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The Liaison Sandwiched between Foreign Exchange Rate and Stock Market Inclination: Empirical Substantiation from India

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ABSTRACT

The paper examines the relationship between foreign exchange rate and the Indian Stock market movement using monthly data selected from BSE and NSE database, for the period started from April 2000 to July 2017. The different techniques employed in this study are ADF (Augemented Dicky Fuller test, VAR(Vector Auto regression) , Cointegration tests, Granger Causality test . The Cointegration test specifies that exchange rate and stock market index shows a long run association and Granger Causality test could not establish causality of any direction between exchange rate and stock market index. The findings of this study can be helpful for investors while designing their portfolio and also suggest not only the foreign exchange rate impact the stock market index other macroeconomic variables may also be considered to determine the impact on the stock market index.

1. Introduction

In the last two decades it was seen that Indian stock market has developed in a remarkable manner by having a positive upward trend in the stock indices basically represented as sensex. As stock market index acts as the barometer for representing the country's economic position, any innovation in this is automatically translated in the performance of the country is gives an impression whether it is improving or not as a whole. There are lot of changes made in the statutory guidelines of the regulatory framework of capital market in our country. The economic reforms 1991 given enough scope in attracting foreign investments to the home country. In this process country's economy has tremendously opened up to the entire world market, as a result transactions were settled up in many foreign currencies which lead to a massive increase in the flow of foreign exchange reserves. It has been further proved with the Asian crises which happened in the year 1997 to 1998. During these crises many emerging countries had faced a declined trend in the home currency in comparison to the exchange rate of foreign currency, which had an impact on the share prices in a negative manner. During that period many analysts had commented that the increase or decrease in the exchange rate basically depends upon their trading turnover i.e., on the volume of receivables and payables in terms of foreign currencies. As the stock prices were affected by changes in the exchange rate it was depicted that the volume of export, import and degree of balance in between them is required to be balanced in order to avoid such circumstances. It was felt that foreign exchange market is a delicate section of the economy which represents our country at the international level in a dynamic way. Now a day's among other economic fundamentals foreign exchange rate acts as the major determinant in deciding the amount of profitability generated not only by the business undertaking rather to the entire country as well. Thus in the present market it is essential to study the stock market trend with the macroeconomic variables with specific reference to the foreign exchange rate.

2. Literature Review

Dahir, A. M., (2018) employed volatility tests through AGARCH model in between change in foreign exchange rate and stock market return in BRICS countries keeping in view stock market movement represents both domestic and foreign investors strategies. For the analysis the data were collected from 2006 to 2016 to run the tests for volatility, lead lag and co movement relationships. The findings of the study revealed that as China is highly capitalized country that did not so any sensitivity towards volatility in exchange rate. It was also suggested that stock exchange rate ia not a leading indicator for affecting stock returns for those investors meant for a short term holding in comparison to those who holds the equities for a medium or long-term investments. Mitra, R.,(2017), examined the relationship between real effective exchange rate and the total value of market capitalization both in short as well as long term perspective in South Africa in between 1979 to 2014 known as Bretton Woods period. By implementing the dynamic co-integration technique the study indicated that in South Africa a positive relation exists in between market capitalization of the index and exchange rate in long run. By comparing the time series data of U.S. and South Africa it was also seen there was no co-integration in between the market capitalization of these two countries. Kal, S. H., (2015) examined the impact of change in foreign exchange returns on the relationship between the returns yields from interest rate and stock market. Impulse response function, Vector autoregressive model were used to achieve the basic objectives of the research area. Data were collected on four currencies in order to frame the exchange rate model which helped in determining to find out the deviation from the fundamentally determined rate of return. During the study period it was found that Sharpe ratios of securities investments in the currencies affected the over or under valuation of the

