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Foreign Exchange Reserve and its Impact on Stock Market Capitalization: Evidence from India

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Abstract:

This paper tries to assess relationship between foreign exchange reserves of India and BSE market capitalization on the basis of annual data from the year 1990-91 to2010-11. This study uses simple linear regression model, unit root test, granger causality test to measure the relationship between foreign exchange reserves of India and BSE market capitalization. The results depicts that foreign exchange reserves of India has positive impact on BSE Stock Market capitalization. The granger causality test suggests that stock market capitalization (SMC) does not Granger cause foreign exchange reserve (FOREXR) at all where as foreign exchange reserve (FOREXR) Granger causes stock market capitalization (SMC). That means the Granger Causality Test shows that causality is unidirectional and it runs from foreign exchange reserve to stock market capitalization but not vice versa. This study sheds lights and provides significant information that will guide the stock brokers, agents, planners, government policy makers to make decision about the stocks and stock markets of India especially about BSE by looking at the trend of foreign exchange reserves of India.

Keywords: Foreign exchange reserve, stock market, capitalization, India, BSE.

1. Introduction:

Most studies suggest that the macroeconomic surroundings has a significant effect on the stock market capitalization rate such as gross domestic product, exchange rates, interest rates, current account and money supply (Kurihara, 2006; Ologunde et al., 2006). Maintaining macroeconomic stability has been of the main challenges for developing countries (Iqbal, 2001).This paper explains the relationship between foreign exchange reserves of India and BSE market capitalization on the basis of annual data from fiscal year 1990-91 to 2010-11. Both of the variables under consideration are very important because foreign exchange reserve is the crucial element out of the major supports to stable the value of home currency against foreign currencies and market capitalization shows the overall investment in stock market.

Foreign exchange is the currency of other countries and Foreign Reserves mean deposits of international currencies held by a central bank. Foreign reserves allow governments to keep their currencies stable; reserves are used as a tool of exchange rate and monetary policy, it facilitate for the payment of external debt and liabilities, it act as a defense against unexpected emergencies and economic shocks.

To know about the relationship of foreign reserves with stock market is important because international reserves accumulation has been the preferred policy recently adopted by developing economies to achieve financial stability. The aim of this policy is to increase liquidity and thus reduce the risk of suffering a speculative attack.(Cruz & Walters, June 2008).

This research is carried out to find the impact of foreign exchange reserves held by Govt. of India on the investment and performance of stock markets of India. Bombay Stock Exchange (BSE) is premier, biggest and the most popular stock market of the country, so it is used as representative of all stock exchanges of India.

The Bombay Stock Exchange, which started in 1875 as “The Native Share and Stockbrokers Association” is the oldest exchange in Asia, predating the Tokyo Stock Exchange by 3 years. For the better part of its existence it held a preeminent position as a monopolistic institution for security trading in India. More recently its position has been challenged by the National Stock Exchange (NSE) an online electronic exchange which was established in 1994. It is therefore not surprising that this monopolistic position of the BSE has led to dubious practices, resulting in lack of transparency, high transaction costs and poor liquidity. Over 7000 stocks are listed at the BSE, (of these, about 1300 are cross listed at the newly formed NSE). Whereas, almost 100% of trading used to take place at the BSE, its share has fallen to about 35% in recent years. There is no organized source of price data for all the securities that trade on the BSE. What is collected and disseminated by the BSE is a 30 stock index called the Bombay Sensitive Index, popularly referred to as the Sensex. The stocks included in the Sensex account for about 38% to 40% of the capitalization of all stocks listed at the exchange. Along with overall financial reforms in the Indian financial sector, the BSE also has undergone some changes in recent years, notably the introduction of its online trading system (BOLT), presumably aimed at dealing with the increased competition from the newcomer on the block – the NSE. The total market capitalization of the BSE market is estimated at 3.8 trillion Indian rupees (approximately US$ 82), about 38% of which is represented by the 30 stocks of the Sensex.

On the other hand, India’s foreign exchange reserves have grown significantly since 1991. The reserves stood at US$ 5.8 billion at end-March 1991. The reserves stood at US$ 304.8 billion as on March 31, 2011 compared to US $ 292.9 billion as on September, 2010.Although both US dollar and Euro are intervention currencies and the FCA are maintained in major currencies like US dollar, Euro, Pound Sterling, Japanese Yen etc., the foreign exchange reserves are denominated and expressed in US dollar only. Movements in the FCA occur mainly on account of purchases and sales of foreign exchange by the RBI in the foreign exchange market in India. In addition, income arising out of the deployment of the foreign exchange reserves and the external aid receipts of the Central Government also flow into the reserves. The movements of the US dollar against other currencies in which FCA are held also impact the level of reserves in US dollar terms.

