3

Research Methodology

3.1 Problem Declaration

In September 1992 India opened its stock market to foreign institutional investors (FIIs). Since then the net portfolio investments from the foreigners in equities have been positive in every year except 1998-99. Initially, mutual funds, pension funds, asset management companies’ investment trusts and incorporated institutional portfolio managers were permitted to invest in Indian stock markets. In 1996-97, the group was expanded to include registered university funds, endowment, foundations and charitable trusts. The Government of India gave preferential treatment to FIIs in 1999-2000 by subjecting their long-term capital gains to lower tax. The Indo-Mauritius Double Tax Convention 2000 (DTAC) exempts Mauritius based entities from paying capital gain tax in India. This encouraged the foreign investors to invest in Indian market by taking the Mauritius route. FIIs cumulative investment in India rose to Rs. 224940 crore during 2006-07 from just its half (i.e. Rs. 110092 crore) in 2003-04. Gross purchases by the FIIs have swallowed to Rs. 362438 crore from Rs. 144858 crore in the corresponding period. Further, FIIs registered with Security and Exchange Board of India which was only 156 in 1994-95 stands now at 1282 (at the end of January 2008). The opening up of domestic market in India has also helped in improving the informational environment of the market. Undoubtedly, the portfolio investment has become a dominant path of foreign investment in Indian economy. The sources of these FIIs flows are varied. The FIIs registered with SEBI come from as many as 28 countries (including money management companies operating in India on behalf of foreign investors). US based institutions accounted for slightly over 42 percent; those from the UK constitute 20 percent with other Western European Countries hosting another 17 percent of FIIs.
Foreign institutional investors have always remained the hot issue of the debate and discussion world over. India is not exception to this controversy and the issue has become more important among the economist, regulators, researchers and academicians due to the beginning of sub-prime crisis in US. The questions which are generally raised about the FIIs investments include: I) How do the foreign portfolio investments effect the stock market and economy of the host country? II) What determines the quantum of capital flows from FIIs?

The opening up of the capital markets in emerging market countries have been perceived beneficial by some researchers while others are concerned about possible adverse consequences such as contagion. Clark and Berko (1997) emphasize the beneficial aspects of allowing foreigners to trade in stock market and outline the “Base-broadening” hypothesis. The perceived advantages of the base-broadening arise from an increase in the investor’s base and the consequent reduction in risk premium due to risk sharing. The theory behind the base-broadening hypothesis suggests that the expansion of investor’s base include foreign investments that lead to increase diversification followed by reduction in risk and consequently lowering the required risk premium. According to Merton (1987), there is permanent increase in the equity share price through risk pooling. Warther (1995) found evidence in favor of the above hypothesis in his study.

Some studies concentrating on India [such as Banerjee and Sarkar,(2006); Badhani, (2005); Biswas, Joydeep,(2005); Ananthanarayanan, et. al., (2003); Rao, Murthy and Rangnathan, (1999)] found clear evidence of benefits of such flows in the form of equity market development, capital market integration and lower cost of capital.

However, the securities market in developing countries is typically both narrow and shallow. Therefore, FIIs participation may cause considerable instability in these markets. About the effect of such mobile capital flows country experiences differ considerably and therefore the question of impact has remained highly controversial. Infact, the conclusion about the impact of FIIs activities on the Indian stock market volatility under reference are rather divided. Some studies like Karmakar, Madhusudan, (2006); Porwal and Gupta, (2006); Upadhyay, Saroj,(2006); Bhattacharya and

Some one has rightly said “Don’t use the theory unless you understand the principles. Use whatever you learn.” As the FIIs are the current issue so it is the right time to revisit the status and issues regarding the foreign institutional investment in Indian market.

3.2 Purpose of the Study

The broad objective of the study is to analyze the impact of foreign institutional investors investment on Indian stock market. The specific objective of the study are as follows:

1) To bring out the impact of FIIs investment on the return of Indian stock market;
2) To assess the impact of FIIs on the volatility of the stock market in India;
3) To examine whether arrival of FIIs have affected trading volume and market capitalization of Indian stock market;
4) To identify the determinants of FIIs investment and assess their impact on FII flows; and
5) To suggest policy guidelines regarding FII flows to India on the basis of findings emerging from this study.

3.3 Hypothesis

Keeping in view the above-mentioned objectives of the study, it was intended to test the following hypotheses:

a) There is no relationship between India’s stock market return and FII flows;

b) The economic fundamentals such as exchange rate, interest rate, economic growth rate, differential interest rate don’t affect the flow of FIIs in India;
c) The stock market return in India is equal for the pre and post introduction of FIIs investment;
d) There is no change in market volatility after the introduction of FIIs investment;
e) There is no relation between the trade volume in Indian stock market and FIIs investment; and
f) There is no impact of arrival of foreign institutional investors on the Indian stock market capitalization.

3.4 Scope of the Study

The study pertains to India, which is one of the fast growing markets in the world. India is an appropriate case for conducting such a study, as portfolio investment has become the dominant path of foreign investment in the Indian economy. India liberalized its financial market and allowed FIIs to participate in their domestic markets in 1992. The opening up of the market resulted in a number of positive effects. First, the stock exchanges had to improve the quality of their trading and settlement procedures in line with the best practices of the world. Second, the transparency and information flows improved on account of the entry of FIIs in India. However, people are also sensing negative effects in the form of potential destabilization because of the bulk buying and selling activity of FIIs.

