ABSTRACT

Prologue

Stock markets’ exposure emanating from dynamics of cogent variables and investors’ behaviour is gaining significance due to the function of these markets in mobilization and channelization of capital towards productive activities. As a protocol of wealth creation, investment activities executed by diverse groups in the stock market are crucial to economic development and both developed & developing economies are intensely pegged with the performance of their stock markets. Besides, the proliferation of techno-driven information sharing architecture has substantiated the dissemination of information both ex-ante & ex-post pertaining to endogenous as well as exogenous issues which in turn lead to intricate and intermingle relationships among variables of economy and stock market.

With the opening up of emerging economies and manifestation of liberalized policies during last few decades, stock markets of such economies are witnessed as volatile markets compared to their counterparts. Further, stock markets of emerging economies are prone to factors viz. changes in the level of economic activities, changes in the political and international economic environment and also related to the changes in other macroeconomic factors. Generally, growth rate in gross domestic product; rate of inflation; rate of interest; fiscal position and exchange rate are considered as barometers of measuring the performance of the economy and are the major determinants of the growth of an economy. Moreover, it is asserted in theoretical & empirical literature that stock prices accurately reflect expectations about future corporate performance and corporate profits per se reflect the level of economic activities. If stock prices reflect the underlying fundamentals, they are expected to be adopted as leading indicators of future economic activities. Hence, dynamic interactions and causal relations among stock prices and macroeconomic variables are imperative to the formulation of macroeconomic policy of a country.

Indian economy has witnessed a complete turnaround during the last two decades in all facets and emerged as one of the fast growing economies of the world attracting
attention of diverse stakeholders. The quantum of capital investment and high saving rates has significantly contributed to such healthy state which made it a heaven for transnational entities looking for lucrative destinations. Conversely, Indian market has experienced the spill-over effect of global financial crisis and unexpected capital flow resulting from unwinding of investments causing fluctuations in macroeconomic variables. Multinational players are adopting cautionary approach and cautiously analyzing movements in all cogent economic variables to better execute their investment activities in Indian market.

**Objectives of the Study**

The present research aims at following objectives:

1. To analyze the impact of GDP on Indian Stock Market.
2. To analyze the impact of Interest Rate on Indian Stock Market.
3. To analyze the impact of Inflation Rate on Indian Stock Market.

**Hypotheses of the Study**

The present research proceeds with the following hypotheses:

1. $H_01 : \text{There is no impact of Gross Domestic Product on Indian Stock Market.}$
2. $H_02 : \text{There is no impact of Interest Rate on Indian Stock Market.}$
3. $H_03 : \text{There is no impact of Inflation Rate on Indian Stock Market.}$

**Data and Period of the Study**

The data used to explore the impact of macroeconomic variables affecting the Indian Stock Market comprises of daily closing prices of S&P CNX Nifty and different macroeconomic variables. Data pertaining to CNX Nifty (proxy of market Indices) have been collected and compiled from the official website of National Stock Exchange of India. Further, data pertaining to different macroeconomic variables viz. Gross Domestic Product, Interest rate, Wholesale Price Index and Consumer Price Index have been collected from publications of the Reserve Bank of India, Handbook of Indian Statistics and monthly bulletin of Reserve Bank of India. Period of the study for the purpose of analysing the factors affecting the Indian Stock Market ranges from 1st April, 2009 to 31st March, 2015. Quarterly data of Gross Domestic Product at
factor cost at current prices, daily data of weighted lending rates used as the proxy of Interest rate and monthly data of Consumer Price Index & Wholesale Price Index have been compiled for the aforementioned period of the study.

**Methodology of the Study**

Owing to typical characteristics of time series data, it is required to explore the typical characteristics of time series variables by applying econometrics techniques in order to substantiate the analysis in consonance with the objectives & hypotheses. The empirical model below illustrates the relationship between Gross Domestic Product, Interest Rate, Inflation Rate and India Stock Market:

\[
\text{CNX Nifty} = f (\text{GDP, INTEREST RATE, INFLATION})
\]

However, each independent variable is taken separately to explore the causal relationship. The methodology used for diagnosing the characteristics of time series is Augmented Dickey Fuller Test and to know whether the series is stationary or stochastic.

