EVALUATION OF TECHNICAL ANALYSIS AS A PREDICTIVE TOOL: A STUDY ON INDIAN STOCK MARKETS

A thesis submitted to the University of Hyderabad

for the award of the degree of

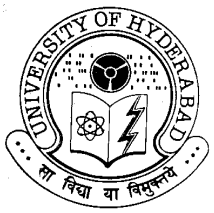
DOCTOR OF PHILOSOPHY

in

MANAGEMENT

By

AZHAR.A
(Reg. No.06MBPH04)



SCHOOL OF MANAGEMENT STUDIES

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November 2010

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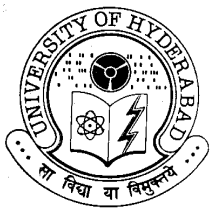

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DECLARATION

I, **Azhar. A,** hereby declare that this thesis entitled, **"Evaluation of Technical Analysis as a Predictive Tool: A Study on Indian Stock Markets"**, submitted by me under the guidance and supervision of **Dr. V. Mary Jessica**, is an original and independent research work done by me. I also declare that it has not been submitted previously in part or in full to this or any other university or institution for the award of any degree or diploma.

Place: Hyderabad AZHAR. A

Date: (Regd. No: 06MBPH04)

CERTIFICATE

This is to certify that this thesis entitled **"Evaluation of Technical Analysis as a Predictive Tool: A Study on Indian Stock Markets",** submitted by AZHAR. A, research scholar in Ph.D programme in the School of Management Studies, University of Hyderabad, is a record of *bonafide* work done under my guidance and supervision.

The thesis has not been submitted previously in part or in full to this or any other university or institution for the award of any degree or diploma.

(Dr. V. MARY JESSICA)
Research Supervisor

(Prof .V .VENKATA RAMANA)
Dean
School of Management Studies

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Azhar. A

PREFACE

The study is an attempt to evaluate the feasibility of technical analysis as predictive tool in Indian stock market. The study specifically concentrates on technical analysis and the implications of technical indicators in identifying the trend in the market. The first chapter is a general introduction to the topic. It covers the significance, hypothesis, objectives, methodology and limitation of the study. The second chapter examines the various literatures pertaining to technical analysis. However, the thrust of the focus is on general technical analysis, moving averages, relative strength index and trading volume. The third chapter discusses the theoretical foundations of technical analysis and it also discusses the efficient market theory on which the study has based. The fourth chapter focuses on the usage of technical analysis in making an investment decision, the types of analysis used, applicability of technical analysis in different kinds of market, profitability of technical analysis and different kinds of technical patterns and technical indicators for the identification trend. The fifth chapter deals with the importance of Moving Averages as tool for technical analysis as well as a tool for making an investment or trading decision. More specifically, it analyses the opinion of market participants about moving averages. The sixth chapter provides an analysis of the secondary data of moving average trading rules. The study uses five variations of simple moving averages. The study draws a comparison between the signals generated by the moving average trading rules and the buy and hold trading strategy. The seventh chapter analyses the effectiveness of relative strength index as a technical indicator, it includes both primary and secondary data analysis. The eighth chapter discusses price - volume relationships and it focuses mainly on the impact of trading volume on share price. The last chapter lists the conclusions of the research and provides certain suggestions as well.

CONTENTS

S. No	List of Figures	Page No

S. No	List of Abbreviations
1	SEBI-Securities and Exchange Board of India
2	TA-Technical Analysis
3	NSE-National Stock Exchange of India
4	BSE-Bombay Stock Exchange
5	EMH-Efficient Market Hypothesis
6	MA-Moving Averages
7	MACD-Moving Average Convergence Divergence
8	RSI-Relative Strength Index
9	A/D ratio-Advance Decline Ratio
10	DMA-Directional Moving Average
11	OBV-On Balance Volume
12	MSCI- Morgan Stanley Capital International
13	BRIC-Brazil, Russia, India and China

Chapter 1

INTRODUCTION

1.1 Introduction

Planned economic regimes have enabled many countries to attain long term growth and development. But the crisis in these country's economies has led them to reconsider the socialist nature of their economies where state acts as a central power and provides planned development strategies. The post-liberalization era has posed new challenges to the world economy, especially to the emerging economies of Asia and Latin America. Fundamental changes have taken place in the global financial system and such changes have slowly penetrated into different countries. The main reasons for this sea change are the financial institution design, policies and more importantly, the governance is not effective to meet the challenges of the 21st century.

The present financial crisis which has shaken the entire economic and financial resources of the world is a result of the lack of proper regulatory mechanism in the global financial system. Consequently, the world financial architecture has begun to focus on the stability and proper flow of capital from country to country, especially from the developing and underdeveloped countries. Stephany Griffith-Jones's comment is very important in this regard. According to him,

> It should be stressed that a development- oriented international financial architecture would benefit not only developing countries. Stable growth in these countries provides growing markets for developed- country exporters and profitable opportunities for investors.

> More generally, avoidance of crises in developing countries reduces the risk of crises spilling over to the developed economies. (82)

Indeed, unplanned and misguided implementation of policies has wreaked havoc on the financial stability of the world. So, the global financial system has to concentrate on the management of this crisis, since the crisis is an ongoing phenomenon in the world. However, the sustainability of the global financial reforms is also a matter of concern.

India is among the emerging economies of the world which is largely as a result of the Economic planning. The economic planning has been instrumental in removing backwardness, improving GDP, developing industrial base, reorienting agriculture and improving the performance of the public sector. The state policies have enhanced the Indian economy, but the implementation of policies has created a major imbalance in input and output level. Indian economy underwent structural changes in 1990-1991 and during the period the economy was passing through a tough phase. The scaling down in the Forex reserves, debt repayment problems and balance of payment deficit, etc have resulted in the decrease of the country's credit rating in international market.

The economic growth in the country suffered during the initial phase of economic liberalization. Even though India implemented liberalization policies, the state has considerable control over the economy. Before the Great depression, it was believed that liberalization meant little state control over the economic matters of the country. However, the Great depression showed that this kind of liberalization is not suitable for capitalist economies. J.M .Keynes argues that state intervention is highly

essential for the sustainable growth of economy. The Keynesian model argues that full employment is essential for the growth of capitalism and to ensure that state intervention is highly required. During the time of recession, state intervention helped many economies to bail out the problems.

As a result of the neo- liberal policies of the government of India, so many structural changes have taken place in the financial system. The Ministry of Finance and Reserve Bank of India are the two main authorities that control the financial system which also includes the securities market. The constitution of Securities Exchange Board of India (SEBI) to regulate and promote the securities market which was earlier done by the controller of capital issue is a land mark in the history of Indian financial system. SEBI is a comprehensive body covering the whole aspects of capital market. It acts as regulator as well as promoter of the capital market.

Money market is concerned with short term loans and advances and the RBI and commercial banks are the main players of this particular segment. However, the capital market includes industrial securities market, government securities market, and long term loan market and is mainly concerned with long term loan and advances. Industrial security's market is concerned with new issue market and stock exchange whereas new issue market or primary market is concerned with the new issue of financial claim but the secondary market or stock exchange is concerned with the purchasing and selling of securities already issued.

Stock market plays an important role in the functioning of any economy. It mobilizes the financial resources of individuals and businesses and channelizes them into productive purposes. Though many people invest in the market, their returns from

the market are not steady and safe. **"**Over ninety per cent of the traders who go into the market without knowledge or studies usually lose in the end", observes W. D. Gann (1951). This is largely due to the scant knowledge that people have about the functioning of stock market. Two of the major factors that control stock market are emotions and strategies. If a trader wants good returns from the market he should act without emotions, and follow certain strategies to gain from the market.

Table 1.1

Performance of BSE and NSE (Rupees in Crores)

	BSE		NSE	
Year	**Market Capitalization**	**Turnover**	**Market Capitalization**	**Turnover**
1993-94	3087923	84536	-	-
1994-95	4761482	67749	1710615	1805
1995-96	5737532	50063	4492716	67287
1996-97	5829416	124284	5130178	294503
1997-98	6370552	207646	6022696	370193
1998-99	5984128	312000	5296013	414474
1999-00	8754348	685028	8718711	839052
2000-01	8500290	1000032	9247468	1339510
2001-02	6531012	307292	6966768	513167
2002-03	7224802	314073	7398448	617989
2003-04	11526163	502618	10661885	1099535
2004-05	16640882	518716	15575638	1140071
2005-06	26846804	816074	24981438	1569556
2006-07	39097235	956185	36587267	1945285
2007-08	63051988	1578856	58743645	3551038
2008-09	47182196	1100074	44211337	2752023

Source: SEBI

1.2 Stock Exchanges and Technical Analysis

Technical Analysis is an emerging field in the forecasting sciences. It predicts the future stock price movements based on past price movements (Brock *et al*, 1992). Several forms of technical analysis have been used in the stock markets since its

inception. However, the usage of present form of technical analysis has started with the advent of Dow Theory. Technical analysis uses a wide variety of charts and indicators that show the price trend over time (Gup, 1973**).** With the advent of computer and information technologies, the use of technical analysis has increased. Market participants have different opinion about technical analysis. Most of the academic writings conclude that it has no meaning in itself **(**Fama, 1970 & Singal, 2004). However, certain studies support the validity of technical analysis in the stock market **(**Levy, 1967; Treynor & Ferguson, 1985; Neftci, 1991**).** However, as a result of the telecommunication revolution, its use has increased immensely. Technical analysis predicts patterns and trends in stock markets and also studies investors' behavior and its effect on subsequent price action of a financial instrument. This behavior is collectively called market sentiment. But it relies heavily on historical price, time, and volume information.

Hence, technical analysis concentrates on the identification of trend and criticizes the concept of Efficient Market Hypothesis. Technicians believe that information such as fundamental, psychological, political will be reflected in price and the study of price action is important in the market. According to Pring (1997),

> "prices are determined by the expectation of those already in the market and those contemplating getting in . . . .The art of technical analysis is to try to identify trend changes at an early stage and maintain an investment or trading posture until the weight of the evidence shows or proves that the trend has reversed" (42).

Technical analyst converts historical price data into chart form to understand the movement of price and thereby predict the future movement of price trend. Hence, technical analysis is also known as the science of charting and the person who prepares the charts is called chartist. Numerous technical trading rules and applications are available in the market. Technical analyst believes that there exist certain trends and patterns in the financial market that can be identified and utilized.

The history of technical analysis begins from 1700 onwards and in its inception it was extensively used by the Japanese rice traders to understand the movement in rice prices. In the beginning of the 1900s, many investors in the stock market began using technical analysis after Charles Dow's publication in the Wall Street Journal. It was Charles Dow who laid the Foundation stone for technical analysis. Later many authors researched on Technical analysis and found that it could be applied in all segments of capital market such as cash market, derivative market, bond market and tradable instrument in the stock market. However, it should be noted that the changes in prices is due to demand and supply forces. The essential thing in technical analysis is price and its trend. Hence a technical analyst should capitalize on these trends and reap the benefit out of it.

1.3 Significance

The role of technical analysis has been mired in controversies since its inception. Several studies have argued that it is not valid or useful in the market. Friedman (1953), Cootner (1964) and Fama (1966, 1970) have done some important studies on the viability of technical analysis and identified that technical analysis is futile. At the same time, studies in the 1980s and the 1990s show that some traditional

or simple forms of technical analysis have displayed a radical forecasting power. Murray (1964) explains that technical analyst can anticipate higher amount of cyclical swing in the market than that of capital market analyst. Grossman and Stiglitz (1980) have argued that since the information is costly, prices cannot perfectly reflect the available information. Brown and Jennings (1989) have argued that usage of past prices to infer private information has a value in a model in which prices are not fully revealing and traders have rational conjectures about the relation between prices and signals. Brock *et al* (1992) explain that technical trading rule can outperform the market. Blume, Easley and O' hara (1994) show that technical analysis is valuable to traders in an economy where the uncertainty arises from the underlying information structure. Murphy (1999) informs that technical analysis relies on the following three premises: a) market action discounts everything; b) Price moves in trend; and c) history repeats itself. Rodiguez, Martel, and Rivero (2000) have opined that simple technical trading rule is always superior to a buy-and-hold strategy in the absence of trading costs. Wong, Manzur and Chew (2002) observe that member firms of the stock exchange make substantial profit by applying technical indicators.