The Bombay Stock Exchange (BSE) and National Stock Exchange (NSE) are two leading stock exchanges of India. The foreign institutional investors are investing in these markets. So both of these markets have been taken to study the determinants of the foreign institutional investment in India. The National Stock Exchange was launched in 1992 and FIIs were also permitted to invest in Indian market in September 1992. Because of this the reference period for the study to investigate the impact of FIIs on stock market in India has been taken from January 1986 to December 2007. However, due to its non-existence the data on NSE prior to 1994 was not available. Hence, it was not appropriate to take National Stock Exchange data to ensure the impact of foreign institutional investors on stock market return and volatility. Therefore, to determine the impact of FIIs
on Indian stock market (i.e. on return and volatility) Bombay Stock Exchange has been considered. The time period of the study varies with the various objectives of the study.

3.5 Data Base and Sources

This study is descriptive and experimental in nature as the effect of certain events or actions have been observed in it objectively and by distinguishing the effect of extraneous variables. This type of research design is appropriate for this study as it aims to measure the effect of certain policy initiative (Stock Market Liberalization). For this purpose pre and post control techniques have been used. The results of the study are based on the secondary data, which have been collected from the various websites such as www.bseindia.com, www.nseindia.com, www.moneycontrol.com, www.stls.frb.org, www.rbi.org.in. Beside websites mentioned above various publications of SEBI, Bombay Stock Exchange, National Stock Exchange and Reserve Bank of India. PROWESS database maintained by CMIE (Centre for Monitoring Indian Economy) have also been important sources of data related to study.

To analyze the pre and post impact of FII investment on underlying market return and volatility the daily data from January 1986 to December 2007 has been collected. However, to determine FIIs impact on trading volume and market capitalization of the stock market monthly data have been used for the period from January 1993 to August 2007. To identify the determinants of foreign institutional investments in Indian stock market, the daily data for the period ranging from April 1999 to December 2006 was taken. The daily data regarding FII investments were not available for time period before April 1999. Hence, the study period is restricted for the aforesaid duration.

A detail presentation of the data series and sources of variables considered for the study is given in Table 3.1 along with procedure of developing various series of requisite data.
TABLE 3.1: THE DATA SERIES AND SOURCES

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<td>FIIP</td>
<td>Daily FIIs Purchase or inflows into the Indian equity markets. Sources: Prowess and website of SEBI: <a href="http://www.sebi.gov.in">www.sebi.gov.in</a></td>
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<tr>
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<td>7 days moving average of FII Purchase</td>
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<tr>
<td>FIIS_MA</td>
<td>7 days moving average of FII Sales</td>
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<td>Daily basis return on the National Stock Exchange. Daily data on the Nifty has been obtained from the NSE site: <a href="http://www.nseindia.com">www.nseindia.com</a></td>
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<td>R_BSE</td>
<td>Risk at the Bombay stock exchange calculated by the using Standard deviation of last 15 days Return.</td>
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<td>Index of Industrial Production source: RBI Handbook of Statistic on Indian Economy, and CMIE monthly review.</td>
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<td>MCAP</td>
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<td>Data for the daily S &amp; P 500 has obtained from the site of Standard and Poors.</td>
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<tr>
<td>L_MSCI</td>
<td>1 day lagged return of MSCI</td>
</tr>
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<td>L_S&amp;P</td>
<td>1 day lagged return of S &amp; P 500</td>
</tr>
<tr>
<td>R_MSCI</td>
<td>Risk at the MSCI calculated by using the Standard deviation of last 15 days Return.</td>
</tr>
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<td>Risk at the S &amp; P 500 calculated by using the Standard deviation of last 15 days return.</td>
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<tr>
<td>FBIR</td>
<td>Daily interest rate of 3 months Treasury bill declared by the Federal Bank and obtained from the site of Federal bank. <a href="http://www.stls.frb.org">www.stls.frb.org</a></td>
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<tr>
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<td>BETA_MSCI</td>
<td>Beta of BSE wet MSCI based on previous 30 days data.</td>
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<tr>
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<td>Calculated by using the Formula:</td>
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<td>Covariance BSE, MSCI/ Variance of MSCI</td>
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<tr>
<td>BETA_S&amp;P</td>
<td>Beta of BSE wet S &amp; P 500 based on previous 30 days data.</td>
</tr>
<tr>
<td></td>
<td>Calculated by using the Formula:</td>
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<td>Covariance BSE, S&amp;P/ Variance of S&amp;P</td>
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<tr>
<td>D_RET1</td>
<td>Differential Return calculated by BSE - S&amp;P</td>
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</tbody>
</table>
3.6 Examination of Data

The research methods including selection of variables and models used are objective specific. The research tools applied under the study are explained as follows:

