2. LITERATURE REVIEW

The primary objective of this chapter is to review the empirical research conducted by international and domestic researchers, to identify research gaps and review the hypothesis.

2.1 Introduction

Many empirical studies exploring the relationship between stock market returns and fundamental economic activities have been conducted in the past by the international researchers, focusing across a number of stock markets and over a vast range of time-periods. However no comprehensive studies have been conducted for the Indian stock market. Moreover their findings have been divergent. Some of these determined the relationships between the two, whereas, the others did not support existence of interlinkages. Existing financial theories provided a number of frameworks represented by different models to study their relationships and direction of causality.

Ross (1976) linked macroeconomic variables with the stock market return by Arbitrage Pricing Theory (APT) and explained asset returns by multiple risk factors. APT answers the question whether risk associated with macroeconomic variables is reflected in expected asset returns. Most of the studies based on APT theory, linked state of economy to the stock market returns by modeling short-term relationship between a range of macroeconomic variables and stock market return in terms of their first differences. According to Chen, Roll and Ross (1986) economic variables have a systematic effect on the stock market returns. This implies that the economic forces affect discount rates and, consequently, the ability of companies to generate cash flows and future dividend payments. In this way macroeconomic variables act as risk factors in the equity market. Some studies on these lines, conducted by Fama (1981, 1990), Fama and French (1989) & Ferson and Havery (1991), found different relationships between stock market returns and macroeconomic variables. The other approach is Present Value Model (PVM) or Discounted Cash Flow Model (DCF). It relates stock price with future expected cash flows and future discount rate of cash
flows. The PVM model has an advantage as it is used for determining long-run relationship between macroeconomic variables and stock market return. Engel and Granger (1987) and Granger (1986) employed cointegration techniques for studying long-run equilibrium between the variables. Lee (1992) employed a pioneering approach to study the relationship between share prices and macroeconomic variables. The VAR model technique foregoes many a priori spurious structural restrictions and has the ability to work with unrestricted dynamic representation of data. Thus it overcomes many limitations and is useful to study the pattern of interrelationships amongst the variables included in the model. Fisher (1981) observed that the VAR model captures the regularities in the stochastic process and, thereby, gains insights into the channels through which the model variables interact with each other (Abdullah & Hayworth (1993). The brief discussion given in different sections below suggests that significant issues relating to relationship between stock market return and macroeconomic variables are still open for empirical examination.

This chapter focuses on the review of empirical research conducted by international and Indian researchers. Section 1 provides an overview, Section 2 covers review of literature for the three distinct phases of study, Section 3 reviews for variable selection, Section 4 explains the research gaps, and Section 5 comprises the conclusions.

2.2 Review of Literature

The review of the literature provides a cross section of representative sample of studies done for both global markets and domestic Indian stock market. Many of these studies have initiated new modeling techniques, expanded theoretical concepts, explored new hypothesis, and focused on different economies depending on their objectives. The literature review has been done in the three phases. The first phase of the review deals with the relationships between macroeconomic variables and stock market returns. The second phase focuses on the relationships between FIIs inflows and outflows, Sensex and exchange rate. The third phase of review attempts on
understanding behavior of major sectoral indices during sub-periods created due to structural breaks. The purpose is to reveal and rationally examine common factors used in these studies in terms of concepts, selection of variables, methodologies adopted, and usage of statistical and econometric techniques, determining the gaps in the studies, and understanding the significance and implications of emerging policies.

2.2.1 Review of Literature for 1st Phase

There have been numerous studies on the impact of macroeconomic variables on stock price for developed economies. The objective is to identify and include macroeconomic variables in the suitable robust model, and to determine the relationship of variables which contribute to price movements of Indian stocks in the long-run as well as the short-run. The significant contribution is of Chen, Roll and Ross (1986) who concluded that stock returns are exposed to systematic economic news and are priced in accordance with their exposure. The paper also provided a basis that a long-term relationship exists between stock prices and relevant macroeconomic variables. They used seven macro variables’ data series – industrial production, risk premium, inflation, and term structure of interest rate, market return, oil prices and consumption. It was assumed that these variables are serially uncorrelated. It was observed that industrial production, spread between long and short interest rates, expected and unexpected inflation, and the spread between high and low grade bonds, are sources of risk and are significantly priced. They found that oil price risk is not separately rewarded in the stock market. Fama (1970, 1990, and 1991) studied the relationship between fundamental economic activities and stock market return. Fama (1991) suggests that stock prices reflect earnings, dividends and interest rate expectations as well as information about future economic activity. Stock returns affect the wealth of investors which in turn influences the level of consumption and investment. Geske and Roll (1983) concluded that the US long-term interest rates show a significantly negative influence on share prices. Hamo (1988) has done a similar study on the Japanese stock market by APT and found that changes in inflation, unexpected changes in the risk premium, and term structure of interest rates, significantly affects stocks. He observed that changes in monthly production is weekly priced and unexpected changes in the exchange rate as well as
changes in oil prices are not priced in the Japanese stock market. Schwert (1981, 1990) showed that growth of industrial production is a significant factor for long-run stock return. Brown and Otsuki (1990) found that money supply, production index, crude oil price, exchange rate and call money rates are associated with a significant risk premium in pricing Japanese equities.

The relationship between the set of macroeconomic variables and stock price is done extensively for developed markets but limited studies have been conducted for emerging markets particularly for India. Research studies have been done for the different countries on the basis of varied sets of significant macroeconomic variables using different methodologies. Some are summarized below:

Rad A (2011) used the unrestricted VAR model to examine the relationships between Tehran Stock Exchange (TSE) price index and three macro economic variables – Consumer Price Index (CPI), free market exchange rate and liquidity (M2) on the monthly data for a period from 2001 to 2007. The impulse response analysis indicated that the response of TSE price index to shocks in the three macro economic variables is weak. The generalized forecast error variance decomposition reveals that the contribution of macroeconomic variables in fluctuations of TSE price index is around 12%.

Asaolu T & Ogunuyiwa (2011) examined the impact of macroeconomic variables on Average Share Price (ASP) for the Nigerian stock market. The monthly data from 1986 to 2007 was taken for six macroeconomic variables – external debt, exchange rate, foreign capital flow, investments, industrial output and inflation rate. The Average Share Price for 25 quoted companies from Insurance, Manufacturing, Banking, Services and Real estate were taken representing dependent variables whereas others as exogenous variables. Granger causality test, cointegration and Error Correction Method (ECM) were employed and results revealed existence of weak relationship between ASP and macroeconomic variables. A long-run relationship was found between ASP and macroeconomic variables. The findings indicated that ASP is not a leading indicator of macroeconomic performance in Nigeria.
Back IM & Jun J (2011) tests for existence of financial contagion using a method which allows an incubation period before contagion takes effect. Contagion is an increase in cross-market linkages following shocks. Using daily data on the total return index for selected Asian countries in 1997 to 1998, strong evidence for existence of financial contagion was found during the Asian crisis. The evidence remains robust even when global and regional factors as well as heteroskedasticity and serial correlation are explicitly controlled. A significant upward shift in the linkage between the stock returns of Thailand and other Asian countries was found.