exchange rates in comparison to their fundamental values. Tang, X., et al.,(2018) had analysed the impact of financial structure on exchange rate and stock market trend by including the data of eleven emerging countries. By utilizing the co-integration methodology and multivariate granger causality tests, the study found financial structure acts as a strong indicator in establishing the relationship between stock prices and exchange rate. On the other side financial economic structure had not much contribution towards establishing such relationships. Heimonen,K., et. Al., (2017), utilized the Taylor rule in order to measure its significance by measuring the relationship between exchange rate and stock prices effectively. For establishing the Tailor rule data were framed from 1999 to 2016 for fourteen OECD countries. The study revealed that unlike other theories belonging to this rule which has previously explained that inflation and real economic activity were playing a major role, but in this analysis as stock price information dividend data and real exchange rate as currency market data were seen as relevant in the formation of the Taylor rule. Gong, P., et. Al., (2017), examined the impact of changes in interest rate and exchange rate on the stock market in China. It has seen that when yen has depreciated and interest rate has increased the stock market was showing a downward trend. The author has suggested that lottery type stocks were always preferred by retail investors. An aggregate behavior was also found that is monetary policy announcements and changes in the exchange rate at the extreme level affects mostly the stock prices in China as these factors were very powerful in gaining public attention collectively. Gyntelberg, J. et al (2018) used daily frequency data on the transactions by foreign investors and analysed the impact of the volume of that transactions on exchange rate volatility in Thailand. They have seen that volatility in stock prices were dependent upon the availability of private information by the foreign investors capital flows. The findings of the information suggested that the amount brought by the investors in the bond market was not significantly affected the exchange rate where as exchange rate were changed because of the volume of transactions and capital flows done by the foreign investors during the study period. Karmakar, N., (2017) employed VAR, CVAR, AR-T-GARCH-EVT model in order to frame the marginal as well as joint model on the foreign exchange market in India. The study revealed that foreign exchange market never crash together rather to boom together. Through the AR-T-GARCH-EVT model the marginal distribution in individual currency return series was established. Out of the seven copulas used BB1 fitted as the copula by using their BIC, LL and AIC values. By using VAR and CVAR model portfolio risk in a joint model was found on the basis of their efficient frontiers. Tsagkanos, A., et al (2013) employed structural nonparametric cointegrating regression model in order to measure the existence of long-run relationship in between foreign exchange rate and stock market index in two countries those are USA and EU. The data were structured in two data set post financial crisis 2008 to 2012 and before the financial crisis an another data series. By using the portfolio balance effect theory it was evident that there exists a causal relationship in the short run in between the variables. By implementing the advanced structural non-parametric cointegrating regression in between stock exchange rate and stock price index it was revealed that in USA there exist a short run causal relationship and in EU a long run causality between the variables were found during the study period. Andries, A. M., (2017) examined the relationship in between interest rate and exchange rate in Romania. By implementing wavelet-based methodology the study has revealed that there exists a negative relationship in the short term and a positive relationship in the long run in between the two variables and always interest rate took the lead. The study has also suggested that the findings are different in comparison to the developed economies as they are not so directly affected by inflation adjusted monetary policies always. During the study period it was also suggested that in order to achieve the monetary policy objectives there is need of giving equal importance to both the variables by the central bank of the country. W. Li, et al., (2018) established a versatile relationship between stock market index liquidity and exchange rate in China by using the data series of Shanghai Component Index, the Shenzhen Componet Index and Chinese Yuan Nominal Effective Exchange Rate from 2010 to 2017 with 1617 observations. By implementing the technique of cross-correlation it was found that volatility in RMB index was less intense and riskier than the volatility in stock market index, because multifractality of the RMB exchange rate was less strong than the multifractality of stock market liquidity. The study has also suggested that because of the strict monetary policy in the country there was a positive persistence exists in the running of cross-correlation analysis in between stock market liquidity and the exchange rate. U. Bashir, et al.,(2016) worked on the relationship between stock market movement and exchange rate fluctuation with a motive to help the investors, organizations, portfolio managers to give a dynamic understanding regarding the linkage between the two variables so that they can avoid any risk associated with their investments in the changing market conditions. For the study data were collected from 1991 to 2015 and employed cross correlation test and causality test in the Latin American countries. The results suggested that a strong positive cross correlation was found in Mexico. A negative cross correlation was found in Mexico and Chile in the short run and in the long run that became slightly positive. In Argentina in short run a weak positive cross correlation was found which increased slightly in the long run. J.-F. Boilard, et al (2018) studied the impact of event rates on foreign currency market in Japan by collecting the data from interbank foreign exchange market i.e. EBS. The data are collected for three weeks of 2011. The events were distributed on universal character and those are the Tohoku earthquake and successive Fukushima disaster on March 11th, 2011 and the direct intervention by Bank of Japan on 31st October was selected as the second event. Previously it was believed that the order book formation was dependent on homogeneous Poisson process, but in this study it was observed that injection and cancellation rates were depend on the market depth near the mid price. A high degree of correlation was also found between the market events with consideration to injection, cancellation, transaction and diffusion of the mid price. Zolfaghari, M., (2017) examined the value at risk of the operating oil companies on the Teheran stock exchange by implementing MRS-GARCH model. The value at risk of stock returns of the operating oil companies were significantly affected by the volatility in the exchange rate during the study period from 2012 to 2016. The data were analysed and compared on the basis of both ARMA GARCH family model and