3.6.1 Methodology for Measuring the Impact of FIIs on Stock Market Return

To assess the impact of FIIs flows into Indian stock market on the return offered by the market is one of the primary objectives of the present study. As mentioned previously in this chapter, Bombay Stock Exchange Ltd. has been taken to represent the Indian stock market. Established in 1875, BSE is not only the oldest stock exchange in India, but also the oldest in Asia. It accounts for over one third of the total trading volume in the country. National Stock Exchange (NSE), located in Bombay was set up in 1993 to encourage modernization and competition. National Stock Exchange, which was open for trading in mid 1994, has trading volume substantially larger than BSE Ltd. Despite the NSE being the a prominent stock exchange in the India, its most popular index S&P CNX Nifty is not considered to compute the return and to find impact of FII flows on them. The reason being the non-existence of return data prior to 1992 when foreign investors were permitted to trade at Indian bourses. Hence, the return at BSE SENSEX forms the basis for the analysis of impact of FII flows. The stocks in BSE SENSEX are the ones in which the FIIs are most likely to invest in. Figure 3.1 shows the movement of BSE SENSEX with FII flows starting January 1993.
For analyzing the return on the Bombay Stock Exchange, Autoregressive Moving Average (ARMA) model has been used. ARMA (p, q) is a commonly used econometric technique for forecasting of interrelated time series. The emphasis of this model is not on constructing a single equation or simultaneous equation models but on analyzing probabilistic or stochastic properties of economic time series on their own under the philosophy let the data speak for themselves. Unlike the other regression models in which $Y_t$ is explained by the k regressors $X_1$, $X_2$, $X_3$………$X_k$, the ARMA model allows $Y_t$ to be explained not only by the external variables but by the past or lagged values of $Y$ itself and stochastic error terms also. In order to determine the regression equation used under the ARMA Model, it is essential to determine the regressors and AR and MA terms. To find the impact of foreign institutional investment on Indian share market return, it is important to remove market wide influence in India (i.e. information related to inflation, growth forecast, interest rate etc. Therefore, following factors have been taken to specify the regression equation.

- Risk in the Return of Domestic Market
- Return of the US Market (S & P 500)
• Risk in Return of US Market
• Exchange Rate US $ v/s Indian Rupee
• Growth Rate of the Economy Represented by Index of Industrial Production
• Indian Interest Rate (3months Treasury Bill Rate)
• Federal Bank Interest Rate (3 months Treasury Bill Rate)

As the main motive was to determine the impact of the foreign institutional investment on the India’s stock market return, FIIs net investment was also taken as a explanatory variable. To determine the impact of FIIs investment on Indian market daily data was taken from 1st January 1986 to 31 December 2007. FIIs were introduced in India in September 1992, the data of FIIs investment is not available prior to 1992 so foreign institutional investment was taken as a dummy variable which takes zero and one value for pre and post liberalization period (September 1992) respectively.

The results of a recent study conducted by Bodla B. S. & Kiran Jindal (2006) indicate that there is no day of the week effect in Indian as well as US stock market. Therefore, we have not taken day of the week dummies into consideration while analyzing the data. As it is specified that we will use ARMA model to find out the impact of FII flows on stock market return so that’s the time to determine the order of Autoregressive (AR) and Moving Average (MA) term of ARMA model. The autoregressive (AR) term refers to the lagged value of time series involved in the regression equation while the Moving average (MA) term is moving average of current and past error terms. In order to identify the degree of AR and MA terms, autocorrelation function (ACF) and partial autocorrelation function (PACF) were plotted by calculating and graphing the residuals calculated from the following equation.

\[ BSE_t = a + b_1 R_{BSE} + b_2 S&P + b_3 R_{S&P} + b_4 EXCHANGE\ RATE + b_5 FBIR + b_6 IIP + b_7 TBR\_IND + b_8 FIIN + e_t \]  

\[ \text{(3.1)} \]

Where

\[ BSE_t = \text{Return at Bombay Stock Exchange} \]
a, b_1, b_2, b_3, ..., b_8 = Intercept and coefficients

R_BSE = Risk at Bombay Stock Exchange
S&P = Return of Standard and Poor 500
R_S&P = Risk at Standard and Poor 500
EXCHANGE RATE = Exchange Rate US $ v/s Indian Rupee
FBIR = Federal Bank Three Months Treasury Bills Rate
IIP = Index of Industrial Production
TBR_IND = Interest Rate of Indian 3 Months Treasury Bills
FIIN = Net Investment by Foreign Institutional Investors
e_t = Error Term

By constructing the ACF and PACF with the help of PACF we can determine the Autoregressive term and with the help of ACF we can determine the order of Moving Average. Hence, the mean return equation used for analyzing the return pattern of Indian stock market is:

\[ BSE_t = a + b_1 R_{BSE} + b_2 S&P + b_3 R_S&P + b_4 \text{EXCHANGE RATE} + b_5 \text{FBIR} + b_6 \text{IIP} + b_7 TBR\_IND + b_8 FIIN + \text{AR}(p) + \text{MA}(q) \]  

Where p is the no. of lags in auto regressive term and q is the no. of lags in moving average term.