The purpose of this research is to explore the impact of foreign exchange reserves of India on BSE market capitalization on the basis of previous behavior of both variables with each other. The main focus of this study is to link the foreign exchange reserves of India with its Stock Markets to observe a comprehensible picture about them as it affects many other variables.

2.Brief review of existing literature:

There are some studies related to this topic that has been conducted previously by other researchers.

Bhattacharya et. al.(2001) conduct a case study to analyze “Causal Relationship between Stock Market and Exchange Rate, Foreign Exchange Reserves and Value of Trade Balance”. They used methodology of Granger non-causality recently proposed by Toda and Yamamoto (1995) for the sample period April 1990 to March 2001. In this study, the Bombay BSE Sensitive Index was used as a proxy for the Indian stock market. The three important macroeconomic variables included in the study are real effective exchange rate, foreign exchange reserves and trade balance. The analysis reveals interesting results in the context of the Indian stock market, particularly with respect to exchange rate, foreign exchange reserves and trade balance. The results suggest that there is no causal linkage between stock prices and the three variables under consideration.

Nishat and Shaheen (2004) analyze long-term equilibrium relationships between a group of macroeconomic variables and the Karachi Stock Exchange Index. The macroeconomic variables are represented by the industrial production index, the consumer price index, M1, and the value of an investment earning the money market rate. They used vector error correction model to explore such relationships during 1973 to 2004. Their results indicate a "causal" relationship between the stock market and the economy and show that industrial production is the largest positive determinant of Pakistani stock prices, while inflation is the largest negative determinant of stock prices in Pakistan. They found that macroeconomic variables Granger-caused stock price movements, the reverse causality was observed in case of industrial production and stock prices. Furthermore, he found that statistically significant lag lengths between fluctuations in the stock market and changes in the real economy are relatively short.

Dimitrova (2005) analyzed the relationship between stock prices and exchange rates using multivariate model. He focuses on the stock markets of United States and the United Kingdom over the period January 1990 through August 2004. This study developed the hypothesis that there is a link between the foreign exchange and stock markets. The researcher asserted that relationship is positive when stock prices are the lead variable and likely to negative when exchange rates are the lead variable.

Doong et al (2005) investigated the dynamic relationship between stocks and exchange rates for six Asian countries (Indonesia, Malaysia, Philippines, South Korea, Thailand, and Taiwan) over the period 1989-2003. According to their study, these financial variables are not cointegrated. The result of Granger causality test shows that bidirectional causality can be detected in Indonesia, Korea, Malaysia, and Thailand. Also, there is a significantly negative relation between the stock returns and the contemporaneous change in the exchange rates for all countries except Thailand.

Ologunde et al (2006) examined the relationships between stock market capitalization rate and interest rate in Nigeria. They used the ordinary least-square (OLS) regression method and they found that the prevailing interest rate exerts positive influence on stock market capitalization rate. Also, they are finding that Government development stock rate exerts negative influence on stock market capitalization rate and prevailing interest rate exerts negative influence on government development stock rate.

Kurihara (2006) suggests that stock market capitalization rate is significantly influenced by the macroeconomic environment factors such as gross domestic product, exchange rates, interest rates, current account and money supply.

Robert Gay (2008) conducted study to investigate the time-series relationship between stock market index prices and the macroeconomic variables of exchange rate and oil price for Brazil, Russia, India, and China (BRIC) using the Box-Jenkins ARIMA model. But no significant relationship was found between respective exchange rate and oil price on the stock market index prices of either BRIC country and also there was no significant relationship found between present and past stock market returns.

Sohail et al(2009) conducted a research on LSE, the intention of this study was to examine long-run and short-run relationships between Lahore Stock Exchange and macroeconomic variables in Pakistan. Monthly data from December 2002 to June 2008 was used in this study. The results revealed that there was a negative impact of consumer price index on stock returns, while, industrial production index, real effective exchange rate, money supply had a significant positive effect on the stock returns in the long-run .

