Foreign Exchange Reserves and Stock Market Prices – A study in Indian Markets

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Abstract: ***This study has been undertaken to investigate the impact of Foreign Exchange Reserves on the Indian stock market indices. Study uses a combination Granger causality to determine the directional relationship between the Stock market prices and Reserve variables. The indices considered for the study are BSE30 and BSE sectoral indices for Auto, Finance and Industrials. For this study, the Foreign-exchange reserves includes Bond and Currency holdings, Gold and Special Drawing Rights (SDRs) which are available with Reserve Bank of India.***

Index Terms – Granger Causality, BSE30, Foreign Exchange Reserve, Augmented Dickey Fuller

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I. Introduction

Stock markets play a vital role in the financial sector of every economy. An efficient capital market drives the economic growth by stabilizing the financial sector. In an efficient capital market, stock prices adjust swiftly according to the new information available. The stock prices reflect all information about the stocks and also the expectations of the future performances of corporate houses. As a result, if stock prices reflect these assumptions in real, then it should be used as a major indicator for the economic activities (Ray, 2012).

This paper aims at exploring the relationship between foreign exchange reserves of India and major Indian stock market indices including some of the sectoral indices. Reserves are the physical currency of other countries and other products which are held by the central bank. Foreign reserves allow governments to keep their currencies stable; reserves are used as a tool of exchange rate and monetary policy, it facilitates for the payment of external debt and liabilities, it acts as a defense against unexpected emergencies and economic shocks.

It is important to ascertain the relationship of foreign reserves with stock market in India because international reserves accumulation has been the preferred policy recently adopted by developing economies like India to achieve financial stability. This has been a key policy initiative adopted by India after the crisis in 1990s. The aim of this policy is to increase liquidity and thus reduce the risk of suffering a speculative attack.

II. Review of literature

Megaravalli, A. V., & Sampagnaro, G. (2018) - The objective of this paper is to examine the long-run and the short-run relationship between India, China and Japanese stock markets and key macroeconomic variables such as exchange rates and inflation (proxied by consumer price index) of the three Asian economies (India, China and Japan). Monthly time series data spanning the period from 2008 January to November 2016 has been used. The unit root test, the cointegration test, Granger causality test and pooled mean group estimator have been applied to derive the long-run and short-run statistical dynamics. The findings of pooled estimated results of three Asian countries show that exchange rate has a positive and significant long-run effect on stock markets while the inflation has a negative and insignificant long-run effect. In the short run, there is no statistically significant relationship between macroeconomic variables and stock markets. This study emphasizes on the impact of macroeconomic variables on the stock market performance of a developing economy (India and China) and developed economy (Japan).

Giri, A. K., & Joshi, P. (2017) The purpose of the present study is to examine the long run and the short run relationship between stock price and a set of macroeconomic variables for Indian economy using annual data from 1979 to 2014. The long run relationship is examined by implementing the ARDL bounds testing approach to co-integration. VECM method is used to test the short and long run causality and variance decomposition is used to predict long run exogenous shocks of the variables. The results confirm a long run relationship among the variables. Evidence suggests that Economic growth, inflation and exchange rate influence stock prices positively.

Islam and Habib.(2016) – Forthe success of the stock market performance, fiscal and conducive economic environment is one of the pivotal aspects. If there is a favorable macroeconomic environment, it assists in the promotion of the profitability of the business. The barometer for measuring the performance of the economy also includes the debt position apart from the other important barometers. It had also been concluded that, mostly in the short run, there is an existence of the bi-directional effect between the stock prices and the exchange rates