Hosseini M, Ahmad Z & Lai Y (2011) examined relationships between stock market indices of China and India and four macroeconomic variables, crude oil price (COP), money supply (M2), industrial production (IP) and inflation rate for the period between 1999 to 2009. They used Johansen-Juselius (1990) multivariate cointegration and VEC model technique which indicated that both countries have short as well as long-run relationships between macroeconomic variables and market index of individual countries. The results for both economies are different. In the long-run the impact of increase in crude oil price and money supply for China is positive, whereas, for India, it is negative. The influence of industrial production for China is negative. The effect of inflation for both stock indices is positive. In the short-run, crude oil price has contemporaneous effect for India but negative and insignificant for China. The immediate effect of inflation on current Chinese stock index (SSE) is positive and significant. However, for India it is negative but insignificant. This analysis will help investors to enhance their knowledge for both short-term and long-term investment strategies for both countries.

Ahmet B (2010) analyzed the effects of macroeconomic variables on the Turkish stock exchange market by consumer price index, money market interest rate, gold price, industrial production index, oil price, foreign exchange return, and money supply, and the main Turkish stock market index (Istanbul Stock exchange, ISE-100) for monthly data from January 2003 to March 2010. A Multiple regression model was designed to test relationships between macroeconomic variables and ISE-100. It was found that interest rate, industrial production index, oil price, and foreign exchange
rates have a negative impact on ISE-100 Index returns. Inflation and gold price do not have any significant influence on ISE-100 returns.

**Von Lach, Krakau (2010)** employed application of linear, non-linear and long-run Granger causality tests in order to examine causal links between the main Polish market price index (WIG) of the Warsaw stock exchange and four macroeconomic variables, namely the value of sold industrial production, unemployment rate, interest rate, and rate of inflation by using monthly data from January 1998 to June 2008. All macroeconomic variables were found to have a long-run causal influence on the performance of the stock market. The linear causality analysis strongly supports the hypothesis that the Polish stock market is informationally inefficient with respect to the value of sold industrial production and interest rate. Further test results provided grounds for claiming that the stock market has already incorporated all past information on the unemployment and inflation rate as no linear causal influence was found for these. They found bidirectional linear causal relationship between the stock market index and sold industrial production and a strong evidence of linear and non-linear Granger causality from changes in the interest rate to fluctuations in the stock market index.

**Bilquees, Mukhtar & Malik (2010)** focused on investigating the impact of exchange rate volatility on exports of India, Pakistan and Sri Lanka using VECM technique for yearly data for a long period 1960 to 2007. Their findings indicated the presence of a unique cointegrating vector linking real exports, relative exports prices, foreign economic activity and exchange rate in the long-run. It was also observed that real exchange rate volatility exerts a significant effect in both the short and long-run. Improvement in the terms of trade represented by the decline in the real exchange rate and real foreign income exerts positive effect on export activities. Maintaining a stable competitive real exchange rate will enhance exports in the three countries.

**Hasan A & Javed M (2009)** examined the both short-run and long-run relationships between macroeconomic variables and equity market returns using monthly data for a period from 6/1998 to 6/2008 by using the VAR framework. The variables considered are industrial production index, consumer price index, money supply,
Pilinkus D (2009) analyzed the relationship between 40 macroeconomic variables (!) and the Lithuanian stock market index (OMXV). The objective is to investigate whether stock prices may serve as a leading indicator for macroeconomic variables in the Lithuanian economy or a group of macroeconomic variables may serve as a leading indicator for stock returns. Granger causality tests have been employed to estimate the relationship between the OMXV index and 40 macroeconomic variables depicting the health of Lithuanian economy. It was found that some macroeconomic variables (GDP deflator, net exports, foreign direct investment) lead OMXV, whereas, macroeconomic variables (GDP, material investment, construction volume index) are led by the OMXV index and macroeconomic indices (money supply, payment balance) and the stock market returns Granger-cause each other. The study establishes existence of a relationship between stock market returns and most of macroeconomic variables.

Humpe and Macmillan (2009) applied cointegration analysis on stock prices in the US and Japan and found that US stock prices are influenced positively by industrial production and are negatively related to both the consumer price index and long-term interest rates.

Adam, Anokye M, Tweneboah & George (2008) examined the impact of macroeconomic variables, namely, inward foreign direct investments, treasury bill rate, consumer price index, average crude oil prices on Ghana stock prices using cointegration test and VECMs. They established co-integration between macroeconomic variables and stock prices in Ghana indicating a long-run relationship. The lagged values of interest rate inflation have significant influence on
the stock market. The inward foreign direct investments, oil prices and exchange rate show weak influence on price changes. The stock index is not informational efficient with respect to interest rate, inflation, inward FDI, exchange rate and world oil price.

**Adam, A M & Tweneboah G (2008)** employed multivariate cointegration and error correction model to examine the impact of Foreign Direct Investment (FDI) on the stock market development in Ghana. The study indicated that there exists a long-term relationship between FDI, nominal exchange rate and stock market development in Ghana. They found that a shock to FDI significantly influenced development of the stock market in Ghana resulting in sector specific policy implications.

**Ratanapakorn and Sharma (2007)** investigated long term and short-term relationship between the US stock price index (S & P 500) and six macroeconomic variables namely industrial production index, narrow money supply (M1), treasury bill rate, government bond rate, inflation rate, Yen /$ exchange rate and observed that the stock prices negatively relate to the long-term interest rates and every macroeconomic variable causes stock prices in the long run but not in the short-run.

**Chachart S, Valadkhani A and Harvie C (2007)** examined the impact of fifteen stock market indices and five macroeconomic variables – Consumer Price Index, Exchange rate, Interest rate (on money), Money supply (M2) and Oil price on the Thai stock market for the pre and post 1997 period on the basis of monthly data from 1988:1 to 2004:12 using a GARCH-M model. It was found that the Singapore stock market influenced Thai stock market for both the pre and post 1997 period. Indonesian and Malaysian stock market were significantly related to the Thai stock market during pre 1997, whereas, Korean and Philippines played predominant role for variation in the Thai stock market during post 1997. Thus, the Thai market was largely influenced by regional neighboring countries and non-regional markets had insignificant role. This explains why the financial crisis of 1997 remained a regional crisis.

**Patra T & Poshakwale S (2006)** studied the short-run dynamic adjustments and long-run equilibrium relationships between selected macroeconomic variables, namely inflation, money supply, exchange rate and trading volumes, and stock returns...
for the emerging Greek stock market using Granger causality, co-integration techniques and error correction models. The empirical evidence suggests that these macro variables have a short-run and long-run equilibrium relationship with the stock prices. However, no causal or co-integrating relationship was found between the exchange rates and stock prices. It was also concluded that the Athens Stock Exchange is inefficient as publicly available information on macroeconomic variables and trading volumes can be used in stock price prediction.