Hussain et al. (2009) analyzed the "Impact of Macroeconomics Variables on Stock Prices: Empirical Evidence in Case of KSE" they consider the quarterly data of several economic variables such as foreign exchange rate, foreign exchange reserve, industrial production index, whole sale price index, gross fixed capital formation, and broad money M2 , these variables are obtain from 1986 to 2008 period. The results shows that after the reforms in 1991 the influence of foreign exchange rate and reserve effects significantly to stock market whiles other variables like IIP and GFCF are not effects significantly to stock prices. This result also shows that internal factors of firms like increase production and capital formation not effects significantly while external factors like exchange rate and reserve are effects significantly the stock prices.

Aydemir and Demirhan (2009) studied the causal relationship between stock prices and exchange rates, using data from 23 February 2001 to 11 January 2008 for Turkey. Their empirical research found the bidirectional causal relationship between exchange rate and all stock market indices. While the negative causality exists from national 100 services, financial and industrial indices to exchange rate, there exists a positive causal relationship from technology sector indices to exchange rate. On the other hand, negative causal relationship from exchange rate to all stock market indices is determined.

3.Methodological issues:

3.1. Data and Variables:

The article investigates the impact of foreign exchange reserve on stock market capitalization in India. For this purpose, the study uses the annual data for the period 1990-91 to 2010-11 which includes 21 annual observations. The two main variables of this study are foreign exchange reserve (FOREXR) and stock market capitalization (SMC). All requisite information regarding these two crucial variables for the sample are collected from Handbook of Statistics on Indian Economy and Handbook of Statistics on Indian Securities Market ,2010-11 published by Reserve Bank of India. The estimation methodology employed in this study is the ordinary least square estimate, unit root test, Johansen cointegration and Granger Casuality test.

The entire estimation procedure consists of four steps: first, ordinary least square estimates, unit root test; second, cointegration test; third, Granger causality test.

3.2.Variables measurement:

Stock market capitalization rate(SMC):

It is measured by the total value of a company's outstanding shares. To find the market capitalization of a company, we need to multiply the market price of the stock by the number of shares outstanding.

The measurement of stock market's price can be done using the "price/earnings ratio" or *P/E* ratio. If a company's stock is trading at 50 USD per share and its earnings per share (EPS) is forecast at 2.50 USD, the *P/E* ratio is 20. Since the cap rate is defined as reciprocal of the *P/E* ratio, it equals 1/20 or 0.05 (5%) According to Rose and Marquis (2008) we define the stock market price by the following equation:

$$Po = \sum_{t=0}^{\infty} E(D_t) / (1+r)^t$$

Where: Po = the present value of stock market price, E (Dt) = the expected cash flows, r = required rate of return, t = time series.

Foreign exchange Reserve:

Foreign reserves can be enhanced by storing more and more international currency and this can be done through three ways, by increasing exports, by foreign remittance and by taking official grants or loans. If foreign reserves are increasing due to exports and remittances then the growth of reserves is positive but if it is increasing with the help of loans then growth will be negative. This research is not concerned with the positive or negative growth, this research examines only the foreign reserves held by central bank and their impact on stock market capitalization. A foreign exchange reserve of India is independent variable in this research and calculated by following equation.

FOREXR = SDR + Gold + FCA + RTP

Where:

FOREXR = Foreign exchange reserves.

Foreign-exchange reserves (also called forex reserves or FX reserves) in a strict sense are 'only' the foreign currency deposits and bonds held by central banks and monetary authorities. However, the term in popular usage commonly includes foreign exchange and gold, Special Drawing Rights (SDRs) and International Monetary Fund (IMF) reserve positions. This broader figure is more readily available, but it is more accurately termed official international reserves or international reserves. These are assets of the central bank held in different reserve currencies, mostly the United States dollar, and to a lesser extent the euro, the pound sterling, and the Japanese yen, and used to back its liabilities, e.g., the local currency issued, and the various bank reserves deposited with the central bank, by the government or financial institutions.

SDR= Special drawing rights.

Special drawing rights (SDRs) are supplementary foreign exchange reserve assets defined and maintained by the International Monetary Fund (IMF). Not a currency, SDRs instead represent a claim to currency held by IMF member countries for which they may be exchanged. As they can only be exchanged for Euros, Japanese yen, UK pounds, or US dollars, SDRs may actually represent a potential claim on IMF member countries' non-gold foreign exchange reserve assets, which are usually held in those currencies. While they may appear to have a far more important part to play, or, perhaps, an important future role, being the unit of account for the IMF has long been the main function of the SDR. Created in 1969 to supplement a shortfall of preferred foreign exchange reserve assets, namely gold and the US dollar, the SDR's value is defined by a weighted currency basket of four major currencies: the Euro, the US dollar, the British pound, and the Japanese yen. SDRs are denoted with the ISO 4217 currency code XDR.