Gurloveleen, K., & Bhatia, B. S. (2015). The study investigated the impact of macroeconomic variables on the functioning of Indian Stock Market., The monthly data of ten macroeconomic variables, namely Broad Money, Call Money Rate, Crude Oil Price, Exchange Rate, Foreign Exchange Reserve, Foreign Institutional Investors, Gross Fiscal Deficit, Index of Industrial Production, Inflation Rate and Trade Balance and one stock market index i.e. BSE 500 have been used to attain the objectives of the research. The Augmented Dickey Fuller (ADF) Test, Multiple Regression and Granger Causality Tests were employed to find out the results. It was found that Foreign Institutional Investors became stationary at level, Call Money Rate, Crude Oil Price, Exchange Rate, Foreign Exchange Reserve, Gross Fiscal Deficit, Inflation Rate and Trade Balance at first difference and Broad Money and Index of Industrial Production at second difference. This stationary data has been applied to find out the significant macroeconomic variables through multiple regression technique. The two macroeconomic variables Foreign Institutional Investors and Exchange Rate were found significant. Granger causality test was used to check the causality relationship between these two significant variables and average closing prices of manufacturing firms of BSE 500. It has been observed that

these variables have no relationship with closing prices of BSE 500 manufacturing firms. The study also revealed that the Indian Stock Market was a weak form efficient because no relationship was found amongst the variables during the study period.

Makan et al (2012) have tried to test the influence of macroeconomic variables on BSE stock prices. The macroeconomic variables are represented by the IIP, CPI, call rate, exchange rate, gold price, oil price and FII. Monthly data for the duration of April 2005 March 2012 was considered. The paper employed Granger causality test, regression analysis and correlation analysis to examine such relationships. Based on the results it was concluded that three out of seven variables were relatively more significant and likely to influence Indian stock market. These factors were exchange rate, FII and call rate. There is a positive relation between FII and Sensex, call rate and Sensex whereas exchange rate and Sensex shows a negative relation. In granger causality test call rate was seen affecting BSE.

Dharmendra Singh (2010) tried to explore the relation especially the causal relation between stock market index i.e. BSE Sensex and three key macro-economic variables by using correlation, unit root stationarity tests and Granger causality test. Monthly data has been used for all the variables and results showed that the stock market index, IIP, WPI, and exchange rate contained a unit root and were integrated of order one. They found that results show bilateral granger causality between IIP and Sensex while WPI is having strong correlation and unilateral causality with Sensex which means Indian stock market is approaching towards informational efficiency at least with respect to two macroeconomic variables, viz. exchange rate and inflation

III. Methodology

BSE30 popularly known as an index of 30 well established and financially sound companies listed on the BSE is considered to determine stock market price. The Sensex is intended to represent an entire stock market and thus track themarket changes over time. The period of the data for consideration is from 1st Jan 2000 to 31st December 2017. In this study, we have considered the BSE30's (Sensex) daily "Close" priced to track the changes in the market over time with respect to other macroeconomic variables. The data for BSE Sensex has been taken from the official website of Bombay Stock Exchange.

For the sectoral indices, following ones are considered.

- BSE Auto Index - The S&P BSE Auto index comprises constituents of the S&P BSE 500 that are classified as members of the transportation equipment sector as defined by the BSE industry classification system. The major constituents of this index include Maruti Suzuki India Ltd, Mahindra & Mahindra Ltd , Tata Motors Ltd, Hero MotoCorp Ltd, Eicher Motors Ltd, Bajaj Auto Ltd etc. The daily "Close" price of the index is used for this study and the data for the study has been taken from the official website of Bombay Stock Exchange.
- BSE Finance Index - The S&P BSE Finance is designed to provide investors with a benchmark reflecting companies included in the S&P BSE AllCap that are classified as members of finance sector. The major constituents of this index include HDFC Bank Ltd, ICICI Bank Ltd, State Bank of India Ltd, Axis Bank Ltd, Housing Development Finance Corporation etc. The daily "Close" price of the index is used for this study and the data for the study has been taken from the official website of Bombay Stock Exchange.
- BSE Industrials Index - The S&P BSE Industrials is designed to provide investors with a benchmark reflecting companies included in the S&P BSE AllCap that are classified as members of the industrials sector. The major constituents of this index include Larsen & Toubro Ltd, Tata Motors Ltd, Adani Ports and Special Economic Zone, Ashok Leyland Ltd, Havells India Ltd etc. The daily "Close" price of the index is used for this study and the data for the study has been taken from the official website of Bombay Stock Exchange.

