

Relationship between Exchange Rates and Stock Market Index: Evidence from the Indian Stock Market

Dr. S. Poornima¹, M. Ganeshwari²

¹HoD & Associate Professor, Department of Business Administration, PSGR Krishnammal College for Women

²Research Scholar, PhD, Department of Business Administration, PSGR Krishnammal College for Women

Abstract: *The debate as whether the development in the foreign exchange markets have ramifications for the stock markets have become one of the tenets in financial economics. This study tries to analyze the dynamic relationship between stock market index and exchange rate. Several statistical tests have been applied in order to study the relationship of both the series. The period for the study has been taken from 1-07-2014 to 29-07-2016 using daily closing indices. In this study, 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, investigation into the causal relationship between the two variables using Granger Causality test highlighted unidirectional relationship between Exchange Rates and NIFTY returns.*

Keywords: Stock market, Exchange rate, Unit root test, Granger Causality test, NIFTY

1. Introduction

Stock market and foreign exchange plays a crucial role for the development of country. Asian crisis (1997-1998) is the major reason for establishing a relationship between exchange rate and stock price. During this period, the merging market has faced depreciation in exchange rate and so resulted in fall of stock price. Hence from this, it is understood that although trade flow has some impact on stock price of companies, the main source of revenue comes from foreign exchange. Many hypotheses shown that there exist a causal relationship between exchange rate and stock price. Fall in the local currency makes leads to increase in foreign demand, resulting in increased value of firm and stock price. Similarly increase in the local currency makes less profit thus leads to decrease of foreign demand.

Exchange rate movements also affect the value of a firm's payables or receivables. Thus, on a macro basis the impact of exchange rate on stock price depends upon both the country's international trade and the degree of trade imbalance. The continuous increases in the world trade and capital movements have made the exchange rates as one of the main determinants of business profitability and equity prices. Exchange rate changes directly influence the international competitiveness of firms, given their impact on input and output price. The present study analyzes the relationship between stock prices volatility and exchange rates movement in India. The analysis on stock markets has come to the fore since this is the most sensitive segment of the economy and it is through this segment that the country's exposure to the outer world is most readily felt.

2. Review of Literature

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 Markov autoregressive model and VAR model. Stock market return are 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. The author used GARCH model to determine the relationship. 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 FPI.

3. Data & Methodology

The present study is directed towards studying the dynamics between stock returns and exchange rates movement. We focus our study towards Nifty returns and Indian Rupee-US Dollar Exchange Rates. The frequency of data is kept at daily level and time span of study is taken from 1-07-2014 to 29-07-2016. The results from daily data are more precise and are better able to capture the dynamics between exchange rates and Nifty index. The data consists of – i) daily closing prices of the Nifty index, used to compute stock returns and ii) Indian Rupee/US Dollar ratios on a daily basis, used to compute exchange rates. The daily

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returns and exchange rates have been matched by calendar date. Data has been taken from NSE and RBI website.

Empirical analysis

The analysis of the study involves correlation, ordinary least squares method, unit root test and granger causality test.

Table 1: Correlation co-efficient matrix of NIFTY returns and Exchange rate

	NIFTY Returns	Exchange rate
NIFTY Returns	.000	-.419
Exchange rate	-.419	.000

Correlation test was conducted between stock returns and exchange rates. Correlation test can be seen as first indication of the existence of interdependency among time series. From the derived statistics, we observe the coefficient of correlation to be -0.419, which shows negative correlation between the two series. Thus, we may conclude that the two series are weakly correlated as the coefficient of correlation depicts some interdependency between the two variables. The correlation needs to be further verified for the direction of influence by the Granger causality test.

Ordinary Least Square Method

Table 2: OLS, Using observations 2014/07/01 – 2016/07/31
Dependent Variable: d_nifty

	Coefficient	Std.error	t-ratio	p-value
Const	-4.41475	3.15354	-1.400	0.1622
d_ex	-173.227	15.6457	-11.07	1.30e ^{-025***}

Mean dependent var	-2.015663	S.D. dependent var	78.32611
Sum squared resid	2444874	S.E. of regression	70.20774
R-squared	0.198170	Adjusted R-squared	0.196554
F(1,499)	122.5852	P-value(F)	1.30e ⁻²⁵
Log-likelihood	-2822.856	Akaike criterion	5649.711
Schwarz criterion	5658.133	Hannan-Quinn	5653.017
rho	-0.036829	Durbin-Watson	2.071661

From the above table it can be concluded that 1% change in exchange rate will lead to an decrease in nifty by 173%. The R-squared value is 19%. So the variation in model due to change in exchange price is explained by 19% and rest of the variation is explained by other factors. Exchange rate effect NIFTY index by 19% and it is proved statistically significant by having p-value of 0.0000 which is less than 0.05. From the above analysis following regression model can be arrived:

$$D_nifty = -4.41 - 173 * d_ex$$

Unit root test

Augmented dickey fuller test is the most commonly used test to analyze the stationarity. The application of unit root test is the first step before doing granger causality test.

Table 3: Unit root test

Variable	At level				At first difference			
	ADF test statistics		P value		ADF test statistics		P value	
	C	C&T	C	C&T	C	C	C&T	C&T
NIFTY returns	-1.661	0.4509	-1.726	0.739	-6.805	1.0093e ⁻⁰⁰⁹	-6.798	9.332e ⁻⁰⁰⁹
Exchange rate	-0.472	-3.587	0.894	0.030	-6.376	1.414e ⁻⁰⁰⁸	-6.388	1.211e ⁻⁰⁰⁷

Note: C represents constant and C&T represents constant and trend

It can be seen from the above table, all the variables are non-stationary at level. But they are found to be stationary at their first difference. So it is said that they are integrated in the order one.

Granger Causality Test

Table 4: Granger causality test of NIFTY return and Exchange rate

Null Hypothesis	Observations	F-Statistics	Prob.
NIFTY does not Granger Cause EX	499	2.10168	0.1233
EX does not Granger Cause NIFTY		6.01241	0.0026

The Granger causality test is a statistical hypothesis test for determining whether one time series is useful in forecasting another. From the above table it can be seen that there is unidirectional relationship between Exchange rate and NIFTY but not with NIFTY and exchange rate.

4. Conclusion

This study was conducted to determine the causal relationship between exchange rates and NIFTY Index. In this regard, the ADF test was used which showed non-stationarity at level and stationarity at first difference. Then, the coefficient of correlation between the two variables was computed, which indicated negative correlation between them. Therefore, Granger causality test was applied to check the causality between the respective variables. The results indicated that causal relationship exist between exchange rates Granger and NIFTY Index.

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