6.1 Introduction

A general expectation is that the stock prices and inflation should positively relate, and that the common stocks are a hedge against inflation because stock represents the ownership of the real assets. The relationship between the stock prices and inflation has been investigated extensively in the literatures (Jaffe and Mandelker (1976), Fama and Schwert (1977), Schwert (1991), and Boudoukh and Richardson (1993)). Moreover the empirical studies suggest that there are anomalies in the stock return and inflation relationship but there is not enough explanation of the negative relationship in the literatures reviewed. After the drastic financial sector meltdown of 2008 and the world wide negative macroeconomic consequences, there has been renewed focus on the macro prudential policies. It is observed that economic and financial stability are important objectives which need to be factored into central bank and government thinking rather than an excessive focus on inflation using the interest rates as the principle instrument of choice. Since 2009, the developed economies like US have maintained very low to negative interest rates using unprecedented policies (UMPs).¹ In contrast to the developed economies, India escaped with the relatively little damage to its banks since its capital account is relatively closed and its financial sector is predominantly government owned. Moving to the Indian inflation, which is the prime focus and a polemic issue in the last 6 decades, India’s average annual inflation rate² was about 6.7% per annum. This rate of inflation was not particularly high compared to the rates prevailing in the developing and emerging economies.

¹ Bayoumi, T. et.al, “Monetary policy in the New Normal”, IMF staff Discussion Note.
² Measured by changes in Wholesale price Index –WPI.
With the growing influence of the stock markets in the overall financial system, identifying the prominent factors that affect the stock prices has become a major issue for the researchers, regulators and investment community. In the year 1991, Indian Government has introduced a series of policy measures to liberalize its economy to cope up with the ongoing process of globalisation all over the world. Relaxation of the licensing rule, rationalisation of the tax structure, enhancement of the ceiling of foreign Direct Investment and private participation are the prime focus of the liberalization which has consequent effect on the integration of the Indian economy with the other developed and developing economies. Moreover, it has also opened the scope of the international trade and foreign reserve in the country.

On the other hand, Indian policy makers also struggled to explain the marked divergence in the inflation between India and other emerging countries from 2008 to 2013. Reserve Bank of India (RBI) tightened monetary policy to contain inflation, raising the repo rate by 3.75 % between March 2010 and October 2011. However inflation is measured by Consumer Price Index (CPI) RBI’s preferred price gauge which was remained close to 10% from 2008 to 2013, only falling to 6.0 % in 2014 following the crash in commodity prices. In February 2015, it formally adopted inflation targeting, with the target for consumer – price inflation set at 6% for 2016. This move was documented as a historic shift in the monetary policy of the RBI to a sole focus on the inflation from the previous ‘multi-indicator approach” under which the central bank considered various other variables such as economic growth and exchange rate while framing its monetary policy structure.

Stock market plays a very crucial function in the financial sector of every economy, encouraging the economic growth and prosperity by stabilising the financial sector and providing a proper investment avenue that certainly contributes to attract the foreign capital along with the domestic capital. As the present price of the share put across the discounted future expected revenues from
their sale, Flannery and Protopapadakis (2002) mull over the macroeconomic variables as the most prominent indicators determining the income from the shares, because these factors have an impact on the future cash flows of the society. This means that it is the macroeconomic factors which have a dominant impact on the share market. Therefore before investing in the shares, the investors should pay attention to these factors while analysing the stocks and compiling the portfolio.

In an efficient capital market, stock prices adjust swiftly according to the new information available. As a result, the stock prices reflect all information about the stocks reflecting expectations of the future performances of corporate houses. If stock prices depict these assumptions in real term, it should be used as a major indicator for the economic activities. Consequently, the dynamic relationship between stock prices and macroeconomic variables can be used to make nation’s macroeconomic policies (Mysami, Howe, Hamzah, 2004). With the successive waves of globalization, capital market cannot be an exception to be unaffected. Therefore, several reforms in the capital market have also been initiated such as opening up of the stock markets to foreign investors, enhancement of the regulatory power of SEBI, trading in derivatives etc. which have resulted in remarkable development in the size and depth of stock markets in India. A perception of the macro dynamics of Indian stock market can be helpful for traders, investors and policy makers of the country. Undoubtedly, India has been one of the fastest growing economies in the world over the last decade and policymakers are constantly vigilant about the signs of overheating and consequent build up of inflationary pressures in the economy. Inflation in a developing economy is a dynamic force that shapes equity investment decisions and equity being a variable income security has a potential of hedging against inflation. Even though there are numerous studies on stocks and pricing model, investigations on the relationship between stock prices and inflation in emerging countries are still limited. Furthermore, the inconclusiveness of empirical results across developing
countries regarding the relationship between stock prices and inflation creates a gap to be studied.

