CHAPTER II

REVIEW OF LITERATURE AND RESEARCH DESIGN

2.1 REVIEW OF LITERATURE

In the field of stock market numerous literatures are available. The United States scholars are pioneer in the financial research. After the first world war the financial field got importance among the sovereign people of the nations. New disciplines have emerged as the branch of economics. In this scenario stock market emerged as one of the major research areas in finance. This chapter includes some prominent studies of the research in stock market in global as well as Indian context. Dow (1920) has been the pioneer in making a systematic study on the prediction of future stock prices or stock returns. He has studied the potential for past share prices and movement therein, to predict future equity values in US stock market. He proved the ability of the technical analysis to explain current and future share prices as well as equity returns.

Cowles (1934) showed that trading based upon “Dow Theory would have resulted in earning less than a buy and hold strategy using a well diversified portfolio. The study concluded that a buy and hold strategy produced 15.5 per cent annualized returns for the period 1902-1929 from US market, when Dow strategy produced annualized return of 12.0 per cent during the same period. Cowles analysis was a land mark in the development of the empirical evidence on the informational efficiency of the market”.

Graham and Dodd (1934) are the first to formally argue the importance of fundamental factors in share valuation exercises. They suggested that the stock owner should not be too concerned with erratic fluctuations in stock prices, since in the long term its true value will be reflected in its stock price. Hence the investors spend time and
effort to analyze the financial state of companies and then assess its intrinsic value before making their final investment decision.

Gordon (1959), in his study based on the data relating to “four industries from US economy for the period 1951 to 1954, very compactly illustrated the connection between a stock’s price, the current level of dividend, the expected growth rate of dividends and the discount rate. His study showed the relevance of dividend in determining intrinsic worth of a stock thereby the stock returns also. But Modigliani and Miller (1961) showed investor indifferences as to the amount of dividend since it has no influence on the value of a firm”. Any investor can create a ‘homemade dividend’ if required or can invest the proceeds of a dividend payment in additional shares as and when a company makes dividend payment.

Holt (1962) made a study for measuring the influence of growth duration of earnings on share price movements. He found that the “forecasting of future earnings and other economic variables become more difficult if the rate of growth is expected to change in the future. So the estimation of growth rate not only in terms of its size but also its duration must be made for correct valuation of a stock”.

Sharpe (1964) and Lintner (1965) predict a positive linear relationship between expected security returns and market betas with their Capital Asset Pricing Model (CAPM). The model is developed under the assumption of the existence of an efficient capital market where security transactions are costless and information is freely available to all investors instantaneously. CAPM, an idealized market environment, bifurcates total risks involved in investments into two orthogonal components, namely, risk associated with the overall market conditions called ‘market risk’ or ‘systematic risk’ and risk specific to the asset called ‘unique risk’ or ‘unsystematic risk’. The unsystematic portion of the risk can be eliminated by holding well-diversified portfolios but the systematic portion cannot be eliminated even if one virtually holds all assets in the economy. The CAPM also predicts that market beta is sufficient to describe cross-sectional expected returns. These predictions have been the subject of a great deal of empirical investigation. Much of the evidence does not support the model. Empirical contradictions of the CAPM

King (1966) examined returns for a sample of 63 stocks in six different industries over the time period 1927-1960. His study used multivariate analysis to decompose the causes of price movements in the stocks. On averaging the overall industries, King found that 20 per cent of the stock price movements were the results of factors uniquely determined by each firm, 31 per cent due to general market factors, 12 per cent were the results of industry factors and 37 percent were the results of factors tied to industry subgroups.

Malkiel and Cragg (1970) studied the effect of historical growth of earnings, dividend payout ratio and stock’s rate of return relative to the market in determining P/E (Price to Earnings Ratio). Earnings growth was found to have a positive effect on the P/E ratio. The closer a of a stock’s return with market index is due to more negative P/E effect. The dividend payout effect was not clear; in some years, the higher the payout the higher the P/E, but this was not true for all years.

Sharpe and Cooper (1972) conducted a study concerning the relationship between risk and return on the basis of 10 risk classes of NYSE common stocks over the period 1931-1967. The risk classes were determined by estimating the beta of each stock at the beginning of each year. The results of the study proved consistent relationship between risk and return. Black et.al (1972) and Fama and Macbeth (1973) also confirmed the basic tradeoff between risk and return. While prior information of the historical evidence does suggest that higher returns are associated with riskier securities, the relationship is not perfect, particularly over relatively short time periods.