As earlier stated, the daily data of the FIIs investment was not available prior to April 1999. Only monthly data was there, so to determine the prompt impact of FIIs investment on Indian stock market return we conducted the analysis on the basis of monthly data of above said series for a time period of 15 year from Jan. 1993 to December 2007 as the monthly data is available only for this duration. Here, we used the following equation:

\[ BSE_t = a + b_1 R_{BSE} + b_2 S&P + b_3 R_S&P + b_4 \text{REER} + b_5 \text{FBIR} + b_6 \text{IIP} + b_7 TBR\_IND + b_8 FIIN + b_9 NSE + b_{10} R_{NSE} + \text{AR}(p) + \text{MA}(q) \]  

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Where

\[ \text{BSE}_t = \text{Monthly Return at Bombay Stock Exchange} \]

\[ a, b_1, b_2, b_3, \ldots, b_8 = \text{Intercept and coefficients} \]

\[ \text{R}_\text{BSE} = \text{Risk at Bombay Stock Exchange} \]

\[ \text{S&P} = \text{Return of Standard and Poor 500} \]

\[ \text{R}_\text{S&P} = \text{Risk at Standard and Poor 500} \]

\[ \text{REER} = \text{Real Effective Exchange Rate} \]

\[ \text{FBIR} = \text{Federal Bank Three Months Treasury Bills Rate} \]

\[ \text{IIP} = \text{Index of Industrial Production} \]

\[ \text{TBR\_IND} = \text{Interest Rate of Indian 3 Months Treasury Bills} \]

\[ \text{FIIN} = \text{Net Investment by Foreign Institutional Investors} \]

\[ \text{NSE} = \text{Return at National Stock Exchange} \]

\[ \text{R}_\text{NSE} = \text{Risk at National Stock Exchange} \]

\[ \text{AR} = \text{Auto Regressive term at lag } p \]

\[ \text{MA} = \text{Moving Average term at lag } q \]

Further, in the place of exchange rate of US $ with Indian Rupee, we have taken the real effective exchange rate that is the average of the exchange rate of 36 currencies with Indian Rupee. We have taken the return and risk at NSE as regressors also because both the markets are behaving complementary and explain each other.

The return of BSE has been compared for pre and post liberalization period and the significance of the difference was examined by using Student \( t \) – test. The formulae of the above said test is:

\[
\frac{t = (\bar{X}_1 - \bar{X}_2) - (\mu_1 - \mu_2)}{\text{Sp} \left[ \frac{1}{n_1} + \frac{1}{n_2} \right]^{1/2}}
\]
\[
\text{And } S_p = \frac{n_1 S_1^2 + n_2 S_2^2}{n_1 + n_2 - 2}
\]

Where, \( S_p \) is the pooled variance, \( n_1 \) is the number of observation in pre liberalization era and \( n_2 \) is the number of observation in post liberalization period. \((\mu_1 - \mu_2)\) is difference between two mean which will be taken as zero as our null hypothesis is that there is not difference in mean return before and after introduction of FIIs in Indian stock market where as \((X_1 - X_2)\) is the difference between sample mean calculated from the given series.

**3.6.2 Methodology for Measuring the Impact of FIIs on Stock Market Instability**

The other main objective of this study was to investigate whether the entry of foreign institutional investors has influence instability of Indian stock market. The study undertakes a comparative analysis of stock return volatility before and after stock market liberalization in India. In order to achieve aforementioned objective, the stock return has been calculated on basis of daily data of closing index.

For analyzing the instability various instability measures can be used. Many econometrics models assume that the variance as a measure of uncertainty is constant. Financial time series such as stock returns or exchange rates exhibits volatility clustering. This means that large changes in time series tend to be followed by large changes and small changes by small changes. The technical term given to the behavior is called autoregressive conditional heteroscedasticity (ARCH). It was Engle (1982) who first introduced the time varying conditional variance model with ARCH process that uses past disturbances to model the variances of the series and allows the variances of error term to vary overtime. Bollerslev (1986) generalized the ARCH process by allowing the conditional variance to be a function of past observations as well as of recent news named as GARCH model. Following the introduction of ARCH and GARCH, there have been numerous refinements of the approach to model volatility to better capture the stylize characteristics of the data. All these possible approaches to measures can be segregated into three parts:
• **Traditional Instability Estimators:** These estimators assume that true instability is unconditional and constant. The estimation is based on either squared returns or standard deviation of return over a period of time.

• **Tremendous Value Instability Estimators:** These estimators are similar to traditional estimators except that these also incorporate high and low prices observed unlike traditional estimators, which are based on opening and closing price of asset.

• **Conditional instability Model:** These models (ARCH/GARCH Class of Model) take into account the time varying nature of volatility. There have been a quite few extensions of the basic conditional volatility models to incorporate observed or known characteristics of the return.

Out of these three models, first two models assume that the instability is unconditional and constant and this assumption does not follow in time series data. The conditional volatility model uses only low frequency daily data explicitly recognized time varying instability of returns and hence can be used to measure the volatility in the proposed study. The forecast by these conditional instability models are based on the parameters of the model itself as well as they are on the return characteristics during the relevant period.

Autoregressive Conditional Heteroscedasticity model is first model designed to model and forecast conditional variances. In this model, the variance of the dependent variable is modeled as a function of past value of dependent variable and independent or exogenous variables like foreign institutional investments, announcements of budgets etc. while measuring volatility of returns. While developing an ARCH model, two distinct specifications have to be considered one for the conditional mean equation that may be structured regression equation and the other for conditional variance equation.

Here, the simplest mean return is:

$$y_t = ax_t + e_t \quad \text{--------------------------(3.4)}$$

Where \(y_t\) is the mean return, \(x_t\) is the independent variable and \(e_t\) is error term. and variance for the ARCH (q) Model is:
The equation is:

\[ h_t = w + \sum_{i=1}^{q} a_i e_{t-i}^2 \]  

Where \( h_t \) is conditional variance at period \( t \), \( q \) is the number of lags included in the model and \( w, a_1, a_2 \ldots \ldots \ldots a_q \) parameters to be estimated.