The present study is important in the contemporary era of economic liberalization which has led to a rise in the number of trading activities in the market and increased the use of technical analysis in the financial field. Moreover, the affordability of computer and internet facilities, increasing number of technical software, and the availability of technical analysis in every broking firm have increased the scope and significance of technical analysis.

Problem Defined

Though many people invest in the market, their returns from the market are not steady and safe. They use different types of analysis for their trading in the market. Technical analysis is one of the important analyses used by the market participants in every stock market in the world. However, most of the academic writings have argued that technical analysis is not effective in the market for predicting the trend. In India, both academicians and a section of investor's community have a preconceived notion that technical analysis is futile and the investors cannot predict the future price movement by using it. Moreover, most of the earlier studies have concentrated on the U.S and European and a few Asian Markets which are considered to be highly developed. Further, the studies have never concentrated on the applicability of technical trading rules in Indian Stock Market. Hence, the present study focuses on the evaluation of technical analysis in Indian stock market in general and stock specific indicators such as moving averages, relative stock index and trading volume- which are considered to be an integral part of technical analysis. The Study has set the following objectives:

1.4 Objectives:

1) To analyze the importance of technical analysis in the formulation of Trading Strategies.
2) To study the importance of Moving Averages as technical indicators
3) To verify the importance of relative strength index as a stock specific indicator
4) To verify the impact of market volume on share price

The present study concentrates on technical analysis and stock specific indicators such as Moving Averages, Relative Stock Index and Trading volume which are considered to be integral parts of technical analysis. In order to study the above objectives, the following hypotheses have been formulated

1.5 Hypothesis

H1: Technical analysis is important in the formulation of trading strategies.

H2: Moving average does play an important role as a technical indicator.

H3: Relative Strength Index does play an important role as stock specific indicator.

H4: Volume does have an effect on share prices.

1.6 Methodology

The study uses descriptive methodology. It focuses on the importance of technical analysis and its indicators such as moving averages, relative strength index and trading volume in Indian Stock Market.

Data

The data has been collected from both primary and secondary sources. The primary data has been collected through questionnaire, which includes forty four questions out of which ten are open-ended and thirty four are close ended questions. The questions specifically focus on the objectives of the study. The primary data has been collected from SEBI registered brokers but Sub brokers have been excluded from the analysis, since almost all sub brokers take recommendations from the main brokers.

Sample

The study has used stratified random sampling method for collecting sample for primary data analysis. The entire population of brokers from different stock exchanges has been stratified and the strata from Kolkata, Chennai, Mumbai and Delhi have been selected. The four metros have been taken because of three major reasons: large number of broking firms, older stock exchanges and the presence of vibrant investors and traders. In Kolkata, a sample of 112 brokers has been taken from a population of 960; In Chennai 77 have been taken from a population of 181, In Mumbai (NSE and BSE were considered), a sample of 300 has been taken from a population of 1978 and in Delhi, 95 brokers have been selected from population of 374, for seeking responses regarding technical analysis. A total number of 584 have been taken from the total population of brokers of 3493 and it constitutes 16.71% of the total population. The secondary data has been collected from the websites, Journals, Periodicals and leading National and International dailies. Price and volume data has been collected from the NSE websites.

Period of Study

The study covers a period of five years starting from 01-03-2002-03 to 31-03-2006-07. This period has been deliberately chosen because Indian market condition was almost stable then and most of the constituents of Nifty remained unchanged during this period. Prior to the introduction of SEBI, scams and price rigging activities had been prevalent in Indian Stock Market. However, after the establishment of SEBI, Stock Market in India has registered a steady Growth, though most of the reforms and developments came into effect from 2002 onwards.

Introduction of Derivative Market, Retail debt market and many other companies are coming up in the stock market to raise the finance. Most of the accounting standards came into force during 2001-02 accounting year.

Tools of Data Analysis

In order to test the hypothesis, the study has used Chi Square test and ANOVA test for primary data analysis and for secondary data analysis, the Granger Causality Test and the methodology of Brock *et al* have been applied (1992).

1.7 Chapterisation

The study is divided into nine chapters. The first chapter is a general introduction to the topic and it covers the significance, hypothesis, objectives, methodology as well as the limitations of the study. The second Chapter examines the various literatures pertaining to technical analysis. However, the main focus is on technical analysis and stock specific technical indicators such as moving averages, relative strength index and trading volume. The third Chapter discusses the theoretical foundations of technical analysis and it also discusses the efficient market theory on which the study is based. The fourth chapter analyses the importance of the usage of technical analysis in making an investment decision, the types of analysis used by brokers, applicability of technical analysis in different kinds of markets, profitability of technical analysis and the different kinds of technical patterns and technical indicators, for the identification of trend. The fifth and sixth chapters discuss moving average as a technical trading rule. The fifth chapter takes up for discussion the opinion of brokers about moving averages and the sixth chapter analyses the secondary data sources pertaining to moving averages. The seventh

chapter deals with the effectiveness of relative strength index as a technical indicator and it includes both primary and secondary data analysis. The eighth chapter discusses price- volume relationships and the mainly focus falls on the impact of trading volume on share price. The last chapter lists the conclusions of the research and extends certain suggestions as well.

1.8 Limitations

The study focuses on three major technical indicators for the analysis and has used price and trading volume information from National Stock Exchange (NSE). Selected Individual shares have been used for the analysis. Questionnaire was supplied only to SEBI registered brokers and sub brokers have been avoided. Moreover, brokers from OTCEI, ISE have been excluded from study.

Chapter2

Review of Literature

This chapter reviews the existing literature on technical analysis with a focus on general technical analysis, moving averages, relative strength index and trading volume. The studies in the twentieth century have shown that the role of technical analysis is meager in an investment analysis. However, studies in the dawn of the twentieth century have shown that technical analysis has some predictive power in the market.

Gup, B. E. (1973). A note on stock market indicators and stock prices. *The Journal of Financial and Quantitative Analysis, 8,* 673-682.

Benton E.Gup (1973) explains the relationship between stock market indicators and stock prices. Short interest ratio, odd lot ratio and mutual fund cash ratio are three indicators that he has used in the article. The index of standard and poor has been taken for the analysis. Multiple regression tests are also used to test the relationship between the chosen indicators and stock prices. The study was conducted for a period of fifteen years from 1955-1970. It has identified that stock market indicators have some predictive ability.

Sharpe, W. F. (1975). Likely gains from market timing. *Financial Analyst Journal, 4*, 60-69.

William F. Sharpe (1975) analyzes the importance of market timings to be used in the market. The study concentrates on Standard and Poor's Composite Index which is divided into three categories during 1929-1972. It compares the return from buy and holds strategy and market timings strategy. The study uses arithmetic mean, geometric mean and standard deviation for strengthening the analysis. The study has found that market timing strategy earns excess profit compared to buy and hold

strategy, especially when the market is trending upward and downward. Accurate market timing earns excess return with less variability.

Fama, E.F. & Blume, M. E. (1966), Filter rules and stock-market trading. *The Journal of Business, 39,* 226-241.

Eugene .F. Fama and Marshal .E .Blume (1966) examine the importance of mechanical trading rules and its comparison with simple buy and hold policy. Alexandrian Filter technique is used to identify the movements in stock prices. The study has used closing prices of individual securities from Dow Jones Industrial average of a period of six years, January 1956 to 1962. Twenty four different filters ranging from 0.5 percent to 50 percent are used in the study. The study finds that filter rules are not very fruitful after considering the brokerage. Filter rules cannot earn more significant return than the returns from buy and hold strategy.

Levy, R. A. (1967). Relative strength as a criterion for investment selection. *The Journal of Finance, 22,* 595-610.

Robert A. Levy (1967) examines the importance of relative strength as a criterion for investment selection. Weekly closing price of 200 stocks listed in NYSE is taken for a period of five years from 1960. Stocks which have been historically strong tend to remain relatively strong for some significant period of time. All the price series are adjusted for stock split, stock dividend and reinvestment of both cash dividend and proceeds received from sale of asset. It is important to note that 26 weeks average rate of return is more compatible in the market. The study finds that considering the relative strength is more important in the investment selection.

Zakon, A. J. & Pennypacker, J .C. (1968). An analysis of the advance-decline line as a stock market indicator. *The Journal of Financial and Quantitative Analysis, 3,* 299-314.

Alan J. Zakon and James C.Pennypacker (1968) explain the importance of Advance-Decline line as a stock market indicator. The data have been taken from Standard and

Poor's index for the period 1963-1967. Simple regression model is used for the analysis. The study argues that there is a significant relationship between the Advance Decline line and Standard and Poor's Composite Index. Advance-Decline line helps to predict not only the major peaks of the market average but also the day to day variations.

James, F.E. Jr. (1968). Monthly moving average—an effective investment tool? *Journal of Financial and Quantitative Ananalysis, 3,* 315-326.

F.E. James, Jr. (1968) analyses the moving average tool as a stock investment strategy. It is considered to be one of the important tools which can predict the future price movement and act as an aid to minimize the losses. The data are taken from New York stock exchange for the period 1926-1960. Moving average has been studied with different length and weight. The study concentrates only on monthly moving averages. In the analysis, Very few of the decision rules beat the simple buy and hold philosophy but in general, it is found that monthly moving average is not an effective tool in predicting the future price movement**.**

Van Horne, J. C. & Parker, G.G.C. (1968). Technical trading rules: A comment. *Financial Analyst Journal, 24,* 128-132.

James C. Van Horne and George G.C. Parker (1968) describe technical trading rule especially, moving average rule. The study analyzes weighted moving average trading rule. It compares weighted moving average and non weighted moving average and finds that both moving averages are not fruitful in predicting the future price movements. The study also finds that the assigning weight to the recent price is not worth while in predicting the future price movement. The study concludes that there is randomness in the stock prices so that the technical trading rules can not predict from the market.

Branch, B. (1976). The predictive power of stock market indicators. *The Journal of Financial and Quantitative Analysis, 11*, 269-285.

Ben Branch (1976) analyses the predictive content of stock market indicators. The study uses mood indicators such as total odd lot short ratio, short selling by floor traders, a composite price earning ratio, Barron's confidence index and other fundamental indicators such as short selling, secondary distribution, mutual fund cash position, the treasury bill rate, the rate of growth of money supply and inflation rate. Multiple regressions are used to test the stated objective of the study during 1960 - 1974. The study claims that there is a significant relationship between some of the market indicators and subsequent stock market performance.

Treynor, J .L. & Ferguson, R. (1985). In defense of technical analysis. *Journal of Finance, 40,* 775-773.

Jack L.Treynor and Robert Ferguson (1985) examine the importance of past market information to make realistic assessment of the likelihood of happening in the market. Bayesian probability approach is used in the study to show how the probability distribution can be brought to bear on the management of a portfolio. The study shows that past price when combined with other valuable information can be helpful in achieving unusual profit. However, it is the non price information that creates the opportunity. The past price serves only to permit its efficient exploitation.

Schachter, B. (1985). Open interest and consensus among investors. *Journal of Accounting Research, 2*, 907-910.

Barry Schachter (1985) examines the effect of open interest on the consensus of the investors. A specialized model is used to analyze the consensus contained in open interest. Volume and open interest are closely related, any meager change in open interest results in a change in volume also. But the study, using the specialized model shows that open interest cannot be related to the consensus of investors. But in some

special situation or cases open interest has an impact on the consensus of the investors. But in general cases, open interest does not have any effect on the consensus of the investors. Hence, in most of the emerging markets, open interest has a considerable impact or it is used as a crucial variable for the analysis of securities because open interest in securities closely relates to the volume in that security.

Brown, D. P. & Jennings R. H. (1989). On technical analysis. *The Review of Financial Studies, 2,* 527-551.

BROWN, D.P. and R.H. JENNINGS, (1989) explain the importance of technical analysis or the use of past prices to deduce private information. It has value in a model in which prices are not fully revealing and traders have rational supposition about the relationship between prices and signals. A two period noisy rational expectation model is used to express the use of historical price by the rational investors. The study finds that technical analysis has value in every prejudiced market environment.