Over the last two decades, there has been a paradigm shift in the Indian Stock market. Due to this financial meltdown the Indian Stock market are not unaffected from the global economic events. Theoretically, the relationship between inflation rate and stock returns is underpinned on economic theory. Economic theory posits that inflationary pressures erode the value of money, thus making a given unit of money purchase fewer goods. A strong association is presumed to exist between stock returns and domestic inflation rate. This is because the value of money upon which stock returns are based is eroded, and as such people no longer find it profitable to invest in stocks. On account of this, people would stop purchasing shares and in some cases, direct their investments which would reflect in reduced trading volumes and traded values of most securities in the market. This eats up into corporate profit which in turn, makes dividends to diminish. If dividends decrease, the expected returns of stocks decrease, thereby causing stocks to depreciate in value. (Fama 1981). This negative association between stock returns and the rate of inflation is thus; in line with theory suggesting that high rate of inflation increase the cost of living and a shift of resources from investment to consumption. This leads to a fall in demand for market securities and subsequently leads to reduction in the volume of stock traded and stock market returns. (Fama 1981, Ozurumba 2012). This negative relationship between the stock prices and inflation can be explained by the following points:

- An increase in inflation increases the discount rate in the stock valuation model which leads to lower stock prices and lower stock returns.
- Increase in inflation increases the consumption expenditure, causing a fall in the investments by channelizing financial resources from investment to consumption.
An increase in inflation negatively affects corporate cash flows by increased input costs, interest payouts and putting demand pressures this would also cause a fall in the share prices and returns due to poor corporate performance.

High inflation normally attracts the monetary and fiscal policies which reduce money supply, increase interest rate and curb the aggregate demand. This would also have a adverse effect on the economic growth, corporate performance and stock returns.

6.2 Theoretical Rational

Relationship between inflation and stock return is subjected to the extensive study at the end of 1970s and the beginning of 80s viz. Linter (1975), Bodie (1976) Fama and Schwert (1977), Jaffe & Mandelkar (1976), Nelson (1976), Fama(1981), Graham (1996) Siklos and Kwok (1999), Bernes et al., (1999) . Moreover, other early studies like Modigliani and Cohn; 1979; Feldstein, 1980 focused on the negative relationship between the information and the level of the real stock prices as reflected in dividend price ratio and price earnings ratios. Following this, Ritter & Warr (2002) and Sharpe (2002) confirmed this negative relationship. Economic Theory posits that inflationary pressures erode the value of money, thus making a given unit of money purchase fewer goods. Arrays of theoretical rationale have been propounded on the dynamics of stock return and inflation by the passage of time by ardent thinkers.

6.2.1 Fisher Theory

Two major schools of thought have dominated the theoretical relationship between the stock returns and Inflation. The first school of thought is based on the generalisation of Fisher’s hypothesis. Fisher’s Hypothesis or Fisher’s effect was proposed by Irving Fisher in 1930. It states that expected rate of return on an asset should comprise of real return plus a compensation for the expected rate of inflation. In the context of Stock Market, stock return should raise along with
inflation acting as a hedge against inflation risk. Thus, it implies that there should be positive relationship between the stock return and Inflation. The relationship between the nominal interest rates and the expected inflation is of fundamental importance in financial markets. Fisher (1930) establishes the foundation of the underlying relationship between the nominal interest rate and the purchasing power of money measured by the inflation rate. The response of the nominal interest rate to the inflation rate is known as the Fisher effect in the literature and it is of paramount importance pertinent to the efficiency of the financial markets and the performance of the monetary policy. The Fisher effect predicts that the real interest rate is not affected by the changes in the expected inflation rate because it results in equal changes in the nominal interest rate. According to Fisher (1930), the expected real interest rate is determined by the real factors such as the productivity of the capital and the time preferences of the consumers, and is independent of the expected inflation rate. Therefore, real assets should provide an efficient hedge against the changes in the nominal monetary aggregates. In principle, Fisher Hypothesis could be extended to any real assets, common stocks, and other risky securities.