Christopher G, Minsoo L, Hua Y & Jun Z (2006) examined the relationship between New Zealand Stock Index and a set of seven macroeconomic variables – Inflation Rate (CPI), Exchange Rate (EX), Gross Domestic Product (GDP), Money Supply (M1), Short-term Interest Rate (SR) and Domestic Retail Oil Price (ROIL) from 1990 to 2003 using cointegration test. They have employed Johansen Maximum Likelihood and Granger-causality test to determine whether the New Zealand stock Index is a leading indicator for macroeconomic variables. It also examines the short-run dynamic linkages between NZSE-40 and macroeconomic variables using innovative accounting analysis. It was seen that in general NZSE-40 is consistently determined by interest rate, money supply and real GDP, and no evidence was found that NZSE-40 is a leading indicator for the changes in the macroeconomic variables.

Erdem, Arslan and Erdem (2005) examined volatility spillover from inflation, exchange rate, M1 money supply and industrial production to Istanbul Stock Exchange’s stock price indices including IMKB 100, financial, industrial and services indices using monthly data. EGARCH model captured significant unidirectional spillovers from inflation, interest rate to all stock price indices. There are negative volatility spillovers from inflation to stock price indices except the Service Index and positive spillover from interest rate to stock price indices except Service Index (negative spillovers). Spillovers from M1 money supply to the financial index and from exchange rate to both IMKB 100 and industrial indices were observed. There is no volatility spillover from industrial production to any index.

Kanokwan, Sel and Ike (2005) investigated the relationship and influence of domestic macro economic variables and stock excess returns and they also assessed
market efficiency in Southeast Asian economies prior to the 1997 Asian crisis. It was found that the autoregressive conditional hetroskedasticity type models are best representative of situation. Some macroeconomic variables are identified that seem to have a certain predictive power for excess return. Asian monetary authorities seem to have a credibility problem in keeping inflation within target range and lack of credibility and transparency may have contributed to the 1997 crisis.

**Chaudhuri K & Smiles S (2004)** used multivariate cointegration methodology to investigate long-run relationship between real stock price and measures of aggregate real activity which includes real GDP, real private consumption, real money and real price of oil for Australian market. Using quarterly data from 1960:1 to 1984:4, they established existence of a long-run relationship between real stock price and real activity. The error correction technique indicated that the real stock prices are related to the changes in the real economic variables. It was further found that the stock market variations in the US and New Zealand markets significantly affects Australian stock return movements.

**Dritsaki and Dritsaki (2004)** studied the long-run relationship between the Greek stock market index and macroeconomic variables industrial production, inflation and interest rate and found a significant causal relationship between these and stock prices.

**Wongbangpo and Sharma (2002)** studied interdependence between the stock markets and fundamental macroeconomic factors for the five South East Asian countries – Indonesia, Malaysia, Philippines, Singapore and Thailand – on the basis of monthly data for GNP, consumer price index, money supply, interest rate and exchange rate for these countries. The results indicates that high inflation in Indonesia and Philippines influences the long-run negative relation between stock prices and money supply, whereas, the money growth in Malaysia, Singapore and Thailand imparts positive effect on their stock markets. The exchange rate is positively related to the stock prices in Indonesia, Malaysia and Philippines and negatively related for Singapore and Thailand.
Maysami and Koh (2000) investigated the long-run relationships between selected macroeconomic variables and the Singapore stock index, as well as among stock indices of Singapore, Japan and the US. The macroeconomic variables used in the study are: exchange rate, short and long-run interest rates, inflation, money supply, domestic exports and industrial production on the basis of monthly data from 1988 to 1995. They found that the changes in two measures of real economic activities, industrial production and trade are not integrated of same order as changes in Singapore’s stock market levels. But the changes in Singapore stock market levels form co-integrating relationship with changes in the price levels, money supply, short-long-run interest rates and exchange rates. It was further found that changes in interest and exchange rates contributes significantly to co-integrating relationship whereas both price level and money supply do not. It means that Singapore stock market is interest and exchange rate sensitive. Significant positive cointegration of the Singapore stock market with stock markets of US and Japan was observed.

Niarchos N and Alexakis C (2000) examined the possibility of predicting stock market prices by the usage of macroeconomic variables for the Athens stock exchange on the basis of monthly data from January 1984 to December 1994. The variables included for the study are inflation, money supply and exchange rate. A positive correlation between stock prices and identified variables was found. The statistical evidence suggests that monthly stock prices in the Athens Stock Exchange are positively correlated to those variables. Further, using cointegration technique and causality test statistically, efficient market hypothesis was rejected.

Kwon C.S and Shin S Tai (1999) investigated whether current economic activities can explain stock market returns in Korea on the basis of stock prices. The VECM illustrates that stock prices are co-integrated with the set of macroeconomic variables, namely, foreign exchange rates, trade balance, production level and money supply. The co-integration indicates a direct long-run and equilibrium relations with identified variables. The stock price variability is fundamentally linked to economic variables and it was observed that the change in stock price lag behinds economic activities. The stock price index and production index simultaneously affect each other. Further, it was found that the stock price index is not a leading indicator for economic
variables which is inconsistent with the findings that the stock market signal bring changes in real activities (Fama 1991; Geske & Roll 1983). The Korean stock price movements are different due to investors’ perceptions from those of the US and Japanese investors, suggesting that the Korean market is more sensitive to international trading activities than to inflation or interest rate variables.

Ibrahim & Mansor (1999) investigated the dynamic interactions between seven macroeconomic variables and the stock prices for the emerging market, Malaysia, using co-integration and Granger causality tests. The Bivariate analysis suggests co-integration between stock prices and three macroeconomic variables – consumer prices, credit aggregates and official reserves.

Abdullah D (1998) employed VAR model using M1, budget deficit, budget surplus, industrial production, consumer price index and long-term interest rate to examine effect of money growth variability for British stock prices using the London share price index. The VDC showed that the money growth variability accounts for 22.82% of variation of interest rate and 19.85 % variation of stock prices.

Abdalla & Murinde, (1997) investigated interaction between exchange rates and stock prices in the emerging financial markets of India, Korea, Pakistan and Philippines in order to study causal linkages between leading prices in the foreign exchange market and the stock market. Unidirectional causality from exchange rates to stock prices in all the sample countries was seen, except for Philippines. The main implication of the study is that the change in the exchange rates affects firms’ exports which ultimately influence stock prices.

Habibullah, Muzafar & Baharumshah (1996) employed a two step tri-variate cointegration approach to check whether money supply and output can be used to predict stock prices in Malaysia on the basis of monthly data on stock price indices, money supply and national output from January 1978 to 1992. It was found that the money supply and national output are not co integrated. This implies that stock price indices for Malaysia have incorporated all past information about both money supply and output, which is consistent with the efficient market hypothesis.
Mukherjee TK and Naka A (1995) explored effect of six macroeconomic variables, namely, exchange rate, money supply, inflation, industrial production, long-term government bond rate and call money rate, call money rate by VECM on Tokyo Stock Exchange index and found that co integrating relation exists and stock prices contribute to this relation. The results were robust to the selection of macroeconomic variables and defined sub periods. It was seen that the VECM consistently outperforms the VAR model in forecasting ability.