FCA = Foreign Currency Assets.

Foreign currency assets include foreign exchange reserves less gold holdings, special drawing rights and India's reserve position in the IMF.

RTP =Reserve Tranche Position.

The primary means of financing the International Monetary Fund is through members' quotas. Each member of the IMF is assigned a quota, part of which is payable in SDRs or specified usable currencies ("reserve assets"), and part in the member's own currency. The difference between a member's quota and the IMF's holdings of its currency is a country's Reserve Tranche Position (RTP). Reserve Tranche Position is accounted among a country's Foreign Exchange Reserves.

3.3.Method:

Step –I: Ordinary least square method:

Here we will assume the hypothesis that there is no relationship between Foreign Trade (FT) and Economic Growth in terms of GDP. To confirm about our hypothesis, primarily, we have studied the effect of foreign exchange reserve on BSE stock market capitalization by a simple regression equations:

$$SMC_t = \alpha + \beta\ FOREXR_t + U_t \qquad \text{………………………………………………………… (1)}$$

Where

SMC = stock market capitalization of Bombay Stock Exchange(BSE)

FOREXR = Foreign Exchange Reserve in India.

t= time subscript.

The first step for an appropriate analysis is to determine if the data series are stationary or not. Time series data generally tend to be non-stationary, and thus they suffer from unit roots. Due to the non-stationarity, regressions with time series data are very likely to result in spurious results. The problems stemming from spurious regression have been described by Granger and Newbold (1974). In order to ensure the condition of stationarity, a series ought to be integrated to the order of 0 [I(0)]. In this study, tests of stationarity, commonly known as unit root tests, were adopted from Dickey and Fuller (1979, 1981).As the data were analyzed, we discovered that error terms had been correlated in the time series data used in this study.

Step II: The Stationarity Test (Unit Root Test):

It is suggested that when dealing with time series data, a number of econometric issues can influence the estimation of parameters using OLS. Regressing a time series variable on another time series variable using the Ordinary Least Squares (OLS) estimation can obtain a very high R^2, although there is no meaningful relationship between the variables. This situation reflects the problem of spurious regression between totally unrelated variables generated by a non-stationary process. Therefore, prior to testing Cointegration and implementing the Granger Causality test, econometric methodology needs to examine the stationarity ;for each individual time series, most macro economic data are non stationary, i.e. they tend to exhibit a deterministic and/or stochastic trend. Therefore, it is recommended that a stationarity (unit root) test be carried out to test for the order of integration. A series is said to be stationary if the mean and variance are time – invariant. A nonstationary time series will have a time dependent mean or make sure that the variables are stationary, because if they are not, the standard assumptions for asymptotic analysis in the Granger test will not be valid. Therefore, a stochastic process that is said to be stationary simply implies that the mean [(E(Yt)] and the variance [Var(Yt)] of Y remain constant over time for all t, and the covariance [covar(Yt, Ys)] and hence the correlation between any two values of Y taken from different time periods depends on the difference apart in time between the two values for all t≠s. Since standard regression analysis requires that data series be stationary, it is obviously important that we first test for this requirement to determine whether the series used in the regression process is a difference stationary or a trend stationary. The Augmented Dickey-Fuller (ADF) test is used. To test the stationary of variables, we use the Augmented Dickey Fuller (ADF) test which is mostly used to test for unit root. Following equation checks the stationarity of time series data used in the study:

$$\Delta y_t = \beta_1 + \beta_1 t + \alpha\, y_{t-1} + \gamma \sum_{t=1}^{n} \Delta y_{t-1} + \varepsilon_t \qquad \text{---------(2)}$$

Where ε_t is white nose error term in the model of unit root test, with a null hypothesis that variable has unit root. The ADF regression test for the existence of unit root of yt that represents all variables (in the natural logarithmic form) at time t. The test for a unit root is conducted on the coefficient of y_{t-1} in the regression. If the coefficient is significantly different from zero (less than zero) then the hypothesis that y contains a unit root is rejected. The null and alternative hypothesis for the existence of unit root in variable y t is H0; $\alpha = 0$ versus H1: $\alpha < 0$. Rejection of the null hypothesis denotes stationarity in the series.