6.2.2 Fama’s Proxy Hypothesis

The second school of thought is negative relationship between inflation and stock returns. Fama’s Proxy Hypothesis states that an increase in money supply would lead to inflation, and may increase discount rate and reduce stock prices. The negative effects might be countered by the economic stimulus provided by money growth, also known as the corporate earnings effect, which may increase future cash flows and stock prices. Benderly and Zwick (1985), Wei and Wong (1992) and Lee (1992) supported Fama’s Proxy Hypothesis while Ram and Spencer (1983) failed to support the theory as they felt that his explanation questions the conventional theories of the Phillips curve in which a positive rather than a negative relationship between the real activity is suggested.
6.2.3 Efficient Market Hypothesis

*Efficient Market Hypothesis (EMH)* states that stock prices must contain all relevant information including publicly available information and has implications for economic policy makers *per se*. Moreover, Economic theory suggests that stock prices should exhibit the expectations about future corporate performance and corporate profits reflect the current level of economic activities conducted during a particular period of time. If stock prices accurately reflect the underlying fundamentals, then the stock prices should be employed as leading indicators of future economic activities, and not the other way around. Therefore, the causal relations and dynamic interactions among macroeconomic variables and stock prices are imperative to the formulation of macroeconomic policy. Further, efficient market hypothesis suggests that competition among the profit-maximizing investors in an efficient market will ensure that all the relevant information currently available about changes in macroeconomic variables are fully reflected in current stock prices, so that investors will not be able to earn abnormal profit through prediction of the future stock market movements (Chong and Koh 2003). In direct contradiction to the conclusions drawn by the EMH, evidence that key macroeconomic variables help predict the time series of stock returns has accumulate for nearly 30 years. The assault on the conclusions drawn from the EMH includes early studies by Fama and Schwert (1977), Nelson (1976), and Jaffe and Mandelker (1976), all affirming that macroeconomic variables influence stock returns.

6.3 Review of Literatures

The literatures on the relationship between inflation and stock returns have been examined by numerous studies. Extensive literatures show that this relationship varies across different time horizons. The empirical findings are mixed, positive, negative or neutral. We briefly review these voluminous literatures to assess whether these researches could explain the basic empirical relationship between
the Inflation and the stock market returns as Inflation and other macroeconomic variables seem to substantially affect the behaviour of the stock prices.

**Gultekin (1983)** investigated the relation between common stock returns and inflation in twenty six countries for the post-war period. The results do not support the Fisher Hypothesis which states that real rates of return on common stocks and expected inflation rates are independent and that nominal stock returns vary in one to one correspondence with expected inflation. There is a consistent lack of positive relation between stock returns and inflation in most of the countries.

**Schwert (1981)** analyzed the reaction of the stock prices to the new information about inflation. Based on daily returns to the standard and Poor’s composite portfolio from 1953-78, it seems that the stock market reacts negatively to the announcement of unexpected inflation in the Consumer Price Index (CPI) , although the magnitude of the reaction is small. Moreover, stock market seems to react at the time of announcement of the CPI, approximately one month after the price data are collected by the Bureau of Labor Statistics.

**Kaul (1987)** hypothesized that the relation between stock returns and inflation is caused by the equilibrium process in the monetary sector. More importantly, these relations vary over time in a systematic manner depending on the influence of money demand and supply factors. Post-war evidence from the United States, Canada, the United Kingdom and Germany indicates that the negative stock return-inflation relations are caused by money demand and counter-cyclical money supply effects. On the other hand, pro-cyclical movements in money, inflation, and stock prices during the 1930’s lead to relations which are either positive or insignificant.

**Singh & Kalirajan (2003)** examined whether a developing countries perspective is different. The empirical analysis is done using the annual data from India for the period of 1971–1998. A specific question that is addressed in this paper is the
threshold inflation rate for India. The findings clearly suggest that the increase in inflation from any level has negative effect on economic growth and substantial gains can be obtained by focusing the monetary policy towards maintaining price stability.

Shanmugam & Misra (2008) explored whether the Indian stock market provides an effective hedge against inflation using monthly data on real stock return, inflation and real activity from April 1980 to March 2004. Results of the study indicate that (i) the Indian stock market reflects future real activity; (ii) the negative stock returns-inflation relation emerges from the unexpected component of the inflation and (iii) this negative relation vanishes when we control for the inflation-real activity relation, thereby providing a strong support for Fama’s proxy effect hypothesis. The split sample analyses indicate that Fama hypothesis is valid only in pre reform period. In the post reform period, real stock returns have been independent of inflation, i.e., the Fisher Hypothesis is valid.