While exploring the characteristics of Gross Domestic Product and CNX Nifty, it is documented that they are not integrated of same order and rather GDP is integrated of I (0) and CNX Nifty is of I (1). Based on such characteristics of both time series, ARDL (Autoregressive Distributed lag) technique has been applied to explore the long-run causal relationship between Gross Domestic Product and Indian Stock Market. The major advantage of using ARDL approach is that it can be used even in cases where different variables have different order of integration, which is not possible with traditional co-integration techniques like Johansen Co-integration test (1988) and Engle & Granger (1987). Moreover, ARDL can estimate the co-integration equation with very small sample size whereas Johansen test requires a large sample size for robust results. In order to investigate the long run co-integration Wald test has been applied.

The research methodology used for investigating the impact of Interest rate and Inflation on Indian Stock Market is Augmented Dickey Fuller Test followed by Granger Causality test proposed by Granger (1969). In order to identify the causal relationship, the variable Y should be regressed on its own lagged values, as well as
the lagged values of other variables and test the null hypothesis that that the coefficients of the lagged values of other variables is jointly zero. If the test fails to reject the null hypothesis, then variable X does not Granger cause variable Y. If the variable X granger causes Variable Y, then changes in X should precede changes in Y. Therefore, in a regression of Y on other variables (including its own past values) if we include past or lagged values of X and it significantly improves the prediction of Y, then we can say that X (granger) causes Y. Similarly the case applies if Y (granger) causes X.

Relevance of the Study

The movement of stock indices is highly disposed to the changes in rudiments of the economy and to the changes in future expectations. These expectations are influenced by the micro and macro fundamentals which may be formed logically on economic fundamentals as well as by subjective factors which are unpredictable and also non quantifiable. It is believed that domestic economic fundamentals play seminal role in the performance of stock market. Further, modern financial theory concentrates upon systematic factors as sources of risk and contemplates that the long run return on an individual asset must replicate the changes in such systematic factors. This implies that securities market has an important relationship with real and financial sectors of the economy. This relationship is generally viewed in two ways. The first relationship considers the stock market as a leading indicator of the economic activity in the country whereas the second relationship focuses on the possible impact the stock market might have on aggregate demand, predominantly through aggregate consumption and investment. The first case states that stock market leads economic activity whereas the second case suggests that it follows economic activity. Knowledge of the sensitivity of stock market to macroeconomic behaviour of key variables and vice-versa is important in many areas of investments and finance. This research may be helpful to comprehend this relationship.

Scope of the Study

Variables like GDP, inflation rate, interest rate, money supply, employment & unemployment rate, oil prices, exchange rate etc. are some of the cogent factors which contribute to systematic as well as systemic risks as documented in the literature.
Moreover, such risks are major source of fluctuations in the prices of the stocks. Among the significant macroeconomic variables, the current study unravels the linkage between the stock market and the selected macroeconomic variables viz. GDP, inflation rate & Interest rate based on their theoretical importance, performance measures of the economy and findings in the earlier empirical studies in the Indian context using different techniques. The study revisits linkage between aforesaid macroeconomic variables and the Indian Stock Market and is open to the potential two-way relationship between them.

**Limitations of the Study**

The present piece of work is a study aimed at arriving conclusions pertaining to the impact of Gross Domestic Product, Inflation Rate and Interest rate on Indian Stock Market. Albeit, Stock market is affected by many factors like Interest rate, GDP, inflation, exchange rate, money supply, fiscal policy, unemployment etc., it is not possible to accommodate all macroeconomic variables because of the unavailability of the structured & reliable data pertaining to all variables. Further, the period of study contains six financial years which could be extended for a robust conclusion. The study has used secondary data which therein suffer from lack of preciseness. The techniques applied in the empirical analysis are the basic econometric techniques but the study could have been done by applying advanced econometric tools and techniques to substantiate conclusions.

**Scheme of Presentation**

The present study is aimed at different dimensions of macroeconomic variables in Indian Stock Market and the scheme of presentation has been divided into seven chapters as follows:

**Chapter 1:** presents the concept of the stock market, its association with macroeconomic variables, theoretical rational and enumerates the objectives and scope of the study along with data used, methodology applied and relevance of the study.

**Chapter 2:** comprises of the researches done by ardent researchers who have examined the intricacies involved with macroeconomic variables in India and in other
countries. The empirical researches enlisted have bearing to both Indian and International market dynamics.


Chapter 4: documents the empirical results obtained on the relationship between Gross Domestic Product (GDP) and share prices in Indian Stock Market.

Chapter 5: covers the results obtained from the empirical exercise done with respect to the impact of Inflation on share prices in Indian Stock Market.

Chapter 6: documents the empirical results obtained with regard to impact of Interest rate on the share prices in Indian Stock Market.