If the ADF test-statistic (t-statistic) is less (in the absolute value) than the Mackinnon critical t-values, the null hypothesis of a unit root can not be rejected for the time series and hence, one can conclude that the series is non-stationary at their levels. The unit root test tests for the existence of a unit root in two cases: with intercept only and with intercept and trend to take into the account the impact of the trend on the series.

The PP tests are non-parametric unit root tests that are modified so that serial correlation does not affect their asymptotic distribution. PP tests reveal that all variables are integrated of order one with and without linear trends, and with or without intercept terms.

Phillips–Perron test (named after Peter C. B. Phillips and Pierre Perron) is a unit root test. That is, it is used in time series analysis to test the null hypothesis that a time series is integrated of order 1. It builds on the Dickey–Fuller test of the null hypothesis $\delta = 0$ in $\Delta y_t = \delta y_{t-1} + u_t$, here Δ is the first difference operator. Like the augmented Dickey–Fuller test, the Phillips–Perron test addresses the issue that the process generating data for y_t might have a higher order of autocorrelation than is admitted in the test equation - making y_{t-1} endogenous and thus invalidating the Dickey–Fuller t-test. Whilst the Augmented Dickey–Fuller test addresses this issue by introducing lags of Δy_t as regressors in the test equation, the Phillips–Perron test makes a non-parametric correction to the t-test statistic. The test is robust with respect to unspecified autocorrelation and heteroscedasticity in the disturbance process of the test equation.

In econometrics, Kwiatkowski–Phillips–Schmidt–Shin (KPSS) tests are used for testing a null hypothesis that an observable time series is stationary around a deterministic trend. The series is expressed as the sum of deterministic trend, random walk, and stationary error, and the test is the Lagrange multiplier test of the hypothesis that the random walk has zero variance. KPSS type tests are intended to complement unit root tests, such as the Dickey–Fuller tests. By testing both the unit root hypothesis and the stationarity hypothesis, one can distinguish series that appear to be stationary, series that appear to have a unit root, and series for which the data (or the tests) are not sufficiently informative to be sure whether they are stationary or integrated.

Step-III: Testing for Cointegration Test(Johansen Approach)

Cointegration, an econometric property of time series variable, is a precondition for the existence of a long run or equilibrium economic relationship between two or more variables having unit roots (i.e. Integrated of order one). The Johansen approach can determine the number of co-integrated vectors for any given number of non-stationary variables of the same order. Two or more random variables are said to be cointegrated if each of the series are themselves non – stationary. This test may be regarded as a long run equilibrium relationship among the variables. The purpose of the Cointegration tests is to determine whether a group of non – stationary series is cointegrated or not.

Having concluded from the ADF results that each time series is non-stationary, i.e it is integrated of order one I(1), we proceed to the second step, which requires that the two time series be co-integrated. In other words, we have to examine whether or not there exists a long run relationship between variables (stable and non-spurious co-integrated relationship) . In our case, the mission is to determine whether or not foreign exchange reserve (FOREXR) and stock market capitalization (SMC) variables have a long-run relationship in a bivariate framework. Engle and Granger (1987) introduced the concept of cointegration, where economic variables might reach a long-run equilibrium that reflects a stable relationship among them. For the variables to be co-integrated, they must be integrated of order one (non-stationary) and the linear combination of them is stationary I(0).

The crucial approach which is used in this study to test r cointegration is called the Johansen cointegration approach. The Johanson approach can determine the number of cointegrated vectors for any given number of non-stationary variables of the same order.

Step-IV: The Granger Causality test :

Granger Causality test:

Causality is a kind of statistical feedback concept which is widely used in the building of forecasting models. Historically, Granger (1969) and Sim (1972) were the ones who formalized the application of causality in economics. Granger causality test is a technique for determining whether one time series is significant in forecasting another (Granger. 1969). The standard Granger causality test (Granger, 1988) seeks to determine whether past values of a variable helps to predict changes in another variable. The definition states that in the conditional distribution, lagged values of Yt add no information to explanation of movements of Xt beyond that provided by lagged values of Xt itself (Green, 2003). We should take note of the fact that the Granger causality technique measures the information given by one variable in explaining the latest value of another variable. In addition, it also says that variable Y is Granger caused by variable X if variable X assists in predicting the value of variable Y. If this is the case, it means that the lagged values of variable X are statistically significant in explaining variable Y. The null hypothesis (H0) that we test in this case is that the X variable does not Granger cause variable Y and variable Y does not Granger cause variable X.In summary, one variable (Xt) is said to granger cause another variable (Yt) if the lagged values of Xt can predict Yt and vice-versa.