Limpanithiwat & Rungsombudpornkul (2010) examined the relationship between inflation and stock prices in Thailand as well as investigates the impact of specific events i.e. Tsunami and global economic recession on the relationship, covering the period ranges from January, 2000 to March, 2010, including Tsunami and recent global financial crises. VAR is used to find and analyse the association. Besides, the interview is also conducted to gather opinion of the investors in Stock Exchange of Thailand on how inflation affects equity value. The findings demonstrates that movement of stock prices is irrelevant to inflation.

Geetha et., al (2011) investigated the relationship between the stock market, expected inflation rate, unexpected inflation rate, exchange rate, interest rate and GDP in the case of Malaysia, US and China. The study conducted ADF for checking the stationarity of the data and found all data to be stationary at first difference. Further, Johansen Co-integration test has been used to establish the long run equilibrium relationship between the variables. The study reveals that
there is long run relationship between the expected and unexpected inflation with stock returns but there is no short run relationship between these variables for Malaysia and US but it exists for China.

Ray (2012) explored the impact of different macroeconomic variables on the stock prices in India using annual data from 1990-91 to 2010-11. A multiple regression model is designed to test the effects of macroeconomic variables on the stock prices and granger causality test is conducted to examine whether there exist any causal linkage between stock prices and macro economic variables. Estimates of multivariate Granger causality indicate that there is no causal association between stock price and interest rate, stock price and index of industrial production, but unidirectional causality exist between stock price and inflation; stock price and foreign direct investment; stock price and gross domestic product; stock price and exchange rate and stock price and gross fixed capital formation.

Nwakanma & Ajibola (2013) examined inflation dynamism and equity returns using monthly data sourced from the various volumes of Central Bank of Nigeria (CBN) Statistical bulletin and Nigerian Stock Exchange (NSE) daily official list for a period of thirty-six months. The study utilizes the unrestricted vector autoregressive (UVAR) mechanism to examine the nature of the relationship between inflation and rate of return on equity. It was observed that inflation rises faster than rate of return on equity; and the nature of the relationship between inflation and return is found to be inconsistent over time. Furthermore, there are no causal effects between past inflationary rates and rate of return; though such effect is evident between current rates of inflation and immediate previous stock returns.

Kalra (2012) examined the relationship between selected macroeconomic variables like Cash Reserve Ratio (CRR), reverse repo rate, gold price, Wholesale Price Index (WPI), oil rate, inflation rate, Gross Domestic Product (GDP), and Sensex. The data is collected on a monthly basis for the time period January 2001 to December 2009. It is found with the help of correlation and regression analysis
that forex rate, inflation rate and gold prices are the most significant variables that help in forming models for forecasting the Sensex, and thus a forecasting model is developed combining these variables.

**Aduda et., al (2012)** sought to investigate the determinants of development in the Nairobi Stock Exchange. Secondary data for the period 2005-2009 was used to model the factors influencing the development of the NSE. The regression results found that, macro-economic factors such as stock market liquidity, institutional quality, income per capita, domestic savings and bank development are important determinants of stock market development in the Nairobi Stock Exchange. The regression analysis reported no relationship between stock market development and macroeconomic stability - inflation and private capital flows.

**Haroon & Jabeen (2013)** examined the relationship and impact of macroeconomic variables i.e. 3-Months, 6-Month and 12 Month Treasury Bill Rate (Proxy of Interest Rate), Consumer Price Index, Wholesale Price Index and Sensitive Price Index (Proxy for Inflation) with Karachi Stock Exchange—KSE 100 Share index. Monthly data has been collected from the period of July 2001 to June 2010. Coefficient of correlation and regression analysis have been used to test the hypothesis. The study explored the impact of inflation indices, interest rate (treasury bills), on KSE movement. The results showed that there was significant relationship between macroeconomic variables and KSE-100 Share index. The study further revealed significant impact of treasury bills on KSE-100 index.