Neftci, S. N. (1991). Naive trading rules in financial markets and wiener-kolmogorov prediction theory: A study of "technical analysis". *The Journal of Business, 64,* 549-571.

Salih.N.Neftci (1991) examines the importance of technical analysis in knowing if there is any objective basis to the popularity of technical methods. It compares Wiener-Kolmogorov Prediction theory and technical analysis. The study uses vector auto regression to predict the Wiener-Kolmogorov theory. This provides the optimal linear forecasts. This study is divided into two segments: in the initial phase, it tries to define the formal algorithm to explain the various kinds of technical analysis rules. In the second phase, it discusses the unexploited properties of stock price left by the wiener –kolmogorov theory. The study concludes that technical trading rules can predict the market better than prediction through Vector auto regression.

Blume, L., Easley, D. & O'Hara, M. (1994). Market statistics and technical analysis: The role of volume. ***Journal of Finance, 49,*****153-181.**

Lawrence Blume, David Easley and Maureen O' hara (1994) Show the informational position of volume and its appropriateness in technical analysis. The major objective of the study is to see how volume information and price movements relate to each other and how technical analysis is valuable to traders in an economy where the only uncertainty arises from the underlying information structure. The study uses alternative equilibrium model for the purpose the study where volume plays an important role in providing information to traders. The study argues that volume contains information which is useful in predicting the future price movements and thereby the volume analysis provides a useful insight to the uninformed traders to interpret the market situation.

Balsara, N., Carlson, K. & Rao, N. V. (1996). Unsystematic futures profits with technical trading rules: A case for flexibility. ***Journal of Financial and Strategic Decisions, 9,*** **57-66.**

Nauzer Balsara, Kathleen Carlson and Narendar V. Rao (1996) evaluate the superiority of mechanical trading rule over simple buy and hold strategy. The study is based on historical futures price data of different commodities and periods. The dual moving average rule is used in this study. Gold, Treasury bond, Soybean and Japanese yen are the commodities used for the study. The study was conducted for a period of eight years, starting from 1979 to 1987. The study observes that mechanical trading rules have shown profitability during the period of the study. Flexible systems are the key to success in any technical trading program in the future market.

Hudson, R., Dempsey, M. & Keasey, K. (1996). A note on the weak form efficiency of capital market: The application of simple technical trading rules to U.K stock prices-1935 to 1994. ***Journal of Banking and Finance, 20, 1121*****-1132.**

Robert Hudson, Michael Dempsey and Kevin Keasey (1996) explain the predictive ability of technical trading rules. The main objective of this paper is to understand

whether an investors can generate excess return by using technical analysis in a costly environment. The data is taken from Financial times Industrial ordinary Index, which is the longest daily series available in the U.K from July 1935 to January 1994. The study uses the two important technical trading rules; moving average and trading range break out rules. The study argues that technical trading rules have a predictive power. But after considering the transaction cost it does not show any significant profitability.

Antoniou, A., Ergul, N., Holmes, P. & Priestley, R. (1997). Technical analysis, trading volume and market efficiency: Evidence from an emerging market. *Applied Financial Economics, 7,* 361-365.

A, Antoniou, N.Ergul, P.Holmes and R.Priestley(1997) provide a clear linkage among technical analysis, trading volume and market efficiency. Technical analyst believes that the history of past prices reflects the information on future price movement. Technical analysis is a pervasive activity and it can be seen in all levels of market analysis. This apparent paradox is analyzed by considering the past prices and volume. The study observes that volume contains useful information regarding the market movement and technical analysis must take a note of trading volume while making an investment decision.

Tan, C. L. & Poh, Yao, J., H.L. (1999). Neural networks for technical analysis: A study on KLCI. *International Journal of Theoretical and Applied Finance, 2,221-*241.

Jingtao Yao, Chew Lim Tan and Hean-Lee Poh (1999) explain the applicability of Artificial Neural Network with technical analysis in forecasting share prices. The study is based on Kuala Lumpur Composite Index for a period of seven years starting from 1984-1991. Moving average, momentum, Relative strength index, Stochastic and moving average of stochastic are the main technical indicators used as inputs in this study. Significant profits were generated by using Artificial Neural Networks on

daily data but weekly data do not produce any significant profit. It also concludes that useful prediction is also made without extensive market data and market knowledge.

Li, J. & Tsang E. P. K. (1999). Improving technical analysis prediction: An application of genetic programming. Proceedings, Florida artificial Intelligence Research Symposium, USA.

Jin Li and Edward P.K Tsang (1999) explore the potential predictive power of technical analysis based on the financial genetic programming. The study is based on Dow Jones industrial average for the period 1969-1976. Financial genetic programming uses the power of genetic programming to generate decision tree through efficient combination of technical rules with self adjusted threshold. The generated problems are more suitable for the prediction of problem at the hand. The study argues that the technique outperforms commonly used, non adaptive individual trading rules. So the study informs that application of genetic programming improves the predictive power of technical analysis compared to individual trading rules

Lo, A. W., Mamaysky, H. & Wang, J. (2000). Foundations of technical analysis: Computational algorithms, statistical inference, and empirical implementation. *Journal of Finance, 55,* 1705-1765.

Andrew W. Lo, Harry Mamaysky and Jiang Wang (2000) explain a systematic and automatic approach to technical pattern recognition by using non parametric kernel regression. U.S based securities are taken for 34 years from 1962-1996 to evaluate the effectiveness of technical analysis. The study concludes that technical analysis can be improved by using automated algorithm. Although, human judgment is still superior to most computational algorithms in the area of visual pattern recognition, technical analysis may well be the next frontier for such methods.

Rodriguez, F.C. F., Martel, G. & Rivero, S. S. (2000). On the profitability of technical trading rules based on artificial neural networks: Evidence from the Madrid stock market. *Economics Letter, 69*, 89–94.

Fernandez-Rodriguez, F.C. Gonzalez-Martel and S. Sosvilla-Rivero(2000) investigate the profitability of a simple technical trading rule based on Artificial Neural Networks (ANNs). The study uses General Index of the Madrid Stock Market for the analysis. The study argues that in absence of trading costs, the technical trading rule is always superior to a buy-and-hold strategy for both bear and stable markets. However, the buy-and-hold strategy generates higher returns than the trading rule based on ANN only for bull market.

Atmeh, M. A. & Dobbs, L. M. (2001). Technical analysis and the stochastic properties of the Jordanian stock market index return. Retrieved from the web October 1, 2008. http://www.staff.ncl.ac.uk/i.m.dobbs/Files/Jordan.pdf.

Muhannad A.Atmeh and Lan M.Dobbs (2001) examine the moving average trading rules in the stock market. Daily General Index of Amman stock Exchange is used for the period 1992-2001. Various moving average trading strategies are examined on the basis of returns. The study finds that technical trading rules can predict the market and short selling rules are also profitable after considering the transaction cost. The study is not concerned with the other technical analysis trading rules.

Fang, Y. & Xu, D. (2002). The predictability of asset returns: An approach combining technical analysis and time series forecasts. *International Journal of Forecasting, 1*, 1-19.

Yue Fang and Daming Xu (2002) explain the way in which one can develop trading strategies which combines technical analysis and time series forecast. Most of the earlier works have studied the technical trading rules and time series models in isolation. The study is based on Dow Jones Industrial average, transportation average and utility average for a period of 100 years starting from 1896 to1996. The study

observes that trading strategies combining both technical analysis and time series forecast yield better return than that of time series model.

Wang, J. (2002). Trading volume and asset price. *Annals of Economics and Finance, 3,* 299-359.

Jiang Wang (2002) brings out the relationship between price and volume. Price and volume are the two important variables for the analysis of market operation. The behavior of volume is closely related with the behavior of price through which investors can learn great a great deal about price as well as the economic fundamentals. The empirical analysis shows that the hedging portfolio has a considerable forecasting power in predicting the future returns of market portfolio. The study shows the link between economic fundamentals and the dynamic properties of asset returns and volume. Interaction between price and quantities in equilibrium earns an ample set of implication for any asset pricing model.

Kavajecz, K. A. & Odders-White. E. R. (2004). Technical Analysis and Liquidity provision. *Review of Financial Studies, 17,* 1043-1071.

Kenneth A. Kavajecz and Elizabeth. R .Odders-White (2004) examine the relationship between liquidity provision and technical analysis. The study suggests that technical analysis, support or resistance level as well as moving average indicators are significantly relates to the state of liquidity on the limit order book. NYSE data is taken for the period July to September 1997. A good amount of people in the investment industry are dedicated to technical analysis and most of the investment institutions and trading firms are using some form of technical trading strategies. The study concludes that limit order book liquidity measures have some predictive power for the future returns.

Ming, M. L., Nor, M. F.&Guru K. B.(1999). Technical analysis in the Malaysian stock market: An empirical evidence. Retrieved from web on October 1, 2008. http://www.departments.bucknell.edu/management/apfa/Dundee%20Papers/25Lai.pdf.

Lai Ming Ming,Fauzias Mat Nor and Blachandher Krishnan Guru(1999) analyse the moving average indicator and trading range break out rules on Malaysian stock market by reproducing the frame work of Brock et al. The study is conducted for the period 1977-1999 on Kuala Lumpur composite stock index. The study reveals that moving average rule generates extra return even in the presence of transaction cost. The study is concentrated only on moving average rule of technical analysis.

Freud, W. C., Larrain, M. & Pagano, M. S. (1997). Market efficiency before and after the introduction of electronic trading at the Toronto stock exchange. *Review of Financial Economics, 6*, 29-56.

William C. Freud, Maurice Larrain and Michael S. Pagano (1997) examine the efficiency of market before and after the introduction of electronic trading in the Toronto stock exchange. The study uses the rescaled range analysis to test the market efficiency. The study also uses the moving average rules and trading range break out and compared with the buy and hold strategy to test the market efficiency. The study finds that the technical trading rules cannot exploit the market and the automation does not change the degree of market efficiency.

Ming, L. M., Hwa, L. S. (2006). The profitability of simple moving averages and trading range break out in the Asian stock markets, *Journal of Asian Economics, 17,144*-170.

Lai Ming-Ming, Lau Siok-Hwa (2006) examine the profitability of simple moving average and trading range breakouts rules in the nine Asian stock indices. The aggregate result shows that the moving average rules are economically and statistically significant. Sixty and twenty days moving averages are considered to be the most profitable trading rules. Further, the study compares the fixed moving

average with the variable moving average and found that the variable moving average rules is profitable.

Groenewold, N., Tang, S. H. K. & Wu, Y. (2008). The profitability of regression based Trading Rules for the Shanghai Stock market. *International Review of Financial* Analysis, 17, 411-430.

Nicolaas Groenewold,Sam Hak Kan Tang and Yanrui Wu (2008) examine the profitability of regression based trading rules. The study analyzes the index of shares prices of shanghai stock market for the period 1992-2001. Most of the papers deal with mechanical trading rules rather than the technical trading rules based on regression or econometric forecasting equation and the statistical test were also carried out to test the significance of the return. The study has found that the portfolios based on the trading rules substantially outperform the buy and hold strategy.

Nam, K., Washer, K. M. & Chu, Q. C. (2005). Asymmetric return dynamics and technical trading strategies. *Journal of Banking and Finance, 29,* 391-418.

Kiseok Nam, Kenneth M.Washer and Quentin C.Chu (2005) examine the profitability of technical trading strategies by identifying the asymmetric dynamic process of stock returns. The daily return series of S&P 500 market index from 1/3/1929 to 31/12/1998 is used in the study. The study concludes that the asymmetry in the return is the main causes of profitability of trading strategies. The market professionals cannot negate the usefulness of technical trading strategies in the stock market investment.

Kim, O. & Verrecchia, R.E.(1981). Trading volume and price reactions to public announcements. *Journal of Accounting Research, 29,* 302-321.

Oliver Kim and Robert .E. Verrecchia (1991**)** bring out the relationship between volume reaction and consensus of investors. Absence of reaction on volume to the release of piece of information implies that there is a total consensus among the investors. Along with the price changes, volume shows the agreement or

disagreement on a newly released piece of information. The study has made an important distinction between the price and volume test, former shows the changes in expectation of market as a whole but later shows the changes in expectation of individual investors. Volume reaction does not provide the complete information on the consensus of the investors but by combining both price and volume reaction, still able to measure the change in expectation of the investors.