Niederhaffer and Regan (1972) had performed a specific test of the relationship between earnings and prices of selected stocks listed in NYSE for the period 1966-1970. Their study has found that changes in stock prices are highly correlated with changes in earnings. An investor with superior earnings forecasts is more likely to enjoy pleasant surprises and avoid disappointing earnings reports and stock performance.
Meyers (1973) and Livingston (1977) in similar studies confirmed King’s findings. The Meyer’s study involved 60 of the same companies used by King (1966) and data of the 60 additional companies have been used. Meyers concluded that although there was strong industry effects, King may have overstated the per cent of residual variance explained by industry association. Livingston used 50 companies in 10 industry groups and studied monthly returns from January 1966 through June 1970. He also found strong co- movement among stocks in the same industry, and concluded that 18 per cent of residual variance was accounted by industry effects.

Sharma and Kennedy (1977) and Sharma (1983) tested the weak-form efficiency of BSE. Both of these studies with the former covering the 1963- 1973 periods and the later encompassing the 1973-1981 period, concluded that Indian stocks generally conformed to random-walk behavior and in the successive period changes were independent. Poterba and Summers (1988), however, found evidence of mean reversion in Indian stock prices, suggesting a deviation from random-walk behavior.

Basu (1977) in his study found that the security prices over the period from 1957 to 1971 in US market not completely described by the Efficient Market Hypothesis (EMH). He argued that publicly available Earnings Price (EP) ratio seems to possess information content and may warrant an investor’s attention at the time of portfolio formation or revision. Based on this analysis, he argued that for the 14-year period of study, high E/P securities have higher expected returns than predicted by CAPM.

Shleifer (1986) was the first to investigate the index effect and his study examined price impacts related to changes in S & P 500 index between 1966 and 1983. His study found an abnormal price increase of 2.79 per cent and the cumulative returns persisted. The returns are positively related to measures of buying index funds and the results were attributed to the downward sloping demand curves for stocks.

Fama and French (1988) found that the predictability of stock price return variances was larger than expected variances in the US stock market for the period 1926-1985. The predictable variances of three to five year stock price returns were estimated to be about 40 per cent for portfolios of small firms and 25 per cent for portfolios of large
firms. They also observed strong negative autocorrelation of stock returns over a three to five year period in their multi period returns regression model. The negative autocorrelation of stock returns implies mean reversion in stock prices.

Barth et.al (1990) made an empirical examination between common stock prices and two major components of bank earnings shows that earnings before securities gains and losses play an important role in explaining bank stock prices. The market appears to assign a significant multiple to this component of earnings, judging from regression results over the 1968-87 period. Gupta (1992) in his study examines the volume and nature of speculation in Indian stock exchanges with focus on effects of excessive speculation. He points out the most important weakness of Indian stock market is the existence of unhealthy and excessive speculation resulting in irrational price behaviour and very high volatility.

Fama and French (1993) introduced a ‘Three Factor Model’ in the spirit of arbitrage pricing theory. They argued that the effects of size and book-to-market equity could be explained as manifestations of risk premiums. Using an arbitrage pricing type model they show that stocks with higher sensitivity on size or book-to-market factors have higher average returns. According to them risk is determined by sensitivity of a stock to three factors (1) Market portfolio, (2) a portfolio that reflects relative returns of small versus large firms and, (3) a portfolio that reflects relative returns of firms with high book-to-market ratio versus low book-to-market ratio firms. They argued that even though size and book to market equity ratios are not direct factors affecting returns, they perhaps might be proxies for more fundamental determinants of risk. Thus they conclude that these patterns of returns are consistent with efficient market hypothesis in which expected returns depend solely on risk.

Mittal (1994), using daily returns data of BSE National Index for the period January 1990 to February 1993, shows that daily returns are most negative for Tuesday and most positive for Friday. Hence, investors can make use of this information to make excess returns by trading in National Index portfolio. Chiang et.al (1995) based on the earnings and dividends as proxies for fundamental values, show that the larger the
difference between the stock price and the fundamental asset value the stronger will be restoring force of the movement of stock price towards the fundamental value. But Wigmore (1997) showed that the share prices increased much more than their intrinsic values in the 1980’s and only 35 per cent of the 245 point raises in the S&P 500 during the 1980s was explained by changes in fundamental values.