Here the inclusion of \( e_t \) in the variance equation denotes the effect of news about the volatility from the past period on the current variance. Therefore, in ARCH (q) model, the volatility at time \( t \) is a function of \( q \) past square terms. For the ARCH model to be well defined, parameter should be stratified that are \( w > 0 \) and \( a_1, a_2 \ldots a_q > 0 \).

Since empirical application of ARCH (q) model require long lag length and a large no of parameters to be estimated, Bollerstev (1986) generalized this process by arguing that instability at time \( t \) is not affected only by squared zero mean variables but also by \( p \) lags of past estimated volatility. In this way, starting with the pioneering work of Engle (1982), numerous refinements have been made in the variance models to capture the time varying volatility. Out of these models, the most important are:

- Generalized Autoregressive Conditional Heteroscedasticity – GARCH (p,q)
- Exponential GARCH – EGARCH
- Threshold GARCH – TGARCH
- Multivariate GARCH – MGARCH
- ARCH – in – mean – ARCH - M

As per the studies conducted world over to measure the effectiveness of these models, the results of GARCH (1,1) Model are more accurate to capture the time varying volatility. To quote Akgiray (1989), Pagan & Sewart (1990), Brailsford and Paff (1996), Brooks (1998) used the US Stock data and found that GARCH model outperformed the most of competitors. Similarly, while using Indian data Madhusudan, Karmakar (2005), Pande (2005) concluded that GARCH (1,1) model provided good forecast of volatility and hence useful for portfolio allocation, performance measurement and option valuation etc. However, in the present study the degree of \( p, q \) is identified with the help of...
autocorrelation and partial autocorrelation functions of the squared residuals based on the principle of ARMA model.

So it was thought that use of GARCH (1,1) model would be more appropriate and hence the same is used in this study to measure the volatility. The specifications of the GARCH (p,q) model is:

$$h_t = w + \sum_{i=1}^{q} a_i * e_{t-1}^2 + \sum_{j=1}^{p} b_i * H_{t-j}$$

(3.6)

where w, a_1, a_2, ..., a_q, b_1, ..., b_q are parameters to be estimated. q is the number of squared error term lags in the model and p is the number of past volatility lags included in the model.

The GARCH process defined above is stationary when $$(a_1 + a_2 + ... + a_q) + (b_1 + b_2 + ... + b_q) < 1$$. The simplest but often useful GARCH (1,1) process, which is called generic vanilla GARCH model is given by

$$h_t = w + a_1 e_{t-1}^2 + b_1 h_{t-j}$$

(3.7)

Where w > 0, a and b ≥ 0. the stationary condition for GARCH (1,1) is a + b < 1. In this condition is fulfilled, it means the conditional variance is finite. A straight forward interpretation of the estimated coefficient in above equation is that the constant w is long term average volatility where a_i and b_i represent how the volatility is affected by current news and past information regarding volatility respectively.

The size of the parameters a_i and b_i determines the short run dynamics of the resulting volatility time series. Large GARCH lag coefficient b_i indicates that shocks to conditional variance take a long time to die out, so volatility is persistent. Large ARCH a_i means that volatility react quite intensity to market movements so if a_i is relatively high and b_i is relatively low, volatility tends to be more spiky.

To capture the impact of foreign institutional investors on the stock market return instability, FIIs analysis is done in two parts. First on the basis of daily data analysis by taking the FIIs as dummy variable because daily data is not available before 1999. Therefore the equation would be:

$$h_t = w + a_1 e_{t-1}^2 + b_1 h_{t-j} + \Psi D_{FII}$$

(3.8)
where \( D_{FI} \) denotes the dummy for introduction of foreign institutional investors (FIIs) in the Indian stock market which takes value zero and one for pre and post entry period of FIIs in the Indian market respectively. If the coefficient of the dummy variable is statistically significant, it means FIIs have an impact on instability of underlying stock market. Negative value of the coefficient indicates reduction in instability where as the positive value of the coefficient indicates upward trend in volatility. Time period for this analysis is 22 years started (1\textsuperscript{st} Jan. 1986 to 31 Dec. 2007).

To capture the exact impact of foreign institutional investors on the stock market return instability FIIs monthly data analysis has also been done because monthly data on the FII investment in India is available since the inception of FIIs in India. So for that the equation used is as follows:

\[
 h_t = w + a_t \epsilon_{t-1} + b_t h_{t-1} + \Psi FIIN
\]

In this equation original value of FII investments is taken on the place of the dummy variable.

### 3.6.3 Methodology for Measuring the Impact of FIIs on Trading Volume and Market Capitalization

The monthly data for a time period of 15 years from January 1993 to August 2007 were used to measure the impact of FIIs on trading volume and market capitalization. The data of the Trading Volume and market capitalization have been taken from the website of the Reserve Bank of India. The impact of foreign institutional investors purchases and sales of the securities at BSE Ltd. on the market capitalization and trading volume has also examined. For this purpose we have taken the monthly data of the purchase and sale of the securities for the same time period. India witnessed multi-billion rupee stock market scam in March 2001, which led to a freeze on the flagship scheme of Indian largest mutual fund (Unit Trust of India) in June 2001. Resultantly, the market witnessed a considerable decline in trading volume at stock market. This abnormality could prompt any researcher to remove outlier and then measure the impact of FII investments on trading volume of Indian stock market. So we have ignored the time period from March 2001 to June 2001 in the calculation of the impact of foreign
in institutional investor investments on the Indian stock market trading volume and market capitalization. However, it is not denied that stock market scams are results of system failure and hence these may recur. Therefore, any robust volatility model should be able to capture this phenomenon and hence we have not removed these extreme observations from our sample while analyzing the stock market volatility.