Abdullah, Dewan A and Hayworth SC (1993) examined Granger causality between 8 macro economic variables namely budget deficit, trade deficit, money growth, industrial product growth, inflation rate, short-term and long-term interest rates and US stock prices. It was found that past money growth, budget deficits, inflation, both short and long-term interest rates Granger cause stock prices. These variables also explain significant proportion of the forecast error variance of stock prices. Further, it was observed that stock prices are related positively to inflation and money growth and negatively to budget deficit, trade deficit and both short and long-term interest rates.

Few studies have been conducted on examining the relationship of macroeconomic variables with Indian Stock market returns.

Tripathi N (2011) examined the relationship between the stock market and a set of macroeconomic variables for January 2005 to February 2011 on the basis of weekly observations for Sensex, WPI, Treasury bill rates, Exchange rate, S&P 500 and BSE trading volume. The Granger causality test shows evidence of unidirectional causality running from international stock market to domestic stock market, interest rate, exchange rate, and inflation rate, indicating sizeable influence in the stock market movement. Bi-directional relationship was observed between interest rate and stock market, exchange rate and stock market, international stock market and BSE volumes, and exchange rate and BSE volume. It was also found that the Indian stock market is sensitive towards changing behavior of international market, exchange rate and interest rate. The study reveals that the Indian stock market is not weak form efficient.
It implies that abnormal returns can be attained by using historical data of stock prices and macroeconomic indicators.

Singh D (2010) has explored causal relationship between macroeconomic variables and stock market for monthly data from April 1995 to March 2009. The selected variables are BSE, WPI, IIP, and exchange rate. Granger causality test indicated that IIP is the only variable having bilateral causal relationship with Sensex, whereas, WPI and Sensex have unilateral causality. Further, the Indian stock market is approaching towards informational efficiency with respect to exchange rate and inflation.

Tuteja & Agarwal (2008) examined the causal relationship between share price index and industrial production for India in a multivariate vector correction model which include macroeconomic variables, namely, money supply, credit to private sector, exchange rate, WPI and money market rate. The focus of the study was to understand the relationship between the health of economy and health of the stock market. They found that the share price index and macroeconomic variables are co integrated, implying that there is a long-term relationship between share price index and identified macroeconomic variables. The stock markets in India are demand driven and industry led, which means that demand for greater equity finance is spurred by higher industrial production but rising price in stock markets cannot be taken as leading indicator of revival of Indian economy.

Pradhan PC (2007) examined the causal linkages between the stock market and economic activity in India. Granger non-causality tests by Toda-Yamamota, Dolado and Lutkephol (TYDL model) was applied, it was found that both stock price (BSE Sensex) and economic activity (IIP) are integrated of order one I(1). The Johansen-Juselius cointegration test suggests existence of one co-integrating vector. This rules out spurious relations and confirms presence of at least one direction of causality. The TYDL model suggests that there is bi-directional causality between stock price and economic activity during the post-liberalization period, implying that a well-developed stock market could enhance economic activity and vice-versa. The main limitation of the paper is usage of IIP as a proxy for economic activity, which neglects two primary sectors – agricultural and service sector.
The review of the literature about the relationship between the fundamental economic activities and stock market price indicated that there are divergent views amongst the researchers about their relationships. Some were able to establish relationships, but some could not determine any. As observed, there have been limited numbers of studies conducted for the Indian stock market till now. Thus, the review of the existing research work also supports that there is a gap for further conducting rational study in order to understand long-run and short-run relationships and direction of causality between the identified macroeconomic variables and emerging Indian stock market. The significance of their relationships will help in suitable policy formulation.

### 2.2.2 Review of Literature for 2nd Phase

In a globalized world, FII, exchange rate and stock index are important economic variables for stability of business and economy.

**Mukherjee & Roy (2011)** studied about the nature and determinants of investments by institutional investors in the Indian stock market and it focused on finding out the factors which govern the investment patterns of two institutional investors in the Indian equity market – FIIs and mutual funds. The basic premise is that the investment behavior is driven by portfolio diversification as well as expectation formation pattern. It was found that investment decision of FIIs are significantly influenced by MFs. Investment pattern of FIIs is opposite of what MFs do in the equity market. Further, while investing in equity, MFs do not track equity return or volatility, but FIIs do track the previous day’s equity return as well as volatility. Both track domestic and international interest rates for investment.

**Poshakwale S & Thapa (2010)** studied the influence of FIIs in explaining short-run and long-run relationships of the Indian equity market with global equity markets using MSCI India Index and MSCI world total return index for the daily data for six years from 1/1/2001 to 15/1/2007. Using VECM, it was found that rapid growth in flow of foreign equity portfolio investment is leading to greater integration of the Indian equity market with global markets. Due to increased global integration post the subprime crisis, the Indian market has become more susceptible to global shocks.
Mishra, Das & Pradhan (2010) in their study, focusing on foreign investments and real economic growth in India, using the VAR framework observed that bi-directional causality runs from net FIIs flows to real economic growth. Economic growth is determined and influenced by the volume of portfolio investments.

FIIs have both a positive and negative impact on the domestic economy triggering significant influence on broadly three areas – stock market, exchange rate and foreign exchange reserves. It increases savings of low and middle-income developing countries (Menkhoff 2003; Modi et al, 2001), enhances market depth and breadth (Sumanjeet & Paliwal 2010).

Srinivasan, Kalaivani and Bhat (2010) examined the relationship between net foreign investment flows and equity market returns for India. The daily data has been divided into two periods non-crisis period (1/7/1999 to 31/12/2007) and global financial crisis period (1/1/2008 to 27/2/2009). Granger causality test indicates that there is an evidence of negative feedback trading hypothesis and positive feedback trading hypothesis by foreign investors before and after the global crisis, respectively. This means that FIIs act as smoothening effect and destabilizes forces before and during the crisis period, respectively. But positive feedback trading strategies from FIIs appears to be the rationale during the period of global financial crisis.

Sehgal S & Tripathi N (2009) in their study on investment strategies of FIIs for the Indian equity market examined whether FIIs adopt positive feedback and herding strategy. They found that FII’s exhibit return chasing behavior while using monthly data, and are using this strategy for daily data as they do not react instantaneously but wait for market information to crystallize. Further, FII’s display a strong herding behavior which is much stronger at the aggregate level than at individual stock level; this may be because FIIs are more cognizant of corporate fundamentals of the individual stock.

Badani & Tripathi (2009) investigated the relationship between FII investments and the Indian stock market using ARIMA model and found that the past FII investments

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12 Positive feedback traders are rushing to buy when the market is booming and are selling when the market is declining. They are eager to mimic each other’s behavior.
have significant impact on the current Sensex & NSE Index, but there is no significant impact of current FII investment on the current indices. A significant finding of the study is that the FII investment in India needs well calibrated policy response, whereas, the daily movement of stock market can be better explained by the factors other than FIIs.

