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# MACROECONOMIC DETERMINANTS OF STOCK MARKET DEVELOPMENT IN INDIA

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**Abstract:**
In the present study, with the help of modern econometric techniques, an effort has been made to empirically investigate the relationship between stock prices or stock market development with different sets of domestic and international macroeconomic variables. Towards this effort different models has been formulated, using the data for different time span and frequency. The study is categorized into three major categories, viz.-a-viz., the first category is the empirical estimation of the study using annual frequency data; the second category is the empirical estimation of the study using quarterly frequency data; and the third category consist of the study using monthly frequency data. ARDL estimations found significant and positive impact of economic growth, inflation and exchange rate on stock index. These results are consistent both in long run as well as in short run.

**Keywords:** ARDL Estimation, Economic Growth, Frequency, Macroeconomic Variables.

**Theoretical Review:**

Numerous researches have been done to look at how macroeconomic factors affect the stock markets of industrialized nations. Several studies of industrialized economies are included below as examples.

Mookerjee and Yu (1997) observe substantial interconnections between the M2 money supply, foreign exchange reserves, and stocks prices using causality test and bi-variate cointegration for singapore. However, Maysami and Koh(2000) show that the interest rate and the current rate have a considerable impact on the long-term association between Singapore's stock values and several macroeconomic factors.

Aurangzeb(2012) identifies the factor affecting performance of stock market in South Asia and results indicate that foreign direct investment and exchange rate have significant positive impact on performance of stock market where as interest rate has negative and significant impact on performance of stock market. Results also indicate the negative but insignificant impact of inflation on stock market performance in South Asia.

When Chen et.al. (1986) compared equity returns to a set of macroeconomic Variables, they discovered that the growth in industrial production, changes in the risk premium, shift in the yield curve, measurement of unexpected inflation, and changes in expected inflation during volatile inflation periods are among the macroeconomic variables that can significantly explain stock returns.

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Studies that have included several macroeconomic factors more recently those by Flenery(1991) and Protopapadakis and Chen(2002). Aditionally, several researches suggest that the consistency of some macroeconomic variables' stock return predictability across time is highly unpredictable. On the other hand, there are many of research that refutes the idea that macro variables can accurately forecast stock returns.

Using annual data from 1959-1960 to 2004-2005, Hussain (2006) investigated the causal relationship between stock price and real sector indicators of the Pakistani economy. Through the use of several econometric tools, including ECM, Engle Granger co-integrating regressions, and Augmented Dickey Fuller (ADF), Unit Root tests, it has separated the data into two halves- pre and post liberalization and examined the causal link between them. The investigation has shown that there is a long term association between stock prices and real sector factors using this data collection and methodology.

Using SENSEX as a primary index, Chowan et. al. (2000) attempted to identify the causes of short term market volatility in India. They have explained how the SENSEX, which was at 276 on October21, 1998, increases to 6000 in February 2000, a rise of 117% in just 15 months, which is not at all strongly supported by Fundamental economic factors in these years given that the Indian economy grew by just 5.9% in 1999-2000. According to the findings of this paper, even long term economic factors do not support such a spike in stock prices. A world wide trend of this kind was noticed, not just in Indian stock markets.

Using Indian data from April 1992 to December 1997, Pethe and Karnik (2000) seek to understand how key macroeconomic variables affect and are affected by stock price indexes in India. However, this paper performs causality test on non-cointegrated variables using an error correction framework, which is improper and not econometrically sound or valid. The study asserts that it is improper to test for causality between two variables in the absence of co integration, and it does so in the light of the significance ascribed to the relationship between the status of the economy and stock markets. The analysis shows a weak causal relationship between IIP and share price indices (Sensex and Nifty), but not vice versa. In other words, it holds the belief that stock prices are influenced by the state of the economy.

In the instance of India, Sarkar, P. (2005) investigated whether there is any significant relationship between growth and capital accumulation. Annual statistics on a variety of factors, including nominal and real share market turnover ratios, the number of listed companies on the stock market, fixed capital formation, and increases in real GDP and industrial output, have all been used from 1950-1951 to 2005. They all support the same conclusion showing there was no significant correlation between real and stock market characteristics, either in the short or long term.

Kwon and Shin (1999) applied Engle- Granger cointegration and Granger causality tests from the VECM and found that the Korean stock market was cointegrated with a set of macroeconomic variables. However, using the Granger causality test on macroeconomic variables and the Korean stock index, the authors found that the Korean stock index was not a leading indicator for economic variables.

Ibrahim (1999) also investigated the dynamic interaction between the KLSE composite index,

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and seven macroeconomic variables (CPI, Industrial production index, money M1 and M2, foreign reserves, credit aggregates and exchange rate) and concluded that Malaysian stock market was informational inefficient.

Chong and Koh's (2003) results were similar and showed that stock prices, economic activities, real interest rates and real money balances in Malaysia were linked in the long run both in the pre and post capital controls sub periods.
Desgupta (2012) has attempted to explore the long run relationship between BSE Sensex and four key macroeconomic variables of Indian economy by using descriptive statistics, ADF tests, Johansen and juselius's cointegration test and granger causality test has been applied by using monthly data for all the variables i.e. BSE Sensex, WPI, IIP, EX and call money rate. Results showed that all the variables has contained a unit root and are integrated of order one. Johansen and Juselius's cointegration test pointed out atleast on cointegration vector and long run relationships between BSE Sensex with index of industrial production and call money rate. Granger causality test was then employed. The granger causality test has found no short run unilateral or bilateral causal relationships between BSE Sensex with the macroeconomic Variables. Therefore, it is concluded that, Indian stock markets had no informational efficiency.

In a separate study, Kanakaraj et.al.(2008) showed the trends in stock prices and different macroeconomic indicators between 1997 and 2007.They have made an effort to investigate and respond to the question of whether the recent stock market boom can be explained in terms of macroeconomic fundamentals and have come to the conclusion that there is a close connection between the two.

Using monthly data from 1994 to 2000, Muhammad and rasheed (2002) investigate the links between stock prices and exchange rates for Pakistan, India, Bangladesh and Sri Lanka. The empirical findings indicate a bi-directional long run causal relationship between these factors only for Bangladesh and Sri Lanka. For Pakistan and India, no correlations between exchange rates and stock prices were discovered.
In accordance with an earlier study, Aggarwal, Abdalla and Murinde (1997) discovered that the results for India, Korea and Pakistan imply that exchange rates granger affect stock prices(1981).Abdalla and Murinde Discovered that the exchange rates for the Philippines Follow the stock Prices. This supports Smith's (1992) conclusion that stock returns significantly affect the exchange rate in Germany, Japan, and the US.

