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## Causal Relation between Stock Return and Exchange Rate: Evidence from India

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# Causal Relation between Stock Return and Exchange Rate: Evidence from India

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## I. INTRODUCTION

The study of causal linkage between stock prices and macro economic variables has always been a matter of great concern to researchers. The relationship between stock returns and exchange rate has also been investigated in different economies. Initially the linkage of exchange rates with stock prices was found to be more significant in context to the developed nations having great exposure to foreign currency. But since last few decades the relationship is observed to be significant for developing and emerging economies also. Sabri (2004) also reported a strong positive correlation amid volatility in the stock market and exchange rate movements in the emerging stock markets. Pan, Fok & Lui (1999) also pointed out that the causal relationship has been stronger after the Asian crisis. The linkage has become more apparent and stronger primarily owing to the increased liberal and deregulatory reforms in these countries. In India also issuance of American Depository Receipts and General Depository Receipts facilitated the trading of foreign securities at different platforms. The liberalization reforms have also bought the exposure of exchange

rate fluctuations over different sectors of emerging economies.

Initially the primary focus of researchers for causality examination was limited to leading stock return. But recently some studies analysed the linkage of exchange rate at micro level like industry specific indices. These studies highlighted a vivid spectrum of influence. Like study by Chamberlain, Howe, and Popper (1997) found that the U.S. banking stock returns are very sensitive to exchange rate movements, but Japanese banking firms are not. Griffin and Stulz's (2001) also analysed the relationship of exchange rate shocks with the industry indexes across the world. Aydemir and Demirhan (2009) investigate the causal relationship of exchange rates with different stock price indices like national 100, services, financial, industrial, and technology. In this context the present study examines the causal linkage of India's leading index Nifty as well as 11 sector specific indices with the exchange rate in terms of US dollars.

## II. LITERATURE REVIEW

Considerable amount of research have been conducted to examine the causal relationship between stock returns and exchange rate. Some studies rejected the possibility of any kind of significant causal relationship between the two variables. Whereas some others have established either unidirectional or bidirectional relationship between exchange rate and stock prices (returns). These studies may be summarised as follows:

### a) Absence of Linkage

Jorion (1990, 1991), Bodnar and Gentry (1993), and Bartov and Bodnar (1994) rejected the possibility of any kind of significant relation between simultaneous dollar movements and stock returns for U.S. firms. Similarly studying 171 Japanese multinationals, He and Ng (1998) also found that only about 25 percent of their sample has significant exchange rate exposure on stock returns. The investigation of weekly return by Griffin and Stulz's (2001) found that exchange rate shocks have a negligible impact on the value of industry indexes across the world. Muhammad and Rasheed (2002) investigated the causal relationship between exchange rate and stock market index in South Asian Countries. The results suggested absence of causal relationship between Exchange Rates and Stock Prices. Desislava

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(2005) also found no existence of causality between exchange rates and stock prices for UK and US for the period 1990-2004. An investigation of US data by Ozair (2006) established no causal linkage and no Co-integration between these two financial variables.

#### b) *Unidirectional Causality*

Examining the relationship between the two variables for developing countries Abdalla and Murinde (1997) found that exchange rates Granger cause stock prices in Korea, Pakistan, and India. However in case of Philippines stock prices observed to Granger cause exchange rates. Ajayi et al. (1998) investigated the causal relations for a period from 1985 to 1991. The study covered seven advanced markets and eight Asian emerging markets. The study reported unidirectional causality in all the advanced economies but no consistent causal relations in the emerging economies. The results were supported by the unique structure and characteristics of their financial markets.

Maysami and Koh (2000) also observed exchange rate as one of the determinants in the stock prices. Smyth and Nandha proved no long run relationship between the two variables for Pakistan, India, Bangladesh and Sri Lanka over the period 1995-2001. However, the study supported the unidirectional causality running from exchange rates to stock prices for India and Sri Lanka. Agus and Carl (2004) examined the statistical relationship between stock prices and exchange rates in four SEAN countries (Indonesia, Philippines, Singapore and Thailand). The study noted that all stock prices and exchange rates are cointegrated and the causality runs from exchange rate to stock prices. The impact of exchange rate over Japanese stock prices was observed by Kurihara (2006) for the period March 2001-September 2005.