**Ahmad M & Masood T (2009)** analyzed the behavior of a few macroeconomic variables in response to Total Capital Inflows (TCI) in India using quarterly data for the period 1994:1 to 2007:4. Macroeconomic variables included in the study are TCI, Real effective exchange rate export based, real effective exchange rate trade based, Nominal effective exchange rate trade based, WPI, money supply, foreign exchange reserves and current account balance. Cointegration test confirms long-run equilibrium relation between total capital inflows and real effective exchange rate – both trade and export based, and between TCI and nominal effective exchange rate – export based. Granger causality test confirms the bi-directional causality between foreign exchange reserves and TCI, and unidirectional causality from TCI to real effective exchange rate, trade based. Further, nominal effective exchange in India does not appreciate in response to capital inflows and there is linkage between real effective exchange rate and capital inflows.

**Badhani, Chhiwal and Suyal (2009)** evaluated the impact of exchange rate fluctuations on the stock prices for different industry specific portfolios. The returns for the entire stock portfolio are found to be positively correlated with the external value of Indian Rupee. It was seen that the indices of export oriented industries are negatively associated with the change in exchange rate after making adjustments for market trends. The IT, technology and knowledge based sectors show high sensitivity towards exchange rate fluctuations. Whereas, the indices of financial sector and import intensive industries show a positive association with the exchange rate of Rupee. The stock indices, in general, do not show a lagged effect of change in the exchange rate, except for BSE capital goods. This observation is consistent with the concept of efficient market hypothesis. The VAR model shows unidirectional causality running from stock prices to exchange rate. This implies that the portfolio
rebalancing activity of FIIs has played a predominant role in the dynamic interaction between stock prices and exchange rate.

**Rajput A & Thaker (2008)** measured the relationship between exchange rate, FII and stock index, and its predictive power for the period from January 2000 to December 2005. It was found that no long-run positive correlation exists between exchange rate and stock index, except for the year 2002 and 2005. FII and stock index show positive correlation but fail to predict the future value.

**Dua & Sen (2006)** studied the relationship of real exchange rate, level of capital flows, volatility of the flows, fiscal and monetary policy indicators, and current account surplus for 1993 Q2-2004 Q1. It was found that the variables are co-integrated and each granger causes the real exchange rate. The generalized VDCs show that the determinants of the real exchange rate, in descending order of importance, include net capital inflows and volatility (jointly), government expenditure, current account surplus, and money supply.

**Batra A (2004)** while studying stock return volatility patterns in the Indian stock market examined the time variation in volatility using monthly data and asymmetric GARCH model augmented by structural change analysis. This helped in the identification of a sudden shift in stock price volatility and nature of events which caused shift in volatility. It was concluded that the period around the Balance of Payments (BOP) crisis and subsequent reforms was the most volatile phase. Major policy changes resulted in sudden shift in stock return volatility, which was a consequence of domestic political and economic events rather than of global happenings.

**Bose & Coondoo (2004)** examined quantitative impact of FII regulatory policy reforms on its investment flow using intervention analysis technique, based on multivariate GARCH regression model. Ten policy interventions during 1999-2004 were examined for their possible significant influence on FII flows and their sensitivity to stock returns. It was found that liberalization of policies have had desired expansionary effect in increasing mean level of FII flows, however, some
restrictive measures to control FII flows do not have significant negative impact on net inflows.

**Batra A (2003)** analyzed trading behavior of FIIs and the impact of its trading biases upon stock market stability. Strong evidence that the FIIs have been positive feedback investors and trend chasers at the aggregate level on daily data was observed. But no evidence of positive feedback trading on monthly basis was found. There was no joint dynamics between long horizon return and net equity purchase. The foreign investors were found to have a tendency to herd on equity market even though it may not happen the same day. At the time of financial crisis, there is an excessive sell side herding even though the extent of herding,\(^\text{13}\) on the average, and either side of the market during crisis may be lower than that in the immediate preceding period.

**Mukherjee, Bose & Coondoo (2002)** study is an extension of Chakrabarti (2001) study which focused on the nature and cause of FII flows. They found that (1) FII flows are caused by returns in the domestic equity market and not conversely, (2) Return on equity is the single most important factor influencing FII inflows, (3) FII sales and FII net inflows are significantly affected by Indian equity market performance but FII purchase is non-responsive to market performance, (4) FII investors are not using Indian equity market for diversification of their investments, (5) Return from exchange rate variation and Indian economy fundamentals seem to have influence on FII decisions, but these are weak, and (6) Daily FII flows are highly auto-correlated.

**Chakrabarti R (2001)** studied the importance of FIIs flow in India and its relationship with other economic variables from May 1993 to June 2001. The study found that even though the flows are highly correlated with the equity returns, they are more likely effect than cause of returns. FIIs not having informational disadvantage compared to the local investors and the Asian crisis changed determinants of FII flows into India resulting in domestic equity returns to be the sole drivers of flows.

\(^{13}\) Herding is to buy or sell stocks together as a group. Short-term trading strategies are positive feedback of trading and herding.
Kohli (2001) investigated the trend of capital inflows and their impact on some key macroeconomic variables. It was observed that inflows lead to appreciation in real exchange rate and increase in money supply.

The study is motivated due to lack of research using high frequency daily data which is divided into sub-periods due to structural breaks. A variety of stationarity tests were used. For the first time VAR models comprising of different endogenous variables were employed to comprehensively understand emerging statistical and economic relationships and causation between them, and the related policy implications.

2.2.3 Review of Literature for 3rd Phase

Due to increasing globalization and liberalization of trade policies, investment opportunities in the emerging markets have increased significantly in the recent past. Many studies focusing on the diversification and optimum portfolio management have been conducted. But few studies on the interrelation amongst stock market sector indices for global markets were done so far, with hardly any relating to the Indian sector indices. The identification of relative importance of the indices in driving others and obtaining information about market inefficiency by the study may be used for potential economic gains and for developing suitable investment strategies.

Ahmed W (2011) examined both long-run and short-run aspects of the inter-sectoral linkages in the Egyptian stock market. The Johansen’s multivariate cointegration analysis reports evidence in support of existence of only a single co-integrating vector within 12 indices. Granger’s causality analysis shows that the short-run causal relationships between the sectoral indices are limited and, where they do exist, are unidirectional. Benefits could be derived from portfolio diversification in the short-run, however, investors with long-term horizon may not benefit from diversifying investments into the different sectors of the Egyptian stock market.

Wang G & Lim C (2010) examined the impact of macroeconomic variables on the industry stock returns in Australia. The monthly time series data from March 2000 to December 2007 is considered for stocks listed on the Australian Stock Exchange (ASX). According to the ASX200 classification; the index comprises of 11 industry
sectors which includes A-REITs, consumer discretionary, consumer staples, energy, financials, healthcare, materials, industrials, IT, telecommunication services and utilities. The 10 macroeconomic variables include changes in ASX P/E ratio, exchange rates between the Australian, New Zealand and US $, ASX bond index return, dividend yield of ASX200, ASX market return and capitalization, the official cash rate, interbank interest rate, treasury bill yield and unemployment rate. The time series regression analysis shows that macroeconomic factors are important determinants of the ASX industry returns. Further there is a positive significant relationship between the industry returns, exchange rates and market returns. The consumer discretionary and IT industries had opposite signs for dividend yield and market capitalization, respectively.