Basci, E., Ozyildirim, S. & Aydogan, K. (1996). A note on price- volume dynamics in an emerging stock market. ***Journal of banking and Finance, 20,*** **389-400.**

Erdem Basci, Suheyla Ozyildirim,KurathAydogan(1996) examine the relationship between share price and trading volume within the context of risk neutral agents having heterogeneous expectations and certain institutional restriction like prohibition of short sales limitations on margin trade and regulatory limits on daily price changes on Istanbull stock exchange. The study suggests that there exists a long term relationship (co integration) between price and trading volume. Moreover, the error correction model was also found significant in most cases.

Assogbavi, T., Jennifer, S., & Fagnisse, S. (2007), Equity price-volume relationships on the Russian stock exchange. ***International Business& Economic Research Journal, 6,*** **107-116.**

Tov Assogbavi, Jennifer Schell and Simeon Fagnisse (2007) show the relationship between the price and volume in the Russian Exchange. The study is based on weekly data using vector auto regression. The study found a strong support for the bi-directional causality between volume and price changes. Investors who follow the momentum investment strategy have to readjust their trading strategies while trading in the market. The operational structure of Russian stock market prevents the investors to react towards the new information.

Kamath, R. R. (2008). The price volume relationship in the Chilean stock market. ***International Business& Economic Research Journal, 7,*** **7-14.**

Ravindra R. Kamath (2008) examines the price volume relationship in the Chilean stock market. The study uses the selective price index of Santiago stock exchange of Chile for a period ranging from January 2003 to October 2006. The study argues that there is a contemporaneous relationship between the price and volume and the causality test shows the clear evidence that returns granger causing the trading volume in the Chilean equity market. The evidence also indicate that trading volume makes the market move foreword.

Lo, A. W. & Wang, J. (2000). Trading volume: Definitions, data analysis, and implication of portfolio theory. ***The Review of Financial Studies, 13,*** **257-300.**

Andrew W. Lo and Jiang Wang (2000) explain the importance of volume as a determining factor in the equity market. The study analyses the cross sectional variations in volume as well as variation in the trading activity from one stock to another. The study analyzes the CAPM and ICAPM models for a period ranging from 1962-1996 across the thousands of securities. It also gives the importance of heuristic models which include technical analysis, market psychology and trading folklore. The Study identified that volume contains information regarding the price movements and informal expiations of volume may not be based on fully articulated economic models.

Pisedtasalasai, A. & Gunasekarage, A. (2007). Causal and dynamic relationships among stock returns return volatility and trading volume: Evidence from emerging markets in south-east Asia. ***Asia-Pacific Finan Markets, 14,*** **277–297.**

Anirut Pisedtasalasai and AbeyratanaGunasekarage(2007) investigate the casual and dynamic relationship among the stock returns, volatility and trading volume in five emerging stock market, which include Indonesia, Malaysia, Philiphines, Singapore and Thailand. The Study was conducted for a period ranging from January 1990 to

December 2004 based on the equity market data of five countries. The study used VAR model and EGARCH model to understand the nexus of return, volatility and trading volume. The study found that returns can predict the trading volume in the four markets but in one market trading volume can predict the stock return.

Moosa, A. I. & AL-Loughni, N. E. (1995). Testing the price-volume relation in emerging Asian stock markets. *Journal of Asian Economics, 6,* 407-422.

Imad A. Moosa, and Nabeel E. AL-Loughni (1995) focus on the price volume relationship in the emerging Asian stock market which include Malaysia, Philiphines, Singapore and Thailand for period ranging from January 1986 to December 1993. The study shows that there is a casual relationship existing between volume to price and not price to volume. There exists a lagged relationship between price and volume in the market .it means volume contain information regarding the price movement moreover Institutional, organizational and structural factors affects the price volume relation.

Ciner, C. (2002). Information content of volume: An investigation of Tokyo commodity futures market. *Pacific- Basin Finance Journal, 10,* 201- 215.

Cetin Ciner (2002) studies the relationship between the volume and price changes of Tokyo commodity futures Markets. The study mainly concentrates on the predictive power of volume of gold, platinum and rubber futures contract traded for a period ranging from January 1992 to September 2000. Granger causality test is used within the context of VAR model. The study shows that volume contains the information to predict the future price movements. It also indicates that trading volume is less informative in periodic call market.

Chen, S.W. (2008). Untangling the nexus of stock price and trading volume: Evidence from the Chinese stock market. *Economics Bulletin, 7,* 1-16.

Shyh- wei Chen.(2008) examines the existence of linear and non linear casual relationship between price and volume in the Chinese market. The study uses the

weekly price data of Shanghai A share and Shanghai B share for a period ranging from 1993 to 2006. The study uses the bound test procedure based on the estimation of the autoregressive distributed lag and non linear causality test are also employed for the analysis. The study has found that there is a long term relationships between the share price and trading volume. As per linear causality test unidirectional causality exists from price to volume and in non linear causality shows that there is bidirectional relationship between price and volume.

Ratner, M. & Leal, R. P.C. (1998).Test of technical trading strategies in emerging equity markets of latin America and Asia. *Journal of Banking & Finance, 23,* 1887-1905.

Mitchell Ratner and Ricardo P.C. Leal (1998) show the profitability of technical trading strategies in the emerging equity markets in Asia and Latin America. The study includes ten equity markets, which includes Argentina, Brazil, Chile, Mexico, India, Korea, Malaysia, Philippines, Taiwan and Thailand. The study uses the daily inflation adjusted returns for a period of thirteen years starting from 1982. The study analyses ten different variable moving average models and compares them with the buy and hold strategy. The study argues that technical trading rules are profitable only in three emerging markets, Taiwan Mexico and Thailand. Technical trading strategies do not show any significant profitability in other markets, especially after considering the transaction costs.

Books

Murphy, J. J. (1991). *Inter market technical analysis*. New York: John Wiley and Sons.

John J Murphy (1991) evaluate the inter market relationship of currency market, bond market, commodity market and stock market. It does not replace the other technical work but simply adds another dimension to it. It also furnishes various leading and lagging technical indicators and its effect in the inter market analysis. This book

presents a broad view of how market relates to each other. There are infinite number of relationship exist between the market. Greater contribution made by inter market analysis is that it improves the technical analyst peripheral trading vision .Inter market analysis can be applied to all market every where in the market.

Chande, S. Tushar. (1997). ***Beyond technical analysis: How to develop and implement a winning trading system.*** **New York: John Wiley and Sons.**

Tushar S. Chande. (1997) tries to bridge the gap between analyses and trading. It provides new innovative ideas, time factor and practical guidelines to help the trading system. This books consist of two parts; the first parts deals with how the system worked on past data, discuss the basic rules, key issues and many new systems. The second part deals with how the system might do in future. Further this book also deals with a new concept called data scrambling, which allows unlimited amount of synthetic data to be generated for true out of sample testing. It also provides complete solution to all problems relating to the implementation of good trading system.

Murphy, J. J. (1999). ***Technical analysis of financial market.*** **New York: Institute of Finance.**

John. J Murphy (1999) explains the philosophy of technical analysis. It compiles the old and new technique of technical analysis. It describes the various technical indictors like moving average, relative strength index, Dow theory, Candlestick approach, wave theory and point and figure charts. It also shows how technical principles are being used in the all most all financial market. Further, it explains advance technical indicators and shows how to build a technical trading system. The study has clearly examined the basic premises of technical analysis, different dimensions of market timing and it also shows how it is different from fundamental analysis.

Wood, S. (2002). *Float analysis, powerful technical indicators using price and volume*. New York: John Wiley and Sons.

Steve Wood (2002) examines the float analysis to study the technical behaviour of stock. It is the new field of study in technical stock research because it treats the stock in simple and holistic way. Traditional charts shows only two third of the stocks true picture. The float is the missing third. Price, volume and number of shares actually traded in the market are constituents of float analysis. It is a powerful tool to anticipate further movement in stock prices. Float analysis elucidate several technical terms such as bottom and top, support and resistance and accumulation and distribution.

Paulos, A. J. (2002). A mathematician plays the stock market. New York, USA: Basic Books.

John Allen Paulos (2002) explains the various pedagogical aspects of stock market. It deals with emotional overreaction and various aspects of behavioral finance. It specifies various aspects of moving averages, support and resistance, predictability and trend and strategies. It also explicates the concept of value investing and fundamental analysis, option and risk, volatility and diversifies the stock portfolios. It also shows various dimensions of insider trading, chaos and unpredictability prevailing in the market. Most of the stock picking techniques and strategies that appears to be mathematical. It should be noted that both mathematical and psychological aspects of trading is essential and clubbed together in the market.

Stevens, L. (2002). *Essential technical analysis,* New York, USA: John Wiley &Sons.

Leigh Stevens (2002) investigates about the processing of market information and profit. This book mainly deals with the tools and techniques of technical analysis. It also shows how to find good stocks at lowest risk enter and exist strategies, less used

technical tools and techniques, which might be marginal for most of the people in terms of improving trading and investment decision. The study shows that person's emotional temperament, work nature, habit and ability to see ahead are more important in technical analysis. It criticizes the idea of using high complex mathematical formula to make better investment decision.

Literatures mentioned above describe the role of technical analysis, especially, technical indicators such as moving averages, relative strength index and trading volume- in the stock market. Profitability of regression based trading rules, comparison of technical trading rules with buy and hold strategy are also mentioned in these literatures. However, most of these academic writings argue that for predicting the trend in the market technical analysis is ineffective. Most importantly, a large number of earlier studies are based on the U.S and European, and a few on Asian Markets which are considered to be highly developed. However, in India the application of technical analysis was perceived to be futile in Indian market and it cannot be used to predict the future price movements. Resultantly, none of the studies have focused on the applicability of technical trading rules in Indian Stock Market. Hence, the present study moves away from foreign markets and provides an evaluation of technical analysis as a predictive tool in Indian stock market.

Chapter 3

THEORETICAL FOUNDATION OF TECHNICAL ANALYSIS

3.1 Introduction

It is essential for an astute trader to be aware of out the market and its movement. To analyze the market and its price movements, especially past price movement, the best way is to put it into graphical presentations that will improve understandability and make analysis easy. If it is numbers, the analysis will be a tedious and difficult. In Financial Market, fundamental analysis and Technical analysis are two schools of thought used to make an active investment decision. Fundamental analysis concentrates on the real or intrinsic value of the security. Hence, it keeps a track of corporate results, trade deficit, changes in money supply etc. It analyzes the causes of price rise or fall. On the other hand, technical analysis is based on past price movement to predict the future price movement. It does not study the causes of price movement but it considers the effect of price movement.

For the successful participation in the financial market the trader should have some basic knowledge about charting techniques. Charting is the process of plotting the price of a security in the chart over a period of time. It is highly useful for forecasting the security price movement and market timing decision which are highly useful for short term traders to track the minor price movement. Technical analysis is often referred to as charting techniques. It uses historic price pattern of securities or financial instrument to predict the future price movement. Furthermore, technical analysis has a common set of principles and rules. The fundamental analysis concentrates mainly on the true value of the security and it is closely related with the

classical economic theory, which stipulates that the price will move in the direction to eliminate the discrepancy between the current price and the true value. According to fundamental analysis, the current price alone does not reflect the future benefit.

3.2 Definition

"Technical analysis is the study of market action, primarily through the use of chart, for the purpose of forecasting future price trend"- John. J .Murphy

Price series is one of the important components in the technical analysis. However, along with price series, the technicians now consider both volume and open interest. Another important aspect with regard to charting is its analysis. A technical analyst can easily analyze the facts and figures in the charts and earn better profit without analyzing the fundamental situation of particular security. It can give fundamental analyst a clue to the future events in the market. So it acts as a leading indicator in the market.

