Impact of Gross Domestic Product on Indian Stock Market

4.1 Introduction

Indian economy has undergone radical changes since the spate of structural policy reforms were proliferated. At the backdrop of the micro and macro impediments practised by the stakeholders of the economies of the developing countries, the sovereign introduced holistic metamorphosis pertaining to the economic, social, political, legal, and different financial issues for being a competitive element in the short run and certainly turn out to be sustainable for long run. With a view to keep pace with the dynamics of major changes in the economy, stock market operations have been become inevitable for the overall development of the economy. The theoretical debates generally focus on the increasing intermediation roles and functions of the stock market in promoting liquidity, mobilizing savings, generating information for potential investments & capital allocation and diversifying risks. It is argued that by altering the quality of these functions, the existence of stock markets can affect the rate of real economic growth (Diamond and Dybvig (1983), Levine (1991), Saint-Paul (1992)). However, Bencivenga and Smith (1991) argued that by reducing uncertainty, the increase in liquidity may reduce saving rates enough to incur a negative effect on economic growth.

Over the past few decades, the interaction of share returns and the macroeconomic variables has been a subject of concentration among academics and practitioners. It is often argued that stock prices are determined by some fundamental macroeconomic variables such as interest rate, exchange rate, GDP, inflation, etc. Anecdotal evidence from the financial area indicates that investors usually believe that monetary policy and macroeconomic events have a large influence on the
volatility of the stock price. According to Galbraith (1955), “the stock market is but a mirror, which provides an image of the underlying or fundamental economic situation”. The stock market mobilizes capital for corporate sector and offers individual and institutional investors alternative investment options for maximizing their return and wealth. The investors are vigilant in the performance of stock market so that they are prudent in their investment decisions.

Researchers and analysts have conflicting views when it comes to the effect of the stock market on economic growth. The ardent researchers have tried to explain the factors that affect the stock prices using different models and econometric techniques. Evidence shows that in some countries, economic growth systematically causes financial development (Demetriades, 1996). The relation between the stock prices and macroeconomic variables such as the GDP, inflation rate, the interest rate, the industrial production have been the subject of various studies in the fields of economy and finance in the last few decades. A significant amount of literature now exists that examines the relationship between stock market returns and a range of macroeconomic & financial variables over a number of different stock markets and time periods. A number of studies carried out in developed markets like the U.S. and Japan revealed that the macroeconomic variables have an effect on share prices. Fama and Schwert (1977), Nelson (1977), and Jaffe and Mandelker (1976) have found that macroeconomic variables have an influence on stock returns. These studies have paved the approach for further examination of similar relations in emerging markets since they constitute a good channel of diversification for global investors.

Financial economics provide a number of models that helps to examine the relationship between stock indices and economic variables and the return on stocks are highly sensitive to both fundamentals and expectations. The latter in turn is influenced by the fundamentals which may be based on either rational or adaptive expectation models as well as by many subjective factors which are unpredictable
and also non quantifiable. Empirical studies indicate that once the financial deregulation takes place, the stock market becomes more sensitive to both domestic and external factors. The movement of stock indices is highly disposed to the changes in rudiments of the economy and to the changes in future prospects potential. These expectations are influenced by the micro and macro fundamentals which may be formed either logically or adaptively on economic fundamentals. It is believed that domestic economic fundamentals play decisive role in the performance of stock market. However, in the era of globalisation and integration of world economies, domestic economic variables are also subject to change due to the policies adopted and expected to be adopted by other countries or some global events. The common external factors influencing the stock return are stock prices in global economy, the interest rate, foreign investment and the exchange rate. Keeping in view of this, this chapter attempts to investigate how stock market index in India is practically being shocked by the commodity indicator, the GDP growth rate. A casual inspection of stock market prices and GDP in Indian market economies reveals that these tend to move together. Countries doing well in terms of GDP performance have a higher propensity to experience higher gains in domestic stock exchanges. Explaining such a seminal association involves assessing the direction of causality among two or more identifiable variables.