Classens (1995) in his study on equity investment in developing countries found that the benefits available to a foreign investor in emerging markets ultimately depend upon a tradeoff between the expected rate of return and its associated risk. For assessing this kind of relationship he considered the underlying factors which are influencing the rate of return and its variability, the efficiency of the domestic stock market and the working of the regulatory mechanism in the host country. The study revealed that the correlation between equity returns from different countries is much lower than that between equity returns in the same country. The benefits of diversification is - a lower risk for higher rate of return or a higher return for same or lower level of risk-are much stronger across international financial markets than within domestic markets.

Bae and Duvall (1996) applied multi-index CAPMs to explore the relationships of US aerospace industry stock returns to selected market and industry variables during the period 1982 -1991. The study found that the market returns represented by the S&P 500 index and Department of Defense expenditures are significantly positively related to aerospace stock returns.

Madhusoodanan (1997) conducted a study to find out the relationship between the expected return and risk by using portfolio method rather than the individual security approach. For this purpose, portfolios were formed to test their performance in the consequent period. Results indicated that the risk and expected return in the Indian market are not necessarily positively related. Moreover in Indian market, the investor rationality and risk aversion do not appear to be important.

Sehgal (1997) empirically tested three-parameter CAPM in Indian capital market by taking monthly rates of return (adjusted for bonus, stock splits and right issues) for 80 securities included in BSE National Index. The evidence indicated that CAPM is not a
suitable descriptor of asset pricing on the Indian capital market for the period of the study. Slope was found negative but insignificant for the total period, implying absence of any significant relationship between beta and average return.

Ajit Singh (1998) examines the growth and evolution of stock markets in India during the 1990’s, which according to him is largely due to internal and external liberalization measures and the general liberal economic ethnicity created by the reforms. Singh argues that even though the corporate sector considerably benefited from the boom in the stock market by raising huge amount of capital from the market, the aggregate real economy did not benefit from this. What really happened was a portfolio substitution from bank deposits to financial corporate securities by households and institutions. Also Singh does not see any increased productive use of investment resources.

Brown et al. (1998) challenged the EMH and proved the validity of Dow theory in producing excess risk adjusted returns to the investors. More specifically the return of a buy and hold strategy was higher than a Dow theory portfolio by 2 per cent, but the riskiness and volatility of the Dow theory portfolio was lower, so that it was able to produce higher risk adjusted returns to its investors in US market.

Sullivan et al. (1999) report that although data snooping biases might not explain the historical possibility of trading based on technical analysis, such trading practices are no longer viable given the increased efficiency of equity markets afforded by cheaper computing power, the lower transaction costs and increased liquidity.

Ramasastri (1999) applied the unit root test to examine the existence of weak form of capital market efficiency in India in the wake of recent capital market reforms. He used daily closing prices of SENSEX for a period of eight years from January 1991 to December 1998 for the analysis. The study concludes that Indian capital market is weakly efficient during the study period.

Chaturvedi (2000) examined the existence of P/E effect in India by using a sample of 90 scrips for a six-year period of 1990-1996. He concludes that significant P/E effect exists in India during this study period.
Jegadeesh and Titman (2001) has verified the profitability of momentum strategies suggested by the technical analysts. Their research found the profitability of buying a portfolio of past ‘winners’ and simultaneously selling a portfolio of past ‘losers’, then holding the resultant position for 3-12 months, which challenge the validity of EMH.


Tuli Nishi and Mittal (2001) made an attempt to determine price earnings ratio of 105 companies in India for the period 1989 - 93 and found variability in market price, dividend payout ratio and earnings per share to be significant variables whereas size, debt equity ratio and growth were insignificant.

Mohanty (2002) examined the effect of a number of firm specific characteristics, such as size, book-to-market equity ratio, price earnings ratio, book leverage, market leverage, price-to-cash flow ratio, price-to-sales ratio, and market beta in explaining cross sectional variations of stock returns over the period 1991 to 2000. By using Fama and MacBeth (1973) methodology on individual securities of the sample, he found variables’ size, market leverage, book-to-market ratio, and price-earnings ratio are significant in explaining stock returns, of which size is the most significant variable. Moreover, he observed that variables other than size did not have any additional explanatory power, once the size effect had been adjusted for. This implies that size captures the effects of the other variables in Indian stock markets.