Manuel Ammann, Mathas and Rico Von wyes (2005) think that fundamental analysis and technical analysis are the two important analyses used in financial market. As per various studies, technical analysis is equally important in every investment analysis. Allen & Taylor (1990) indicate that around 90% of the traders at the London foreign exchange market use chatting techniques on a large scale and 60% of the traders consider technical analysis as equally valuable as fundamental analysis. Technical analysis is usually called "Voodoo finance" by fundamental analysis. Subjectivity is the main criticism against technical analysis trading rule. An active

portfolio manager who uses technical analysis performs better than a passive portfolio manager.[1]

Caginalp and Balenovich (2003) argues that "the dissemination of information and reassessment of value is a slow process which may be overshadowed by the sellers of under valued securities who are either unaware of true value and hesitate to relay on the optimizing behavior of others and are attempting to limited losses. The direction of the price movement is only due to the demand and supply forces of the financial instrument". Therefore, there is a close linkage between technical analysis and inefficiency of the market. The immense use of technical analysis in the market in contradiction to classical economic theory is posing a serious question to mathematical economics.

3.3 Efficient Market Hypothesis

The phrase 'Efficient Market Hypothesis' was first introduced by Louis Bachelier, a French Mathematician. The concept of Efficient Market Hypothesis is introduced by Eugene Fama in 1960s. According to Fama, an active market consists of intelligent and well informed investors. So, the price reflects all the available information. The theory points out that if a market is efficient, no analysis can outperform the market. According to Efficient Market Hypothesis, all the available information is reflected in the price. So every stock trades in the market are at their fair value and nobody can purchase undervalued share or stock and sell it for higher price. The theory says that it is impossible for an investor to outperform the market with market timings and expert stock selection. Securities will be appropriately priced

[1] Manuel Ammann, Mathas and Rico Von wyes(2005)Out performance with technical analysis-An intraday study on the Swiss stock Market,Swiss Institute for Banking and Finance

and it will reflect all available information. If a market is efficient, no information or analysis can be expected to result in the outperformance of an appropriate benchmark. However, the present study focuses on technical analysis which concentrates the on past price statistics and contradicts random walk theory. It argues that past price contains information which can predict the future price movements in the share market.

3.4 Basic Principles

Principles are the law or doctrine to be followed. Basic principles always act as a corner stone of technical analysis since the concept is built upon them. Price discounts information, price moves in trend and history repeats are the three basic principles of technical analysis and they form the inevitable law or doctrine of technical analysis.

3.4.1 Price Discounts Every Information

It is one of the basic premises of technical analysis. The major criticism of technical analysis is that it never considers fundamental information about stock or index. According to this principle, any information, whether it be political, economical or psychological is reflected in price. Technical analyst believes that changes in price are due to changes in demand and supply. If the demand exceeds the supply, the price will go up. If the supply exceeds the demand, the price will go down.

3.4.2 Price moves in Trend

According to technical analyst, the price of the security or index always moves in trend, the trend may be upward, downward or sideways. Technical analyst always concentrates on identification of trend and trading based on the same. Trend identification will become a difficult task unless the person has some basic

understanding of the market. It is an adaptation of Newton's first law of motion. So a trend is more likely to continue than reverse.

3.4.3 History repeats

Human psychology plays an important role in the direction of the market though it changes from time to time in the market environment. Technical analysis use chart patterns to realize the market and identify the direction of the market. Technical analyst believes that certain patterns and trend that worked in the past will continue in future as well. The key to understand the future lies in the study of the past and the future is the repetition of the past.

3.5 Difference between Technical Analysis and Fundamental Analysis

a) Technical analysis is an internal analysis. It analyzes the market price, Volume and its movement. However, fundamental analysis is external which analyzes the economic, industry, company and political factors.

b) The focus of technical analysis is to identify the changes in the direction of stock price and move along with the trend. The fundamental analysis focuses mainly on finding the intrinsic value of the particular scrip, which is very difficult to find out in the practical market. Generally, crowd psychology designs the price and its direction.

c) Technician attempt to assess the over all situation regarding the stock by analyzing market sentiments and momentum. However, fundamental analysis is never concerned about the market sentiments, where people never considered the different factors affecting the price.

3.6 Elasticity and compliance of Technical Analysis

The formalized history of Technical analysis began with Charles. S. Dow. Dow theory is a barometer which helps to anticipate future price movements. The success of Dow theory lies in trader's ability to interpret. According to Dow theory, market has three types of movements: primary movements, secondary movements and minor movements. The primary movements are the major trends which may last for several years and they are either bearish or bullish. The secondary movements are the corrective movements which always move in the opposite direction of the primary movements. Minor movements are the day to day fluctuations in the market. Moreover, the theory classifies market trend into three different forms; a) accumulation phase, b) public participation phase and c) distribution phase. Hence, Dow theory explains the movements of the price as well as the market reaction or market philosophy. Technical analysis was first used in equity market to track future price movements

Technical analysis is applicable to every areas of trading like stock trading, future trading, commodity trading and currency trading. The traders can earn better return if they follow the tools and techniques of technical analysis. It is more useful in a trending market than in a non trending market. The signals generated by the technical indicators may go wrong in side ways market but the signal generated by the technical indicators in a trending market shows a better return. Technical analyst can easily follow as many markets as they desire.

3.7 Technical Analysis and Forecasting

Technical Analysis can play an important role in the forecast price and a technical analyst uses charts to understand the direction of the market. By seeing the direction on the chart, the technicians can easily understand the movement of economic indicators. Price of the commodity, crude oil, Treasury bond etc can easily be shown in a chart and forecast the trend of the market. By seeing the price chart of various commodities and crude oil one can easily forecast the inflationary pressure in the economy. So a technical analyst can show trend in these markets earlier than the traditional indicator that is published quarterly or monthly.

3.8 Technical Analyst & Types

Technical analyst is known by different names such as chartist, market analyst, Visual analyst etc. Technical analysts can be broadly classified into two: a) Traditional Chartists and b) Statistical Technicians.

3.8.1 Traditional Chartists

These are the market practitioners, who use charts as a primary tool to understand the market. Charting is a highly subjective approach and the success of this approach is highly dependent on the skill and experience of the practitioner in the market. Basically, reading of chart is an art rather than a science.

3.8.2 Statistical Technicians

Statistical Technicians are the market practitioners who use mechanical trading system to generate buy or sell signals. By using computer programming, these practitioners completely eliminate the subjective human elements in trading.

Generally, they may or may not use price charts but consider market action for better trading decision. These people are further classified into two: those who use mechanical computer trading system and those who use computer technology for developing better indicators. It should be noted that all the chartists are technicians but all the technicians are not chartists. Moreover, charting is just one area of technical analysis.

Past Information is highly essential in economic forecasting. In technical analysis, predicting the future price trend is based on past price series. So both technical analysis and economic analysis are related in certain aspects. In broader term, charting is related to time series analysis because both use past price information to predict the future price. This is also related to statistics. Price chart comes under the descriptive statistics and drawing inferences based on that is called intuitive statistics.

3.9 Types of Charts

Charts are the basic tools of technical analysis and they show the graphical representation of past price and volume information. Charts can be classified into four broad categories: Line Charts, Bar charts, Candlestick Charts and Point and figure charts.

3.9.1 Line Charts

Line charts are simple forms of price charts. It is based on closing price data. However, some technicians use median price as well. A straight line is used to connect all the closing price points plotted in the graph. It does not show any open,

high, low and close price together. This type charts are unambiguous and shows a clear trend. Short term traders are not profited by these charts but patient players can earn better return by using line charts.

Fig.3.1. Line Chart, www.investopedia.com

3.9.2 Bar Charts

Bar chart is investor's favorite and it is as explanatory as the technical analyst. This chart contains the highest, lowest and closing price of the securities. A bar is formed by connecting the highest price and the lowest price in a day by a vertical line. A small horizontal line on the vertical line indicates the closing price. The top of the bar indicates the highest price and bottom of the bar indicates the lowest price. In modern times, bar chart also shows the open price by drawing a horizontal mark on the high low bar. Now most of the bar charts incorporate the technical indicators on the Bar. New bar charts are displayed with Indicators, volume, open interest and other technical tools.

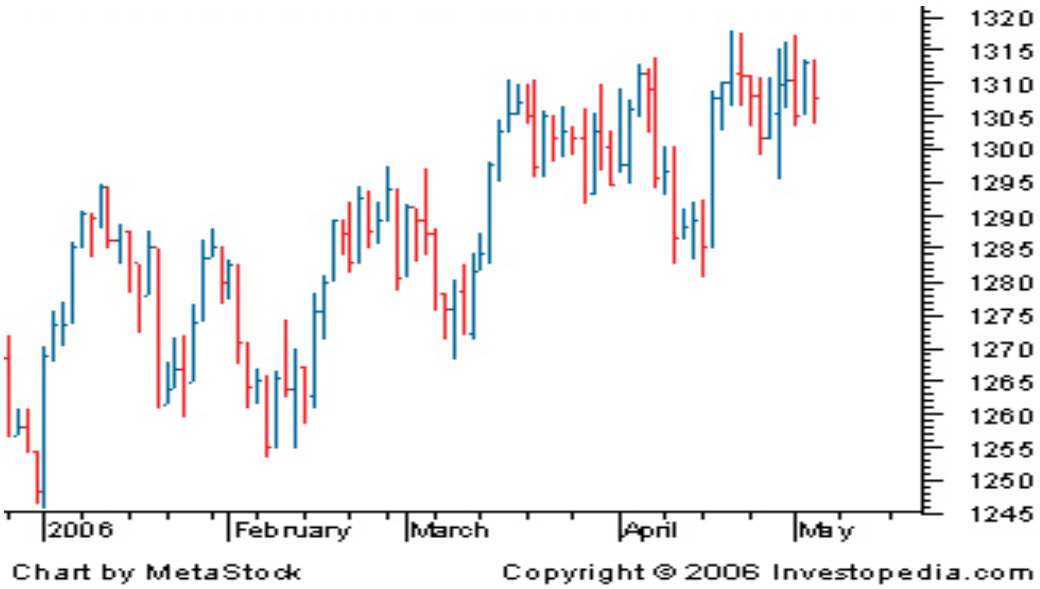


Fig.3.2. Bar Chart, www.investopedia.com

3.9.3 Japanese Candlestick Charts

Just as standard bar charts, candlestick charts too show the open, close, high and low prices of a security. The highest price and the lowest price are connected by a straight line and the opening and closing price would be recommended by a rectangle .So the entire price bar looks like a candle, the height of the body indicates the open and closing price. When the body of the candlestick is black, it indicates that the closing price of the day is lower than the opening price of the day which means that bearish trend prevails in the markets. When the closing price of the day is higher than the opening price it is an indication of bullish trend in the market and it is represented by a white candlestick. When the opening price and closing price of the day is the same then it is indicated by dhoji.

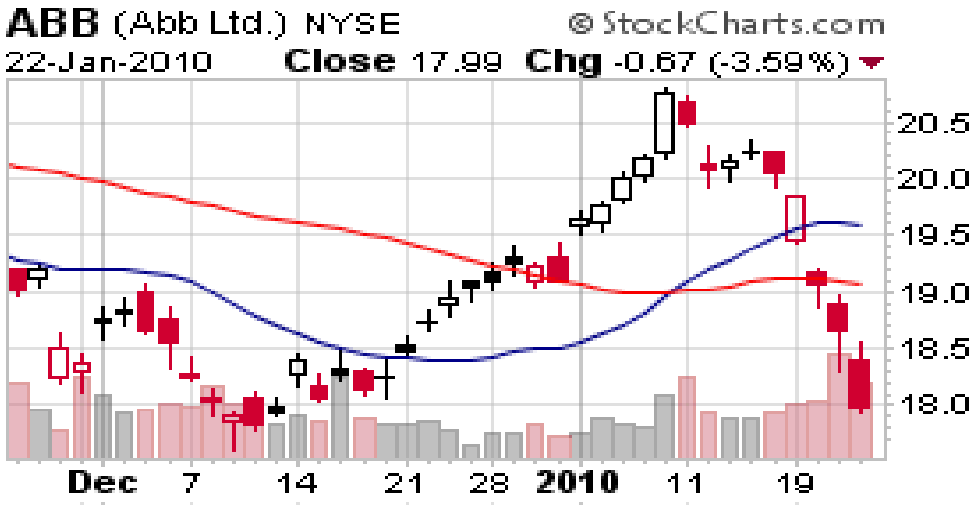


Fig.3.3. Japanese Candlestick Chart, www.stockCharts.com

3.9.4 Point Figure Charts

Line charts, bar charts and candlestick charts contain price volume and time information but point and figure charts do not have volume and time information. It is concerned with only price changes. This type of chart is prepared by putting a 'X' mark on the respective price column, if there is any further increase in price put another 'X' in the top of that column till the uptrend continues. If there is any down trend, put 'O' on the right of the existing column. In this way practitioners analyze the movement in the market. But practitioners do not use the point and figure charting due to their practical constraints.