The growth rate of gross domestic product in the BRIC countries is overwhelmingly larger than in traditionally strong economy such as the United States and Germany. The statistic shows the growth of the real gross domestic product (GDP) in India from 2010 to 2015, with projections up until 2020. In 2015, India's real gross domestic product growth was at about 7.26 percent compared to the previous year. Despite the world-wide recession in 2008 and 2009, India still managed to trace remarkable GDP growth rates, especially when most of the world recorded negative growth in at least one of those years. Part of the reason for India’s success is the economic liberalization that started in
1991 and encouraged trade subsequently ending some public monopolies. GDP growth has sluggish in recent years, due to sky rocketing inflation. India’s workforce is expanding in the industry and services sectors, growing partially because of international outsourcing — a money-spinning endeavour for the Indian economy.

4.2 Theoretical Rationale

There are numerous theoretical underpinnings which state the correlation between the economic growth and stock returns. These are passive informant theory, accurate active informant theory, faulty active informant theory, financing theory and stock market pressure theory.

4.2.1 Passive Informant Hypothesis: According this theory, stock prices reflect the present discounted value of all the future dividends and the dividend growth is related to GDP growth. Thus, a correlation between this year’s stock returns and next year’s economic growth arises naturally. (Mauro, 2000: 5).

4.2.2 Accurate Active informant Hypothesis: According to this theory, the changes in the stock market accommodate the managers with all the information concerned with the market expectations about the future economic developments. The investors generally use this information as the base for their investment decisions and validate the market’s expectations. For that reason, stock market is considered as a ‘sunspot’ and its changes turn out to be absolutely correlated with fundamentals. (Mauro, 2000:6).

4.2.3 Faulty active informant Hypothesis: According to this theory, investors’ decisions about the investment are influenced by the stock price movements but the investors cannot discriminate between the movements reflecting fundamentals and movements reflecting the market segments. Hence, the stock market movements can mislead the investors for overinvesting compared with what later turns out to be warranted by the fundamentals. (Mauro, 2000:6)
4.2.4 Financing Hypothesis: According to this theory, when the stock prices are high compared to the replacement cost of capital, the investors prefer to expand their activities by investing new physical capital with issuing the new shares of their company more willingly than purchasing existing firms on the stock market. Hence high stock returns will tend to be followed by sky-scraping investment, mechanism and economic growth. (Mauro, 2000:6).

4.2.5 Stock Market Pressure Hypothesis: According to this theory, the changes in the stock prices can affect the investment even though they neither get across the information nor renovate financing costs. If investors hold negative views on a firm’s prospects and decrease its stock price, managers may have to cut their investments projects so as to protect themselves from the possibility of being fired or taken over (Mauro, 2000:6).

Economic theory suggests that there should be a strong link between economic activity and security prices, given that the stock price is the discounted present value of the firm’s payout. If this payout is ultimately a function of real activity, such a association is supposed to prevail in the Economy. (Duca, 2007, p. 3). According to the standard discounted-cash-flow valuation model, stock prices usually drives the growth rates of economic activity in real terms provided that investors’ perceptions about firms’ future payouts are exact on average. This is because the anticipated future payouts of firms should depict real economic activity which, therefore, can be interpreted as an aggregate proxy of corporate earnings (Binswanger, 2002, p.1). This is one hypothetical argument denoting the causal relationship between stocks prices and economic output.

Theoretically, proponents often claim that a fall in share prices decreases domestic wealth results in lower demand for domestic money and interest rates, and foreign investors cut their investment down in domestic assets and currencies (Noman et al., 2012) thus affecting GDP negatively which means a pessimistic economic growth can be predicted. In contrast, a rise in share prices increases
domestic wealth as domestic and foreign investors become eager to invest in a country’s equities, which leads to capital inflows and currency appreciation (Granger et al., 2000, Caporale et al., 2002; Stavrek, 2005; Pan et al., 2007), thus affecting GDP positively so that an optimistic economic growth can be envisaged. In addition, there are other hypothetical propositions underpinning the paramount association between these two variables. Reinforcing the connection between the two variables the stock market and economic growth some other theoretical concepts are there to explain as to how the economic output is affected by the stock market or vice-versa.