Fayoumi, Khamees & Thuneibat (2009) employed VECM to study information transmission among stock return indices for Amman Stock Exchange (ASE) for dynamic interaction among daily return of indices for 3/9/2000 to 30/8/2007. A co-integrating relation for long-run for four major sector indices – general, financial, industrial and services was observed. Granger causality confirmed short-run causality running from general, financial and industry to other indices but no evidence was found that the service index Granger causes returns in to other indices. Variance decomposition and impulse response analysis confirmed these results indicating that the financial sector is the most significant while service being less integrated with other sectors provides an opportunity for its diversification within ASE.

Poshakwale S & Patra T(2008) studied long-run and short-run relationship between the main stock indices of Athens Stock Exchange (ASE) by using daily data from 1996-2003 and observed that the sector indices do not show a consistent and strong long-run relationship. It was found that at least in the short-run, the banking sector seems to have a strong influence on the returns and causes volatility in other sectors. The VDC analysis shows that the most sectors are largely influenced by their own innovations. The banking sector plays a predominant role by explaining 25% of variance of construction and insurance sector, and around 15% of variance of industrial investment, which also confirms that the ASE is not weak form efficient.
Constantinou et al. (2008) analyzed daily price for the 12 sector indices of the Cyprus Stock Exchange (CSE) for portfolio diversification by the domestic investors. It was seen that no cointegration exists in most bivariate combinations, which implies existence of long-term profitable investment opportunities by way of portfolio diversification. Further, it was suggested that no short-run causality relationship exists between the sectoral indices, indicating opportunities for development of short-term investment strategies in the CSE.

Hassan & Malik (2007) used a multivariate GARCH model to simultaneously estimate mean and conditional variance using daily returns among different US sector indices from 1/1/92 to 6/6/2005. In order to make an optimal portfolio allocation decision, it is important as a financial market participant to understand the volatility transmission mechanism over time and across sectors. Significant transmission of shocks and volatility among different sectors was observed. These results support the idea of cross-market hedging and need for sharing of common information by investors in the identified sectors.

Mohammad S et al. (2006) examined opportunities for diversification and long-term investments across identified economic sectors by using sectoral indices for the Malaysian stock market. High, but unstable correlation amongst different industry sectors was observed, which means focus should also be on potential movements in sector specific and subsector specific risks. Due to increasing sector specific effect on the portfolio, investment in one or two sectors may attract higher total risk than what happened in the past.

Wang and Yang (2005) studied the relationship between major sector indices of Chinese stock exchange for 1993-2001. Various sectors are highly integrated and sector prices reflect information from other sectors. High degree of interdependence of the sectoral indices indicates limited opportunity for diversification benefits from sector specific investments. A shock to any sector has significant impact on the other. It was found that industry is the most influencing sector and Finance, being least integrated with other sectors, provides best investment opportunity for diversification.
Lafunte and Ruiz (2004) provided empirical evidence of the relationship and effect of new market (technology index) on return and volatility of Spanish stock indices using GARCH methodology. A positive significant impact on the financial, industrial and utility sector volatility was observed, and it was found that high volatility in the new markets enhances volatility in other sectors. Merely a statistical effect is detected on the returns of the industrial sector, suggesting that only this sector requires a risk premium when shocks in the technological sector increases the global market risk.

Ewing, Forbes & Payne (2003) studied how shocks to macroeconomic variables affects five major S&P sector specific stock market indices, namely, utilities, transportation, industrial, financials and capital goods. The research uses generalized impulse response analysis and identifies various responses of the sectors to unanticipated changes in some key macroeconomic variables and it also found strong interrelationships amongst five S&P’s stock indices. It was suggested that investors are not only interested in individual stock performance but are also keen in knowing the behavior of different market indices. It was observed that the institutional investors use sectoral indices as benchmark to evaluate performance of stocks and portfolios.

Ewing B.T (2002) examined five S&P stock indices to determine the relative importance of individual index shocks in terms of accounting for forecast error variance of other indices using generalized forecast error variance decomposition [Koop et al(1996) , Pesaran and Shin(1998)]. The results highlighted the importance and popularity of stock market indices in the financial markets due to two reasons. First, the study has helped in the identification of relative roles of individual indices’ shocks as being transmitted to others and, secondly, to know how generalized forecast error variance decomposition is useful in examining interrelationship between different time series.

Lee, Boon & Baharumsha (2001) explored the dynamic linkages between macroeconomic fundamentals, economic growth and the Kuala Lumpur Stock exchange index before the 1997 Asian crisis for quarterly data from 1987:1 to 1997:2 by employing VAR model. Two models were set up. The first considered 7
macroeconomic variable including stock price index, inflation rate (CPI), interest rate, industrial output, money supply (M3), exchange rate and trade balance. This model was estimated with various stock indices, including the composite index, industrial index, Finance index, property index, plantation index and mining index. The second model which included the stock capitalization, stock volume, real GDP and saving helped to investigate the contribution of Malaysian stock market to economic growth. The two significant findings are that macroeconomic variables are significantly important for determining movements in stock prices in both the short- and long-run. A healthy stock market is important for economic growth.

Arbelaez H et al. (2001) examined the short-term and long-term linkages amongst six Colombian stock indices, namely – general, industrial, financial, commerce, various and a selection of former Medellin Stock Exchange for the daily data from 2/01/1988 to 9/08/1994 using VECM. It was found that the Colombian capital market index time series are integrated of order one and are highly correlated. The indices exhibit long-term linkages and in 50% cases show Granger causality. The impulse response analysis results indicate that the responses to innovations in other indices are small but are rapid and persistent. Variance decomposition shows high percentage of error variance which is accounted for by the innovations in the same index.

The present study complements the earlier research which had primary focus on overall market returns. The research is perhaps the first attempt in providing insights into responses of the 11 sector specific indices of the Indian capital market in an integrated and globalised environment. The study fills a void in existing research work and provides an insight into the magnitude and persistence of responses of sectoral indices due to unexpected innovations. The main objective of the empirical research is to provide evidence on the short- and long-term relationships amongst sectoral indices in the sub periods answering specific questions about indices’ behavior in the mutually exclusive time frames and their change of behavior over a period of time – Do these indices influence each other? Is there an index driving other sector index? What is the direction of causality? Is it consistent over a period of time? Are there any policy implications?
2.3 Literature Review for Variable Selection

We have selected macroeconomic variables based on the literature review starting from the path breaking contribution of Chen, Roll and Ross (1986) till the recent studies done by Rad A; Asaolu T & Ogunuyiwa; Hosseini M, Ahmad Z & Lai Y (2011) for determining a basic econometric model. The selected macroeconomic variables, namely, GDP, Inflation (WPI), Index of Industrial Production (IIP), Exchange Rate (Rs/$), Oil Price, FII, Interest Rates (91-day treasury bills), Long-term Interest Rates (10 years Government security- GSEC10), Money Supply (M3), Foreign Exchange Reserves and Trade Balance are likely to influence the Indian economy and, in particular, returns of the composite index Sensex.