FOREXR and SMC are, in fact, interlinked and co-related through various channel. There is no theoretical or empirical evidence that could conclusively indicate sequencing from either direction. For this reason, the Granger Causality test was carried out on FOREXR and SMC.

The spirit of Engle and Granger (1987) lies in the idea that if the two variables are integrated as order one, I(1), and both residuals are I(0), this indicates that the two variables are co integrated. The Granger theorem states that if this is the case, the two variables could be generated by a dynamic relationship from FOREXR to SMC and, vise versa.

Therefore,a time series X is said to Granger-cause Y if it can be shown through a series of F-tests on lagged values of X (and with lagged values of Y also known) that those X values predict statistically significant information about future values of Y. In the context of this analysis, the Granger method involves the estimation of the following equations:

If causality (or causation) runs from FOREXR to SMC, we have:

$$d\,SMC_{it} = \eta_i + \Sigma\alpha_{11} d\,SMC_{i,\ t-1} + \Sigma\beta_{11} dFOREXR_{i,\ t-1} + \varepsilon_{1t} \quad \ldots\ldots(3)$$

If causality (or causation) runs from SMC to FOREXR, it takes the form:

$$dFOREXR_{it} = \eta_i + \Sigma\alpha_{12} dFOREXR_{i,\ t-1} + \Sigma\beta_{12} dSMC_{i,t-1} + \lambda ECM_{it} + \varepsilon_{2t} \quad \ldots\ldots(4)$$

where, SMC_t and $FOREXR_t$ represent Stock Market Capitalization and foreign exchange reserve respectively, ε_{it} is uncorrelated stationary random process, and subscript t denotes the time period. In equation 3,failing to reject: H_0: $\alpha_{11} = \beta_{11} = 0$ implies that foreign exchange reserve does not Granger cause stock market capitalization. On the other hand, in equation 4,failing to reject H_0: $\alpha_{12} = \beta_{12} = 0$ implies that stock market capitalization does not Granger cause foreign exchange reserve.

The decision rule:

From equation (3), $dFOREXR_{i\ t-1}$Granger causes $dSMC_{it}$ if the coefficient of the lagged values of FOREXR as a group (β_{11}) is significantly different from zero based on F-test (i.e., statistically significant). Similarly, from equation (5), $dSMC_{t-1}$ Granger causes $dFOREXR_{it}$ if $\beta_{12}$is statistically significant.

4. Analysis of the Result:

Table 1 presents the descriptive statistics for the entire period. Stock Market capitalization and foreign exchange reserve both have shown positive skewness which indicates steeper tails than the normal distribution. Stock market capitalization shows leptokurtic (kurtosis>3). The both series –SMC and FOREXR for the entire period show high dispersion. Jarque-Bera test for SMC suggests that this series are normally distributed (as Probability<0.05) but series for FOREXR are not normal.

[Insert Table-1 here]

4.1.Ordinary Least Square Technique:

In Ordinary least Square Method, we reject the hypothesis that there is no relationship between the variable and the results of the Ordinary Least Squares Regression are summarized in the Table 2. The Ordinary least Square Method indicates that there is positive relationship between foreign exchange reserve and stock market capitalization. The empirical analysis on basis of ordinary Least Square Method suggests that there is positive relationship between the variables.

[Insert Table-2 here]

The result of the regression depicts that the value of co-efficient of correlation (r) is equal to 0.94 which shows that there is positive relationship between market capitalization and foreign exchange reserves.

The results show that the value of co-efficient of determination (R^2) is equal to 0.8876 which shows that 88.76% of the variation in the BSE market capitalization is explained by the variation in the foreign exchange reserves. The remaining 11.24% is unexplained.

The value of Regression constant or intercept is 1.193 which is the average market capitalization without independent variable. Here it shows that the average value of market capitalization is positive (above the X-axis line) with the value of 1.193 core rupees when foreign exchange reserves are zero.

The value of Regression co-efficient or slope is equal to 4.029 which shows that the BSE market capitalization will increase by 4.029 crore rupees for an increase of one crore Rs in foreign exchange reserves of India.