**Objectives of the Study:**
Although the literature on the macroeconomic determinants of stock market development is very rampant, most studies focus on daily data and some of the studies focus on weekly and monthly data. A careful survey of the existing literature reveals the conflicting evidence on determinant of stock market development of many countries, depending on which test a particular study used or which type of data the researchers employed. In this study an attempt

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is made to study determinant of stock market development by using data of different time span. The major objective is to find out the correlation and causal relationship, if any, between the stock market and real economic variables. The specific sets of objectives of the study are as follows:

To shed light on the nature of causal relationship that exists between the stock market and macro economic variables

**Hypothesis of the Study:**

Based on the objective of the study the following hypotheses have been tested.

$H_0$: The impact of various macroeconomic determinants on stock market development is significant.

$H_1$: The impact of various macroeconomic determinants on stock market development is insignificant.

**Data Collection:**

The present study is based on the Indian stock market only and macroeconomic level data has been used. Various data sources are used for data collection. The data used in the study is time series data. The data related to stock market indicators have been collected from the website of Bombay Stock Exchange (BSE), National Stock Exchange (NSE), Security and Exchange Board of India (SEBI), money control, yahoo finance. To collect the data on macro economic variables various issues of Economic Survey and various issues of Handbook of Statistic on Indian Economy issued by RBI have been used.

**Research Design:**

Many empirical studies have been done in the area of macroeconomic variables and stock market; however the focus of these studies was on developed nations. Further the methodologies used in these studies are quite different to each other. In this study the empirical results of various econometric techniques have been taken in account. For example Ng- Perron unit root test has been used to study the integration of the variables; ARDL approach of co integration has been used to study the long run relationship; VECM method is used to study causality and impulse response function has been used to forecast shocks. From the review of a lot of studies various macro economic variables have been short listed. These are Index of Industrial production, real gross national product, gross capital formation, employment, exports, exchange rate (Real Effective Exchange Rate, Nominal Effective Exchange Rate), consumption, interest rate (T-bill rate, call money rate), inflation (Producer Price Index, Consumer Price Index and Wholesale Price Index), aggregate foreign currency reserves, Crude oil price, real consumption, consumption expenditures, investment expenditure, federal funds rate, Foreign Direct Investment, Foreign Institutional Investment, foreign portfolio investment, GDP deflator, trade balance, school enrollment, trade openness, money supply (M1, M2, M3), gold prices, foreign exchange reserves, macroeconomic prosperity index, consumer confidence index, corporate goods price index and gross fixed capital formation. Stock market capitalization, stock market turnover ratio and the level of stock market indices have been used as dependent variable.

The other key conclusion drawn by the study indicates that, while previous studies have

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significantly improved our understanding of the relationships between macroeconomic variables and stock prices, the findings from the literature are mixed given that they were sensitive to the choice of countries, variable selection, and the time period studied. It is difficult to generalize the results because each market is unique in terms of its own rules, regulations, and type of investors. Additionally, the VAR framework, co integration tests, Granger causality tests, and GARCH models were commonly used to examine the relationships between stock prices and macroeconomic variables. However, there is no definitive guideline for choosing an appropriate model.

**NG- Perron Test:**

The older unit root (ADF, PP, KPSS) test suffered from some limitations. They have very limited sample power and suffer from size problem. NG and Perron (Econometrica, 2001) developed a new test which becomes a preferred test over the older unit root test. This test has some important features. First the time series is detrended by using the GLS estimators. It will help to improve the power of the test if we have a larger AR root in the differenced series. Further it also reduces size distortion if we have a large and negative moving average root in the differenced series. Secondly NG-Perron test has a different lag selection criterion. The older unit root test has the limitation of choosing small lag length in case we have a larger negative moving average root. This problem is not face in NG-Perron test. NG and Perron developed fair test statistic. These are as mentioned below as Shown in NG& Perron (2001).

$$K = \sum_{t-2}^{T} y_{t-1}^2 / T^2$$

$$MZ_t = \frac{(T^{-1}\hat{y}_t^2 - f_0)}{2K}$$

$$MSB = \left(\frac{K}{f_0}\right)^{1/2}$$

$$MZ_t = MZ_\alpha \times MSB$$

$$MPT = f(x) = \begin{cases} \frac{(\bar{c}^2 K - \bar{c}T^{-}\tilde{y}_t^2)}{f_0}, & if \quad x_t = (1) \\ \bar{c}^2 K + \frac{(1-\bar{c})T^{-1}\tilde{y}_t^2}{f_0}, & if \quad x_t = (1,t) \end{cases}$$

Where

$f_0$ = estimate of the residual spectral density at the zero frequency.

The statistics $MZ_\alpha$ and $MZ_t$ are efficient versions of the PP $Z_\alpha$ and $Z_t$ test that have much smaller size distortion in the presence of negative moving average errors. Again the choice of the autoregressive truncation lag, p, is critical for correct calculation of $f_0$. Here p is chosen using the modified information criteria (MIC(p)) of Ng and Perron (2001) as p=pMIC=arg minpMIC(p).

Where

$$\tau_\tau(p) = \left(\hat{\sigma}_p^2\right)^{-1} \hat{\gamma}^2 \sum_{t=p\ max+1}^{T} \tilde{y}_{t-1}^2$$

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$$\hat{\sigma}_p^2 = (T - p_{max})^{-1} \sum_{t=p\,max+1}^{T} \hat{\mu}_{t-1}^2$$

**ARDL Co Integration:**

Pesaran et. al. (2001) developed auto regressive distributed lag (ARDL) bound testing approach. This approach helps in modeling the long run determinants. There are many co integration method available like Engle granger (1987), Johansen and Juselius(1990) and Johanson (1991). ARDL technique is econometrically better than these methods. Firstly in ARDL there is no need for pre testing the series to find out the order of integration. Secondly Engle granger method some time faces the problem of testing hypothesis on the basis of estimated coefficient in the long run. Acc to Pasaran(1999), modeling with ARDL will correct both serial correlation and endogeneity problem. Thirdly as mentioned by Narayan (2004), the small sample properties of ARDL approach are better than multivariate co integration. Hence in ARDL framework the problem like the presence of a mixture of I(0) and I (1) regressors does not exists. Fourthly long as well short run parameters are simultaneously estimated. In the present study we have followed the model as specified by Pasaran et.al. (2001).