#### c) *Bidirectional Causality*

Bahmani-Oskooee and Sohrabian (1992) also pointed out that bidirectional Granger causality between the U.S. stock market and the exchange rates. However they rejected the possibility of any long-term relationship between the two. Mok (1993) asserted that the relationship between stock returns and exchange rates are bidirectional in nature for Hong Kong. Pan, Fok & Lui (1999) found that the exchange rates Granger-cause stock prices with less significant causal relations from stock prices to exchange rate. The study reported that the causal relationship have been stronger after the Asian crisis. Ibrahim (2000) witnessed the bidirectional causality for Malaysia for a period from January 1979 and June 1996.

Sevuktekin and Nargelecekenler (2007) proved bidirectional causality between the two financial variables in Turkey, using monthly data from 1986 to 2006. Pekkaya and Bayramoglu (2008) analysed the causality between exchange rate and stock prices of Istanbul Stock Index and S&P 500 in Turkey. The study

covering a period from 1990 to 2007 established bidirectional causality between returns and exchange rate. Aydemir and Demirhan (2009) also proved bidirectional causal relationship between exchange rates and all stock market indices for a period from February 2001 to January 2008.

In a study by Rjoub (2012) Granger causality reflected the bidirectional relationships between exchange rate and Turkish stock prices and Impulse response results indicated the temporary nature of shocks. The results of study by Umoru and Asekome (2013) portrayed positive co-integrating relationship between the Naira-US\$ exchange rate movement and the Nigerian stock market prices with bi-directional Granger causality. Doong et al. (2005) failed to find a cointegration relationship between the exchange rates and stock prices in six emerging Asian countries for a period from 1989 to 2003. But the study detected a bidirectional causality relationship in Indonesia, Korea, Malaysia, and Thailand.

In all countries except for Thailand, stock returns were significantly negatively correlated with the simultaneous changes in exchange rates, which meant for the authors that currency depreciations are usually accompanied by the falls in stock prices.

### III. RESEARCH METHODOLOGY

Most of the above researchers have used co-integration and Granger test to examine the causal linkage. However, the notion of using Granger causality to investigate the causal linkage has been criticised by some researchers like Kennedy (2003) asserts that Granger causality just provides information about "precedence" rather than about causality. Similarly Kleinbaum, et al. (1998) asserted that statistical analytical tools cannot be used to identify the causality as regression or multivariate methods are not deterministic models. But still Co-integration and Granger causality test form integral part of methodology adopted by researchers across the globe (Kumar 2009). In the present paper the co-integration and Granger test has been applied to check the causal linkage between the two variables. The study covers a period from January 2007 to March 2015. The daily indices have been used to calculate logarithm return of eleven sector specific indices namely Automobiles, Banking, Energy, Finance, FMCG, IT, Media, Metal, Pharmaceutical, Public Sector Undertakings and Realty. The relationship has also been examined for Nifty: the leading index of India.

At the outset, the normality of the distribution has been examined through Jarque Berra test. The correlation of different returns has been observed with respect to exchange rate. As the selection of any statistical test to examine co-integration or causality linkage depends upon the possibility of presence/

absence of unit root in data, therefore Unit root has been tested for the sample data. The data has been found to be stationary at the original level. The absence of any co-integrated equation recommended the use of vector auto-regressive (VAR) model to determine the optimum lag length. Finally the Granger Causality Test has been applied to examine the causal linkage between the stock returns and exchange rate.

#### IV. FINDING AND ANALYSIS

At the outset the distribution pattern has been tested through Jarque berra (JB) test. The test examines the null hypothesis of normal distribution of data. Descriptive statistics of all variables i.e. return from twelve indices and exchange rate has been revealed through table 1.