The first linkage was recommended by Tobin (1969). He focused on how the cost of capital was affected by even minute changes in the prices of share markets and captured by a coefficient known as Tobin’s Q, which is the ratio of the market value of current capital to the cost of replacement capital. According to him, a high share price leads to a high value of the firm in relation to the cost of replacement capital (Tobin’s Q). As a result, this leads to a rise in investment expenditure and thus to a higher total economic output as firms find it easier to finance investment expenditures. This occurs because investment would be convenient as it would require a relatively lower share offering in a situation of a high share price.

The second proposition linking stock market performance with GDP was given by Modigliani (1971). His concepts fit along the effect of wealth on consumption. A durable increase in share prices brings about an increase in the entity’s wealth and thus resulting in a higher enduring income. By means of the permanent income hypothesis, Modigliani claimed that inter-sequentially, consumers balance out their consumption with the intention of maximizing their utility. A rise in permanent income will subsequently enable consumers to raise their consumption levels in each period.

The third explanation of how economic output is affected by stock price is referred to as the financial accelerator (Bernanke & Gertler, 1989). This concept
emphasizes on the effect that stock prices have on firms’ balance sheets. Due to the presence of asymmetric information in borrowing markets, the capability of firms to raise money depends largely on the collateral, they use as pledge. The collateral value, firms can propose increases in situations where their stock price value increases. As the security they can put forward increases, higher credit can be acquired on better terms which sequentially can be utilized for further investments and because of that it signifies a suitable expansion in the economic activity.

The theoretical linkage between the macroeconomic variables and the stock market performance can be directly obtained from the Present Value Model (PVM) and the Arbitrage Pricing Theory (APT). The Present Value Model focuses on the long run relationship between the stock market movement and the macroeconomic fundamentals. According to these models, any new information about the fundamental macroeconomic factors such as real output, inflation, exchange rate, interest rate, foreign investment and so on may influence the stock price/returns through the impact of expected dividends, the discount rate or both (Chen et al, 1986, Naik & Padhi, 2012). A simple discount model shows that the fundamental value of corporate stock equals the present value of expected future dividends. The future dividends must eventually replicate real economic activity. If all currently available information is taken into account, there could be a close relationship between stock prices and expected future economic activity. As pointed out by Ahmed (2008, quoted in Naik & Padhi, 2012), these relationships can be viewed in two alternative ways; (i) the stock market as the leading indicator of economic activity or stock market leads economic activity; and (ii) the possible impact the stock market has on the aggregate demand through the aggregate consumption and investment suggesting stock market lags economic activity.

4.3 Review of Literature

In order to unfold the various prospects of Gross Domestic Product with respect to the Indian Stock Market, there are anecdotal as well as empirical evidences that
there exists the robust relationship between the stock market returns and Gross Domestic Product i.e. economic growth. Ardent researchers have examined the relationship between the stock market returns and Gross Domestic Product and the findings are generally mixed.

Demetriades and Hussein (1996) conducted a time series analysis on the relationship between stock market and economic growth; used a panel of 16 countries over a period of 27 years. They had two proxies for financial development, which were ratio of bank claims in the private sector to nominal GDP and ratio of bank deposit liabilities to nominal GDP. They found that the relationship between stock market and economic growth was country specific; the results reveal that six countries showed causation from growth to financial development, while only three of the countries examined showed causations from financial indicators to economic growth.

Levine and Zervos (1998) presented cross-country econometric evidence showing that, sample of 47 countries, stock market liquidity contributed a significant positive influence on GDP growth during 1976-1993. Study shows that the Levine-Zervos results are not robust to alternative specifications because of the incomplete manner in which they control for outliers in their data. They show that when one properly controls for outliers, stock market liquidity no longer exerts any statistically observable influence on GDP growth.