MRS-GARCH family model and the findings suggested that MRS-EGARCH-M model was superior than MRS-GARCH model on the basis of the comparisons formed. Liao, S., et al., (2011) investigated the financial characteristics issues in Taiwan's capital market by implementing a data mining approach to measure the co-movement in between exchange rate and Taiwan's capital market. The data in relation to exchange rate and capital market were collected from E. Sun Bank web site from 2006 to 2008 with 138 observations. By doing the data mining operation various portfolio were established in between foreign currencies and category of stock indexes in Taiwan which will help the investors and portfolio managers in building up the respective financial investment proposals. Tudor, C., et al (2012) analysed the movement of exchange rates and stock prices in 6 emerging and 6 developed financial market by utilizing the Granger causality tests during 1997 to 2012. The study revealed that in UK volatility in stock price was a major factor for the volatility in exchange rate. In korea both the variables became very interactive during the study period. In Brazil and Russia change in exchange rate affects the stock returns in the subsequent month. Though the direction of causality found through Granger causality still correlation among the variables could not found out during the study period. Dieci, R., et al., (2013) established a financial model which helps the investors in designing proper strategies in determining their order size. This model considered from the point of view of both domestic as well as foreign investors requirements as they are dependent on foreign exchange market for their trading. The financial model has involved natural nonlinearity at its state on the basis of the connections in between the stock market of two countries and the foreign exchange market which will help the speculators of both the countries in implementing their technical fundamental trading strategies. Afshan, S.,et al., (2018) utilized the wavelets approach in order to establish a strong relationship in between foreign exchange rate and stock market index. For the analysis purpose the weekly data were collected from 1999 to 2016 in relation to USD/ PKR, YEN/PKR, EUR/ PKR, PKR/ GBP and CNY/PKR as exchange rate and SP as stock price index. For the stationarity of the data set unit root test was implemented on the log series of the dataset. The study has revealed that there was presence of bidirectional causality in the long run. It was also observed that both the variables are leading and lagging each other during the study period.

3. Research Methodology and Data

This study used monthly data series on stock market index and the exchange rate in relation to five currencies i.e INR/USD, INR/EURO, INR/SGD, INR/POUND and INR/YEN belonging to United States of America, Europe, Singapore, United Kingdom and Japan respectively, that were obtained from the Database on Indian Economy (RBI web site), spanning April 2000 to July 2017. Since the research is aimed to investigate significant relationships it may be categorized as correlation research. Articles and other resources were reviewed for literature and previous studies. E-View software was used for the analysis.