Table 4.1 : Descriptive Statistics

Variable	Average (%)	Maximum (%)	Minimum (%)	Std. Dev.	Skewness	Kurtosis	JB Stats.	Prob.
Nifty	0.036	16.334	-13.014	0.016	0.09	12.68	7949.29	0
Automobile	0.064	14.005	-10.315	0.015	-0.05	9.30	3366.98	0
Bank	0.053	17.239	-13.488	0.021	0.15	7.54	1753.55	0
Energy	0.017	15.443	-14.531	0.017	-0.17	11.59	6263.54	0
Finance	0.056	17.807	-12.605	0.021	0.14	8.33	2411.91	0
FMCG	0.066	8.304	-8.513	0.013	-0.27	6.98	1364.88	0
IT	0.038	11.720	-12.490	0.018	-0.13	7.93	2067.82	0
Media	0.011	12.562	-11.236	0.018	-0.18	8.09	2210.18	0
Metal	-0.001	16.187	-13.441	0.023	-0.13	7.10	1433.47	0
Pharmaceutical	0.075	11.159	-8.634	0.012	-0.33	10.94	5383.13	0
PSU	0.028	16.352	-12.681	0.022	0.11	6.10	817.48	0
Realty	-0.076	21.255	-27.060	0.031	-0.41	9.22	3334.36	0
Exchange Rate (XR)	0.017	14.077	-14.006	0.008	0.84	129.83	1364193.00	0

Source: Author's Calculation

JB statistics rejects any possibility to accept null hypothesis. Thus we may conclude that the dataset does not follow normal distribution. As this is an expected result for financial series, we may proceed to examine the correlation of return with exchange rate. All the returns found to be negatively correlated with exchange rate (table 2). The result indicates negative relation between return and exchange rate. But it doesn't indicate that whether decline in domestic currency stimulates economic activities or increase (decrease) in stock prices causes negative impact upon currency value. Any conclusion in this context may be taken only after examining the causality results.

The study applies Granger causality test to investigate the causal relationship between returns and exchange rate. However, Granger causality test may report positive results even without any presence of true relationship between the variables (driven by a common third process) with a different lag. In such a case the results have spurious influence due to unit root or co-integration between different variables. To rule out any such possibility unit root test and Johansen co-integration test have been conducted. Unit root test examines the null hypothesis of presence of unit root in

the variable. Table 2 depicts the correlation and the results of unit root test.

Table 4.2 : Correlation and Unit Root

Sector	Correlation with Exchange Rate	Unit Root	
		t-Statistic	Probability
Nifty	-0.2769	-42.5823	0.0000
Automobile	-0.2531	-38.8211	0.0000
Bank	-0.2733	-39.8867	0.0000
Energy	-0.2535	-42.6971	0.0000
Finance	-0.2826	-39.9795	0.0000
FMCG	-0.1928	-44.7806	0.0001
IT	-0.1304	-33.6098	0.0000
Media	-0.1890	-40.816	0.0000
Metal	-0.2444	-40.4157	0.0000
Pharmaceutical	-0.1645	-43.7213	0.0001
PSU	-0.2388	-39.8845	0.0000
Realty	-0.2296	-40.1203	0.0000
Exchange Rate	1.0000	-41.128	0.0000

Source: Author's Calculation

The t-statistics rejects all the possibility to accept null hypothesis. Therefore we may infer that data doesn't have unit root and is stationary at the original level. Johansen co-integration test rejects all the possibility of presence of any co-integration between return and exchange rate. The results of Johansen test recommend the use of VAR model to determine the optimum lag length for the inference of Granger-

causality between stock return and exchange rate. The lag length for the test has been decided to be three on the basis of Akaike Information Criterion. Granger causality test has been conducted to examine the direction of causal relationship between stock return and exchange rate. Table 3 shows the results of Granger Causality Test.