Hassapis and Kalyvitis (2001) investigated the link between real stock price changes and economic growth. They develop a simple growth model, which presents the relationship between real stock prices and output. Evidence from the G-7 economies by use of the VAR methodology shows that real stock price changes and output growth are strongly related, as predicted by the theoretical model. The bivariate framework also provides useful information for understanding the response of economic growth and real stock prices to external shocks.
Levine (2003) focuses on the ambiguous predictions about the relationship between stock market liquidity and economic growth. The paper presents cross-country evidence on the association between one measure of stock market liquidity and average economic growth rates over the period 1976 – 1993. The data suggest that there is a strong positive relationship between long-run economic growth rates and stock market liquidity.

Osinubi (2003) ventured into assessing whether “stock market promotes economic growth”. The study used the least square regression using data from 1980-2000. The result indicates positive link between economic growth and stock market development. The result furthered suggested that, the pursuit of policies geared towards rapid development of the stock market.

Capasso (2003) assessed the Linkages between stock market development and economic growth within the context of a dynamic general equilibrium framework of information asymmetries, endogenous contract choice and capital accumulation. The findings indicate that stock market activity is closely related to show activity, with firms having greater evidence toward issuing equity (rather than debt) as capital accumulation proceed.

Beck and Levine (2004) attempts to analyze the link between stock market development, bank development and economic growth for 40 countries for the period 1975-1998. Stock market development is measured using turnover ratio, banking sector development is measured by using ‘bank credit’ which is deposit-taking bank claims on the private sector divided by GDP. Economic Growth is measured using real per capita GDP growth rate. The result suggest evidence for robust statistical relationship between banks, stock markets and economic growth and cross-country growth regressions show the importance of the overall level of financial development, rather than the composition of the financial system.
Azarmi et. al. (2005) undertook the empirical analysis in order to explore the relation between stock market development and economic growth for a period from 1981 to 2001. Growth is proxied by using real per capita GDP while stock market development is proxied using market capitalization ratio, total turnover ratio and turnover ratio. The study finds a negative correlation between stock market development and economic growth for the post liberalization period. The results are consistent with the suggestion that the Indian Stock market is a casino for the sub-period of post liberalization and for the entire ten-year event study period.

Adam and Sanni (2005) carefully analysed the roles of stock market on Nigeria`s economic growth using Granger-causality test and regression analysis. The authors discovered a one-way causality between GDP growth and market capitalization and a two-way causality between GDP growth and market turnover. They also observed a positive and significant relationship between GDP and turnover ratios.

Acaravci et. al. (2007) examined the causal relationship between financial development and economic growth in Turkey for the period from 1986 to 2004 using unit root tests, cointegration tests, VECM and VAR framework. Economic growth is proxy using GDP and financial development is proxied using domestic credit provided by banking sector. The results show one-way causality from financial development to economic growth in Turkey.

Duca (2007) paper employs the Granger causality test in order to examine causality direction. The focus of the paper is on long-term trends and the evidence presented is garnered from five of the top ten stock markets in the world in terms of market capitalisation. Observed unidirectional causality between GDP and stock prices implies that the level of economic activity in a country can potentially depend on the stock market amongst other variables.
Chakraborty (2008) outlined the causal relationships between financial development and economic growth in India. He used the growth rate of GDP as a proxy for economic growth, while he used stock market capitalisation and bank credits as proxy for financial development. He found that the direction of the relationships was from real GDP to stock market development, indicating that growth leads financial development.

Abu (2009) examined whether stock market development encourage economic growth in Nigeria, employed the error correlation approach. The economic growth result revealed that stock market development raises economic growth. However, the study recommended the removal of impediment to stock market development which comprises of legal and regulatory barriers, tax, creating enabling environment where business based, employment policies that will increase the productivity and efficiency of firms as well as encouraging of the Nigerian securities exchange commission to facilitate the growth of the market.

Nazir et.al., (2010) documented the relationship between the stock market development and economic growth in Pakistan for the period of 1986 to 2008. They investigated the stock market development and economic growth relationship by using the two major measures of stock market development, namely: size of the market and liquidity prevalent in the market in terms of market capitalization. The results revealed that economic growth can be attained by increasing the size of the stock markets of a country as well as the market capitalization in an emerging market like Pakistan.