**Adusei (2014)** explored the relationship between inflation and stock market using data (January 1992- December 2010) from the Ghana Stock Exchange (GSE) which is one of the emerging markets in Africa. Employing unit root tests, ARDL approach to co-integration and Granger Causality in the Error Correction Model for analysis, the study finds that there is a negative statistically significant relationship between inflation and stock returns in the short run and a positive statistically significant relationship in the long run. In terms of direction of
causality, evidence is found in support of unidirectional causality running from inflation to stock returns, meaning inflation drives stock market returns towards long-term equilibrium.

**Tripathi & Kumar (2014)** examined long term relationship between inflation and stock returns in BRICS markets using panel data for the period from March 2000 to September 2013. Correlation results reveal a significant negative relationship between stock index and inflation rate for Russia and a significantly positive relationship for India & China. ADF, PP and KPSS unit root tests indicate non-stationary characteristic of the data and found no long term co-integrating relationship between stock index values and inflation rates using panel cointegration test. Changes in inflation may bring some short run movement in stock return but certainly equity does not seem to be a good hedge against inflation in long run at least in emerging BRICS markets.

**Uwubanmwen & Eghosa (2015)** examined the impact of inflation rate on stock returns in the Nigerian Stock Market. It also attempted to determine whether inflation rate had any effect on stock returns in Nigerian stock market and to ascertain whether stock prices effectively predict stock returns in the Nigerian stock market, using monthly data covering the period 1995 to 2010. Secondary data were extracted from the Nigerian Stock Exchange Fact Book and the Central Bank of Nigerian Statistical Bulletin. The result indicates that the inflation rate has a negative but weak impact on stock return; hence, inflation is not a strong predictor of stock returns in Nigeria.

**Hoang (2015)** aimed to investigate the effects of macroeconomic variables on stock market volatility in three Asian countries by applying GARCH MIDAS model, covering the period from 01/2003 to 06/2014. The GARCH MIDAS framework allows incorporating macro variables directly in the model and obtaining long-term and short-term volatility separately. Empirical findings show that some macroeconomic variables significantly affect stock market volatility.
While Chinese and South Korean stock market reacts to either inflation or industrial production growth information, Japanese stock market is sensitive to both factors. The results also indicate that three markets behave differently to the same factors.

6.4 Research Gap

Based on the survey of literature, it is observed that a large number of studies have been made to determine the relationship between change in inflation rate and stock price movement applying different tools and techniques and ended up with diverse remarkable conclusions. Undoubtedly, the above mentioned research studies have a great contribution in this field but most of these studies typically focus on developed economies and the effects of inflation rate on the stock prices of developing Asian countries like India is less obvious. Moreover, the findings of these studies are mixed and inconsistent. These findings are sensitive to the choice of countries, methodology employed 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. Moreover, the results of those researches relating to the developed countries are debatable in the context of an emerging economy like India due to differences in socioeconomic conditions and prevailing regulatory environment of the country. Under these circumstances, the study of the impact of inflation rate on security prices in Indian during the long and the short runs becomes a logical prolongation of the existent academic analysis. The present study is an endeavour to overcome these limitations through empirical analysis to come to a valid conclusion. Therefore, we aim to contribute to the existing literature by analysing the linkage between inflation rate and its impact on Indian Stock Market.

6.5 Objective of the Study

This study would also be a rich addition to the existing theoretical and empirical frameworks on short run causal relationship between inflation and stock returns,
particularly for emerging markets. The present chapter contributes to the stock market – Inflation rate relationship literatures in the developing countries by revisiting the issue with reference to the developing economy, India. Moreover, it is concerned with whether Indian Stock Market provides an effective hedge against inflation. More specifically the objective of this chapter is:

• To analyse the impact of Inflation Rate on Indian Stock Market

6.6 Hypothesis Development:

In order to shed some light on the continual debate on the Impact of Inflation on Indian Stock market, the current chapter attempts to examine whether the changes in the Interest rate leads to dynamic changes in Indian Stick Market. Accordingly, the null hypothesis that is to be tested is as follows:

**Null Hypothesis (H₀):** There is no relationship between Inflation rate and Indian Stock Market.

**Alternative Hypothesis (H₁):** There exist relationship between Inflation rate and Indian Stock Market.

In case of accepting the above null hypothesis, it means that there is no effect of changes in the Inflation rate on Indian Stock Market. Alternatively, in case of rejecting the null hypothesis, it means that the changes in Inflation Rate either positive or negative have significant impact on the Indian Stock Market.