Research Methodology

Following several previous study, this study employed various econometrics tests such as: Augmented Dicky Fuller (ADF) test, Vector Auto Regression (VAR), Johansen test of Cointegration, Granger causality test, and variance decomposition (VDCs).

Formulation of Hypotheses

Ho1: There is no statistically significant long-run relationship between foreign exchange rate and stock market index.
H02: There is no statistically significant causality relationship between foreign exchange rate and Stock market index.
We derived two sub hypotheses from this hypothesis:
H02-1: Exchange rate does not Granger cause stock market index.
H02-2: Stock market index does not Granger cause Exchange rate.

ADF test for stationary shows all the data were non stationary at level but stationary at their first difference series.

Vector Autoregressive: for lag selection. Out of five measurement techniques LR, FPE & AIC signifies lag 4 should be implemented for Johansen co integration test.

Table-1 VAR Lag Selection Criteria

Lag	LogL	LR	FPE	AIC	SC
0	265.9462	NA	0.000245	-2.639462	-2.606479
1	1034.865	1514.771	1.17E-07	-10.28865	-10.1897
2	1047.711	25.04938	1.07E-07	-10.37711	-10.21220*
3	1053.365	10.91158	1.05E-07	-10.39365	-10.16277
4	1059.814	12.31813*	1.02e-07*	-10.41814*	-10.12129
5	1063.581	7.118616	1.03E-07	-10.41581	-10.05299
6	1063.946	0.68396	1.07E-07	-10.37946	-9.950681
7	1065.748	3.333697	1.09E-07	-10.35748	-9.862735
8	1068.504	5.042312	1.10E-07	-10.34504	-9.784322

Cointegration test: out of the two tests of Johansen test of co integration Trace test indicates there was no cointegration, but out of Max-eigen value test it was found that there was cointegration among the variables and it identifies there is existence of one cointegrating equation.

Table-2 Co integration Test Results

Hypothesized		Trace	0.05	
No. of CE(s)	**Eigenvalue**	**Statistic**	**Critical Value**	**Prob.****
None	0.209948	119.1519	125.6154	0.1158
At most 1	0.128451	71.31348	95.75366	0.6777
At most 2	0.080142	43.40448	69.81889	0.8774
At most 3	0.070184	26.44671	47.85613	0.8743
At most 4	0.034873	11.67477	29.79707	0.9425
At most 5	0.021655	4.469193	15.49471	0.8623
At most 6	0.000122	0.024852	3.841466	0.8747

Trace test indicates no cointegration at the 0.05 level

Hypothesized		Max-Eigen	0.05	
No. of CE(s)	**Eigenvalue**	**Statistic**	**Critical Value**	**Prob.****
None *	0.209948	47.83839	46.23142	0.0334
At most 1	0.128451	27.909	40.07757	0.5683
At most 2	0.080142	16.95777	33.87687	0.9234
At most 3	0.070184	14.77194	27.58434	0.766
At most 4	0.034873	7.205573	21.13162	0.9454
At most 5	0.021655	4.44434	14.2646	0.8097
At most 6	0.000122	0.024852	3.841466	0.8747

Max-eigenvalue test indicates 1 cointegrating eqn (s) at the 0.05 level

Granger causality test:

H01: Exchange rate does not Granger Cause stock market index
H1: Exchange rate Cause stock market index
H02: Stock market index does not Granger Cause exchange rate
H1: Stock market index cause exchange rate

Out of the Granger causality tests made below it was evident that Sensex Granger cause USD, Sensex Granger cause yen, Euro Granger cause Sensex, Pound Granger Cause USD, SGD Granger Cause USD, Euro Granger Cause USD, Nifty Granger Cause Yen, Euro Granger Cause Nifty.