Mawla (2011) aimed to test the relationship between stock market liquidity indicators and the economic growth represented by the growth rate of a group of Arab states from 1994 to 2007. The model adopted for testing the relationship is the simple linear regression model. It concluded that liquidity provided by stock market doesn't have significant effect upon the economic growth of the sample countries.
Karunanayake et.al, (2012) investigated the interplay between stock market returns and GDP growth rates in four Anglo-Saxon economies (namely, the US, the UK, Canada and Australia) analysed the dynamics of cross-country volatility transmission across these countries by using quarterly data from 1959 to 2010 and a multivariate GARCH model. The US economy influences all three countries with the strongest impact exerted on the Canadian economy. In addition, own-volatility and co-volatility spill-over within and across all eight series are found to be positive and statistically significant, thereby confirming the close association between co-volatility of both stock returns and GDP growth series shared by these four countries.

Reddy and Agrahari (2012) this paper analyzes the effect of the stimulus packages announced by various governments across the world including India on their stock markets and also their economies with special emphasis on Indian economy. Stock prices of major companies in Indian stock market and the market indices as S&P NSE, Sensex etc; the various indicators of economy as GDP, IIP, balance of payment that after the stimulus packages announcement and their flow in the economy, the Indian stock market as well as the Indian economy has revived after the recession, concluding the mean statistic before the stimulus is less than the mean statistic after stimulus suggesting the positive effect of the stimulus packages.

Khaliq (2013) this paper identifies the position of stock market liquidity at Amman Stock Exchange (ASE) during the period from 1991 to 2011. For measurements of liquidity at ASE they have used tow measuring tools as; market capitalization to GDP, the turnover ratio. Also, the research aims to test the relationship between these indicators and the economic growth represented by the growth rate of GDP. The model adopted for testing the relationship is the simple linear regression model. It has been found that market capitalization to GDP
doesn't exert significant effect upon the economic growth but the turnover ratio has significant effect upon the economic growth.

**Nguyen and Pham** (2014) evaluated the causality relationship between stock market development and economic growth in Canada and Australia based on the time series data for the period of 1981 Q3 to 2012 Q3. The results of Granger causality test suggest the causality between stock market development and economic growth in Canada but it is not the case in Australia. The results indicate that stock market and economic growth has long-run relationship and that the stock market development does help improve the future growth in some developed countries.

**Jibril et al.,** (2015) This research ventured into to assess the effect of Nigerian stock exchange market development on economic growth using a 20 year time series data from 1990-2010. The method of analysis is ordinary least square techniques. The study measures the relationship between stock market development indices and economic growth. The stock market capitalization ratio was adopted as a proxy for market size while value traded ratio and turnover ratio were used as proxy for market liquidity. The study revealed that market capitalization and value traded ratio have a negative correlation with economic growth while turnover ratio has a strong positive correlation with economic growth.

**Bhunia & Ganguly** (2015) investigated how stock market index in India is practically being shocked by two commodity indicators, GDP growth rate and exchange rates. The study is based on secondary data obtained from RBI database, BSE database and Index Mundi database for the period between 1991 and 2013 with 23 observations using ADF unit root test and Johansen cointegration test. The empirical results illustrate that there is significant long-term cointegration unwavering relationships exist. Indian stock market index is very depending upon
the price of international crude oil price, gold price, exchange rates and GDP growth.

This section gave a summarised account of myriad studies in diverse dimensions conducted in International and Indian setting with regard Gross Domestic Product and its intervening dynamics on Stock Prices. It can be observed from the review of literature that findings of different studies are not consistent with each other and the relationship is still ambiguous. Different findings in different studies might be due to different methodologies applied, different set of variables used for the study and different time periods considered for the study etc. In the light of the existing literatures, the intent of this chapter is to revalidate the outcomes pertaining to the causal relationship between GDP and Stock Market in Indian context.