4.2.Unit Root Test:

Table 3presents the results of the unit root test. The results show that both variables of our interest, namely FOREXR and SMC attained stationarity after first differencing, I(1), using ADF Test.

[Insert Table-3 here]

Table (3) presents the results of the unit root test for the two variables for their levels. The results indicate that the null hypothesis of a unit root can not be rejected for the given variable and, hence, one can conclude that the variables are not stationary at their levels.

To determine the stationarity property of the variable, the same test above was applied to the first differences. Results from table (3) revealed that the ADF value is lesser than the critical t-value at 1,5 and 10% level of significance for all variables. Based on these results, the null hypothesis that the series have unit roots in their differences is rejected, meaning that the two series are stationary at their first differences [they are integrated of the order one i.e I(1)]. KPSS test also confirms the stationarity of the two variables.

4.3.Johansen Cointegration test:

The Johanson approach can determine the number of cointegrated vectors for any given number of non-stationary variables of the same order. The results reported in table (4) suggest that the null hypothesis of no cointegrating vectors can be rejected at the 1% level of significance. It can be seen from the Likelihood Ratio (L.R.) that we have a single co-integration equations. In other words, there exists one linear combination of the variables.

[Insert Table-4 here]

Source: Own estimate

4.4.Granger Causality Test :

The results of Pairwise Granger Causality between stock market capitalization (SMC) and foreign exchange reserve (FOREXR) are contained in Table 5. The results reveal the existence of a unidirectional causality which runs from foreign exchange reserve (FOREXR) to stock market capitalization (SMC).

[Insert Table-5 here]

We have found that for the Ho of "BSE does not Granger Cause FOREXR", we cannot reject the Ho since the F-statistics are rather small and most of the probability values are close to or even greater than 0.1 at the lag length of 1 to 2.

And for Ho of "FOREXR does not Granger Cause SMC" , we reject the Ho since the F-statistics are rather larger with larger probability values which are close to or even greater than 0.1 at the lag length of 1 to 2.

Therefore, Granger Causality Test indicates that SMC does not Granger Cause FOREX at all where as FOREX Granger Causes SMC. That means the Granger Causality Test shows that causality is unidirectional and it runs from FOREX to SMC and not vice versa.

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5. Conclusion:

This study tries to assess the impact of foreign exchange reserve on stock market capitalization of India covering a period of 1990-91 to 2010-11.The result shows that there exist significant positive impact of foreign exchange reserve on stock market capitalization .The granger causality test suggests that that stock market capitalization(SMC) does not Granger Cause foreign exchange reserve(FOREX) at all where as foreign exchange reserve (FOREX)Granger Causes stock market capitalization (SMC). That means the Granger Causality Test shows that causality is unidirectional and it runs from foreign exchange reserve to stock market capitalization but not vice versa.

Significance of this research work is to provide the considered necessary information that will guide the stock brokers, agents, planners, government policy makers to make decision about the stocks and stock markets of India especially about BSE by looking at the trend of foreign exchange reserves of India. The research will also try to add value for executives, directors, researchers and other students to know about the foreign reserves and stock markets of India.

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Table:1: Descriptive Statistics

	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Probability	Obs.
SMC	1745798	572198	6634387	90836.00	2042263.	1.345621	3.442057	6.508419	0.038611	21
FOREX	448448.6	197204.0	1361013	11416.00	477552.8	0.898686	2.266976	3.296883	0.192349	21

Source: Own estimate

Table 2:Result of OLS Technique

Dependent Variable: BSE Method: Least Squares Sample: 1990-91 to 2010-11 Included observations: 21				
Variable	Coefficient	SE	t statistic	Prob.
C	1.193	0.02211	53.968	0.4979
FOREX	4.029	0.32891	12.249	0.0000
R-squared 0.887605 Adjusted R-squared 0.881690 S.E. of regression 702461.8 Sum squared resid. 9.38E+12 Log likelihood -311.4561 Durbin-Watson stat 1.811146 r=0.942128		Mean dependent var 1745798. S.D. dependent var 2042263. Akaike info criterion 29.85296 Schwarz criterion 29.95244 F-statistic 150.0472 Prob(F-statistic) 0.000000		

Ho: There is no relationship between the variables; $H_{1:}$ There is relationship between the variables

Source: Own estimate.