The development of stock market is a complex and multi-faced concept. There are various indicators of judging stock market development. One common used measure is the Value Traded Ratio (VR), which is total value of shares traded on a country’s stock exchanges as a percent of GDP. The second measure is the value share traded as a percent of market capitalization. This turnover ratio (TR) measures the trading relative to the size of the stock market. The third indicator, the market capitalization (MR), which is market capitalization of listed shares in a stock exchange as a percent of GDP, measures the size and expansion of the market. The value traded and turnover ratios are considered as the indicators of liquidity.

Demirgue-Kunt and Levine (1996) in their study showed that to measure the stock market development as aggregate index called SINDEX was constructed. Later, in another study Samal (1997) followed this technique for the period from 1991-92 to 1995-96. Joydeep Biswas (2005) also applied the similar technique for the period 1991-92 to 2003-04. Similarly, in the present study a SINDEX has also been constructed for the period 1991-92 to 2007-08. The average of market capitalization ratio (MR), value traded ratio (VR) and turnover ratio (TR). [i.e.MR+TR+VR/3] has been taken as the SINDEX in our study.

As the trading volume and market capitalization are new series in our analysis, so there is a need to test the stationarity of these. For this also, we used the Augmented Dickey Fuller (ADF) test to test the stationarity of various time series namely trading volume, market capitalization, monthly purchase and sales by foreign institutional investors by using the following equation

\[ Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \alpha_i \sum_{i=1}^{m} \Delta Y_{t-i} + \varepsilon_t \]  \hspace{1cm} (3.10)
The dynamic linkage was examined by using the concept of Granger Causality Test. The following equations were used for the purpose.

\[ Y_t = \beta_0 + \sum_{i=1}^n \alpha_i X_{t-i} + \sum_{i=1}^n \beta_i Y_{t-i} + \varepsilon_{1t} \]  
\[ X_t = \lambda_0 + \sum_{i=1}^n \delta_i Y_{t-i} + \sum_{i=1}^n \lambda_i X_{t-i} + \varepsilon_{2t} \]

In the above equations \( Y_t, X_t \) are the variables to be tested and \( \alpha_i, \beta_i, \lambda_i, \delta_i \) are coefficients explaining the relation of dependent variable with the lag terms of independent variable and lag terms of dependent variable in itself. \( \varepsilon_{1t}, \varepsilon_{2t} \) are mutually uncorrelated white noise errors. \( t \) is the time period and \( i \) is the number of lags. The null hypothesis is \( \alpha_i = \delta_i = 0 \). If the \( \alpha_i \) is statistically significant but \( \delta_i \) is not then it means \( X \) causes \( Y \). In the reverse case \( Y \) causes \( X \). But if both are significant then causality runs both ways. We took 2 lags as it is prescribed that 2 lags are sufficient to explain causality.

Side by side we also calculated the compound annual growth rate (CAGR) to measure the growth pattern of the market after the introduction of foreign institutional investors by using the relative volume technique. Relative volume is calculated as the average of the market daily trading volume to the total market trading volume. Here, we used the relative trading volume ratio rather than market original trading volume data in order to capture the effect of other developments of the stock market on the trading volume. Moreover, trading volume tends to grow over time independent of the effect of the trading done by the foreign institutional investors due to various reasons like increasing awareness and public confidence in the stock market etc. Mathematically, the relative volumes are calculated as follows:

\[ \beta_2 = \frac{\text{Relative changes in regressand}}{\text{Absolute change in the regressor}} \]

Where \( \beta_2 \) is the change in trading volume due to the time, regressand is the trading volume and regressand is the time, we can say \( \beta_2 \) is that part of the trading volume which grow due to the time it means it is growth rate and by calculating its antilog and subtracting 1 from it and multiplying the difference by 100 we got compound growth rate.
3.6.4 Determinants of FIIs in Indian Stock Market

(a) Variables selected to Identify the Determinants of FIIs

The present study consider six dependent variables namely: FIIs sale (FIIS), purchases (FIIP), net investment (FIIN) and 7 days moving averages of all three denoted as FIIS_MA, FIIP_MA and FIIN_MA respectively. The logic of taking these variables is as follows: Rationally, global investors would continuously adjust investment portfolio round the clock using available market information and thereby tracking the returns on all possible markets. The trading behaviour of these investors can be classified into two categories: (I) Momentum or Positive Feedback Trading and (II) Herding strategy. In the case of the Momentum Trading or Feedback Trading, the investors have a tendency to buy and sell stocks based on their observed return records i.e. to buy recent winners and sell recent losers. In case of Herding strategy all investors behave in a similar manner and take decision by observing the behaviour of other investors. To capture these behavioural patterns the investor’s action may be aggregated and summarized into two basic measures: (I) Sale and (II) Purchase. Hence, we have chosen to examine the nature of FIIs flows to India in terms of three variables: FIIs sales, FIIs purchases and FIIs net investment. Further, as the time series data have been taken on the daily basis so to remove the effect of day to day variation 7 days moving average of the above mentioned variables have also been taken as dependent variables. Thus, in total there are 6 dependent variables are taken.