The selection of influencing macroeconomic variables relates to sensitivity of results and it depends upon money, goods and securities markets (Abdullah and Hayworth, 1993). The Money market is represented by interest rate and money supply. Inflation, GDP and IIP contribute to goods market. Security market includes Sensex, NIFTY, FDI/FII. Exchange rate and oil price relates to influence of the overseas markets on the external sector of the Indian economy.

Interest rates play an important role in stock returns. According to the earlier studies of different economies, the short-term interest rate (3 months T-bill) and long-term interest rates (ten year bond yield) have negative impact on stock prices. Changes in the short-term interest rates are due to monetary policy as well as business cycle, whereas, changes in the long-term interest rate reflect changes in the discount rate in larger perspective. An increase in interest rate may reduce corporate profitability due to probable recession or because of increase in the cost of capital. On the contrary, a positive relationship was found between short-term interest rate represented by call money rate and Japanese stock price by Mukherjee and Naka (1995). In a study, Butter and Jansen (2004) tried to forecast 10-year German bond yields by multivariate time-series method and found that interest rates are co-integrated with various macroeconomic factors.

There are divergent outcomes with supporting analysis about the effect of inflation on the stock prices (Modigliani & Cohn 1979; Geske & Roll, 1983). Negative stock
return and inflation results were empirically concluded by many researchers including Fama (1981), Shwert (1981), Geske & Roll (1983), Mukherjee and Naka (1995), Erdem, Arslan & Erdem (2005), Patra T & Poshakwale S (2006) and Humpe & Macmillan (2009). The increased inflation may enhance the nominal risk free rate, resulting in higher discount rate or cost of capital which will consequently decrease stock prices. Whereas, a positive relationship was demonstrated by Abdullah and Hayworth (1993) and Ratanpakorn & Sharma, (2007). The stock prices react positively to inflation because equities act as a hedge against inflation.

Money supply refers to the stock of money held by the public in the economy at a particular time. M3 is better measure than M1. Money supply may be related to increase and uncertainties of inflation which is negatively related to share price. The evidence presented in the study of Patra T & Poshakwale S (2006) confirms an indirect effect of money supply on the stock prices through inflation. The decrease in money supply led to reduction in inflation which in turn increased the demand of stocks for Athens stock market. Further, an increased money supply may result in higher liquidity in the economy, reducing the interest rates and, thus, increasing the share prices (Patra T & Poshakwale S (2006). The increase in money supply can also enhance economic activity or increase in output, and may positively increase share prices Ratanpakorn & Sharma, (2007). Positive impact due to increase in money supply may also be seen as possible change of portfolio by portfolio substitution as non interest bearing assets may switch over to risk bearing equities (Abdullah & Hayworth 1993; Mukherjee and Naka 1995; Cheung & Lai 1999).

The level of aggregate economic activity (proxy by GDP & IIP) will have an impact on corporate profitability and, therefore, may influence stock price. An increase in output may increase cash flows raising the stock price in the same direction; an opposite effect may be seen during recessionary condition. Many studies including Gesk and Roll (1983), Chen, Roll and Ross (1986), Fama (1990), Abdullah & Hayworth, (1993), Mukherjee and Naka (1995), and Hume and Macmillan (2009) suggest positive relation between stock price and real activity. The stock return real activity brings fluctuations in stock prices which results in increased consumption and inflow of fresh investments and, consequently, increasing productivity and raising
stock prices. Hume and Macmillan (2009) further found that industrial production was negatively related to interest rate and rate of inflation.

It has been seen that exchange rate depreciation would stimulate exports and curtail imports, while exchange rate appreciation will be detrimental to exports and encourage imports. Mukherjee and Naka (1995) hypothesize a positive relation between the exchange rate and stock prices. When the Japanese yen depreciates against the US dollar, Japanese products become cheaper in US. If the demand of these goods is elastic, the volume of Japanese exports should increase causing higher yen dominated cash flows to Japanese companies. The opposite should hold when yen appreciates against the US dollar. Thus, if you are exporting and your local currency becomes weaker, your product becomes cheaper for your buyer. If you are importing and your local currency becomes strong then the products becomes cheap. If the country is export dominant, the exchange rate appreciation lowers its competitiveness and negatively affects domestic stock prices, whereas, if a country is import dominant, the exchange rate appreciation reduces costs and generates a positive impact on domestic stock prices Ratanapakorn & Sharma (2007). However Adam A M & Tweneboah G (2008), while studying stock market movement in Ghana, found that exchange rate demonstrate weak influence on price changes. In a study Ray H (2008) has concluded that in the long-run, the exchange rates are positively related to Indian stock prices and money supply. The innovation analysis shows that Indian exchange rates drives and are driven by the stock prices and key macroeconomic variables.

Adam A M, Tweneboah G (2008) included oil price as one of the macroeconomic variables for studying impact of oil price surge on the stock price of Ghana and found its significant relationship with the stock index. Higher oil prices not only push inflation, resulting in higher interest rates, but also dampen growth due to overall increase of cost of capital and, thus, affecting stock prices.

Foreign portfolio inflows through FIIs depend upon the attractiveness of investments and associated returns. Batra A (2003) in a study of foreign portfolio inflows and equity returns in India showed aggregate evidence of FIIs chasing trends and adopting
positive feedback trading on a daily basis, even though no such behavior is evident over horizons of a month or so. This evidence seems to support the hypothesis that resident investors have better information on a daily basis, thus, making it essential for FIIs to use price signals to discern underlying information that may have triggered them. Further, foreign investors have a tendency to herd on the Indian equity market even though they all may not do it on the same day. **Bose S and Coondoo (2004)** studied the impact of FII regulations in India and found mild evidence of bidirectional causality between returns on the BSE stock index and net inflows of FII on a monthly basis. **Adam A M and Tweneboah G (2008)** used multivariate cointegration and error correction model to examine the impact of FDI on development of stock market in Ghana and found long-run relationship between FDI, nominal exchange rate and stock market development.

Foreign exchange reserves are maintained to minimize risk and volatility in returns, and to have adequate resources for essential imports. **Tursoy T, Gunsel N & Rjoub H (2008)** examined the impact of 13 macroeconomic factors including foreign exchange reserves against 11 industry portfolios of Istanbul Stock Exchange (ISE) to observe the effects of variables on stock returns.

The Table 2.3-1 summarizes significant macroeconomic variables employed by different researchers in their studies

**Table 2.3-1 Macroeconomic Variables Included by the Different Researchers from 1981-2011**

<table>
<thead>
<tr>
<th>Macroeconomic variables</th>
<th>Studies based on these variables</th>
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<tbody>
<tr>
<td>Economic Indicator</td>
<td>References</td>
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As these macroeconomic variables are interrelated, they may have a combined impact on the stock market and it will perhaps be a difficult task to determine exclusive and independent impact of individual variable on stock price.