Malakar and Gupta (2002) took an effort to explain the major determinants of sectoral stocks in Indian stock market. Their sample consists of eight major cement companies in India and this study covered the period from 1968 to 1988. The study has found earnings per share and investment expenditure to be significant determinants of share price.
Lee and Ryan (2002) analyze the dividend signaling-hypothesis (to find the dividend impact announcement of the stock price) and the issue of direction of causality between earnings and dividends - whether earnings cause dividends or vice versa. For a sample of 133 dividend initiations and 165 dividend omissions, they found that dividend payment is influenced by recent performance of earnings, and free cash flows. They also found evidence of positive (negative) earnings growth preceding dividend initiations (omissions).

Lanne and Saikkonen (2004) analyzed monthly excess US stock returns from January 1946 to December 2002. The results indicate the presence of conditional skewness in stock returns. This is because large pieces of news persist, which increases present and future volatility. The evidence seems to suggest that informationally efficient and stock prices can be predicted with a fair degree of reliability.

Samanta (2004) carried out spectral shape tests for daily data on the BSE-100 from January 1993 to December 2001. He partitioned the entire period into 18 sub-periods and tested separately for each sub-period. The study showed that the market was considerably inefficient during each sub-period till June 1996. It achieved high level of efficiency during July 1996 to December 1999 and showed efficiency at a relatively lower level thereafter, except with some aberration during 2000.

Mishra (2004) examined the relationship between stock market and foreign exchange markets in India using Granger causality test and VAR technique. They used monthly data for stock return, exchange rate, interest rate and demand for money for the period 1992 to 2002. The study found a unidirectional causality between the exchange rate and interest rate and also between the exchange rate return and demand for money. The study also suggested that there is no granger causality between the exchange rate return and stock return.

Nath and Dalvi (2005) examined the day of the week effect anomaly during 1999 to 2003 for Nifty. They found market inefficiency exists in Indian stock market. Dhankar and Chakraborty (2005) also confirmed this finding and the variance ratio test applied by
the study suggests dependency of SENSEX series, thereby utility of technical analysis in predicting stock price behavior is helpful for the investors during the study period.

Ahamed et al. (2005) in their effort to study the integration of Indian stock market with the global markets, after analyzing the daily closing data of NASDAQ, Nikkei and SENSEX from 1999 to 2004 found that there is no long-term relationship of the Indian stock market with the US and Japanese markets.

Courteau et al. (2005) assessed the relative performance of the direct valuation method and industry multiplier models using firm-quarter value line observations over an 11 year (1990 - 2000) period. Results from both pricing error and return-prediction analysis indicate that direct valuation yields lower percentage pricing errors and greater return prediction ability than the forward price to aggregate forecasted earnings multiplier model. However, they suggested a simple hybrid combination of these two methods leads to more accurate intrinsic value estimates, compared to either method used in isolation. It would appear that fundamental analysis could benefit from using one approach as a check on the other.

Ahmad Khan et al. (2006) made an attempt to seek evidence for the weak form efficient market hypothesis using the daily data for Sensex and Nifty for the period 1999-2004. The random walk hypothesis for the Sensex and the Nifty stock indices were rejected and the study also found the inefficiency of Indian stock market with high and increasing volatility. Both the indices showed a negative autocorrelation at lag 2, indicating over-reaction one day after information arrival, followed by a correction on the next day.

Sehgal and Tripathi (2007) investigated value effect in the Indian stock market by using alternative value measures such as book equity-to-market equity (BE/ME), earnings-to-price (E/P), cash flows-to-price (C/P) and dividends-to-price (D/P). The basic data consists of month end adjusted prices of 482 companies forming part of BSE 500 equity index over the period 1990-2003. The study reports existence of statistically significant value effect on unadjusted as well as risk-adjusted basis on all the value
measures used. The study also found operating profitability, size and financial leverage as the three important sources of value effect.

Chandan Sharma (2008) in his study based on annual data of fourteen developing economies for the period from 1990 to 2006 found no direct relation between stock market development and economic growth.

