveals that both the Nifty and Exchange rate returns were stationary at 1% Significant in ADF Test at Level Difference itself. During the study period, the Test Statistics were higher than the Critical Value and their returns were stationary at 1% significant in Level Difference itself. So the null hypothesis “NH2: There is non stationery of the Nifty Index and Exchange rate (INR vs. US \$.) returns” is rejected.



**Table -3**  
**The Results of Unit Root Test for S&PCNX Nifty Index and Exchange rate Returns from April 2012 to March 2017**

Augmented Dickey-Fuller test statistic			t-Statistic	Prob.*
Exchange Rate Returns	ADF test statistic	Significant	-14.39185*	0
Test critical values:		1% level	-3.433747	
		5% level	-2.862927	
		10% level	-2.567555	
Nifty Returns	ADF test statistic		-31.91203*	0
Test critical values:		1% level	-3.435541	
		5% level	-2.86372	
Source: Computed using E-views		10% level	-2.567981	

**\*Significant at 1% level.**

#### **4. Analysis of Granger Causality Test for S&P CNX Nifty Index and Exchange Rate**

As shown in **Table -4**, Pair wise Granger Causality Test for the returns of S&P CNX Nifty and Exchange Rate from April 2012 to March 2017. The result clearly explained that only exchange rate causal relationship with Nifty returns were significant and recorded causality relationship on the basis of one way bidirectional causality (F – Statistics and Probability values). But Nifty does not Granger Cause with Exchange rate. So it concludes that there is bidirectional relationship exists. So the null hypothesis namely “NH3: There is no significant casual relationship between the S&P CNX Nifty Index and Exchange rate (INR vs. US \$.)” is partially rejected.

**Table -4**  
**The Results of Granger Causality for S&PCNX Nifty Index and Exchange rate Returns from April 2012 to March 2017**

Null Hypotheses	Obs	F-Statistic	Prob.
EXRATE does not Granger Cause NIFTY	1214	3.63677	0.0125*
NIFTY does not Granger Cause EXRATE		0.20033	0.8962

Source: Computed using E-views

**\*Significant at 1% level.**



### 5. Analysis of Co-integration Test for S&P CNX Nifty Index Returns and Exchange Rate

The results of Johanson Co-integration test for S&P CNX Nifty Index returns and exchange rate returns given in **Table-5**. It clearly explained that both the Trace statistics and Maximum Eigen value statistics values of S&P CNX Nifty Index and Exchange rate returns were greater than the critical value at 1% level. So it found that Exchange rate returns were co-integrated with S&P CNX Nifty Index returns. These results confirmed the Exchange rate returns enjoyed long run relationship with S&P CNX Nifty Index returns during the study period. So the null hypothesis namely “There is no long run relationship between S&P CNX Nifty Index Returns and Exchange rate Returns of INR vs. US \$” is rejected.

**Table -5**  
**The Results of Johanson Co-integration Test for S&P CNX Nifty Index and Exchange rate Returns from April 2012 to March 2017**

<b>Unrestricted Co-integration Rank Test (Trace)</b>				
<b>Hypothesized</b>		<b>Trace</b>	<b>0.05</b>	
No. of CE(s)	Eigen value	Statistic	Critical Value	Prob.**
None *	0.190034	486.762	15.49471	0.0001
At most 1 *	0.173749	231.3178	3.841466	0

**\*Significant at 1% level.**

<b>Unrestricted Co-integration Rank Test (Maximum Eigenvalue)</b>				
Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.190034	255.4442	14.2646	0.0001
At most 1 *	0.173749	231.3178	3.841466	0

**Source:** Computed using E-views

### **Discussion and Conclusion**

An attempt was made to study the relationship between the Exchange Rate and Stock Market Index. For the purpose of the study it considered S&P CNX Nifty Index returns and Exchange rate (INR vs. US \$.) returns for the period of five years from April 2012 to March 2017. The study found out that S&P CNX Nifty Index returns earned high return with high risk and the Exchange rate returns recorded low return with low risk. Both returns were normally distributed during the study period. Further it found that there was no significant relationship between S&P CNX Nifty Index and Exchange rate returns. The ADF test concludes that the time series were stationary at level difference itself. The Granger Causality Test found that there is bidirectional relationship exists between Exchange Rate and Nifty Returns. The study also confirmed that Exchange rate returns enjoyed long run relationship with S&P CNX Nifty Index returns during the study period.