2.4 Research Gaps

A significant number of the studies on the relationship between macroeconomic factors have been conducted for the developed economies. But few studies have been done for the developing and emerging economies and, in particular, for India, where during the last decade the economy grew significantly in comparison to the others due to multiple liberalization measures and larger inflows of investments.

It is seen by the literature review that there are disagreements between researches about the relationship between stock market price and macroeconomic variables which are indicators of fundamental economic activities. Very limited work has been done to study market efficiency of the Indian capital market in relation to fundamental economic activities. Further, out of these limited studies, most focused on the relationship between the general stock market index (the Sensex) and macroeconomic variables, and looked into its total effect, but this study moves further by taking into account the influence of 11 sector indices and the Sensex on each other. Thus, there is a need for a comprehensive study for the Indian economy focusing on relationships between the significant macroeconomic variables, sector indices and Sensex by identifying a robust model which may explain their interplay.

The key area of the study in the first phase is to identify a set of macroeconomic variables that Granger cause stock price movements and determine the causal relationship between macroeconomic variables, which may give direction for policy formulation. Do these variables share long-term equilibrium as well as short-term
relationship? The study will attempt to determine a suitable VEC Model for establishing effective relative contribution of these variables and it further determines cointegrating relationships to understand their importance in long-run relationship. By imposing restrictions on the model, based on economic theory, exogenous macroeconomic variables will be segregated, thus, developing a robust stable model. This will help in explaining precisely stock return fluctuations and will also help to understand how a web of macroeconomic variables could explain economic growth. The multivariate data analysis is based on large monthly data set. The study will also investigate influence of a short-run magnitude of shock transmitted through any system variable and also the responsiveness of variables due to a unit of trigger of the innovation.

During the second phase of the study, as the model developed in the 1st phase did not include FIIs due to its stationarity at levels, FIIs were chosen which have a major role in driving the Indian economy. The study investigates the influence of FIIs on the Indian equity market and its role in integration with the US economy. The study further examines macroeconomic determinants influencing long- and short-run relationships between the Sensex and FIIs. The motivation to conduct further research is because of lack of Indian and foreign research using high frequency daily data which has been divided in this study into four sub-periods due to structural breaks. For the first time VAR models comprising of different endogenous variables – Sensex, purchase and sales of FIIs, S&P 500 and exchange rate are employed for the four different time frames starting from 1/1/1999 to 31/12/2010. This will address the gaps in the earlier Indian research and will also help in developing new understanding of emerging statistical and economic relationships, causation, and related policy implications.

The third phase of the study examines both short- and long-run relationships amongst sectoral stock price index of BSE. The daily data relates to 11 sectoral indices for Finance, Information Technology, Oil & Gas, FMCG, Transport, Capital Goods, Metal, Telecom, Power, Housing and Healthcare from 23/08/2004 to 31/12/2010. The study fills up the gap of hardly any comprehensive research conducted earlier on interlinkages of sectoral indices of the Indian stock market, although some studies
with limited scope have been conducted from 2001 to 2011 for country specific sector indices for different global stock markets. The empirical study on interlinkages of sectoral indices will attempt to answer some important questions which may improve knowledge of the emerging Indian capital market for investment. The utility of the study is significant as it answers some basic important questions: Do these sectoral indices behave identically? Is there a short-term causal relation between them? What is the direction of causality? Do they influence each other in the long-run? What is the response of these indices due to their own shock and innovations in other indices? An understanding of the behavior of sectoral stock index may provide useful information and insight about the Indian economy which could be used as a leading indicator for sector specific investments opportunity.

The study also attempts to fill in the gap in the existing literature on how the information transmits across sectors. The examination of information flow patterns at the sectoral level would be useful for both individual and institutional investors. Quite often, the sector indices are used as a benchmark to track the performance of actively managed portfolio (Ewing 2002; Ewing et al. 2003; Wang et al. 2005). Further, examining the importance of sectors indices in the BSE will provide better an insight for understanding the dynamics of significantly reforming and liberalizing Indian financial markets. The study attempts, for the first time, to examine the interplay of sectoral indices in four time frames due to structural breaks by usage of independent VAR models. It, also for the first time, uses the GIRF function (Pesaran & Shin 1998; Koop et al. 1996) which has not been commonly employed to investigate pattern of flow of information in the sectoral indices (with exception of Ewing et al. (2003) & Wang et al. (2005). This technique will overcome the inherent problem of ordering of variables and may provide a robust solution.

Thus, the study in the first phase identifies relationships between macroeconomic variables and Sensex; it further investigates the relationship between FIIs, Sensex and role of FIIs in the integration of Indian economy with US economy and, in the last phase, it examines the role and importance of interplay of significant sector indices in driving the Sensex and explains significant policy implications.
2.5 Summary and Conclusions

The review has been conducted of relevant research done on the subject till 2011. The review is comprehensive but not exhaustive. The literature review provided above gives a brief of the past studies conducted, using a variety of methodologies for determining a relationship between stock price index and macroeconomic variables for the emerging Indian economy. The study has come out with conflicting relationships between macroeconomic variables and stock market index due to unique dynamic economic conditions. The purpose of the literature review for the first phase was to improve knowledge and indentify the gaps in the study about short- and long-run relationships between the stock market returns and macroeconomic variables. The research question of the study is whether the macroeconomic variables significantly explain stock market return and the hypothesized relationship between the variables. It further identifies the possibility to estimate robust VECM comprising of a set of macroeconomic variables, selected on the basis of literature review, explaining the relationship and direction of causality. The dynamic model needs to be improved by segregating variables into significant endogenous and exogenous variables. To precisely understand contribution in terms of proportion of variation of a variable being explained by the other, VDC and IRF needs to be employed. The outcomes will be useful as it will help in formulation of policy and for investment strategies.

As observed, some research has been conducted on investigating the influence of FIIs on the Indian stock market. But the results were conflicting due to multiple reasons. In order to improve the understanding of the volatility of FIIs and also to determine significant determinants responsible for inflows and outflows, high frequency daily data subdivided by structural breaks needs to be considered. Suitable VAR model comprising of relevant set of macroeconomic variables explaining actual state of affairs should be selected amongst the different models examined for each sub-period. How to increase inflows and also curb outflows needs to be answered. What could be the policy implications to achieve these objectives for different economic scenarios should be the key area of research for the 2nd phase?
Determining how the sector indices behave uniquely in the different sub-periods created by structural breaks will improve understanding about long-run and short-run relationships of sector indices in the least researched area. This will help in developing diversification strategies focusing on understanding the interplay of different sectors of the economy and related policy issues. Different VAR models developed for the four sub-periods created due to structural breaks will be distinct and will help to identify key driving and integrating sector index and other significant sector indices. Volatility created by one sector in others and understanding proportion variation created by one sector index in the other indices will provide sector specific short-term investment strategies. Thus, the literature review has identified gaps and given direction for further study so as to improve understanding of the influencing role macroeconomic variables, sector response to liberalization measures, and identifying right models representing the actual state of affairs.