Shan and Morris (2002) find weak evidence that financial development leads economic growth, either directly or indirectly. Shahid Ahmed (2008) examined the nature of the causal relationships between stock prices and the key macro economic variables representing real and financial sector of the Indian economy for the period March, 1995 to March, 2007 using quarterly data. The results of the study revealed differential causal links between aggregate macro economic variables and stock indices in the long run. However it revealed that causal pattern is similar in both markets in the short run. The study results indicate that stock prices in India lead economic activity except movement in interest rate. Interest rate seems to lead the stock prices.

Ray et al. (2008) made an attempt to unravel the relationship between the real economic variables and the capital market in Indian context. They considered the monthly data of several economic variables like the national output, fiscal deficit, interest rate, inflation, exchange rate, money supply, foreign institutional investment in Indian markets between 1994 and 2003, and ascertained the relative influence of these variables on the sensitive index of the Bombay stock exchange. Compared to the earlier similar attempts, they applied the modern non-linear techniques like VAR and Artificial Neural Network (ANN). The finding shows that certain variables like the interest rate, output, money supply, inflation rate and the exchange rate has considerable influence in the stock market movement in the considered period, while the other variables have very negligible impact on the stock market. Based on CAPM as theoretical framework and the samples of size varying from 182 companies to 544 companies for various estimation period between April 1991 to March 2006. Francy (2008) provides empirical validity of the three factor model of Fama and French (1992) in determining stock returns in India. The explanatory power of the three-factor model was found to lie between 69 per cent and 90
per cent for the various portfolios constructed which shows that the three factor model has captured the majority of the positive returns that had been left unexplained by the CAPM in Indian context.

Bettman et al. (2009) made an attempt to assess the relative ability of fundamental and technical analysis to explain share prices based on the data pertaining to US stock market listed companies that spans the period January 1983 through December 2002. For this purpose they incorporated both fundamental factors (Book value and EPS) and technical factors (lagged share prices and momentum factors) in their hybrid dummy regression models. The test results of the study confirmed the complementary nature of the two approaches in stock valuation by showing that, although each performs well in isolation, models integrating both have superior explanatory power. Taylor and Allen (1992) also verified the complementary nature of technical and fundamental analysis.

Brajesh Kumar and Prayanka Singh (2009) empirically examined the relationship between returns, volatility and trading volume for 50 Indian stocks. Three measures of trading volume namely number of transactions number of shares traded and value of shares traded are used. It is found that in Indian stock market, the number of transactions may be a better proxy of information than the number of shares traded and the value of shares traded. The evidence for positive contemporaneous relation between returns and volume as well as conditional and unconditional volatility and volume is found. They also found that the level of volume is dependent on the direction of price change only in case of 60 per cent of the stocks in the sample.

A.S. Ahmed et al. (2009) provides empirical evidence on factors that drive differential interpretation of earnings announcements. The study gives insight on the investor disagreement can increase investment risk, increase the cost of capital, and cause stock prices to deviate from fundamental value. Further it implied that increasing the quality of earnings and pre-announcement information can improve the efficiency of capital markets.

Deutsche Bundes Bank (2009) in its study based on stock price movement in DAX for the period 1991 to 2009 tested and proved that corporate earnings is an
important fundamental determinant of stock returns in Germany. The Impulse Responses Function (IRF) generated by the VAR model used in the study confirmed direct reaction by stock yields to changes in earnings expectations.

Srivastava, A. (2010) Studied weak form efficiency in Indian stock market by using run test, auto correlation and unit root test five major indices of Indian stock market (NSE). His study finds that the Indian stock market showing weak form efficient in particular study period.

Maduvij et al. (2011), studied the risk return relationship of Indian securities by taking Indian pharmaceutical stocks and establish a tradeoff between risk and return of stocks.

Akbar Ali and Khan. (2012) used auto correlation, L-jung box Q statistics, run test, unit root test to find the random walk effect on the stock markets of all the SAARC nations. Their study used one day, one week and one month and found that all the stock returns are non-normally distributed.

Banerjee et al. (2012) focused on the implications of the expectations of future profitability signalled by the splits on the ownership pattern of individual and institutional investors such as foreign investors (FIs) and foreign institutional investors (FIIs).