$Z_t = c_0 + \beta t + \sum_{i=1}^{p} \phi_i Z_{t-i} + \varepsilon_t, t = 1,2,3 \dots \dots, T$

Where

$c_0 = (k + 1)\ vector\ of\ intercepts$

B= (k+1) vector of trend coefficients

$\Delta Z_t = c_0 + \beta t + \Pi_{Z_{t-1}} \sum_{i=1}^{p} \Gamma_i \Delta Z_{t-i} + \varepsilon_t, \quad t = 1,2,3 \dots \dots, T$

(k+1)× $(k + 1)$= matrics

Π= $l_{k+1} + \sum_{i=1}^{p} \Psi_i$ contain the long run multipliers

$\Gamma_i = -\sum_{j=i+1}^{p} \Psi_i, \ i = 1,2,3 \dots . p - 1$ contains short run dynamic coefficient of the VECM. $Z_t is\ the\ vector\ of\ the\ variables\ y_t\ and\ x_t respectively. y_t is\ an\ I(1)$ Dependent variable defined as ln$Y_t$ and $X_t$=$[y_{it}, i = 1,2,3 \dots ., T]$ is a vector matrix of 'forcing' I(0) and I(1) regressors as already defined with a multivariate identically and independent distributed (i, i, d) zero mean vector $\varepsilon_t$= $(\varepsilon_{1t}, \varepsilon_{2t})$, and a homoskedastic process. Further assuming that a unique long run relationship exists among the variables, the conditional VECM now becomes:

$$\Delta Y_t = C_{y0} + \beta t + \delta_{yy} y_{t-1} + \delta_{xx} x_{t-1} + \sum_{i=1}^{p-1} \lambda_t \Delta y_{t-1} + \sum_{i=1}^{p-1} \epsilon_i \Delta x_{t-1} + \varepsilon_{yt}, t = 1,2,3 \dots \dots, T$$

Where

δ= long run multipliers

$c_0$=drift

$\varepsilon_t$=white noise errors

ARDL implementation has two stages. First, the long run co integration is tested by computation of F statistic. It will tell the joint significance of the coefficients of lagged level variables. This model has an intercept or trend or both. In one set provided by Pasaran (1999) all variables are assumed of the order I(0) while in another set they are considered I(1). If the value of F is more than the upper bound critical value at a particular significance level then it shows long run level relationship with the dependent variable. On the other hand if F value less than the lower bound critical value then there is no long run level relationship with the

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dependent variable. If the F value lies between lower and upper bounds the result is inconclusive. The null hypothesis for F statistic is as follows:

$H_0$: $\delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = 0$

$H_1$:$\delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_4 \neq \delta_5 \neq 0$

**Empirical Analysis:**

**1. Analysis based on annual data:**

In the present study the selected variables have been used to establish the relationship between macroeconomic determinants and the share prices. The time period selected for this exercise is from 1994 to 2019. Various econometric model have been used which are explained as under.

Log BSNX = $a_0$ + Log GDP + $a_1$log CPDEX + $a_2$Log REER + $a_3$Log FDI +$\varepsilon_t$

Where:

Log BSNX = natural log of BSE Sensex

Log GDP = natural log of Gross Domestic Product

Log CPDEX = natural log of Consumer Price Index

Log REER = Natural log of Real Effective Exchange Rate

Log FDI = natural log of Foreign Direct Investment

**Stationarity test and Lag length selection:**

NG –Perron unit root test is used to see if the variables under study are integrated at an order higher than one. The result found all the variables as non stationary. Further first differences of the variable have been calculated and again the stationary test has been applied on these differenced variables. It has been found that after differencing the variables, the stationary emerged. With these results it can be concluded that all the selected variables are differenced stationary I(1).

The present study uses autoregressive distributed lag approach (ARDL) of co integration. Here it become significant to decide the lag optima so that the error terms are not auto correlated. As per Narayan, 2005; Pesaran, 2001, a higher lag order is preferred so that the conditional ECM do not face over parameterization problems.

**Table 1.1: Unit root test: Ng-Perron Test**

| **Variables** | | **Trend with constant** | | | **Stationarity** |
|---|---|---|---|---|---|
| | Mza | MZt | MSB | MPT | **Status** |
| **LogBSNX** | 1.044 | 0.687 | 2.287 | 60.999 | I (1) |
| **ΔLogBSNX** | -28.151 | -5.223 | 1.001 | 3.003 | |
| **LogGDP** | 4.027 | 4.822 | 2.539 | 142.222 | I (1) |
| **ΔLogGDP** | -26.342 | -5.539 | 0.489 | 3.666 | |
| **LogCPDEX** | -22.648 | -5.056 | 0.734 | 4.682 | I (1) |
| **ΔLogCPDEX** | -27.962 | -5.827 | 0.461 | 3.821 | |
| **LogREER** | 0.366 | 1.005 | 2.112 | 47.444 | I (1) |

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| | | | | | |
|---|---|---|---|---|---|
| **ΔLogREER** | -24.210 | -5.654 | 1.001 | 2.888 | |
| **LogFDI** | -1.116 | -1.102 | 1.223 | 35.555 | I (1) |
| **ΔLogFDI** | -27.423 | -5.987 | 0.569 | 3.125 | |

Source: Calculation by using E-views 8.0

**Table 1.2: Lag Order Criterion**

| *Lag* | *LogL* | *SMLR* | *FPE* | *AIC* | *SIC* | *HQIC* |
|---|---|---|---|---|---|---|
| 0 | -73.11 | NA | 1.21e-08 | 5.00 | 5.11 | 4.94 |
| 1 | 207.11 | 384.44* | 9.98e-10* | -7.50 | -4.36* | -6.68* |
| 2 | 299.08 | 80.01 | 1.19e-13 | -8.31* | -2.01 | -6.21 |

Note: each test is at 5% level; * indicates lag order selected by the criterion, SMLR: sequential modified LR test statistic, FPE: Final prediction error, AIC: Akaike information criterion, SIC: Schwarz information criterion, HQIC: Hannan-Quinn information criterion

**ARDL Bounds Test:**

ARDL approach is used to study the long run relationship among variables.OLS regression have been used for the first difference part followed by the significance test of the lagged parameters. The null hypothesis here was that the coefficients values of lagged variables are equal to zero. This null hypothesis is tested through F statistic. The results are mentioned in table 1.3. The value of F statistic has been found statistically significant at 5 p.c. level. It confirms a co integrated relationship among the selected variables.

**Table 1.3: ARDL Bounds test**

**Panel I: Bounds testing to co-integration:**

Estimated Equation : *LogBSNX = F (LogGDP LogCPDEX LogREER LogFDI)*

| | | |
|---|---|---|
| | Optimal lag | 02 |
| | F – Statistics | 6.897** |
| **Panel II: Diagnostic Tests:** | | |
| | Diagnostic Tests Indicators | |
| | Normality J-B value | 0.921 |
| | Serial Correlation LM Test | 1.8602 |
| | Heteroscedasticity Test (ARCH) | 1.198 |
| | Ramsey Reset Test | 0.088 |

** denotes significance at 5 percent

The second step is to estimate the long- and short-run estimates of ARDL test. The results contain in table 1.4 reveals that the coefficient of GDP is positive and significant at 1 p.c. level. It shows the positive relationship between GDP and stock market index. The coefficient of GDP, Inflation (LCPDEX), and Exchange Rate (LREER) are statistically significant at 1%. It is evident from the table that 1% increase GDP, Inflation and Exchange Rate leads to 4.49%, 2.56% and 3.43% respectively, increase in Stock Prices (Sensex).