6.7 Data

The empirical investigation is being carried out using the monthly data from 1st April, 2009 to 31st March, 2015 which covers 72 observations. The monthly average closing values of Nifty has been considered as a proxy of the Indian Stock Market and has been used to obtain a measure for market price movement of Indian Stock Market .Monthly Consumer Price Index (CPI) of General Index and
Wholesale Price Index (WPI) for all commodities have been used as the proxy for Inflation in India, the base year for CPI and WPI are 2004-2005 and 2012 respectively and the base value is 100. Closing data pertaining to Nifty are collected from the official website of National Stock Exchange and the Inflation rate (CPI & WPI) related data are collected from various issues of Handbook of Indian Statistics on Indian Economy and Reserve Bank of India Bulletin, published by Reserve Bank of India and Eviews is used for econometric analysis.

6.8 Variables Specification

Inflation is one of our independent variable, it refers to continual rise in general price level or the rate at which prices of goods and services increase and purchasing power of people is low. The increase in price variability causes high inflation. The study uses the two independent variables in order to examine the relationship between the inflation and stock market. Hence, the proxies used for Inflation are Consumer Price Index and Whole Price Index.

Consumer Price Index (CPI)

CPI is a statistical estimate constructed using the prices of a sample of representative items whose prices are collected periodically. Consumer Price Indices measure changes over time in the general level of the prices of the goods and services that households acquire for the purpose of consumption. CPI is widely used as a macroeconomic indicator of Inflation, as a tool by governments and Central Bank for inflation targeting and for monitoring price stability, and as deflators in the national accounts. Therefore, we can say that CPI measures the changes in the price level of a market in which a basket of consumer goods and services are purchased by the households. High rate of Inflation enhance the cost of living and generally cause a shift of resources from investment to the consumption. Consequently, it leads to fall in the demand for the market instruments which lead to reduction in the volume of the stock traded. Moreover,
the monetary policy responds to the increase in the rate of inflation with economic
tightening policies and also affects the profits of the corporate units which in turn,
cause the dividends to diminish thereby lower stock prices. When inflation moves
upward, it leads to stringent monetary policies which results in increase in the
discount rate. Consequently, it indicates that the cost of borrowing increases and as
a result, investment in the stock market is reduced. Therefore, it is generally
assumed that increase in inflation is negatively related to the stock prices.
Currently, four CPIs are estimated in India, corresponding to different segments of
the population. Namely: (a) CPI for Industrial Labourers (IL); (b) CPI for
Agricultural Labourers (AL); (c) CPI for Rural Labourers (RL); and (d) CPI for
all-India (or combined CPI) which was released recently and encompasses all
groupings of the population3. Further, all-India CPI is sub-divided into urban CPI
which corresponds to prices for populations resident in urban areas and rural CPI
which takes into account the rural populations in India4. India did not have one
composite consumer price index before the advent of all-India CPI. Four different
price indices corresponding to specific sections of the population were estimated.
That is CPI (IL), CPI (AL), CPI (RL) and CPI (UNME).

The dissemination of four different indices was a source of some confusion to both
observers and analysts. Karan (2012) constructed a composite CPI by using
different weight criteria5. Now this cause for differences in opinion has been
eliminated as Government has decided on a CPI for the country as a whole.
However, the difficulty now lies in accessibility of distant past data since this is
only available January 2011 onwards with 2010 as a base-year. Consequently, for
time-series analysis in the next Section, CPI (IL) rather than CPI (AL) or CPI (RL)

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3 The CPI for Urban Non – Manual Employee (UNME) has been discontinued from April, 2010, so
effectively now there are four CPIs. [http://mospi.nic.in/stat_act](http://mospi.nic.in/stat_act).

4 Urban CPI includes all cities / towns with population more than 9 lakhs as per 2001 population Census,
covering 310 towns in total whereas rural CPI is based on the representative samples of two villages from
each district covering 1181 villages across India.