4.4 Objectives

From reviewing the literature, it is realized that the GDP growth rate, which is the representative of the state of the economy of a country, directly or indirectly affect the overall stock market indices. Moreover, it is generally expected that the stock market indices of a country would tend to move in the same direction of the country’s GDP growth rate. The research question for this study is whether Indian stock market behaved in consistent with past evidences or not, i.e. to assess the extent to which the stock market of India moved in line with the GDP growth rate. To answer the research question, the objective of this chapter is to explore causality between GDP and Indian stock market indices. Hence, this chapter is intended to accommodate the objective as follows:

- To analyse the impact of GDP on Indian Stock Market.

4.5 Hypothesis Development

“It is an experiential question whether principal economic indicators (such as GDP Growth rate) are significant explanatory factors of stock market
returns” (Kwon & Shin, Spring, p. 71). The mounting importance of share price volatility around the world has recently opened a new research avenue into the relationship between share price and economic growth, particularly following the contemporary financial aspects. However, there has been limited research with regard to the interrelationship between share price and gross domestic product of industrialized economies following the recent financial turmoil. And a seminal issue arises that, does the economy run ahead the stock market, or does the stock market anticipate economic developments? Both the outcomes are conceivable; the question can only be clarified empirically based on data and facts. In order to highlight the contentious issue of the interrelationship between the Stock Market and GDP, the present chapter ventures to make an empirical analysis on the same lines in the Indian context. To ascertain the effect, the chapters proceeds to find out the viability of the following null and alternate hypotheses:

**Null Hypothesis (H₀):** There is no causal relationship between Gross Domestic Product and Indian Stock Market.

**Alternative Hypothesis (H₁):** There is causal relationship between Gross Domestic Product and Indian Stock Market.

In case of accepting the above null hypothesis, it infers that there is no significant impact of Gross Domestic Product on Indian Stock Market and GDP is not considered as the main reinforcing factors which leads to the dynamic changes in the Securities market prices. Alternatively, in case of rejecting the null hypothesis, it means that the Gross Domestic Product has statistically significant impact (positive impact) on the Indian Stock Market.

**4.6 Data**

The present chapter use data pertaining to GDP and Nifty Index. GDP (Gross Domestic Product) is the measure of a country’s economic performance. It is the market value of all final goods & services made within the borders of a nation in a
year. GDP acts as a measure of total economic production for a country. To study the relationship between the stock market performance and Gross Domestic Product, we compiled the secondary data on GDP and S&P CNX Nifty from the handbook of Statistics on Indian Economy and official website of National stock Exchange respectively for the six financial years i.e. from 1st April, 2009 to 31st March, 2015. The quarterly data for GDP at factor cost (at current prices in Billion, base year 2004-05) and the average data of National Stock Exchange for every three months have been adjusted according to the GDP data and considered as the data for each quarter.

**Figure 4.1: GDP Growth Rate**

The above graph depicts the GDP growth rate of Indian Economy. Over the last 5-6 years, the GDP of India has been budding at a healthy rate of over 8% (average) annually. With a growing economy, India has seen higher employment opportunity for the people which have led to an increase in their disposable income. Moreover, with higher demand in place, companies have seen a surge in their profits leading to an increase in their stock prices.
The graph drawn above shows the trend of growth in Gross Domestic Product of India and value of NSE of Indian Stock Market. It is very clear that the Gross Domestic product of India has been increasing year after year for a time period of 2009-2015 due to various economical and non economical factors which is a paramount signal for the overall growth of Indian Economy. On the other hand, if we go through the growing pattern of Indian Stock Market i.e. NSE, the same is depicted here also that the prices of the shares have recorded an increasing trend simultaneously. But at the same time, it is also obligatory to make it clear that the development pattern in both the variables recorded may be or may not be because of changes in each other variables at the same time as there are number of factors which can lead to changes in the GDP and NSE values.