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**Table 1.4: Long Run Coefficients estimated using ARDL**
**(Dependent variable: LogBSNX)**

| | | *ARDL(1,0,0,0)* | |
|---|---|---|---|
| ***Regressors*** | ***Coefficient*** | ***t- values*** | ***Prob. Values*** |
| LogGDP | 4.49* | 7.058 | 0.000 |
| LCPDEX | 2.56* | 3.076 | 0.050 |
| LREER | 3.43* | 4.394 | 0.002 |
| LFDI | -0.123 | -1.243 | 0.158 |
| CONS | -4.168 | -2.798 | 0.007 |
| Robustness Indicators | | | |
| $R^2$ | 0.959 | | |
| Adjusted $R^2$ | 0.967 | | |
| F Statistics | 343.22 [0.000] | | |
| D.W. Stat | 2.098 | | |
| Serial Correlation, F | 0.502[0.459] | | |
| Heteroskedasticity, F | 0.399[0.509] | | |
| Ramsey reset test, F | 0.075[0.766] | | |

Note: (1) The lag order of the model is based on Akaike information Criterion (AIC).
* indicate significant at the 1 percent level of significance.

The short-run relationship of the macroeconomic variables and stock market index is presented in Table 1.5. As can be seen from the table, GDP, Exchange Rate and Inflation have a significant and positive impact on stock market index in the short run. The short run adjustment process is examined from the ECM coefficient. The coefficient lies between 0 and -1 and the equilibrium is converging to the long run equilibrium path. However, if the value is positive, the equilibrium will be divergent from the reported values of ECM test. The coefficient of the lagged error-correction term (-0.636) is significant at the 1% level of significance. The coefficient implies that a deviation from the equilibrium level of stock market index in the current period will be corrected by 63 percent in the next period to resort the equilibrium.

**Table 1.5: Short Run Coefficients Estimated using ARDL**
**(Dependent variable: LogBSNX)**

| ***Regressors*** | | *ARDL(1,0,0,)* | |
|---|---|---|---|
| | ***Coefficient*** | ***T – Ratio*** | ***Prob. Values*** |
| ΔLogGDP | 1.648* | 6.546 | 0.000 |
| ΔLogCPDEX | 0.233*** | 1.749 | 0.092 |
| ΔLogogREER | 0.774** | 2.183 | 0. 038 |
| ΔLFDI | 0.049 | 0.804 | 0.429 |
| ΔCONS | -3.251 | -2.056 | 0.050 |
| ECM t-1 | -0.636 | -3.333 | 0.003 |
| Robustness Indicators | | | |

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| | |
|---|---|
| $R^2$ | 0.559 |
| Adjusted R2 | 0.286 |
| D.W. Stat | 2.131 |
| SE Regression | 0.195 |
| RSS | 0.952 |
| F Statistics | 3.029[0.018] |

Note: (1) The lag order of the model is based on Schwarz Bayesian Criterion (SBC) (2) *, ** and *** indicate significant at 1, 5 and 10 p.c level ofsignificance, respectively.

**VECM based causality:**

The next step is to test for the causality between the variables, the short run and long run granger causality test findings are reported in Table 1.6. The results of table 1.6 indicate that short run unidirectional causality running from LFDI and LGDP to LBSNX in India. It is also observed that error correction term is statistically significant for specification with LBSNX as the dependent variable which indicate that there exist a long run causal relationship among the variable with LBSE as the dependent variable. These results are also in conformity with the ARDL test results.

**Table 1.6: Results of Vector Error Correction Model**

| ***Dependent Variable*** | ***Sources of Causation*** | | | | | ***Long run*** |
|---|---|---|---|---|---|---|
| | ***Short run independent variables*** | | | | | |
| | **ΔLBSE** | **ΔLCPDEX** | **ΔLREER** | **ΔLFDI** | **ΔLGDP** | ***ECM(t-1)*** |
| **ΔLBSE** | 0.00 | -1.57 | -1.044 | 3.81* | -2.74** | -4.78* |
| **ΔLCPI** | 0.22 | 0.00 | -1.89* | 1.12 | 1.01 | 0.85 |
| **ΔLREER** | 0.67 | 0.36 | 0.00 | -1.28 | 0.11 | -0.49 |
| **ΔLFDI** | 1.95*** | -0.51 | -0.07 | 0.00 | -0.48 | -0.18 |
| **ΔLGDP** | 0.53 | -1.13 | -2.02*** | 2.00*** | 0.00 | -1.51 |

*, ** and *** indicate significant at 1, 5 and 10 percent level of significance, respectively.

The robustness of the results mention in table 1.6 are further analysed by applying the diagnostic and stability tests. It has been found that the model passes the diagnostic test against serial correlation, functional misspecification and non-normal error. For stability cumulative sum and cumulative sum of squares test have been applied. Both of these have been found within the critical boundaries at 1 and 5 p.c. level. It shows that the long run and short run parameters affecting the stock market are stable.

**Variance Decomposition (VDC) Analysis:**

VDC reveals that part of the movements in the dependent variable which are due to their own shocks. While running auto regression the VDC captures the quantum of information which each variable contributes to other variable. One of the advantages of this approach is that it is not affected by ordering of the variables. The results of the VDC are presented in table 1.7. The empirical evidence indicates that 81.39 p.c. of stock price change is contributed by its own

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innovative shocks. Foreign Direct Investment contributes to stock prices by 2.92 p.c. and consumer price contributes 1.89 p.c. From this analysis, it can be referred that the movement in stock prices can be predicted from the stock price itself. The share of other variables is very minimal.

**Table 1.7: Variance Decomposition (VDC) Analysis**

| *Period* | *S.E.* | *LBSNX* | *LCPDEX* | *LREER* | *LFDI* | *LGDP* |
|---|---|---|---|---|---|---|
| 1 | 0.225 | 100.00 | 0.000 | 0.000 | 0.000 | 0.000 |
| 2 | 0.306 | 92.260 | 2.748 | 0.153 | 2.131 | 0.823 |
| 3 | 0.348 | 89.648 | 2.169 | 0.371 | 2.526 | 0.725 |
| 4 | 0.370 | 87.757 | 1.984 | 0.401 | 2.653 | 0.658 |
| 5 | 0.383 | 86.273 | 1.937 | 0.376 | 2.750 | 0.616 |
| 6 | 0.390 | 85.040 | 1.885 | 0.388 | 2.834 | 0.603 |
| 7 | 0.395 | 83.961 | 1.836 | 0.447 | 2.892 | 0.628 |
| 8 | 0.399 | 82.994 | 1.822 | 0.530 | 2.921 | 0.659 |
| 9 | 0.402 | 82.136 | 1.847 | 0.611 | 2.927 | 0.766 |
| 10 | 0.405 | 81.396 | 1.896 | 0.678 | 2.920 | 0.842 |

**2 Analysis and Estimation: quarterly data based:**

This section of the study shows the estimation results for the relationship between macroeconomic variables and the stock market development by using quarterly data on the above described variables.