Chapter 7: presents a brief summary of the study and attempts to draw conclusions based on the empirical exercise. The major implications are also elaborated on the basis of analysis and interpretations.

Analysis and Interpretation of the Study

This section presents the analysis of data and Interpretations of the results with respect to different objectives framed:

Objective 1: To analyze the impact of Gross Domestic Product (GDP) on Indian Stock Market.

To study the above objective, the null and alternate hypotheses are as follows:

H₀: There is no impact of Gross Domestic Product on Indian Stock Market.

In order to explore any long run co-integration relationship between GDP and stock indices and specification of model, we started with testing the presence of unit root and the order of integration of time series variables by applying Augmented Dickey Fuller Test. The outputs of ADF test is documented in Table 1 and asserts that GDP is stationary at level and CNX Nifty is non stationary at level. Further, ADF test has been applied at first difference and the market indices is found stationary. Hence, GDP and NSE are both integrated of different orders as GDP of order I (0) means data is stationary at level and NSE of order I (1) means the data is stationary at first
difference. The results of Augmented Dickey Fuller test has been compiled in the table below:

<table>
<thead>
<tr>
<th>Variables</th>
<th>At Level</th>
<th>At first Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Intercept</td>
<td>Trend &amp; Intercept</td>
</tr>
<tr>
<td></td>
<td>t-Stat.</td>
<td>p-value</td>
</tr>
<tr>
<td>GDP</td>
<td>-1.0264</td>
<td>0.7259</td>
</tr>
<tr>
<td>CNX Nifty</td>
<td>0.6703</td>
<td>0.9886</td>
</tr>
<tr>
<td></td>
<td>-9.7909</td>
<td>0.0000</td>
</tr>
<tr>
<td></td>
<td>-0.2986</td>
<td>0.9855</td>
</tr>
<tr>
<td></td>
<td>-3.3451</td>
<td>0.0249</td>
</tr>
<tr>
<td></td>
<td>-11.1318</td>
<td>0.0000</td>
</tr>
<tr>
<td></td>
<td>0.9886</td>
<td>0.9855</td>
</tr>
<tr>
<td></td>
<td>-3.6467</td>
<td>0.0487</td>
</tr>
<tr>
<td></td>
<td>-11.023</td>
<td>0.0000</td>
</tr>
<tr>
<td></td>
<td>-11.023</td>
<td>0.0000</td>
</tr>
<tr>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Computed

The t-statistic for GDP at level is -9.7909 having a p-value of 0.0000 which is statistically significant and indicates that GDP is stationary at level where as t-statistic for CNX Nifty at first difference is -3.3451 having a p-value of 0.0249 which is statistically significant and indicates that it is stationary at first difference.

Resultantly, GDP and CNX Nifty series are stationary at different order of lag and integrated as I (0) and I (1) respectively. Having observed that they are integrated of different order, ARDL model for exploring the long-run relationship has been applied. To estimate the ARDL model, the optimal lag length has been chosen using Akaike Information Criteria and checked the data at 3 different lags. The calculated value of AIC at lag 6, lag 4 and at lag 2 are 14.46607, 15.30670 and 14.76483 respectively which implies that the minimum value is witnessed at lag 6. Hence, ARDL co-integration has been done at lag 6 in order to get robust estimates. Under ARDL model, the null hypothesis that there is no long run relationship between GDP and CNX Nifty representing the Indian stock market is tested. In other words, coefficients of GDP & CNX Nifty at first lag are equal to zero under autoregressive distributed lag model and symbolically denoted as $\beta_1 = \beta_2 = 0$. The following model is used to examine the relationship between GDP and CNX Nifty:

$$
\Delta \text{nifty} = c + \beta_1 \text{gdp}_{t-1} + \beta_2 \text{nifty}_{t-14} + \sum_{j=1}^{n} \delta_j \Delta \text{nifty}_{t-j} + \sum_{j=1}^{n} \gamma_j \Delta \text{gdp}_{t-j} + \epsilon_t
$$

Further, Wald Test has been applied to diagnose the coefficients of GDP and CNX Nifty at first lag and the output is documented in Table 2. The f-statistic is 3.504 having probability value of 0.222 which is statistically insignificant at 5% level of significance and the null hypothesis could not be rejected for the above model.
Moreover, the failure of the rejection of hypothesis implies that there is no co-integration between Gross domestic product and CNX Nifty which asserts that they do not have a long run relationship.