4.7 Methodology

The research methodology used for the examination of the long run co-integration between the Indian Stock Market and Gross Domestic Product is ARDL
(Autoregressive Distributed Lag) and for establishing the causal relationship between the aforesaid variables the Granger Causality test has been applied. Generally, long run relationships among variables can be found out by applying Johansens (1988) and Johansen and Juselius (1990) multiple cointegration tests. To unfold the characteristics of time series data, we have employed Augmented Dickey-Fuller (ADF) unit root test for stationarity followed by ARDL for establishing long run co-integration between the variables and Engle Granger Causality Test to determine if the two variables have any causal relationship. It is crucial to check for stationarity as regression with non–stationary data may lead to spurious result. Both graphical and statistical tests for normality have been conducted by calculating the descriptive statistics and the p-values of the Jarque Bera Statistics which is used to decide whether the data is normal or not. By applying this test, data was found to be non normal.

4.7.1 Augmented Dickey Fuller Test

A more formal and less arbitrary method for testing the presence of a unit root was developed by Dickey and Fuller. The ADF test has been performed by taking the daily closing prices of CNX Nifty and quarterly value of gross domestic product for the sample period under investigation. The Dickey-Fuller (DF) test results indicated that GDP and CNX Nifty series are stationary at different order of lag and integrated as I (0) and I (1) respectively. This indicates that GDP is stationary at levels and CNX Nifty is stationary at first order.

4.7.2 ARDL (Autoregressive Distributed Lag)

Autoregressive distributed lag (ARDL) approach has been applied due to the fact that both the time series variables are integrated of different orders as diagnosed. Further, to explore any causal relationship between GDP and CNX Nifty, the ARDL model by Pesaran et al. (1996) has been used. Unlike the most widely method used for testing co-integration – the residual based Granger (1987) and
maximum likelihood –based Johansen (1988; 1991) and Johnsen –Juseliuus (1990) test, the ARDL approach can be applied regardless of the stationary properties of the variables and allows for the inferences on the long run estimates which is not possible under the alternative co-integration procedures. Moreover, this procedure can be applied irrespective of whether the series are I (0) or I (1) or fractionally integrated (Pesaran and Pesaran, 1997).

4.7.3 Granger Causality Test

Further, Granger Causality Test is applied to explore whether one time series is useful in forecasting another. Ordinarily, regressions reflect "mere" correlations, but Clive Granger argued that causality in time series could be reflected by measuring the ability of predicting the future values of a time series using past values of another time series. Causality tests seek to answer simple questions of the type, ‘Do changes in $y_1$ cause changes in $y_2$?’ The argument follows that if $y_1$ causes $y_2$, lags of $y_1$ should be significant in the equation for $y_2$. If this is the case and not vice versa, it would be said that $y_1$ ‘Granger causes’ $y_2$ or that there exists unidirectional causality from $y_1$ to $y_2$. On the other hand, if $y_2$ causes $y_1$, lags of $y_2$ should be significant in the equation for $y_1$. If both sets of lags are significant, it would be said that there is ‘bi-directional causality’ or ‘bi-directional feedback’. If $y_1$ is found to Granger-cause $y_2$, but not vice versa, it would be said that variable $y_1$ is strongly exogenous (in the equation for $y_2$). If neither set of lags are statistically significant in the equation for the other variable, it would be said that $y_1$ and $y_2$ are independent. Finally, the word ‘causality’ is somewhat of a misnomer, for Granger-causality really means only a correlation between the current value of one variable and the past values of others; it does not mean that movements of one variable cause movements of another.
4.8 Empirical Results

The analysis starts with diagnosing the basic properties of time series data by computing the descriptive statistics. Descriptive statistics encircle the portrayal of mean, median, standard deviation, kurtosis, skewness and Jarque Bera statistics with the probability for the chosen macroeconomic indicator and stock market index in India which is documented in the Table 4.1.