**The Model specification:**

The following general specification has been used in this study.

Log MC = $\alpha_0$+$\alpha_1$ Log GDP + $\alpha_2$log FDI + $\alpha_3$Log FII +$\varepsilon_t$

**Stationarity test and Lag length selection:**

Before we proceed for ARDL estimation, unit roots test have been applied to find out the order of integration. The unit root test used here is present is newly developed Ng- Perron test ( Ng-Perron, 2001). The test results are presented in Table 1.8. The analysis of the unit root test results indicates that LFDI is integrated of order zero I(0) and the remaining variables are integrated of order one (I(1)) and none of the variables are integrated of order two I(2).

**Table 1.8: Unit root test: Ng-Perron Test**

| **Variables** | | **With trend and intercept** | | | **Stationarity** |
|---|---|---|---|---|---|
| | Mza | Mzt | MSB | MPT | **Status** |
| **LMC** | -10.086 | -3.301 | 0.429 | 12.943 | I (1) |
| **ΔLMC** | -36.984 | -4.601 | 0.273 | 4.153 | |
| **LFDI** | -35.839 | -4.753 | 0.446 | 4.835 | I (0) |
| **ΔLFDI** | -1424.604 | -29.883 | 0.632 | 0.229 | |
| **LFII** | -17.237 | -3.111 | 0.453 | 5.393 | I (1) |
| **ΔLFII** | -37.693 | -4.589 | 0.543 | 4.825 | |
| **LGDP** | -16.029 | -2.970 | 0.473 | 10.891 | I (1) |

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| | | | | | |
|---|---|---|---|---|---|
| **ΔLGDP** | -31.483 | -4.841 | 0.201 | 2.381 | |

Source: Calculation by using E-views 8.0

The next step involves the selection of optimal lag length of the model. The optimal lag length was determined by different criterion suitable to the models (Table 1.9) using 5 maximum lags in the model. The results of table 9 suggest that the optimal lag length is 4 based on LR, FPE and HQ.

**Table 1.9: Lag Order Selection Criterion**

| ***Lag*** | ***LogL*** | ***LR*** | ***FPE*** | ***AIC*** | ***SIC*** | ***HQ*** |
|---|---|---|---|---|---|---|
| 0 | -193.10 | 0 | 0.00 | 6.41 | 7.22 | 6.35 |
| 1 | -8.13 | 329.54 | 2.37E-06 | 1.50 | 2.218* | 1.44 |
| 2 | 19.67 | 44.30 | 2.65E-06 | 1.42 | 3.43 | 2.18 |
| 3 | 57.13 | 52.96 | 1.91E-06 | 0.76 | 3.74 | 3.03 |
| 4 | 99.42 | 52.416* | 1.07e-06* | 0.20* | 4.20 | 1.428* |

* indicates lag order selected by the criterion, LR: sequential modified LR test statistic (each test at 5% level), FPE: Final prediction error, AIC: Akaike information criterion, SC: Schwarz information criterion, HQ: Hannan-Quinn information criterion

**ARDL Bounds test:**

The results of bounds test confirm the long-run relationship because the calculated F-statistics are significant at the 1% level of significance (Pesaran (2001). This gives strong indication of the existence of a long-run relationship among the variables included in the model. Further, the estimated results show that the model specification seems to pass all diagnostic tests successfully.

**Table 1.10: ARDL bounds test results**

**Panel I: Bound testing to co-integration:**

Estimated Equation : *LMCP = F (LFDI LFII LGDP)*

Indicators

| | |
|---|---|
| Optimal lag | 04 |
| F – Statistics | 7.489* |

**Panel II: Diagnostic Tests:**

Diagnostic Tests Indicators

| | |
|---|---|
| Normality J-B value | 0.9010 |
| Serial Correlation LM Test | 1.4987 |
| Heteroscedasticity Test(ARCH) | 1.0287 |
| Ramsey Reset Test | 0.0865 |

Once we established that a long-run co-integrating relationship exists, the next step is to estimate the long-run coefficient. The estimated long-run coefficients are reported in table 1.11. The estimated result shows that coefficient of FDI is positive, but not significant. This implies

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that FDI has not been effective in influencing stock market development in India. The findings are consistent with Raza (2013). However the study found that the stock market is positively related to real GDP. The coefficient of real GDP has positive impact on the Stock Market and it's significant at the 5% level. The value of coefficient implies that 1% increase in real GDP leads to increase in the stock market by 22% on an average. The result implies that the GDP affects the stock market indirectly through its effect on inflation, and because investors use it as a key indicator of economic activity and future economic prospects. Therefore, any significant change in the GDP, either up or down, can have a significant effect on the sentiments of the investors. If investors believe the economy is improving (and corporate earnings along with it) they are likely to be willing to pay more for any given stock. If there is a decline in GDP (or investors expect a decline) they would only be willing to buy a given stock for less, leading to a decline in the stock market and the result that there exist a positive nexus between the stock market and economic growth are consistent with the studies of Randall et al. (2000), Rousseau and Wachtel (2000), Daferighe and Aje (2009) and Hsing (2011).

**Table 1.11: Estimated Long-run Coefficients using ARDL Approach (Dependent variable: LMCP)**

| ***Regressors*** | | ***ARDL(1,0,0,0)*** | |
|---|---|---|---|
| | ***Coefficient*** | ***t- values*** | ***Prob. Values*** |
| **LFII** | 0.161** | 2.586 | [0.016] |
| **LFDI** | 0.052 | 0.416 | [0.731] |
| **LGDP** | 0.221** | 1.988 | [0.055] |
| **CONS** | 10.191 | 2.226 | [0.029] |
| Robustness Indicators | | | |
| $R^2$ | 0.982 | | |
| Adjusted $R^2$ | 0.980 | | |
| F Statistics | 1069.10 | | |
| D.W. Stat | 1.912 | | |
| Serial Correlation, F | 8.356[0.671] | | |
| Heteroskedasticity, F | 0.551[0.698] | | |
| Ramsey reset test, F | 0.094[0.715] | | |

Note: (1) The lag order of the model is based on Akaike information Criterion (AIC).
** and *indicate significant at 5 and 1 percent level of significance, respectively. Values in [#] are probability values.

The short-run dynamics can be achieved by constructing an ARDL-based Error Correction Model (ECM). The results of short-run dynamics using the ECM version of ARDL are reported in table 1.12. From the reported values of ECM test, we found that the $ECM_{t-1}$ term is -0.159 and is significant at 5%, again confirming the existence of co-integration that the derivation from long-run equilibrium path is corrected 16% per year.