Table-3 Granger Causality Tests

Null Hypothesis:	Obs	F-Statistic	Prob.	
POUND does not Granger Cause SENSEX	204	1.6883	0.1542	Accept H0
SENSEX does not Granger Cause POUND		2.21855	0.0684	Accept H0
SGD does not Granger Cause SENSEX	204	1.10732	0.3543	Accept H0
SENSEX does not Granger Cause SGD		0.85467	0.4923	Accept H0
USD does not Granger Cause SENSEX	204	0.66926	0.614	Accept H0
SENSEX does not Granger Cause USD		6.09264	0.0001	Reject Ho
YEN does not Granger Cause SENSEX	204	0.41793	0.7956	Accept H0
SENSEX does not Granger Cause YEN		2.87578	0.0241	Reject Ho
EURO does not Granger Cause SENSEX	204	3.07015	0.0176	Reject Ho
SENSEX does not Granger Cause EURO		1.17036	0.3252	Accept H0
SGD does not Granger Cause POUND	204	1.47523	0.2112	Accept H0
POUND does not Granger Cause SGD		0.83929	0.5017	Accept H0
USD does not Granger Cause POUND	204	1.74847	0.1409	Accept H0
POUND does not Granger Cause USD		3.61245	0.0073	Reject Ho
YEN does not Granger Cause POUND	204	2.02837	0.092	Accept H0
POUND does not Granger Cause YEN		1.09195	0.3617	Accept H0
EURO does not Granger Cause POUND	204	0.94302	0.4402	Accept H0

POUND does not Granger Cause EURO		1.12318	0.3468	Accept H0
NIFTY does not Granger Cause POUND	204	2.13411	0.0781	Accept H0
POUND does not Granger Cause NIFTY		1.72487	0.146	Accept H0
USD does not Granger Cause SGD	204	0.82495	0.5107	Accept H0
SGD does not Granger Cause USD		4.32661	0.0022	Reject Ho
YEN does not Granger Cause SGD	204	0.26712	0.8988	Accept H0
SGD does not Granger Cause YEN		0.77437	0.5431	Accept H0
EURO does not Granger Cause SGD	204	0.66463	0.6173	Accept H0
SGD does not Granger Cause EURO		0.35766	0.8385	Accept H0
NIFTY does not Granger Cause SGD	204	0.87565	0.4795	Accept H0
SGD does not Granger Cause NIFTY		1.22842	0.3001	Accept H0
YEN does not Granger Cause USD	204	1.30477	0.2696	Accept H0
USD does not Granger Cause YEN		1.21101	0.3074	Accept H0
EURO does not Granger Cause USD	204	3.64332	0.0069	Reject Ho
USD does not Granger Cause EURO		0.36	0.8369	Accept H0
NIFTY does not Granger Cause USD	204	6.40301	7.00E-05	Accept H0
USD does not Granger Cause NIFTY		0.65363	0.625	Accept H0
EURO does not Granger Cause YEN	204	1.19771	0.3131	Accept H0
YEN does not Granger Cause EURO		0.22796	0.9225	Accept H0
NIFTY does not Granger Cause YEN	204	2.56593	0.0395	Reject Ho
YEN does not Granger Cause NIFTY		0.39832	0.8097	Accept H0
NIFTY does not Granger Cause EURO	204	1.10298	0.3564	Accept H0
EURO does not Granger Cause NIFTY		3.25543	0.013	Reject Ho

4. Conclusion

The study has revealed existence of long run causality in between stock market trend and exchange rate. It has also suggested in few cases both exchange rate and stock market index causes each other. There are few other findings like both Sensex and Nifty granger cause Yen where as only Sensex cause USD only, Euro granger causes both the stock markets. Sometimes it has also seen that one exchange rate can also granger cause another exchange rate. Though there exists a causal relationship in between the research variables the policy makers should always try to be cautious during the policy making of bilateral and multi lateral trade as the trading volume has always a direct impact upon the appreciation and depreciation of the currency rate.

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