For this study, the Foreign-exchange reserves includes Bond and Currency holdings, Gold and Special Drawing Rights (SDRs) which are available with Reserve Bank of India.These are assets of the Reserve bankheld in different reserve currencies, mostly the United States Dollar, and to a lesser extent in Euro, PoundSterling, and Japanese Yen.The SDR is neither a currency nor a claim on the IMF. Rather, it is a potential claim on the freely usable currencies of IMF members. SDRs can be exchanged for these currencies – US Dollar, Euro, Chinese Yuan, Japanese Yen and Pound Sterling.

As a first step in the study, to identify the relationship between Reserves and Stock market prices, simple correlation between them is calculated. Correlation has been calculated separately with Foreign Exchange holdings, SDR and Gold with respect to main indices and sectoral indices. Correlation would point to the fact that variables are observed to occur together. But correlation values may not be always a good estimator of the causation between the variables.

Hence as a second step in the process, to understand the relationship between the variable regression methods are considered. It has been noticed from the literature review and earlier studies that macroeconomic time series data theoretically have long-run relationship. It is also widely claimed that these time series data evolve over time such that their mean and variance are not constant making it non-stationary. Analyzing non-stationary time series data may lead to wrongly conclude that two variables are related when in reality they are not and this phenomenon is called spurious regression. So, as a part of the study, we have used Augmented Dickey Fuller (ADF) to test the stationarity and for the non-stationary series, used differencing methods to convert them to stationary series.

Granger Causality tests are used to determine the directional relationship between the Stock market prices and Reserve variables. The Granger representation theorem suggests that there will be Granger causality in at least one direction if there exists a cointegration relationship among the variables, providing that they are integrated order of one.

IV. Results and Conclusion

As detailed in the methodology, correlation values were calculated between the stock market prices and exchange rate. The results are as detailed in the table below.

Table I Correlation values between the stock market prices and exchange rate.

Index	Reserve Type	Correlation Value
BSE30	Foreign Currency Reserve	0.9647
BSE30	Gold Reserve	0.8535

BSE30	SDR	0.6104
BSE Finance Index	Foreign Currency Reserve	0.9511
BSEFinance Index	Gold Reserve	0.8310
BSEFinance Index	SDR	0.5475
BSE Auto Index	Foreign Currency Reserve	0.9523
BSEAuto Index	Gold Reserve	0.8433
BSEAuto Index	SDR	0.5464
BSE Industrials Index	Foreign Currency Reserve	0.8336
BSE Industrials Index	Gold Reserve	0.6691
BSEIndustrials Index	SDR	0.5554

Stationarity tests were conducted on the stock market time series data for all indices, Currency reserves, SDR and Gold. The results of the stationarity point to the fact that all the time-series are non- stationary. All the time series were differenced and stationarity tests were conducted again to make sure that the conversion of the non-stationary series into stationary onewere done post differencing. Post converting data into stationary one, granger causality tests were conducted to determine the directional relationship between stock market prices and exchange rates. The results for the tests are detailed below.

Table II Relationship between stock market prices and exchange rates.

X Value	Y Value	P value
Foreign Currency Reserve	BSE30	0.0057
Gold Reserve	BSE30	0.0002
SDR	BSE30	0.9577
Foreign Currency Reserve	BSE Finance Index	0.6618
Gold Reserve	BSE Finance Index	0.4212
SDR	BSE Finance Index	0.9971
Foreign Currency Reserve	BSE Auto Index	0.975
Gold Reserve	BSE Auto Index	0.4913
SDR	BSE Auto Index	0.9765
Foreign Currency Reserve	BSE Industrials Index	0.9442
Gold Reserve	BSE Industrials Index	0.5598
SDR	BSE Industrials Index	0.9941

The null hypothesis is Variable "X" doesn't Granger cause "Y". At a significance level of 0.05, the null hypothesis can be rejected for Foreign Currency Reserve – BSE30 and SDR – BSE30 combination as the P values are lower than the significance level of 0.05.So, based on the test results it can be concluded that Foreign Currency Reserve and SDR has an impact on the index value of BSE30. Also, they have limited causality relationship with each of the sectoral indices considered for the study.

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