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**Table 1.12: Estimated Short-run Coefficients using ARDL Approach (Dependent variable: LMCAP)**

| ***Regressors*** | | ***ARDL(1,0,0,0)*** | |
|---|---|---|---|
| | ***Coefficient*** | ***T – Ratio*** | ***Prob. Values*** |
| **ΔLFII** | 0.035* | 4.234 | [0.000] |
| **ΔLFDI** | 0.015 | 0.057 | [0.597] |
| **ΔLGDP** | 0.045 | 0.432 | [0.689] |
| **ΔCONS** | 1.679 | 2.440 | [0.028] |
| **ECM t-1** | -0.159 | -3.255 | [0.003] |
| Robustness Indicators | | | |
| $R^2$ | 0.601 | | |
| Adjusted R2 | 0.418 | | |
| D.W. Stat | 1.926 | | |
| SE Regression | 0.225 | | |
| RSS | 0.008 | | |
| F Statistics | 8.618 [0.000] | | |

Note: (1) The lag order of the model is based Akaike informtion Criterion (AIC).
* indicate significant at the 1 percent level of significance, respectively.Values in [#] are probability values.

The comparison of long-run coefficients with that of short-run ECM coefficients confirms that the directions of relationships are maintained. However, the economic growth variable which is positive and significant at the 10% level in the long-run failed to explain the variation in stock market growth significantly in the short-run. This may be due to the fact that investor's behavior in the stock market regulated by long-term growth rate of GDP and may not bother about short-term fluctuations in it. Here also, the coefficient of FDI is positive and insignificant.

**VECM based causality:**

The short-run and long-run granger causality test findings are reported in Table 1.13. It is observed that error correction term is statistically significant for specification with MC as the dependent variable which indicates that there exist long-run causal relationships among the variables with MC as the dependent variable. This result is also confirmed by the ARDL test statistics.

**Table 1.13: Results of Vector Error Correction Model**

| ***Dependent Variable*** | | | | | ***Long run*** |
|---|---|---|---|---|---|
| | **ΔLMC** | **ΔLGDP** | **ΔLFDI** | **ΔLFII** | ***ECM(t-1)*** |
| **ΔLMC** | 0.000 | 1.137 | 2.009 | 3.321* | -2.707** |
| **ΔLGDP** | 0.597 | 0.000 | 0.100 | 0.714 | -0.404 |
| **ΔLFDI** | 0.436 | 1.120 | 0.000 | 0.573 | 2.417 |

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| | | | | | |
|---|---|---|---|---|---|
| **ΔLFII** | 1.459 | 2.096 | 2.933*** | 0.000 | 1.036 |

* indicates 1% level of significance, ** indicates 5% level of significance

The robustness of the short-run results is investigated with the help of diagnostic and stability tests. The ARDL-VECM model passes the diagnostic against serial correlation, functional misspecification and non-normal error.

**Variance Decomposition Analysis:**

The results of Variance Decomposition are illustrated in table 1.14. The empirical results show that the LMC explanatory has increased over the time through FDI growth variable as the second year, 4.39% of market capitalization variable changes is explained by the variance.

**Table 1.14: Variance Decomposition (VDC) Analysis**

| *Period* | *S.E.* | *LMCAP* | *LGDP* | *LFDI* | *LFII* |
|---|---|---|---|---|---|
| 1 | 0.155 | 100.00 | 0.000 | 0.000 | 0.000 |
| 2 | 0.318 | 98.405 | 2.236 | 4.391 | 0.103 |
| 3 | 0.320 | 94.605 | 2.196 | 7.149 | 0.392 |
| 4 | 0.326 | 86.337 | 3.218 | 11.880 | 2.970 |
| 5 | 0.358 | 80.866 | 3.607 | 17.255 | 2.535 |
| 6 | 0.381 | 77.521 | 3.836 | 17.644 | 2.775 |
| 7 | 0.415 | 72.240 | 3.674 | 17.840 | 3.537 |
| 8 | 0.435 | 68.871 | 3.514 | 17.576 | 3.612 |
| 9 | 0.453 | 65.946 | 3.140 | 17.237 | 3.437 |
| 10 | 0.487 | 64.088 | 2.902 | 16.247 | 3.201 |
| 11 | 0.499 | 61.973 | 2.722 | 15.243 | 2.914 |
| 12 | 0.511 | 60.036 | 2.556 | 14.566 | 2.853 |
| 13 | 0.531 | 57.790 | 2.259 | 14.122 | 2.601 |
| 14 | 0.549 | 55.665 | 2.233 | 13.398 | 2.504 |
| 15 | 0.571 | 53.515 | 2.099 | 12.716 | 2.377 |

**3. Estimation results of the study using monthly frequency data:**

The present section of the study includes the estimation results for the relationship between macroeconomic variables and the stock prices, by incorporating data for monthly frequency variables. The study exhibits the empirical relationship empirical relationship between fundamental macroeconomic variables and Index of Bombay stock exchange (BSE Sensex), using the monthly time series data from the Nov 1994 to March 2019. The selection of the monthly data set is used to capture the short run fluctuation in the variables. Most of the study in Indian context is carried on annual data; hence this study will provide valuable information on the dynamic relationship of stock prices and macroeconomic variables.

The Model specification:

Log BSE = $\alpha_0$ + $\alpha_1$Log IIP + $\alpha_2$log FII + $\alpha_3$Log CDEXI+ $\alpha_4$Log REER+ $\alpha_5$

**Stationarity Test and Lag Length Selection:**

The results show that all the variables are non-stationary at levels. The next step is to difference the variables once in order to perform stationary tests on differenced variables. The results

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show that after differencing the variables once, all the variables were confirmed to be stationary. It is, therefore, worth concluding that all the variables used in this study are integrated of order one i.e. difference stationary I(1). Therefore the study uses autoregressive distributed lag (ARDL) approach to co-integration.