Table 4.1: Descriptive Statistics of GDP and CNX Nifty

<table>
<thead>
<tr>
<th>Statistics</th>
<th>CNX Nifty</th>
<th>GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>5829.455</td>
<td>22172.23</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>1124.596</td>
<td>4932.975</td>
</tr>
<tr>
<td>Skewness</td>
<td>1.100753</td>
<td>-0.072129</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>3.749285</td>
<td>1.816099</td>
</tr>
<tr>
<td>Jarque Bera</td>
<td>5.408053</td>
<td>1.422433</td>
</tr>
<tr>
<td>Probability</td>
<td>0.066935</td>
<td>0.491047</td>
</tr>
<tr>
<td>Observation</td>
<td>24</td>
<td>24</td>
</tr>
</tbody>
</table>

Source: Computed Output

The result documented in the above table represents the p-value for CNX Nifty and GDP i.e. 0.066935 and 0.491047 respectively which is highly insignificant at 5 % of level of significance and the data is not complying with the normality characteristics. Consequently, it is pertinent to diagnose the properties of time series before analysing causality and we have checked the data for stationarity by applying Augmented Dickey Fuller Test.

ADF test is very sensitive to the lag length of the series; therefore first the optimal lag length was determined by performing the test of checking lag length criterion under the framework of Vector Autoregressive (VAR). It is important to note that
in analysing the time series the lag order is quite sensitive to the result, and therefore selection of lag length in an appropriate criterion is very necessary (Naik, 2013). In order to select the appropriate lag structure the present study used Akaike Information Criterion (AIC) and Schwarz Criterion (SC). Both the test confirmed that the lag –length of the variables should be 1. Therefore a maximum lag order of 1 has been selected based on the Schwarz information criterion for the analysis. The stationarity of the GDP and CNX Nifty series have been checked by using the ADF test with different specifications at 5% level of significance. The unit root test has been conducted on data of both the variables individually. Unit root test results have been documented in Table 4.2.

Table 4.2: Unit Root Test

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

$$\Delta nifty = c + \beta_1 gdp_{t-1} + \beta_2 nifty_{t-1} + \sum_{j=1}^{n} \delta_j \Delta nifty_{t-j} + \sum_{j=1}^{n} \gamma_j \Delta gdp_{t-j} + \epsilon_t$$

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 4.3.

<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

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.

Finally, Granger causality test has been applied to substantiate findings by exploring any causal relationship between GDP and CNX Nifty. The direction of causality between gross domestic product and stock market of India has been
tested using the pair wise Granger causality test. The outputs of causality test have been presented in Table 4.4.

**Table 4.4: 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 CNX Nifty</td>
<td>0.74675</td>
<td>0.3983</td>
<td>Accepted</td>
</tr>
<tr>
<td>CNX Nifty does not cause GDP</td>
<td>0.24868</td>
<td>0.6237</td>
<td>Accepted</td>
</tr>
</tbody>
</table>

Source: Computed

The test contends whether there exist uni-directional or bi-directional causal relationship between Indian stock market and gross domestic product. The outputs connotes that p-value in both the cases are 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.

**4.9 Conclusion**

This chapter is dedicated to explore the impact of Gross Domestic product on Indian Stock Market. The literature is rich with the motives with regard to the rationale behind the dynamic relation between the stock market and the macroeconomic variables. In order to analyse any impact of Gross Domestic Product on Indian Stock Market, the data pertaining to the variables GDP and CNX Nifty index for six financial years (2009-2015) have been collected from Handbook of Indian Statistics released by RBI and official website of NSE respectively. Both the time series data have been to unfold their characteristics by using Augmented Dickey Fuller test and the results indicate that GDP is stationary at level where as CNX Nifty is stationary at first difference. Having observed that
they are integrated of different order, ARDL model for exploring the long-run relationship has been applied. This is followed by Granger Causality Test where the causality between GDP and CNX Nifty has been analyzed. The outputs of ARDL indicate that 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. Further, the output of causality test implies that there does not appear to be any causality from GDP to the stock index and vice versa. Hence, the empirical conclusion that comes out is that although these variables are moving in the same direction but are not fundamentally caused by each other. The results are consistent with the result of Gevit Duca (2007). In other words, it can be said that Stock market in India has not yet become strong enough to influence the Real economy but as they are moving in the same direction, there is surely some other exogenous variables which influence them together.