5 Karan(2012) assigned equal weights to all four CPI indices, namely CPI(IL), CPI(AL), CPI(RL) and
CPI(UNME) to obtain a single measure of CPI inflation.
is considered. CPI (IL) has wider geographical coverage as it covers all Indian states while the latter two cover 20 states. Further, the CPI (IL) series has the latest base year 2001 while the others have dated base years 1986-87. Moreover, CPI-IL is used as a cost of living index in the organised sector. And, CPI (IL) by default represents CPI when it is estimated. It had been a broad based inflation indicator for the country as a whole particularly before the introduction of all-India CPI, including both services and manufacturing products. It has been observed that CPI-IL and all-India CPI show similar inflation trends.\(^6\)

**Whole Sale Price Index**

WPI measures the price of a representative basket of the wholesale goods. In India, this basket is composed of the three groups: Primary Articles (20.1% of total weight), Fuel and Power (14.9%) and Manufactured Products (65%). Food Articles from the Primary Articles Group account for 14.3% of the total weight. The most important components of the manufactured Products Groups are Chemical and Chemical Products (12%); Basic Metals, Alloys and Metal Products (10.8%); Machinery and Machine Tools (8.9%); Textiles (7.3%) and Transport Equipments and Parts (5.2%). WPI numbers were typically measured weekly by the Ministry of Commerce and Industry. This makes it more timely than the lagging and infrequent CPI statistics. However, since 2009 it has been measured monthly instead of weekly basis. Inflation in India generally occurs as a consequence of global traded commodities and the several efforts made by the Reserve Bank of India to weaken rupee against dollar. Inflation is considered as the negative news by the securities market as it tends to curb consumer spending and therefore company earnings. It also affects the domestic currency adversely in the foreign Exchange Market. The following graph shown below depicts the clear picture about the data of the three variable series i.e. CNX Nifty, CPI and WPI for the selected period of six financial years.

6.9 Methodology

The empirical literatures documented different methodologies to analyse the impact of inflation on the securities market. We extended the previous studies by exploring the causal relationship between Inflation and Indian Stock Market. The data used in the study are essentially time series and it becomes necessary to unfold the characteristics of the data. In order to have a ready reference, descriptive statistics such as skewness, kurtosis and Jarque Bera have been calculated which provides basic, although elementary evidence about changes in time series behaviour and the properties of the data and explain the fact that the CNX Nifty, CPI and CPI distribution for the chosen period are not normally distributed which is a well documented fact in the financial literatures. The study proceeds with applying Augmented Dickey Fuller Test for testing the presence of unit root test. A stationary time series is one for which the mean and variance are constant over time; they depend actually only on the lag between the two time periods and not on the actual time at which they are computed. The time series variables considered in this study are CNX Nifty series, WPI series and CPI series monthly.
Further, to examine the causal links between the stock returns and Inflation during the sample period, Granger (1969) Causality test is employed. The relationship between the stock prices and the macroeconomic variables has been predominantly investigated assuming that the macroeconomic fluctuations are influential on the stock prices through their effect on the future cash flows and the rate at which they are discounted (Chen et.al.1986; Geske and Roll 1983; Fama 1981).

**Lag Length Criteria**

In applying the econometric techniques, determination of lag length is an important task at the same time in order to present the realistic result. The optimum lag length based on the three commonly used criteria, namely AIC, SIC HQC are determined under the framework of Vector Autoregressive (VAR) and the minimum value of the lag is selected to carry out the analysis among the variables.

**6.10 Empirical Results**

Descriptive statistics of the all the series have been calculated to know the behaviour of the data. Table 6.1 presents the descriptive statistics for the variables used in the study. Summary statistics include the mean, median, Minimum, maximum, standard deviation value for the period 2009-10 to 2014-15. The mean &Standard Deviation exhibit the statistical behaviour of the variables. For normally distributed data, the mean and standard deviation should be 0 and 1 respectively but the given series doesn’t comply with this standard value of mean and standard deviation. The relatively higher figure of standard deviation indicates that the data are not normally distributed. Among the three variables the CPI and NSE are asymmetrical i.e. skewness is positive for the series of these two variables indicating flat long right tail of the distribution comparably with the left hand side. On the contrary, WPI has a negative skewness which indicates the flat tail on the left hand side of the distribution. As a whole, the distribution shows positive or
negative skewness which refers to flatter tails than the normal distribution. Kurtosis values of the three variables also depicts that the data is not normally distributed because the values of kurtosis are deviated from three. Out of three variables, NSE shows leptokurtic distribution (kurtosis >3) and WPI and CPI shows platykurtic (kurtosis<1). The Jarque Bera test, a type of Lagrange multiplier test developed for testing whether the series is normally distributed.