**Table 1.15: Unit root test: Ng-Perron Test**

| **Variables** | | **Without trend and intercept** | | | **Stationarity** |
|---|---|---|---|---|---|
| | Mza | MZt | MSB | MPT | **Status** |
| **LNSE** | 0.777 | 0.578 | 1.003 | 51.925 | I (1) |
| **ΔLNSE** | -8.839 | -2.345 | 0.357 | 5.370 | |
| **LFII** | 0.648 | 2.198 | 12.978 | 69.988 | I (1) |
| **ΔLFII** | -73.810 | -7.052 | 0.128 | 0.603 | |
| **LIIP** | -4.663 | -1.676 | 0.484 | 9.529 | I (1) |
| **ΔLIIP** | -77.074 | -7.206 | 0.125 | 0.581 | |
| **LREER** | 0.206 | 0.132 | 0.866 | 37.793 | I (1) |
| **ΔLREER** | -72.048 | -6.915 | 0.128 | 0.751 | |
| **LTBR** | 1.964 | 2.100 | 1.443 | 115.324 | I (1) |
| **ΔLTBR** | -22.237 | -3.868 | 0.235 | 2.014 | |
| **LWPI** | 0.193 | 0.125 | 0.879 | 38.385 | I (1) |
| **ΔLWPI** | -19.277 | -3.559 | 0.249 | 2.481 | |

Source: Authors' own Calculation by using E-views 8.0

**Table 1.16: Lag Order Selection Criterion**

| ***Lag*** | ***LogL*** | ***LR*** | ***FPE*** | ***AIC*** | ***SIC*** | ***HQ*** |
|---|---|---|---|---|---|---|
| 0 | -287.464 | NA | 0.000 | 4.618 | 4.801 | 4.693 |
| 1 | 740.664 | 1911.676* | 0.000 | -10.423* | -8.785* | -9.758* |
| 2 | 802.950 | 108.028 | 0.000 | -10.375 | -7.281 | -9.118 |
| 3 | 855.143 | 83.997 | 0.000 | -10.169 | -5.618 | -8.321 |
| 4 | 899.426 | 65.733 | 0.000 | -9.840 | -3.833 | -7.399 |
| 5 | 951.085 | 70.223 | 0.000 | -9.626 | -2.162 | -6.594 |
| 6 | 1003.081 | 64.183 | 0.000 | -9.417 | -0.496 | -5.793 |
| 7 | 1063.823 | 67.384 | 0.000 | -9.345 | 1.030 | -5.129 |
| 8 | 1121.063 | 56.345 | 0.000 | -9.218 | 2.615 | -4.410 |

* indicates lag order selected by the criterion, LR: sequential modified LR test statistic (each test at 5% level), FPE: Final prediction error, AIC: Akaike information criterion, SC: Schwarz information criterion, HQ: Hannan-Quinn information criterion

After determining the order of integration of all the variables, the next step is to employ an ARDL approach to co-integration in order to determine the long run relationship among the

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variables. By applying, the procedure in OLS regression for the first difference part and then test for the joint significance of the parameters of the lagged level variables when added to the first regression.

**ARDL Bounds test:**

The results report that calculated F-Statistics & diagnostic tests of the estimated model. The result shows the calculated F-statistics were 5.25316. Thus the calculated F-statistics turns out to be higher than the upper-bound critical value at the 5 percent level. This suggests that there is a co integrating relationship among the variables included in the model, i.e. BSE Sensex (LBSNX), the Index of Industrial Production (LIIP), Financial Institutional Investment (LFII), G, consumer Price Index (LCPDEX), and Real Effective Exchange Rate (LREER).

**Table 1.17: ARDL bounds test results**

**Panel I: Bound testing to co-integration:**

Estimated Equation: *LBSNX = F (LIIP LFII LCPDEX LREER)*

| Indicators | |
|---|---|
| Optimal lag | 01 |
| F – Statistics | 5.25316** |

**Panel II: Diagnostic Tests:**

| Diagnostic Tests Indicators | |
|---|---|
| Normality J-B value | 0. 9011 |
| Serial Correlation LM Test | 1.4214 |
| Heteroscedasticity Test (ARCH) | 1.0215 |
| Ramsey Reset Test | 0.0694 |

The coefficient of Inflation (LWPI) is negative and significant at 1%. It is evident from the table that 1% increase in Inflation leads to -0.349%, decrease in BSE sensex (LBSNX). The findings of the study are consistent with Fama (1981), Mukherjee and Naka (1995), and Maysami and Koh (2000), who have found a negative correlation between inflation and stock prices. The negative relationship may be due to the reason that because inflation causes the value of money to decrease and consequently the purchasing power of the people decreases, which leads to a negative effect of saving and investment activities of the stock exchange.

**Table 1.18: Estimated Long Run Coefficients using ARDL Approach**
**(Dependent variable: LBSE)**

| | ***ARDL(1,0,0,0)*** | | |
|---|---|---|---|
| ***Regressors*** | ***Coefficient*** | ***t- values*** | ***Prob. Values*** |
| **LIIP** | .093 | 1.009 | [0.345] |
| **LFII** | -0.011 | -0.496 | [0.642] |
| **LCPI** | -0.349 | 3.106** | [0.004] |

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| | | | |
|---|---|---|---|
| **LREER** | 0.455 | 0.361 | [0.735] |
| **CONS** | -0.894 | -0.119 | [0.911] |
| Robustness Indicators | | | |
| $R^2$ | 0.988 | | |
| Adjusted $R^2$ | 0.987 | | |
| F Statistics | 877.934 [0.000] | | |
| D.W. Stat | 1.845 | | |
| Serial Correlation, F | 1.374[0.189] | | |
| Heteroskedasticity, F | 2.899[0.091] | | |
| Ramsey reset test, F | 0.926[0.338] | | |

Note: (1) The lag order of the model is based on Akaike information Criterion (AIC).
(2) ** and * indicate significant at 5 and 1 percent level of significance, respectively. Values in [#] are probability values.

As can be seen from the results, Inflation (LCPDEX) has a significant and negative impact on BSE sensex (LBSNX) in the short run at 1% level of significance. One can say that 1% increase in inflation leads to 0.217%, decrease in BSE sensex. This may be due to the fact that investors are more sensitive towards the movements in inflation in the short run. Whereas, Real Effective Exchange Rate (LREER) is significantly positive at 1% level in short-run.. The appreciation of the Real Effective Exchange Rate in India would attract more investors to invest in the stock market in the short run. The short run adjustment process is examined from the ECM coefficient. The coefficient lies between 0 and -1, the equilibrium is converging to the long run equilibrium path, is responsive to any external shocks. However, if the value is positive, the equilibrium will be divergent from the reported values of ECM test. The coefficient of the lagged error-correction term (-0.0746) is significant at the 1% level of significance. The coefficient implies that a deviation from the equilibrium level of Bombay stock exchange Stock Exchange in the current period will be corrected by 7 percent in the next period to resort the equilibrium.

**Table 1.19: Estimated Short Run Coefficients using ARDL Approach (Dependent variable: LNSE)**

| | ***ARDL(1,0,0,0)*** | | |
|---|---|---|---|
| ***Regressors*** | ***Coefficient*** | ***T – Ratio*** | ***Prob. Values*** |
| **LIIP** | 0.006 | 0.880 | [0.381] |
| **LFII** | -0.745E-3 | -0.471 | [0.638] |
| **LCPDEX** | -0.0217* | 3.144 | [0.002] |
| **LREER** | 1.391* | 5.464 | [0.000] |
| **ΔCONS** | -0.0623 | -0.111 | [0.911] |
| $ECM_{T-1}$ | -0.0746 | 3.106 | [0.002] |
| Robustness Indicators | | | |
| $R^2$ | 0.430 | | |

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| | |
|---|---|
| Adjusted R2 | 0.374 |
| D.W. Stat | 1.845 |
| SE Regression | 0.047 |
| RSS | 0.264 |
| F Statistics | 10.163[0.000] |

Note: (1) The lag order of the model is based on Akaike information Criterion (AIC).* and *** indicate significant at 1 and 10 percent level of significance, respectively. Values in [#] are probability values.