**Table 2: Wald Test**

<table>
<thead>
<tr>
<th>Null hypothesis</th>
<th>F-statistic</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>$H_0$: $\beta_1 = \beta_2 = 0$ (there is no co-integration among the variables)</td>
<td>3.504</td>
<td>0.2220</td>
</tr>
</tbody>
</table>

Source: Computed

Finally, Granger causality test has been applied to substantiate findings by exploring any causal relationship between GDP and CNX Nifty. The test contends whether there exist uni-directional or bi-directional causal relationship between Indian stock market and gross domestic product. The outputs are summarised in Table 3 and connotes that p-value in both the cases 0.3983 & 0.6237 which are statistically insignificant at 5% level of significance. Hence, we could not reject the null hypothesis that GDP does not granger causes NSE or NSE does not granger cause GDP. Results indicate that there does not appear to be any causality from GDP to the stock index and vice versa.

**Table 3: Granger Causality Test**

<table>
<thead>
<tr>
<th>Null Hypotheses</th>
<th>F-statistics</th>
<th>Probability</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP does not cause Stock Returns</td>
<td>0.74675</td>
<td>0.3983</td>
<td>Accepted</td>
</tr>
<tr>
<td>Stock Returns does not cause GDP</td>
<td>0.24868</td>
<td>0.6237</td>
<td>Accepted</td>
</tr>
</tbody>
</table>

Source: Computed

**Objective 2: To analyze the impact of Interest Rate on Indian Stock Market.**

To study the above objective, the null and alternate hypotheses are as follows:

$H_0$: There is no impact of Interest rate on Indian Stock Market.
In order to explore the relationship, daily money market lending rate as a proxy of interest rate and daily closing prices of CNX Nifty as a proxy of Indian stock market have been used. As a prerequisite, characteristics of both the time series have been diagnosed by applying ADF test to know the presence of unit root. The outputs of ADF test is presented in Table 4 and asserted that both the series are stationary at first difference and there is presence of unit root at level. The t-statistics of both series at first difference are -20.907 & -34.642 having p-value of 0.00 and statistically significant. Accordingly, first difference series of interest rate and CNX Nifty have been generated using Eviews.

Further, causal relationship between interest rate and stock prices/returns has been explored by applying Granger causality test in order to know whether changes in interest rate cause changes in Stock returns or changes in Stock returns cause changes in interest rate. The outputs as documented in Table 5 asserted that F-statistics are 0.6288 & 1.6081 having p-value of 0.5964 & 0.1856 for both the hypotheses. As p-values are statistically insignificant at 5% level of significance, the test fails to reject the null hypothesis of interest rate does not cause stock returns as well as the null hypothesis of Stock returns does not cause interest rate. It seems that there is no causality between interest rate and stock prices/returns.
**Objective 3:** To analyze the impact of Inflation Rate on Indian Stock Market.

To study the above objective, the null and alternate hypotheses are as follows:

**H₀:** There is no impact of Inflation Rate on Indian Stock Market.

In order to explore the relationship, monthly Consumer price index & Wholesale price index as a proxy of inflation and monthly average of daily closing prices of CNX Nifty as a proxy of Indian stock market have been used. As a prerequisite, characteristics of both the time series have been diagnosed by applying ADF test to know the presence of unit root. The outputs of ADF test is presented in Table 6 and asserted that both the series are stationary at first difference and there is presence of unit root at level. The t-statistics of all series at first difference are \(-7.489\), \(-5.6227\) & \(-8.4459\) having p-values of 0.00 and statistically significant. Accordingly, first difference series of consumer price index, wholesale price index and CNX Nifty have been generated using Eviews.

<table>
<thead>
<tr>
<th>Variables</th>
<th>At Level</th>
<th>At first Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Intercept</td>
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</tr>
<tr>
<td></td>
<td>t-Stat.</td>
<td>p-value</td>
</tr>
<tr>
<td>CPI</td>
<td>-1.1932</td>
<td>0.6732</td>
</tr>
<tr>
<td>WPI</td>
<td>-2.2534</td>
<td>0.1899</td>
</tr>
<tr>
<td>CNX Nifty</td>
<td>-0.4068</td>
<td>0.9016</td>
</tr>
</tbody>
</table>

Source: Computed

Further, causal relationship between inflation and stock prices/returns has been explored by applying Granger causality test in order to know whether changes in inflation cause changes in Stock price or changes in Stock price cause changes in inflation. The outputs as documented in Table 7 asserted that F-statistics are 0.2899 & 2.4067 having p-value of 0.7492 & 0.0982 for both the hypotheses. As p-values are statistically insignificant at 5% level of significance, the test fails to reject the null hypothesis of consumer price index does not cause stock returns as well as the null hypothesis of Stock returns does not cause consumer price index. It seems that there is no causality between CPI and stock prices/returns. Further, causality test has been applied by taking wholesale price index and stock price. The outputs as documented...
in Table 8 asserted that F-statistics are 1.4922 & 0.0612 having p-value of 0.2326 & 0.9406 for both the hypotheses. As p-values are statistically insignificant at 5% level of significance, the test fails to reject the null hypothesis of wholesale price index does not cause stock returns as well as the null hypothesis of Stock returns does not cause wholesale price index. It seems that there is no causality between WPI and stock prices/returns.