Stock Return in the Host and Investing Countries:

Some research studies (e.g. Narayan and Smith, 2005; Panda, Chkradhara, 2005; Bartam and Dufey, 2001; Morley and Pentecost, 2000; Mohanty, 1998; Aggarwal, 1997 etc. conclude that the stock return in the host country is the significant determinants of foreign portfolio inflows. Accordingly, return offered by the Indian stock market is taken as an independent variable.
The relationship between the FIIs flows and market returns has been found using both, the return of the Bombay Stock Exchange and National Stock Exchange. The returns for Market i for day t would be given by equation.

\[
R_{it} = \log P_{it} - \log P_{it-1}
\]

(3.14)

Where

\[
R_{it} = \text{Market return for t time period}
\]

\[
\log P_{it} = \text{Log of price for current time period t}
\]

\[
\log P_{it-1} = \text{Log of price for the preceding period.}
\]

Foreign portfolio investment to a stock market may also be affected by the return offered by the home country market to which FIIs belong. It means the stock market behavior of such countries should be considered for examining the determinants of the FII flows to a stock market. As around 42 percent of the total FII flows to Indian stock market comes from US (Source: www.sebi.gov.in), its stock market is assumed to have an impact on foreign funds flowing to other countries. So to represent the US market S & P 500 Index was taken. For representing the emerging market Morgan Stanley Capital International World Index (MSCI) has been taken as the explanatory variable for FII flows.

**Macroeconomic Factors:**

Review of the existing studies [for instance Gorden and Gupta (2003), Mukherjee and Coondoo (2002)] shows that numerous macroeconomic factors influence FII flows. These variables include interest rate in foreign countries, exchange rate between investing country and host country currencies, growth potential of the host country, risk of investing and host country markets and differential return of host and investing country markets etc. Accordingly, we have examined the influence of the following variables on FII flows: (a) Federal Bank Interest Rate (3 Months Treasury Bills) as a representative of International Interest Rate; (b) Exchange rate of Indian rupee v/s US $; (c) Index of
Industrial Production as an indicator of growth potential of the Indian economy; (d) risk at the both domestic and foreign markets (e) Deferential return of BSE and MSCI and (f) Deferential return of BSE and S&P.

Moving Averages, Risk and Return with Lag:

Moving average of each of the indices under reference and return with one day lag have been taken as independent factors so as to eliminate the effect of day to day variations and to capture the effect of the previous day return on FIIs. Lastly, to determine the impact of the volatility in the various markets standard deviation of last 15 days return was taken.

(b) Statistics Analysis

The time series analysis begins with the checking of the basic characteristics of the various time series so that it can be found whether they are fit for the further analysis or some corrections are required. So first of all we verified the times series data properties. That is, the stationarity problem of the both dependent and independent variables was examined. For this, Augmented Dickey-Fuller Test (ADF) was used for checking the unit root of the major variables. The following form of ADF regression equation was used for the purpose:

\[ Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \alpha_1 \sum_{i=1}^{m} \Delta Y_{t+i} + \varepsilon_t \]  

Where \( \varepsilon_t \) is a pure white noise error term and \( Y_{t-1} \) additional lagged term, included with an idea of ensuring that the errors are uncorrelated. \( \beta_1, \beta_2, \delta, \alpha \) are the coefficients where \( \delta \) is the first difference operator taken to test the null hypothesis that \( \delta = 0 \). If \( \delta \) is equal to zero it mean there is a Unit Root, which implies non-stationarity in the series under consideration. If a series is stationary at level then is also integrated of zero order and a series stationary at 1st difference is integrated of 1st order and so on.

As the use of differenced variable instead of original variable may sometimes result in the serious loss of long run information, it is essential to keep the long run
information on the variables and to avoid the problem of spurious regression. These two problems have to be avoided simultaneously. For this possible, co-integration between the variables need to be checked and to find out the co-integration between variables Augmented Engle-Granger Test (AEG) test may be conducted. Accordingly, in this study firstly we estimated co-integration regression using the variables having the same order integration. The co-integration equation by the OLS method is given as:

\[ Y_t = a_0 + a_1X_1 + a_2X_2 + a_nX_n + Z_t \]  

Where \( a_0, a_1, a_2, a_n \) are the regression coefficient and \( X_1, X_2, X_n \) are the independent variable considered for the study (i.e. BSE, NSE, MSCI, S&P, US_EX, IIP etc.). \( Z_t \) is the residual term

Next, residuals (\( Z_t \)) from the co-integration regression are subject to the test stationary by applying Augmented Dickey Fuller unit root test based on the following equation:

\[ (ADF) \Delta Z_t = \beta_1 + \beta_2t + \delta Z_{t-1} + \alpha_1 \sum_{i=1}^{m} \Delta Z_{t-1} + \varepsilon_t \]

If the \( Z \) is proved stationary, it means that calculated co-integration regression is not spurious.