**VECM based causality:**

It is clearly observed that bidirectional causality is running between inflation and BSE Sensex index. It is also observed that error correction term is statistically significant for specification with LBSNX as the dependent variable which indicate that there exist a long-run causal relationship between the variable with LBSNX as the dependent variable. This result is also confirmed by the ARDL test statistics.

**Table 1.20: Results of Vector Error Correction Model**

| ***Dependent Variable*** | | | | ***Long run*** | | |
|---|---|---|---|---|---|---|
| | **ΔLBSNX** | **ΔLIIP** | **ΔLFII** | **ΔLCPDEX** | **ΔLREER** | $ECM_{t-1}$ |
| **ΔLBSNX** | - | 0.380 | 0.530 | 6.833** | 0.897 | 1.664** |
| **ΔLIIP** | 3.656 | - | 0.567 | 1.729 | 0.714 | -0.364 |
| **ΔLFII** | 0.799 | 0.389 | - | 3.116 | 1.352 | 0.723* |
| **ΔCPDEX** | 7.012** | 0.024 | 3.813 | - | 1.063 | -1.817*** |
| **ΔLREER** | 2.696 | 7.242*** | 2.199 | 1.153 | - | -0.356 |

*, ** and *** indicate significant at 1, 5 and 10 percent level of significance, respectively.

The robustness of the short run result is investigated with the help of diagnostic and stability tests. The ARDL-VECM model passes the diagnostic against serial correlation, functional misspecification and non-normal error. This confirms the stability property of a long run and short run parameters which have an impact on the market index in case of India. This confirms that models seem to be steady and specified appropriate.

**Variance Decomposition (VDC) Analysis:**

The empirical evidence indicates that 71.85% of BSE Sensex index change is contributed by its own innovative shocks. Further shock in inflation explains BSE Sensex index by 15.67% and the results are consistent with the results of VECM. Thus, it can be said that the most important macroeconomic variables that influence BSE Sensex index in India are inflation, though it is marginal at 15.67%. From this analysis, it can be referred that the Indian Stock Market Returns can be predicted from the inflation. The share of other variables is very minimal.

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**Table 1.21: Variance Decomposition (VDC) Analysis**

| *Period* | *S.E.* | *LBSE* | *LFII* | *LREER* | *LIIP* | *LCPI* |
|---|---|---|---|---|---|---|
| 1 | 0.054 | 100.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 2 | 0.085 | 97.815 | 0.252 | 0.148 | 0.320 | 0.086 |
| 3 | 0.107 | 97.020 | 0.532 | 0.146 | 0.297 | 0.575 |
| 4 | 0.123 | 95.720 | 0.668 | 0.168 | 0.456 | 1.565 |
| 5 | 0.135 | 94.387 | 0.681 | 0.181 | 0.502 | 2.816 |
| 6 | 0.145 | 92.809 | 0.657 | 0.176 | 0.500 | 4.188 |
| 7 | 0.153 | 90.911 | 0.628 | 0.162 | 0.483 | 5.631 |
| 8 | 0.160 | 88.714 | 0.600 | 0.149 | 0.462 | 7.111 |
| 9 | 0.165 | 86.301 | 0.574 | 0.150 | 0.442 | 8.583 |
| 10 | 0.171 | 83.774 | 0.549 | 0.178 | 0.422 | 10.005 |
| 11 | 0.176 | 81.222 | 0.526 | 0.241 | 0.403 | 11.347 |
| 12 | 0.180 | 78.714 | 0.504 | 0.349 | 0.389 | 12.589 |
| 13 | 0.184 | 76.298 | 0.485 | 0.508 | 0.379 | 13.725 |
| 14 | 0.188 | 74.006 | 0.468 | 0.719 | 0.351 | 14.752 |
| 15 | 0.192 | 71.854 | 0.453 | 0.981 | 0.345 | 15.672 |

**Conclusions and Findings:**

In the present chapter of the study, with the help of modern econometric techniques, an effort has been made to empirically investigate the relationship between stock prices or stock market development with different sets of domestic and international macroeconomic variables. Towards this effort different models has been formulated, using the data for different time span and frequency, according to the need of the study. The study is categorised into three major categories, viz.-a-viz., the first category is the empirical estimation of the study using annual frequency data; the second category is the empirical estimation of the study using quarterly frequency data; and the third category consist of the study using monthly frequency data.

The first category, deals with the estimation and discussion on the relationship between stock prices and macroeconomic variables by using data from the year 1994 to 2019. The long-run estimates of ARDL test showed that positive and significant relationship exists between economic growth and stock prices. It also confirms a significant and positive influence of Exchange Rate and Inflation on stock price movements in India. The results of long run estimates of ARDL are consistent in the short run as well. The error correction model of ARDL approach reveals that the adjustment process from the short-run deviation is quite high. The result of VECM based granger causality show that there exists a short run unidirectional causality running from foreign direct investment and GDP to BSE in India. Further, the result indicates the presence of long run causality for the equation with the stock price as the dependent variable. The results of the VDC analysis show that a major percentage of stock price change is its own innovative shocks.

The second category, i.e. the study with quarterly frequency data, empirically examined the

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relationship between macroeconomic variables and stock market development (MCP) in India, data from the period 1994:Q4 to 2019:Q1. The long-run estimates of ARDL test showed that economic growth and FIIs in India significantly influence market capitalization positively. However, economic growth failed to explain the variation in stock market growth significantly in the short-run. The results of VECM based granger causality show that there exists long-run causality running from economic growth, FDI and FII towards Stock Market Capitalization, whereas, in short-run the change in FII causes a change in Stock Market Capitalization. The result of the VDC analysis shows that FDI is having maximum shock on stock market capitalization after its own shock.

The third category, i.e. the study with monthly frequency data, empirically examined the relationship between stock prices and macroeconomic variables, using different time period for the study and different set of macroeconomic variables, formulating different models. The first part of the monthly study deals with the estimation and discussion on the relationship between BSNX and macroeconomic variables by using data from the period Nov 1994 to March 2019. The long-run estimates of ARDL test showed that positive and significant relationship exists between economic growth (IIP), Exchange Rate and Inflation on stock price movements in India. The error correction model of ARDL approach reveals that the adjustment process from the short-run deviation is slow. The result of VECM based causality found no short run causality running from any of the variables to BSE in India. Further, the result indicates the presence of long run causality for the equation with the stock price as the dependent variable. The results of VDC show that a major percentage of stock price change is its own innovative shocks.

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