Table 3: Unit Root Test:

	Augmented Dickey Fuller (ADF) Test			Phillips- Perron(PP) Test			Kwiatkowski–Phillips–Schmidt–Shin (KPSS) tests		
	First difference,Intercept&Trend			First difference ,Intercept&Trend			Intercept only		
	Lag 0	Lag 1	Lag 2	Lag 0	Lag 1	Lag 2	Lag 0	Lag 1	Lag 2
BSE market capitalization	-8.4291	-5.0308	-5.829	-8.4291	-8.62685	-9.0758	0.03127	0.0832	0.08539
Foreign Exchange Reserve	-5.33934	-5.5285	-5.2928	-5.3393	-5.3808	-5.2946	0.07595	0.0649	0.08164
	1% Critical Value* -4.535 5% Critical Value -3.675 10% Critical Value -3.276			1% Critical Value* -4.534 5% Critical Value -3.675 10% Critical Value -3.276			1% Critical Value* 0.216 5% Critical Value 0.146 10% Critical Value 0.119		

Source: Author's own estimate

Ho: series has unit root; H_1: series is trend stationary.

#A value greater than the critical t-value indicates non-stationarity.

Table 4: Johansen Cointegration Tests:

Hypothesized N0. Of CE (s)	Eigen value	Likelihood Ratio	5% critical value	1% critical value
None **	0.812775	33.90406	19.96	24.60
At most 1	0.103254	2.070667	9.24	12.97

Ho: has no co-integration; H1: has co-integration

*(**) denotes rejection of the hypothesis at 5%(1%) significance level

L.R. test indicates 1 cointegrating equation(s) at 5% significance level

Table:5:Granger Casuality test

Null Hypothesis	**Lag**	**Observations.**	**F-statistics**	**Probability**	**Decision**
FOREXR does not Granger Cause SMC	1	20*	12.0364	0.00293	Reject
	2	19	7.35555	0.00655	Reject
SMC does not Granger Cause FOREXR	1	20	0.62972	0.43840	Accept
	2	19	0.50779	0.61250	Accept

*Observations. after lag;

Source: Own estimate

Appendix Table 1: Relevant Statistical Data of Stock Market Capitalization and Foreign Exchange Reserve of India, 1990-91 to 2010-11.

Year (1)	Stock Market Capitalization (CroreRs.) (2)	SDRs # # (CroreRs.) (3)	Gold # (Crore Rs.) (4)	Foreign Currency Assets*(Crore Rs.) (5)	Reserve Tranche Position (Crore Rs.) (6)	Total Foreign Exchange Reserve (Crore Rs.) Col.7=col.(3+4+5+6)
1990-91	90836	200	6828	4388	-	11416
1991-92	323363	233	9039	14578	-	23850
1992-93	188146	55	10549	20140	-	30744
1993-94	368071	339	12794	47287	-	60420
1994-95	435481	23	13752	66005	-	79780
1995-96	526476	280	15658	58446	-	74384
1996-97	463915	7	14557	80368	-	94932
1997-98	560325	4	13394	102507	-	115905
1998-99	545361	34	12559	125412	-	138005
1999-2000	912842	16	12973	152924	-	165913
2000-01	571553	11	12711	184482	-	197204
2001-02	612224	50	14868	249118	-	264036
2002-03	572198	19	16785	341476	3190	361470
2003-04	1201207	10	18216	466215	5688	490129
2004-05	1698428	20	19686	593121	6289	619116
2005-06	3022191	12	25674	647327	3374	679387
2006-07	3545041	8	29573	836597	2044	868222
2007-08	5138014	74	40124	1196023	1744	1237965

2008-09	3086075	6	48793	1230066	5000	1283865
2009-10	6165619	22596	81188	1149650	6231	1259665
2010-11	6634387	20401	102572	1224883	13158	1361013

* : FCA excludes US $ 250.00 million (as also its equivalent value in Indian Rupee) invested in foreign currency denominated bonds issued by IIFC (UK) since March 20, 2009.

: Includes Rs 31463 crore(US $ 6699 million) reflecting the purchase of 200 metric tonnes of gold from IMF on November 3, 2009.

: Includes SDRs 3082.5 million allocated under general allocation and SDRs 214.6 million allocated under special allocation by the IMF done on August 28, 2009 and September 9, 2009, respectively.

Source: Handbook of Statistics on Indian Economy & Handbook of Statistics on the Indian Securities Market,2010-11