Then we specified the proper regression equation because if the regression equations is under or overstated then the results may not be correct. To specify the proper regression equations data mining technique is used. According to this technique, firstly we used the bi-variate form of the OLS and find out the respected regression coefficients, R-square values and Durbin-Watson values of each of the independent variable with each dependent variable. Only those variables were taken for the final multiple regression analysis, which turned significantly associated with the particular dependent variable. Then we estimated the relationship between the various dependent variables with explanatory variables. Multiple regressions method was applied to determine the investment functions. In this way six specification of the model (i.e. with six dependent variables: FIIS, FIIP, FIIN and their moving averages with various
independent variables) were made by forming OLS equation. The model net investment is as under:

\[ FIIN = f(\text{Constant, NSE, MSCI, R\_NSE, R\_MSCI, L\_NSE, L\_MSCI, NSE\_MA, MSCI\_MA, L\_FIIN, US\_EX, FBIR, IIP, BETA\_MSCI, D\_RET, Error term}) \] ---- (3.18)

The rest of the equations for relevant explanatory variables were also taken as per data mining technique with FIIS, FIIP, FIIN\_MA, FIIS\_MA and FIIP\_MA as dependent variables.

After this in order to determine causal relationship a pair wise Granger Causality Test was used by taking all the dependent variables with the explanatory variables, which turned significant in multiple regression. Granger Causality Test is a bi-variate analysis and involves estimates X(Y→X) and Y(X→Y) by using following pair of regressions:

\[
Y_t = \beta_0 + \sum_{i=1}^{n} \alpha_i X_{t-i} + \sum_{i=1}^{n} \beta_i Y_{t-i} + \epsilon_{1t} \tag{3.19}
\]

\[
X_t = \lambda_0 + \sum_{i=1}^{n} \delta_i Y_{t-i} + \sum_{i=1}^{n} \lambda_i X_{t-i} + \epsilon_{2t} \tag{3.20}
\]

In above mentioned equations \( Y_t, X_t \) are the variables to be tested and \( \alpha_i, \beta_i, \lambda_i, \delta_i \) are coefficients explaining the relation of dependent variable with the lag terms of independent variable and lag terms of dependent variable in itself. \( \epsilon_{1t}, \epsilon_{2t} \) are mutually uncorrelated white noise errors. \( t \) is the time period and \( i \) is the number of lags. The null hypothesis is \( \alpha_i = \delta_i = 0 \). If the \( \alpha_i \) is statistically significant but \( \delta_i \) is not, it mean \( X \) causes \( Y \). in the reverse case \( Y \) causes \( X \). but if both are significant then causality run both ways. We have taken the 2 lags as it is prescribed that 2 lags are sufficient to explain causality.

3.7 Implication of the Study
The present study is an addition to the existing body of knowledge as very scanty work is available in this area of research in case of India. As we know that the BSE Sensex has crossed the 17000 points. That is mainly due to foreign institutional investment. Our finance Minister P. Chidambram stated during an interview to ‘Economic Times’ that, this boom is not harmful for our economy and not supposed to decline in near future. Now the question arises why is it so? Why are the foreign institutional investors coming to India? What will be the impact of this boom on Indian stock market? To find out the answer of these questions and to know another aspects related to foreign institutional investment, the study is structured. The present study is an attempt to find out the impact of foreign institutional investment on Indian stock market and to highlight the procedural and legal aspect related to foreign institutional investment in India. The study will also contain the trends of foreign institutional investment in India and with the help of the data an attempt was made to determine the factors determining the flow of FIIs in India.

3.8 Restrictions of the Study

During the completion of this study, we have faced some limitations. First, it has been assumed that prices discount a symmetric response to the news. Secondly, some of the part of the study is not based on high frequency data due to its unavailability.

3.9 Organization of the Study

The study is organized as under:

**Chapter 1** presents an overview of evolution of foreign institutional investment in Indian market. It gives brief outline of introduction of foreign institutional investment, conceptual and functional framework of FIIs and their benefits and cost to Indian stock market.

**Chapter 2** reviews the existing literature on the present topic. It is divided in three sections: impact of the entry of foreign institutional investors on volatility and return of the Indian stock market, impact of foreign institutional investors on volatility...
and return of the foreign stock markets and determinants of the foreign institutional investments in Indian stock market.

**Chapter 3** presents the research methodology used in the study. The various aspects herein include background of the study, objectives and hypothesis of the study, database, data analysis tools, rationale and limitation of the study.

**Chapter 4** enumerates the legal and regulatory aspects of foreign institutional investments. It appraise the process how the FIIs can apply to get registered in Indian stock market, routes through which they can investment in India, what are the restrictions applied on their investments, what legal obligations they have to fulfill and what rights are available to them.

**Chapter 5** presents the result relating to the impact of foreign institutional investment on stock market return A pre and post liberalization analysis is conducted to know the exclusive impact of FIIs on Indian stock market return with the help of ARMA model.

**Chapter 6** elaborates the impact of the foreign institutional investors on Indian stock market volatility.

**Chapter 7** presents the analysis relating to the impact of introduction of foreign institutional investors on market trading volume and market capitalization.

**Chapter 8** describes the factors, which push and pull foreign institutional investments towards the Indian stock market. In this part we describe the time series properties of the various time series and then we analyze the data with the help of multiple regressions and Granger Causality Model.

**Chapter 9** embodies the major findings and conclusions emerged from the present study and suggestion offered to review the policy of government of India towards foreign institutional investors.
3.10 References