### **References**

- Babu. M. Hariharan. C and Srinivasan. S. (2016). Efficiency of Emerging and Emerged Capital Markets: An empirical study on BRICS and G7 Nations. Research Bulletin, vol.42(1) 61-77.
- Courage Mlambo et. al(2013). Effects of Exchange Rate Volatility on the Stock Market: A Case Study of South Africa, Mediterranean Journal of Social Sciences, vol.4 (14),pp-561-570.
- Desislava Dimitrova(2005). The Relationship between Exchange Rates and Stock Prices: Studied in a Multivariate Model. Issues in Political Economy, Vol. 14, pp- 256-230.
- Gagan Deep Sharma, Mandeep Mahendru, Sanjeet Singh(2013). Are the Stock Exchanges of Emerging Economies Interlinked?: Evidence from BRICS, Indian Journal of Finance, Vol. 7(1)-105-112.
- Hau, H and H Rey (2006), “Exchange rates, equity prices, and capital flows”, *Review of Financial Studies*, Vol. 19-273–317.
- I-Chun Tsai (2012). The relationship between stock price index and exchange rate in Asian Markets: A quantile regression approach, Journal of International Financial Markets, Institutions & Money, 22, pp. 609-621.
- Levine, R. & Zervos, S. (1996). Stock market development and long-run growth. The World Bank Economic Review, 10 (2), 323-339.

Lilue, Jieque Wan(2012). The Relationship between Shanghai Stock Market and CNY/USD exchange rate: new evidence based on cross correlation analysis, structural co-integration and nonlinear causality Test, *physica A*, No.391, pp.6051-6059.

Lustig, H, N Roussanov, and A Verdelhan (2011), “Common risk factors in currency markets”, *Review of Financial Studies*, Vol.24, PP. 3731–3777.

Maditinos, D., Šević, Ž., & Theriou, N. (2007). Investors' behaviour in the Athens Stock Exchange (ASE). *Studies in Economics & Finance*, 24 (1), 32-50.

Majid, M. S. A., Meera, A. K. M., Omar, M. A., & Aziz, H. A. (2009). Dynamic linkages among ASEAN-5 emerging stock markets. *International Journal of Emerging Markets*, 4(2), 160-184.

Malarvizhi. K and Jaya. M.(2012). An analytical study on the movement of Nifty Index and Exchange rate, *IJMT*, Vol.2, No.7, pp.274-282.

Masih, A., & Masih, R. (1997). A comparative analysis of the propagation of stock market fluctuations in alternative models of dynamic causal linkages. *Applied Financial Economics*, 7 (1), 59-74.

Melvin, M and J Prins (2015), “Equity hedging and exchange rates at the London 4p.m. ? x”, *Journal of Financial Markets*, Vol. 22, pp-50–72.

Menkhoff, L, L Sarno, M Schmeling, and A Schrimpf (2012), “Carry trades and global foreign exchange volatility”, *Journal of Finance*, Vol. 67, pp-681–718.

Meric, G., Pati, N., & Meric, I. (2011). Co-movements of the Indian stock market with other stock markets: Implications for portfolio diversification. *Indian Journal of Finance*, 5 (10), pp-13-20

Poornimal, M.Ganeshwari(2016). Relationship between Exchange Rates and Stock Market Index: Evidence from the Indian Stock Market. *International Journal of Science and Research (IJSR)*. Vol5, No.10, pp-1-18.

Ritesh Jayantibhai Patel(2017). Co-Movement and Integration Among Stock Markets: A Study of 14 Countries, Indian journal of finance, Vol.11, (9)- 58-64.

Walid Chkili Duc Khuong Nguyen(2014). Exchange rate movements and stock market returns in a regime switching environment: Evidence for BRICS countries, IPAG working paper.

Waseem ASLAM (2014). Relationship between stock market volatility and exchange rate: a study of KSE. Journal of Public Administration, Finance and Law. No.562-72.

Vohra, P. S. (2016). A study of co-movement among indices of Bombay Stock Exchange. Indian Journal of Finance, 10(9) 11 - 29.