Fig.3.4. Point and Figure charts, www.stockCharts.com

3.10 Support and Resistance

The identification of support and resistance level in price is an important aspect in technical analysis. In a liberated market environment, the support and resistance level changes. Support is a price level at which sufficient buying pressure is generated to reduce further fall in the price. It is the time bull takes control and prevents further fall in price. In support level, most of the investors believe that the price will go up. Generally, support is required during the falling market. Resistance is a price level at which sufficient selling pressure is generated to prevent further raise in price. In this situation, the bear takes control and prevents further rise in price. Resistance is required during rising price. In this level, most of the investors feel that the price will go down.

3.11 Trend lines

One of the basic principles of technical analysis is price moves in trend. A trend line is a straight line. They can be up, down or sideways. Trend lines are

essential for identification of different stock market patterns as well as understanding the trend of the market. Trends can be broadly classified into short term, medium term and long term trends. The number of points the trend line passes through and the duration of time the trend exists with out any change are the two important factors which determine the significance of trend line.

3.12 Chart Patterns

Charts are integral part of technical analysis. The recognition of patterns in the charts is highly helpful to a technical analyst in the identification of trend and it predicts the future price movement. Chart patterns are broadly classified into two: Reversal patterns and Continuation Patterns

Reversal patterns are those patterns which provide an indication or signal of reversing the existing market trend. Double top, double bottom, head and shoulders, wedges, triple top and triple bottom are some of the examples of reversal patterns. Continuation patterns are those patterns which provide an indication of continuation of the existing market trend. Cup with handle, flag and pennants triangles, rectangle price channels are the major reversal patterns.

3.13 Stock Market Indicators

Stock market indicators are indicators of future movement of stock prices in stock market. Many investors and professionals depend upon stock market indicators to understand the movement of the stock price. There are different kinds of indicators available in the market under different classifications. The study has explained

important indicators which are commonly used in Indian stock market. They can be broadly classified into two: Stock specific indicators and market indicators.

3.13.1 Stock Specific Indicators

Stock specific indicators are those which provide the information of a specific single share price or index movements. Different types of moving averages, relative strength index, and rate of change are prominent types of stock specific indicators. The most important types of stock specific indicator are shown bellow.

3.13.1.1 Moving Averages

Moving averages are the simplest but useful tools in the armoury of a technical analyst. This technique is more useful in volatile market, where it is very difficult to predict the price movement in the market. Moving averages is of different types: simple Moving average, Exponential Moving average and MACD. All the Moving Averages are lagging indicators which always lag behind the price. In India, Market participants now use different types of moving averages such as simple moving average, weighted moving averages to identify the market trend. Most of the practitioners use different types Moving averages together to achieve more clarity in the market.

3.13.1.2 Relative Strength Index

Relative strength is one of the important oscillators. It was first introduced by Wilder in 1978. It does not compare the relative strength of two single securities but it analyzes the internal strength of a single security. If the relative strength of the security is above seventy, it is an overbought situation and it is an indication to sell

and if it is below thirty, it is an oversold position and hence an indication to buy. Generally, 14 days RSI is calculated to understand the relative strength of the security.

3.13.1.3 Rate of Change

Rate of change is an important indicator which measures the rate of change of the price of security compared to some previous day price. Rate of change may be positive, negative or zero and its value oscillate around the zero line. According ROC a buy signal is generated when ROC is below zero but a sell signal is generated when the ROC is above zero. It measures the pace of price change. An upward heave in the ROC results in a sharp price increase and decrease in ROC indicate a price fall.

3.13.1.4 On Balance Volume (OBV)

On balance volume is a stock specific indicator which was developed by Joseph Granvillee in 1963. It shows the association between volume and price changes. The basic assumption of OBV analysis is that OBV changes leads to price changes. When the security price closes higher than the previous close, then the day's volume is regarded as up volume. When the security price closes lower than the previous close then the day's volume judged as down volume. Since it is a subjective indicator the trader has to understand the price chart and decide whether the OBV confirms or rejects the trend.

3.13.2 Market Indicators

Market indicators are those which provide the information on general market movements. Advance Decline Ratio, Open interest, mutual fund cash ratio, short

selling, market volume and activities in bond market etc are examples of market indicators. Following are the important types of market indicators.

3.13.2.1 Advance-Decline Ratio

Advance declining ratio is one of the important market indicators used in technical analysis. This ratio is calculated by taking into account of number of advances and decline during a particular period; it may be daily, weekly, monthly or yearly. This is to identify the general trend and strength of the market. In India, it is widely used to understand general reaction of the market.

3.13.2.2 Open Interest

Open interest is the total number of contracts outstanding at the end of the day. The unexercised option or future contract at the end of day is called open interest. It is used for the purpose of confirming the trend and trend reversal and by using it, investors can analyse the market situation. If open interest increases, investors can say that new money is flowing into the market and it is an indicator of present trend continuation – if there is a decline in open interest the investors can assume that the trend is going to reverse. It is one of the major indicators of market liquidity. An abnormal high in the open interest in a rising market is a warning of trend reversal in the market. Most of the experienced traders agree that open interest is one of the technical indicators which confirm the trend.

3.13.2.3 Mutual Fund Cash Ratio

Mutual funds are the biggest institutional force in every stock market. Especially in Indian stock market, it is still showing its strength. They have invested

huge amount of money in the market. Mutual fund cash ratio is one of the market indicators which are followed by many of the market analysts. If the mutual fund companies invest the cash in the market then it indicates that market is in a good position. But if they hold cash in their hands instead of investing in the market, then it is an indication of bearish trend in the market. So a low cash ratio indicates that market is in high position and high ratio indicates that market is in bearish mood.

3.13.2.4 Short Selling

Short selling means that selling without having. The seller sells the stock in the anticipation that the price will come down and he can purchase it at a lower price and reap the profit out of it. In technical analysis, short selling is known as short interest ratio. It is significant for market as well as individual securities. If the ratio is less than 1.0the market is considered to be weak or the market is over bought. If the ratio is in between 1.0 and 1.50, then it is considered to be a neutral indicator and if the ratio is above 1.50, it is considered to be bullish. Above 2 is treated as favorable. So purchasing the shares to cover the positions is one of the major market indicators.

3.13.2.5 Market Volume

Market volume is an integral part of any analysis in of stock market. Especially in technical analysis volume is treated as a important element. It helps the analyst in confirming the trend .So the volume support the other technical indicators available in the market. When the market is moving up with the support of volume then the trend will prevail and the market is moving up without the support of the volume, in that case trend would not persist for long. And the same will happen in the

bearish market also. So, the volume which decides and confirms the trend and it is considered to be the most important technical indicator in the market.

3.13.2.6 Activities in the Bond Market

Bond market is a market for debt securities. In India, bond market is classified into two; government bond market and corporate bond market. A bond is generally risk free but it is exposed risk when it transacted before its maturity. Interest rate risk, credit risks are the two important risks involved in the Bond market. Interest rate is a part of country's monetary policy. So, any instability or variations in the economic and monetary policy affects the interest rate. So, a technical analyst should track the activities in the bond market to understand the general economic condition.

Technical analysis uses different tools, indicators and methods for understanding and predicting the market. They have been used by the market participants in different markets throughout the globe. Technical analysis works through the application of graphs and patterns which are highly comprehensible for the common investors. Of late, they have developed different new and innovative technical indicators for the market. However, most of the tools, except a few, have been developed based on international markets. Moving from basing on a global market, the present study concentrates on technical analysis practiced in India.

Chapter 4

IMPORTANCE OF TECHNICAL ANALYSIS IN STOCK INVESTMENT DECISION: AN EMPIRICAL ANALYSIS

4.1 Introduction

Investors and portfolio managers often go to the market with the intention of making good earnings. However, their efforts will be in vain if they do not have proper trading strategies. Trading strategies provide an edge to the investors in the market to perform better than other participants. The traders use various strategies to make the best of the market but formulation of trading strategy is a difficult task. A clear understanding of the market is highly essential in the formulation of trading strategies. Technical analysis is an important tool in the market that provides a clear idea about the current market situation and helps the investors take correct investment decision. Technical analysis uses historical price and volume statistics to make an investment decision. It concentrates mainly on the market's actions and reactions but never considers the fundamental changes related to the stock or the index in the market.

The present chapter focuses chiefly on the importance of technical analysis and also discusses the usage of technical analysis in making an investment decision, the types of analysis used, applicability of technical analysis in different kinds of market, profitability of technical analysis and different kinds of technical patterns and technical indicators for the identification of trend.

4.2 Informational Efficiency

In financial Market, there are two major types of efficiency: informational efficiency and operating efficiency. The concept of informational efficiency has always been a question of debate among Market participants and academia. If the

market is informationally efficient, there is no need for any kind of analysis. The response of the brokers regarding the informational efficiency is presented in table 4.1

Table 4.1

Informational Efficiency

Locations	Yes	No	Total
Delhi	40.00	60.00	100.00
Mumbai	43.67	56.33	100.00
Chennai	38.96	61.04	100.00
Kolkata	39.29	60.71	100.00
Average	41.61	58.39	100.00
Pearson's Chi-square: 1.09507, df=3, p=0.778265			

Source: Primary Data

In table 4.1, 41.61 percent of the brokers maintain that information in Indian financial market is processed effectively. However, 58.39 percent of them feel that it is not processed effectively. In Delhi, while 60 percent think that information is not processed effectively, 40 percent argue that it is. In Mumbai, Chennai, and Kolkata the corresponding percentages are 56.33 and 43.67, 61.01 and 38.96, and 60.71 and 39.29 respectively.

Pearson's Chi-square has been used to test whether there is any significant difference in the opinion of different brokers at different places. The analysis has found that there is no significant difference among the opinion of different brokers at different places regarding the informational efficiency of the market at five percent level of significance. Since the p value (0.778265) is greater than 0.05, the study has concluded that Indian market is still informationally inefficient and this informational inefficiency indicates the possibility of various types of analysis in the market. If the market is informationally efficient, there is no point in having analysis.

4.3 Analysis Used for Stocks

Maximization of return on stocks with minimal risk is the aim of every astute investor. However, simple buying and selling of securities does not result in good return, so the brokers analyze the stocks for better return. Basically, there are two types of analysis used by the market professionals: fundamental and technical analysis. At the same time, there are also people who trade in the stock market without any analysis. The opinion regarding the analysis which is used for analyzing the stock is explained in Table.4.2

Table 4.2

Analysis used for stocks

Locations	Fundamental Analysis	Technical Analysis	Both	No Analysis	Total
Delhi	10.53	34.74	54.74	0.00	100.00
Mumbai	18.00	24.67	53.33	4.00	100.00
Chennai	19.48	12.99	63.64	3.90	100.00
Kolkata	14.29	21.43	62.50	1.79	100.00
Average	16.27	24.14	56.68	2.91	100.00
Pearson’s Chi-square: 18.7130, df=9, p=0.027779					

Source: Primary Data

Table 4.2 shows that 16.27 percent of the brokers feel that they use fundamental analysis for analyzing the stock, 24.14 percent of analysts admit that they use technical analysis while 56.68 percent of brokers use both fundamental and technical analysis to analyze the stock. However, 2.91percent of the brokers do not use any of the above mentioned analysis.

In Delhi, 10.53 percent of the brokers use fundamental analysis, 34.74 percent use technical analysis and 54.74 percent use both fundamental and technical analysis together for analyzing the stocks. For Mumbai, the corresponding figures are 18.00,

24.67, 53.33, and 4.00 respectively; for Chennai, they are 19.48, 12.99, 62.50, and 3.90; and for Kolkata, 14.29, 24.14, 62.50, and 1.79.

To test the significance of different opinion among the different brokers regarding the type of analysis used for analyzing the stocks, the Pearson's Chi-square test is used. According to the test, there is a significant difference in the opinion among the brokers at different places at five percent level of significance, since the p value is (0.027779) lesser than 0.05. Traders use both fundamental analysis and technical analysis for analyzing the stock. This again indicates lack of informational efficiency in Indian market.