**Table 7: Granger Causality Test of CPI and CNX Nifty**

<table>
<thead>
<tr>
<th>Null Hypotheses</th>
<th>F-statistics</th>
<th>Probability</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPI does not cause Stock Returns</td>
<td>0.2899</td>
<td>0.7492</td>
<td>Accepted</td>
</tr>
<tr>
<td>Stock Returns does not cause CPI</td>
<td>2.4067</td>
<td>0.0982</td>
<td>Accepted</td>
</tr>
</tbody>
</table>

Source: Computed

**Table 8: Granger Causality Test of WPI and CNX Nifty**

<table>
<thead>
<tr>
<th>Null Hypotheses</th>
<th>F-statistics</th>
<th>Probability</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>WPI does not cause Stock Returns</td>
<td>1.4922</td>
<td>0.2326</td>
<td>Accepted</td>
</tr>
<tr>
<td>Stock Returns does not cause WPI</td>
<td>0.0612</td>
<td>0.9406</td>
<td>Accepted</td>
</tr>
</tbody>
</table>

Source: Computed

**Major Findings**

➢ The results with respect to the first objective purport that changes in the share prices are not influenced by Gross domestic product for the observed period of study as the results depicts that there is no long run relationship between the Gross Domestic Product and Stock Prices.

➢ With respect to the second objective, the findings reveal that there is no causal relationship between the Interest Rate and Indian Stock Market for the selected time period. Interest rate does not necessarily influence the changes in the stock prices and vice-versa.

➢ In the context of third objective, the results suffice that CPI does not influence the share prices during the period under study in India and vice-versa. Further, wholesale price index as a proxy of inflation does not influence stock prices in
Indian stock market. Hence, there is no causal relationship between the WPI and Indian Stock Market.

Conclusion

With the opening up of emerging economies and manifestation of liberalized policies during last few decades, stock markets of such economies are witnessed as volatile markets compared to their counterparts. Further, stock markets of emerging economies are prone to factors viz. changes in the level of economic activities, changes in the political and international economic environment and also related to the changes in other macroeconomic factors. Generally, growth rate in gross domestic product; rate of inflation; rate of interest; fiscal position and exchange rate are considered as barometers of measuring the performance of the economy and are the major determinants of the growth of an economy. Moreover, it is asserted in theoretical & empirical literature that stock prices accurately reflect expectations about future corporate performance per se and reflect the level of economic activities. If stock prices reflect the underlying fundamentals, they are expected to be adopted as leading indicators of future economic activities. Hence, dynamic interactions and causal relations among stock prices and macroeconomic variables are imperative to the formulation of macroeconomic policy of a country. The present research aims at exploring the relationship among macroeconomic variables and stock prices in India.

Macroeconomic variables viz. gross domestic product, interest rate and inflation have been chosen to study their influence on stock prices in Indian stock market. Period of the study for the purpose of analysis ranges from 1st April, 2009 to 31st March, 2015. Findings of the study assert that fluctuation in stock prices is not caused by gross domestic product and change in GDP is also not caused by stock prices. Further, interest rate does not influence stock price and vice-versa. There is no long run relationship between interest rate and stock price. Finally, there is neither unidirectional nor bi-directional causal relationship between inflation and stock prices.

Implications

➢ Independency of stock prices to that of gross domestic product purports that Indian stock market is either witnessing high informational efficiency or trading strategies are biased towards behavioral dynamics without paying heed to market
fundamentals. However, empirical literature on informational efficiency exhibits semi-strong state in stock market. Hence, the second implication seems to be prevalent.

➢ Relationship between inflation and stock price contends that changes in general price level are not reflected while adjusting the discounted rate or may be countered by the economic stimulus resulting from inflation conditional upon additional money supply. Inflation due to additional money supply tends to magnify productive activities and leads to better corporate performance which resultantly poses favorable impact on stock price *per se.*