Table 6.1: Descriptive Statistics of CNX Nifty, CPI and WPI

<table>
<thead>
<tr>
<th>Descriptive statistics</th>
<th>CNX Nifty</th>
<th>WPI</th>
<th>CPI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>5827.256</td>
<td>159.4194</td>
<td>206.4790</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>1123.335</td>
<td>18.45843</td>
<td>31.55305</td>
</tr>
<tr>
<td>Skewness</td>
<td>1.024563</td>
<td>-0.305605</td>
<td>0.014080</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>3.805617</td>
<td>1.787159</td>
<td>1.732562</td>
</tr>
<tr>
<td>Jarque Bera</td>
<td>14.54380</td>
<td>5.533685</td>
<td>4.821579</td>
</tr>
<tr>
<td>Probability</td>
<td>0.000695</td>
<td>0.062860</td>
<td>0.089744</td>
</tr>
<tr>
<td>Observation</td>
<td>72</td>
<td>72</td>
<td>72</td>
</tr>
</tbody>
</table>

Source: Computed Output

While testing the normality, it was found that Jarque-Bera Statistics are significant at 10% level of significance, sufficing the fact that the data is not complying with the normality characteristics. Hence, for subsequent analysis of causal relationship between variables, first the data is checked for stationarity by applying Augmented Dickey Fuller Test. Before applying any econometric technique it is mandatory to determine the lag length, optimum lag order is searched and selected by using Akaike Information Criteria and Schwarz Information Criteria in a VAR framework. Lag order of one has been obtained under SIC and AIC as the optimum
one in order to present a realistic results. Bearing in mind the informational efficiency of the security markets, empirical studies prefer low order lag length i.e. one throughout the subsequent studies. After the selection of the optimum lag length order i.e. Augmented Dickey Fuller (ADF) test is employed in order to analyze unit roots. The results are presented in Table 6.2 at levels and at first difference.

Table 6.2: Unit Root Test of CPI & WPI (Inflation) and CNX Nifty

<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>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

The outputs of ADF test as presented in Table 6.2 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.

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 6.3 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.

**Table 6.3: 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 6.4: 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

The outputs as documented in Table 6.4 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.

**6.11 Conclusion**

This chapter is devoted to unfold the impact of Inflation rate on Indian Stock Market. The relationship between inflation and stock return has been an interesting area of research for academicians and practitioners over the past few years as
inflation assumed centre stage in emerging markets. The issue of whether inflation has a significant effect on stock market return is still a debatable issue. After a profound study, a fact is clear that the relationship may be significant or insignificant depending on the country, stock market, monetary policy of the country, the methodology used and the period of study among other factors. The present study explored the relationship between the stock prices and Inflation as a key indicator of Indian economy during the period 2009:4 to 2015:3 using the monthly indexes of NSE Nifty with Wholesale price Index (WPI) and Consumer Price Index (CPI) descriptive statistics used to check the normality of the data series, the econometric test ADF, Granger Causality Test have been applied to test the hypothesis. VAR has been conducted for determining the optimum lag length. Although it seems to be a significant relationship between the macroeconomic variables and the stock market but the results of the study show contradictory results that the stock market returns is not much affected by real economic fundamentals. To explore the relationship, monthly data is used from April 2009 to March 2015 and analysed by first applying the basic statistical and analytical tools such as Unit Root Test and Granger Causality Test. The results reported that series of variables used are non stationary at levels but stationary at first difference. Granger Causality Test has been applied on the two Variables (CPI and WPI) with Stock market Returns one by one and found that there exists no causality between Consumer Price Index and Stock Market Returns. On the other hand, while applying Granger Causality test between Wholesale Price Index and Stock market returns, we found no causality relationship between WPI and Stock returns, i.e. WPI does not cause Stock returns and Stock Returns does not cause WPI. Thus, the result implies that fluctuations in the Indian Stock Market are not only due to changes in Economic variables. Rather, the volatility in it is due to some other external factors too. Fama and Schwert (1977) found a negative relationship between the performance of the stock market and inflation. Hence the present
study contradicts the Fisher’s Hypothesis and at the same time, the study proves and supports the Fama Proxy Hypothesis. The empirical findings of the present study are consistent with some studies as discussed earlier. Empirical tests have documented a negative relationship between inflation and nominal stock returns (Fama and Schwert; Gultekin, 1983. In the light of the lack of agreement between the theory and evidence, it is difficult to predict the direction of the relationship between stock market returns and inflation.