Table 4.3 : Granger Causality Test Results

S. No.	Null Hypotheses	F-Statistic	Prob.	Result
1.	AUTO does not Granger Cause XR	6.9536	0.0001	Rejected
2.	BANK does not Granger Cause XR	13.2286	1.00E-08	Rejected
3.	ENERGY does not Granger Cause XR	11.7269	1.00E-07	Rejected
4.	FINANCE does not Granger Cause XR	13.4908	1.00E-08	Rejected
5.	FMCG does not Granger Cause XR	3.7225	0.011	Rejected
6.	IT does not Granger Cause XR	4.0079	0.0074	Rejected
7.	MEDIA does not Granger Cause XR	5.9282	0.0005	Rejected
8.	METAL does not Granger Cause XR	9.3963	4.00E-06	Rejected
9.	NIFTY does not Granger Cause XR	13.9040	6.00E-09	Rejected
10.	PHARMA does not Granger Cause XR	1.5054	0.2112	Accepted
11.	PSU does not Granger Cause XR	6.9722	0.0001	Rejected
12.	REALTY does not Granger Cause XR	7.3739	7.00E-05	Rejected
13.	XR does not Granger Cause AUTO	8.9889	6.00E-06	Rejected
14.	XR does not Granger Cause BANK	8.7587	9.00E-06	Rejected
15.	XR does not Granger Cause ENERGY	11.6760	1.00E-07	Rejected
16.	XR does not Granger Cause FINANCE	9.9466	2.00E-06	Rejected
17.	XR does not Granger Cause FMCG	10.4590	8.00E-07	Rejected

18.	XR does not Granger Cause IT	16.9404	7.00E-11	Rejected
19.	XR does not Granger Cause MEDIA	2.0281	0.1079	Accepted
20.	XR does not Granger Cause METAL	5.9392	0.0005	Rejected
21.	XR does not Granger Cause NIFTY	15.0773	1.00E-09	Rejected
22.	XR does not Granger Cause PHARMA	16.7910	9.00E-11	Rejected
23.	XR does not Granger Cause PSU	5.42059	0.001	Rejected
24.	XR does not Granger Cause REALTY	6.81514	0.0001	Rejected

Source: Author's Calculation

Table 3 reports bidirectional causal relationship between exchange rate and return from all indices (except for pharmaceutical and media). Pharmaceutical industry revealed unidirectional relation with exchange rate running from exchange rate to Pharmaceutical sector. In case of media a unidirectional relationship has been found to run from media to exchange rate. But the reverse was found not to be true.

## V. CONCLUSION

The present paper sheds lights on the causal linkage between Exchange Rate and the Returns in Indian stock market. Daily data has been examined for a period from January 2007 to March 2015 for Nifty, eleven industry specific sector indices and exchange rate. All the series found to be not normally distributed and returns have shown negative correlation with exchange rate. To avoid any possibility of spurious results due to unit root or co-integration between different variables at the outset unit root test and Johansen co-integration test have been conducted. The results reported absence of unit root as well as co-integration between the variables and therefore we determine the optimum lag length of the bivariate VAR proceeding to test for inference of Granger-causality.

The results established bidirectional causal relationship between exchange rate and return from all indices (except for pharmaceutical and media). The results are in consensus with the previous studies (like Ibrahim 2000, Sevuktekin and Nargelecekenler 2007, Pekkaya and Bayramoglu 2008, Aydemir and Demirhan 2009, Rjoub 2012 and Umoru and Asekome 2013) conducted for other economies. Unidirectional relationship was found for Media sector running to exchange rate from the sector and also for Pharmaceutical running from exchange rate to the sector but the reverse was not found to be true. Investing return, volatility and risk spillover Kumar and Maheshwaran (2013) also observed significant volatility spillover and downside risk spillover from exchange rate to the pharmaceutical sector.

Though the results are subject to the limitation of limited data yet the findings have policy implications. The results are expected to be of great use for policy makers as well as portfolio managers for taking asset allocation decisions. The bi-directional causality

between stock return and exchange rate suggests that government should be cautious while making any changes in exchange rate policy as well as industrial policy. Further there is also a possibility to use information of the one variable to predict about the other.

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