4.4 Importance of Technical Analysis

Basically, there are two schools of thought which are used to analyze the stocks: technical and fundamental analysis. Fundamental analysis is concerned with the economy, industry and company analysis and it is very complex in nature; but technical analysis is concerned with the past price statistics and it is very simple and helps identify the trend. Opinion regarding the importance of technical analysis is described in Table 4.3

Table 4.3

Importance of Technical Analysis

Locations	Yes	No	Total
Delhi	91.58	8.42	100
Mumbai	90.67	9.33	100
Chennai	93.51	6.49	100
Kolkata	88.39	11.61	100
Average	90.75	9.25	100
Pearson's Chi-square: 1.51903, df=3, p=0.677888			

Source: Primary Data

In table 4.3, 90.75 percent of the respondent remarked that technical analysis is important in analyzing the stocks. However, 9.25 percent think that technical analysis is not important in analyzing the stocks.

In Delhi, 91.58 percent consider technical analysis to be important in analyzing the stock whereas 8.42 percent regard technical analysis as insignificant. In Mumbai, 90.67 percent hold that technical analysis is important, while 9.33 percent deny its importance. In Chennai, 93.51percent deem it important, while 6.49 percent regard it as unimportant. In Kolkata, 88.39 percent esteem it as important and 9.25 percent consider it to be insignificant.

Pearson's Chi-square test is used to test the significance of the difference of opinion among various brokers at different places regarding the importance of technical analysis in analyzing the stocks. The test has found that there is no significant difference among the opinion of different brokers at five percent level of significance, since the p value (0.677888) is greater than 0.05. Hence, it can be concluded that technical analysis is considered to be important in analyzing stock or scrip.

4.5 Reasons for Using Technical Analysis in Analyzing the Stocks

According to the table 4.3, 90.75 percent of brokers regard technical analysis as important, though they have different opinions regarding the reasons for using technical analysis. Various reasons are given in table 4.4

In table 4.4, 15.66 percent of the brokers admit to using technical analysis to understand the price oscillations; 34.53 percent of them use it to understand the trend of the market; 22.64 percent employ it to understand the support and resistance level; 10.00 percent use it to understand the real picture of the market and 17.17 percent employ it to understand the price movements that are often ahead of fundamental development. In Delhi, 16.09 percent use it to understand price oscillations; 34.48 percent use it to understand the trend of the market; 24.14 percent use it to understand the support and resistance level of the scrip; 11.49 percent use it to draw a real picture

of the market and 13.79 percent use it to understand price movements that are often ahead of fundamental movements.

Table 4.4

Reasons for Using Technical Analysis in analyzing the Stocks

Locations	understand the price oscillation	Understand the trend	Support & resistance	Real picture of the market	Understand the price movements	Total
Delhi	16.09	34.48	24.14	11.49	13.79	100
Mumbai	12.87	34.56	25	7.35	20.22	100
Kolkata	20.2	40.4	16.16	8.08	15.15	100
Chennai	19.44	26.39	20.83	20.83	12.5	100
Average	15.66	34.53	22.64	10	17.17	100

Source: Primary Data

In Mumbai, the corresponding percentages are 12.87, 34.56, 25.00, 7.35, and 20.22 respectively. In Kolkata, these are 20.20, 40.40, 16.16, 8.08, and 15.15 respectively, while in Chennai, the figures are 19.44, 26.39, 20.83, 20.83, and 12.50 respectively. Therefore, it can be seen that brokers use technical analysis more to understand the trend of a particular stock or market. They also use technical analysis to understand price oscillation, support and resistance, price movements and to understand the real picture of the market.

4.6 Reason for not Using Technical Analysis in Analyzing the Stock

In table 4.3, 9.25 percent of the brokers responded that technical analysis is not important in analyzing the stocks and they have given various reasons for not using it. The various reasons are given in table 4.5

From table 4.5, it is clear that 64.81 percent of the brokers do not use technical analysis as they think that the country's economic condition is important. 35.19 percent of them believe that external factors may influence share price. The corresponding percentages for the four metros are 62.50 and 37.50 for Delhi, 67.86

and 32.14 for Mumbai, 61.54 and 38.46 for Kolkata, and 60.00 and 40.00 for Chennai.

Table 4.5

Reason for not Using Technical Analysis in Analyzing the Stock

Locations	Economic Condition	External Factors	Total
Delhi	62.50	37.50	100.00
Mumbai	67.86	32.14	100.00
Kolkata	61.54	38.46	100.00
Chennai	60.00	40.00	100.00
Average	64.81	35.19	100.00

Source: Primary Data

4.7 Weight given to Technical Analysis in an Investment Decision

Intelligent Investment decision always pays to an active investor. An active investor uses different kinds of analysis to take critical investment decisions. Technical analysis is an important element of trading or investment decision. Trading decision is always vital since it involves a lot of benefit and risk. The opinion regarding the weight given to technical analysis in an investment decision is explained in table 4.6

Table 4.6

Weight given to Technical Analysis in an Investment Decision

Locations	Number	Mean	SD
Delhi	95	44.37	15.56
Mumbai	300	44.97	16.2
Chennai	77	42.86	15.67
Kolkata	112	44.33	16.24
Average	584	44.47	16.01
Sum of squares=277.4679, df =3, Mean=92.4893, F= 0.359524, P=0.782267			

Source: Primary Data

Table 4.6 shows that the average weight given by the brokers to technical analysis in an investment decision is 44.47 with a standard deviation of 16.01. In

Delhi, this is 44.37 with a standard deviation of 15.56, while it is 44.97 with a standard deviation of 16.20 in Mumbai. In Chennai, it is 42.86 with a standard deviation of 15.67, while Kolkata registers 44.33 with a standard deviation of 16.24. ANOVA test is applied to examine the significance of the difference of opinion by different brokers regarding the weight given for technical analysis in an investment decision. The test finds that there is no significant difference among the opinion of different brokers regarding the weight given for technical analysis in an investment decision at five percent level of significance, since the p value (0.782267) is higher than the 0.05. Brokers give adequate weight to technical analysis while making an investment decision.

4.8 Working Technical Analysis in Indian Market Condition

Indian stock market was not so developed during the pre- liberalization era and it had to face problems associated with trading and settlement. However, in the post liberalization era Indian stock market is considered to be a balanced market among the emerging markets in the world. Now it is flooded with huge amount of money and players. Opinion of brokers regarding the working of technical analysis in Indian market of described in table 4.7

Table 4.7

Working Technical Analysis in Indian market Condition

Locations	Yes	No	Total
Delhi	89.47	10.53	100.00
Mumbai	85.33	14.67	100.00
Chennai	89.61	10.39	100.00
Kolkata	83.93	16.07	100.00
Average	86.30	13.70	100.00
Pearson’s Chi-square: 2.29305, df=3, p=0.513863			

Source: Primary Data

According to table 4.7, 86.30 percent of brokers admit that technical analysis works in Indian condition, whereas 13.70 percent of them reject it. However, a majority of the respondents have argued in support of technical analysis in Indian condition. In Delhi, the corresponding percentages are 89.47 and 10.53, while in Mumbai, Chennai, and Kolkata the respective figures are 85.33 and 14.67, 89.61 and 10.39, and 86.30 and 16.07. Pearson's Chi-square test is used to identify the significance of the difference of opinion of different market participants at different places regarding the working of technical analysis in Indian conditions. According to the analysis, there is no significant difference among the opinion of brokers at different places at five percent level of significance since the p value (0.513863) is greater than 0.05. Hence, it can be stressed that technical analysis works in Indian conditions.

4.9 Profitability of Technical Indicators

Technical analysis is used by stock brokers and investors to analyze the stock. Technical analysis uses technical Indicators, which are the basic tools of technical analysis, and provide the signal for technical analyst regarding the movement of the stock price. The Profitability of technical analysis depends upon the identification of the trend in the initial phase itself and the analyst has to take decision in the market. The opinion regarding the profitability of technical analysis is described in table.4.8

Table 4.8 explains that 5.65 percent of the brokers do not find technical analysis profitable, while 65.58 percent of them consider it to be occasionally so and 28.77 percent of them find it profitable most of the times. The corresponding percentages for the four metros are: 9.47, 61.05, and 29.47 in Delhi; 4.00, 67.33, and 28.67 in Mumbai; 1.30, 67.53, and 31.17 in Chennai; and 5.65, 63.39, and 26.79 in Kolkata.

Table.4.8

Profitability of Technical Indicators

Locations	Never Found	Sometimes	Most of the times	Total
Delhi	9.47	61.05	29.47	100.00
Mumbai	4.00	67.33	28.67	100.00
Chennai	1.30	67.53	31.17	100.00
Kolkata	9.82	63.39	26.79	100.00
Average	5.65	65.58	28.77	100.00
Pearson's Chi-square: 10.8212, df=6, p=0.094100				

Source: Primary Data

Pearson's Chi-square test is used to test the significance of the difference opinion by the different brokers at different places regarding the profitability of technical analysis. Pearson chi- square test finds that there is no significant difference among the opinion of different participants at different places since the p value is (0.094100) higher at five percent significant level. Hence, it is clear from the opinion that technical analysis is profitable in Indian market even though the degree of profitability experienced is different from broker to broker and it depends on the ability and experience of the brokers in the market.

4.10 Technical Analysis in Volatile Market

A volatile market results in high variations in the price of the stock; hence the prediction in the volatile market is a highly difficult task. Moreover, trend identification in the midst of volatility is a tedious task because there is a fear of false signal in the market. False signal may lead to wrong decision by the brokers and ultimately results in the bad image for technical analysis. The opinion of brokers regarding the working of technical analysis in predicting the volatile market is described in table 4.9

Table 4.9

Working of Technical Analysis in Volatile Market

Locations	Yes	No	Total
Delhi	50.53	49.47	100.00
Mumbai	53.00	47.00	100.00
Chennai	62.34	37.66	100.00
Kolkata	54.46	45.54	100.00
Average	54.11	45.89	100.00
Pearson's Chi-square: 2.74503, df=3, p=0.432641			

Source: Primary Data

According to table 4.9, 54.11 percent of the brokers are of the opinion that technical analysis is effective in predicting the share price in a volatile market. 45.89 percent of them hold that it is not. In Delhi, the percentages are 50.53 and 49.47, whereas in Mumbai they are 53.00 and 47.00 respectively. In Chennai, the corresponding percentages are 62.34 and 37.66, while in Kolkata, they are 54.46 and 45.54 respectively. Pearson's Chi-square test is used to test the significance of the difference opinion of different participants at different places regarding the effectiveness of technical analysis in predicting the volatile market. The analysis has found that there is no significant difference among the opinion of different brokers at different place at five percent level of significance, since the p value (0.432641) is greater than 0.05. Hence it can be assumed that technical analysis is effective in predicting the volatile market.

4.11 Existence of Manipulation in Indian Market

Manipulation in price and misbehavior in the market are the major hindrances to the development of a stock market, though this phenomenon is very common in every emerging market. The Indian market is an emerging one and there are many loopholes in the rules and regulations of the stock exchanges, trading and settlement.

These kinds of lapses in the rules and regulation have resulted in various scams and price rigging activities in the market. The opinion of brokers regarding the existence of manipulation in Indian Market is explained in table 4.10

Table 4.10

Existence of Manipulation in Indian Market

Locations	Yes	No	Total
Delhi	54.74	45.26	100.00
Mumbai	65.00	35.00	100.00
Chennai	63.64	36.36	100.00
Kolkata	56.25	43.75	100.00
Average	61.47	38.53	100.00
Pearson's Chi-square: 4.83804, df=3, p=0.184071			

Source: Primary Data

In table 4.10, 61.47 percent maintain that manipulation is still prevalent in Indian market, while the rest do not feel so. The corresponding figures in percentages of the four metros are as follows: 54.74 and 45.26in Delhi; 65.00 and 35.00 in Mumbai; 63.64 and 36.36 in Chennai; and 56.25 and 38.53 in Kolkata. Pearson's Chi-square test is used to test the significance of difference of opinion of different brokers at different places regarding the prevalence of manipulation in Indian market. There is no significant difference between the opinion among the different participants at different places at five percent level of significance, since the p value (0.184071) is greater than 0.05. Hence, it can be concluded that manipulation is prevalent in Indian market and since the manipulation is prevalent, it means that market is informationally inefficient.