Mallikarjunappa et al., (2012), examined the merger and acquisition announcement impact on the stocks of Indian securities market. They have taken nearly 234 companies for the analysis and find that there is significant influence on the announcement of merger and acquisition on the share prices. They find that wealth effect of share holders of Indian companies has significant impact due to the merger and acquisitions.

Ali et al., (2013), tested Indian stock market on random walk by using unit root tests. They find that the Indian stock market showing the non-normality during the study period.
2.2 RESEARCH DESIGN

Method

The present study is descriptive and analytical in nature and hence survey method is adopted for the study.

Period of the Study

Secondary data for the study were collected for a period of twelve years from January 2001 to December 2012. The study period (2001 to 2012) comprises huge ups and downs in the Indian as well as global stock market. At present in the globalized economic scenario, slow down in the economy of any country will affect another country immediately like a domino effect. The findings and conclusion made on the basis of analysis with respect to the stock returns of PSUs might be generalized one in view of the volatility of the study period indicating of LPG. This is an added advantage of this study.

Sample Selection

For attaining the various objectives of the study, it is used 6 different kinds of stock returns namely, one day return, one week return, one month return, three months return, six months return and one year return of the 60 listed PSUs in Bombay Stock Exchange (BSE). There are totally 260 Public Sector Undertaking (PSU) companies in India of which 60 companies are listed in the prominent stock exchanges such as BSE, NSE and some of the regional stock exchanges. The study focused only on the stocks of PSUs listed in the BSE.

Sources of data

The data retrieved from the CMIE-Prowess, is one of the reliable database used mostly by researchers in the field of finance and economics. Capitaline- Plus data base is also another big and reliable database in the field of business & finance. RBI official website (www.rbi.org), official websites of BSE (www.bseindia.com, www.bsepsu.com) official website of Department of Disinvestment (www.divest.nic.in) and the Ministry of Finance of Govt. of India official website (www.finmin.nic.in). Further the study
used the data collected from the secondary sources like RBI Bulletin, various publications of Ministry of Finance, Department of Disinvestment Public Enterprises Survey, standard journals and standard business news papers like Business Line, Business Standard, and The Economic Times and their official websites.

2.3 TOOLS USED FOR THE ANALYSIS

The following statistical and econometric analysis have been used for the study:

- Fractal Analysis and computation of Hurst Exponent
- Impact of disinvestment on the stock returns of public sector companies by using AAR, CAR, CAAR, etc.
- Neural Network analysis and ARIMA models.
- Unit root test such as Augmented Dickey Fuller Test (ADF test), VAR

The following are the key financial measures that are underlying in the above statistical and econometric analysis.

**Stock Returns**

Natural logarithmic value of six kinds of stock returns of PSUs used in this study are computed by the following formula.

**Daily return**

\[ r_t = (\ln P_t - \ln P_{t-1}) \times 100 \]

- \( r_t \) → daily return of PSUs stocks
- \( \ln P_t \) → value of PSU share at time \( t \) and \( \ln P_{t-1} \) = one day lagged value PSU share

**One week return**

\[ r_t = (\ln P_t - \ln P_{t-7}) \times 100 \]

- \( r_t \) → weekly return of PSUs stock
- \( \ln P_t \) → value of PSU at time \( t \) and \( \ln P_{t-7} \) = seven days lagged value PSU share
One month return

\[ r_t = (\ln P_t - \ln P_{t-30}) \times 100 \]

- \( r_t \rightarrow \) monthly return of PSUs stock
- \( \ln P_t \rightarrow \) value of PSUs stocks at time t and \( \ln P_{t-30} = 30 \) days lagged value PSUs stock.

Three months return

\[ r_t = \frac{1}{3}(\ln P_t - \ln P_{t-90}) \times 100 \]

- \( r_t \rightarrow \) three months return of PSUs stock
- \( \ln P_t \rightarrow \) value of PSU at time t and \( \ln P_{t-90} = 90 \) days lagged value PSUs stock

Six months return

\[ r_t = (\ln P_t - \ln P_{t-180}) \times 100 \]

- \( r_t \rightarrow \) six months return of PSUs stock
- \( \ln P_t \rightarrow \) value of PSU at time t and \( \ln P_{t-180} = 180 \) days lagged value PSUs stock

One year return

\[ r_t = (\ln P_t - \ln P_{t-365}) \times 100 \]

- \( r_t \rightarrow \) One year return of PSUs
- \( \ln P_t \rightarrow \) value of PSU at time t and \( \ln P_{t-365} = 365 \) days lagged value PSUs stock return

The above mentioned stock returns are used for the Fractal Analysis and computation of Hurst exponent to study performance of PSU stocks. It is explained in the third chapter. The fourth chapter details the Stationarity tests, Vector Auto Regression for finding the impact of macroeconomic factors on the stock returns of PSUs. The Fifth
chapter includes the tools AAR and CAAR for finding the impact of disinvestment announcement. The sixth chapter describes the forecasting performance of PSU Index with the help of Artificial Neural Network (ANN). The six different kinds of returns used for the analysis may give lot more helpful information to the short term, medium term and long term investors. This study could be a exclusive study on Indian PSUs stocks listed in the stock exchange.

2.4 OPEN SOURCE SOFTWARE USED IN THIS STUDY

One of the significance of this study is that it accommodates open source software for all kinds of analysis. A brief explanation about the software used in this study may be helpful to the researcher in this field.

Gretl

WEKA

Gretl

Gretl is open source software and it can be downloaded from the website:
http://gretl.sourceforge.net/win32/

Features at a glance
Gretl is an Econometrics package, including a shared library, a command-line client program and GUI facility.

Graphical User Interface: User-friendly Gretl offers an intuitive user interface; it is very easy to get up and running with econometric analysis. It has been associated with the several Econometrics textbooks authored by Ramu Ramanathan, Jeffrey Wooldridge, James Stock and Mark Watson. The package offers many practice data files and command scripts, which are well annotated and accessible. Two other useful resources for Gretl users are available documentation and Gretl- users mailing list.

Flexible: one can choose their preferred point on the spectrum from interactive point-and click to complex scripting, and can easily combine these approaches.

Cross-Platform: Gretl’s “home” platform is Linux but it is also available for Microsoft windows and Mac operating systems.
Open Source: The full source code for gretl is available to anyone who wants to critique it, patch it, or extend it. Sophisticated Gretl offers a full range of least-squares based estimators, both for single equations and for systems, including vector auto regressions and vector error correction models. Several specific maximum likelihood estimators (e.g. Probit, ARIMA, GARCH) are also provided natively; more advanced estimation methods can be implemented by the user via generic maximum likelihood or nonlinear GMM.

Extensible users can enhance Gretl by writing their own functions and procedures in Gretl’s scripting language, which includes a wide range of matrix functions.

Accurate: Gretl has been thoroughly tested on several benchmarks, among which the NIST reference datasets. Internet ready Gretl can fetch materials such as databases, collections of textbook data files and add-on packages over the internet. International Gretl will produce its output in English, French, Italian, Spanish, Polish, Portuguese, German, Basque, Turkish, Russian, Albanian or Greek depending on the computer’s native language setting.

Figure 1.1
Home page of Gretl software
The above picture depicts the home page of Gretl software, an alternative software for E-views.

WEKA

Introduction to WEKA

WEKA is the acronym of Waikato Environment for Knowledge Analysis is a popular suite of machine learning software written in Java, developed at the University of Waikato, New Zealand. The WEKA suite contains a collection of visualization tools and algorithms for data analysis and predictive modeling, together with graphical user interfaces for easy access to this functionality.

The original non-Java version of WEKA was TCL/TK front-end software used to model algorithms implemented in other programming languages, plus data preprocessing utilities in C, and a make file-based system for running machine learning experiments. This Java-based version (WEKA 3) is used in many different application areas, in particular, for educational purposes and research. There are various advantages of WEKA:

- It is freely available under the General Public License
- It is portable, since it is fully implemented in the Java programming language and runs on almost any architecture
- It is a huge collection of data preprocessing and modeling techniques
- It is easy to use due to its graphical user interface

WEKA supports several standard data mining tasks, more specifically, data preprocessing, clustering, classification, regression, visualization, and feature selection. All techniques of WEKA’s software are predicated on the assumption that the data is available as a single flat file or relation, where each data point is described by a fixed number of attributes (normally, numeric or nominal attributes, but some other attribute types are also supported).