4.12 Technical Analysis in Short Run

There is a belief that technical analysis for short run analysis of stocks and fundamental analysis is for long run analysis of stocks. Short run includes intraday and days but long run includes month and year Technical analysis is not a one time

analysis but it is dynamic and every minor changes can be recognized at the right time. The opinion of brokers regarding the suitability of technical analysis in the short run is explained in table 4.11

Table 4.11

Technical Analysis in short run

Locations	Yes	No	Total
Delhi	86.32	13.68	100.00
Mumbai	82.00	18.00	100.00
Chennai	89.61	10.39	100.00
Kolkata	83.93	16.07	100.00
Average	84.08	15.92	100.00
Pearson's Chi-square: 3.08500, df=3, p=0.378720			

Source: Primary Data

It is evident in the table that 84.08 percent of the respondents believe that technical analysis work well in the short run and 15.92 percent oppose it. The figures for the four metros are: 86.32 and 13.68 in Delhi; 82.00 and 18.00 in Mumbai; 89.61 and 10.39 in Chennai; and 83.93 and 16.07 in Kolkata. Pearson's Chi-square test is used to test the significance of the difference of opinion of different brokers at different places regarding the working of technical analysis in the short run. No significant difference between the opinion of different participants at different places at five percent level of significance is found since the p value (0.378720) is greater than 0.05. The analysis indicates that technical analysis works in short run.

4.13 Technical Analysis in Different Markets

Every market has different kinds of features and specialties but the features of technical analysis are one and the same in all sorts of markets. It was first used in equity market and later moved to futures market. Now, it is used by the participants of every market, but the degree of usage varies from market to market. The opinion

regarding the successful usage of technical analysis in different markets is explained in table 4.12

Table 4.12

Technical Analysis in different market

Locations	Equity market	Futures market	Commodity market	All the Three	None of the three	Total
Delhi	23.16	16.84	24.21	34.74	1.05	100.00
Mumbai	25.33	12.33	23.00	34.33	5.00	100.00
Chennai	27.27	6.49	24.68	37.66	3.90	100.00
Kolkata	20.54	18.75	24.11	33.04	3.57	100.00
Average	24.32	13.53	23.63	34.59	3.94	100.00
Pearson's Chi-square: 10.5884, df=12, p=0.564490						

Source: Primary Data

Table 4.12 shows that 24.32 percent of respondents use technical analysis in equity market, 13.53 percent use it in futures market, 23.63 percent use it in Commodity market, 34.59 percent use it in all the three markets, and 3.94 percent do not use it in any of them. Accordingly, the figures in percentages for the metros are: 23.16, 16.84, 24.21, 34.74, and 1.05 in Delhi; 25.33, 12.33, 23.00, 34.33, and 5.00 in Mumbai; 27.27, 6.49, 24.68, 34.66, and 3.90 in Chennai; and 20.54, 18.75, 24.11, 34.04, and 3.57 in Kolkata.

Pearson's Chi-square test is used to test the significance of different opinion of different brokers at different places regarding the successful usage of technical analysis in different markets. There is no significant difference between the opinion of different participants at different places at 5 percent level of significance, since the p value (0.564490) is greater than 0.05. Technical analysis is used in both equity market and derivative markets successfully, though brokers use it more in equity markets and commodity markets.

4.14 Effectiveness of different types of Technical Tools

Identification of trend and movement of the price are easily explained by using technical tools and it is the major strength of technical analysis. This helps the investors and brokers to take right decision at the right time. The opinion of respondents regarding the effectiveness of different types of technical tools is described in Table 4.13

Table 4.13

Effectiveness of different types of Technical tools

Locations	Bar Charts	Line Charts	Candlestick Charts	Total
Delhi	16.84	31.58	51.58	100.00
Mumbai	17.00	33.00	50.00	100.00
Chennai	16.88	23.38	59.74	100.00
Kolkata	17.86	41.96	40.18	100.00
Average	17.12	33.22	49.66	100.00
Pearson’s Chi-square: 8.63076, df=6, p=0.195472				

Source: Primary Data

According to table 4.13, 17.12 percent believe that bar charts are effective, 33.22 percent think that line charts are effective, and 49.66 percent maintain that Candlestick charts are more effective in the market. The figures for the metros are: 16.84, 31.58, and 51.58 in Delhi; 17.00, 33.00, and 50.00 in Mumbai; 16.88, 23.38, and 59.74 in Chennai; and 17.86, 41.96, and 40.18 in Kolkata. Pearson’s Chi-square test is used to identify the significance of the difference of opinion of different brokers at different places regarding the effective technical trading rules in the market. It has been found that there is no significant difference between the opinions among the different participants at different places at five percent level of significance, since the p value (0.195472) is greater than 0.05. Hence, it can be stressed that Candlestick charts are the most effective tool in the technical analysis.

4.15 Technical Analysis and Different Time Periods

While technical analysis is considered to be the short term analysis of stocks, fundamental analysis is the long term analysis of stocks. Technical analysis is also used in the long term and intraday analysis of the stocks. Opinion of respondents regarding the usefulness of technical analysis in different time periods is shown in table 4.14.

Table 4.14

Technical Analysis and different time periods

Locations	Short Term	Long term	Intra Day	All the three	Both short & intraday	Total
Delhi	26.32	30.53	14.74	27.37	1.05	100.00
Mumbai	31.67	25.00	18.00	25.33	0.00	100.00
Chennai	32.47	24.68	19.48	23.38	0.00	100.00
Kolkata	24.11	28.57	18.75	28.57	0.00	100.00
Average	29.45	26.54	17.81	26.03	0.17	100.00
Pearson's Chi-square: 9.69388, df=12, p=0.642793						

Source: Primary Data

If we go by table 4.14, 29.45 percent of the respondents view technical analysis as more useful in the short term, whereas 26.54 percent of them think that it is useful in the long term. 17.81 percent of them use it in intraday analysis, while 26.03 percent use it for all the three time periods. A mere 0.17 percent uses it for both short term and intraday analysis. For Delhi the respective percentages are 26.32, 30.53, 14.74, 27.37, and 1.05; whereas for Mumbai the corresponding figures are 31.67, 25.00, 18.00, and 25.33. While for Chennai the respective numbers are 32.47, 24.68, 19.48, and 23.38, for Kolkata they are 24.11, 28.57, 18.75, and 28.57. However, in Mumbai, Chennai, and Kolkata no one uses it for both short term and intraday analysis.

When the Chi square test is applied, it has been found there is a no significant difference among the opinion of different brokers regarding the usefulness of technical analysis in different time periods at five percent level of significance, since the p value (0.642793) is greater than 0.05. Hence, it can be stressed technical analysis is more useful in short term analysis at the same time brokers use technical analysis in long term analysis as well.

4.16 Adequacy of Fundamental analysis

One of the major criticisms of fundamental analysis is that it is a one time analysis and no looking back is possible. Technical analysis is the real time analysis and it provides a clear sight of price movement of various stocks. Fundamental analysis focuses on the intrinsic value of the scrip while technical analysis is concerned with price movement and the timing of the market. The opinions regarding the adequacy of fundamental analysis are explained in table 4.15

Table 4.15

Adequacy of Fundamental Analysis

Locations	Yes	No	Total
Delhi	35.79	64.21	100
Mumbai	36.00	64.00	100
Chennai	36.36	63.64	100
Kolkata	37.50	62.50	100
Average	36.30	63.70	100
Pearson’s Chi-square: .092266, df=3, p=0.992749			

Source: Primary Data

According to this table, only 36.30 percent of the brokers regard fundamental analysis as adequate for analyzing the stock whereas 63.70 percent of them hold the opposite view. The corresponding percentages for Delhi are 35.79 and 64.21, for

Mumbai they are 36.00 and 64.00, for Chennai the figures are 36.36 and 63.64, and Kolkata registers 37.50 and 62.50 respectively.

Pearson's Chi-square test has been used to test the significance of different opinions of different brokers at different places regarding the adequacy of fundamental analysis in analyzing the stocks. The test has found that there is no significant difference between the opinion among the different participants at different places at five percent level of significance, since the p value (0.992749) is greater than 0.05. Hence, it can be concluded that fundamental analysis is not adequate for analyzing the stock. In a dynamic market, it is very difficult to use fundamental analysis since it is considered to be a one time analysis.

4.17 Technical Trading Patterns and Identification of Trend

Technical trading patterns are the pictorial representations of the price movement. It provides certain basis for trend identification, continuation and reversal. Clear Identification of trend is the main crux of technical analysis because all the decisions are to be taken based on the detection of the trend. Patterns are pictorial formations of the price movements and also indicate the investor's sentiments, trend continuation and trend reversal. The responses regarding the technical trading patterns and their ability to identify the trend are explained in table 4.16

Table 4.16

Technical Trading Patterns and Identification of Trend

Locations	Yes	No	Total
Delhi	65.26	34.74	100.00
Mumbai	66.67	33.33	100.00
Chennai	68.83	31.17	100.00
Kolkata	57.14	42.86	100.00
Average	64.90	35.10	100.00
Pearson's Chi-square: 3.89726, df=3, p=0.272794			

Source: Primary Data

The table makes it clear that 64.90 percent of the brokers hold that market indicators provide a clear trend in the market. However, 35.10 percent of them do not. In Delhi, the former forms 65.26 percent, whereas the latter forms 34.74 percent of the total respondents. In Mumbai, Chennai, and Kolkata the corresponding figures are 66.67 and 33.33, 68.83 and 31.1, and 57.14 and 42.86 respectively. To test the significance of the difference of opinion of different brokers at different places regarding the technical trading patterns in the identification of trend, Pearson's Chi-square test has been used. As per the test result, there is no significant difference among the opinion of brokers at different places at five percent level of significance since the p value (0.272794) is greater than 0.05. Hence, it can be stressed that technical trading patterns provides clear trend in the market. Moreover, technical trading patterns provide the direction of trend. However, it is difficult to obtain every pattern together in the market.

4.18 Market Indicators and Identification of Trend

Technical indicators provide insights into the market position, especially market indicators. In technical analysis, indicators are classified into stock specific indicators and market indicators. Market indicators provide the overall general trend of the market. Open interest, volume and put call ratio are some of the market indicators used in the identification of trend. Opinion of brokers regarding market indicators and its ability to spot the trend are explained in Table 4.17.

The table 4.17 shows that 91.27 percent of the respondents believe that market indicators can show clear trend in the market, whereas 8.73 percent of them do not. In Delhi the corresponding percentages are 91.58 and 8.42; in Mumbai 91.67 and 8.33; in Chennai 90.91 and 9.09; and in Kolkata 90.18 and 9.82.

Table 4.17

Market Indicators and identification of Trend

Locations	Yes	No	Total
Delhi	91.58	8.42	100.00
Mumbai	91.67	8.33	100.00
Chennai	90.91	9.09	100.00
Kolkata	90.18	9.82	100.00
Average	91.27	8.73	100.00
Pearson's Chi-square: .250572, df=3, p=0.969039			

Source: Primary Data

Pearson's Chi-square test has been used to test the significance of the difference of opinion of different brokers at different places regarding the trend identification by using the market indicators. The test has found that there is no significant difference between the opinion among the different participants at different places at five percent level of significance, since the p value (0.969039) is greater than 0.05. Hence, it can be concluded that Market indicators provide clear trend in the market. However, the market indicators provide a general trend of the market.

4.19 Single Indicator and Identification of Trend

Technical indicators are meant for recognizing the trend of the market or a specific script. There are different kinds of technical indicators but the selection of the indicators basically depends on the analyst. The responses of brokers regarding the predictive power of single indicators are explained in table 4.18.

According to the table, 18.49 percent of the respondents are of the opinion that single indicator is sufficient for predicting the trend whereas 81.51 percent argue against it. The corresponding figures for Delhi, Mumbai, Chennai and Kolkata are 24.21 and 75.79, 14.33 and 85.67, 19.48 and 80.52, and 24.11 and 75.89 respectively.

Table 4.18

Single Indicator and Identification of Trend

Locations	Yes	No	Total
Delhi	24.21	75.79	100.00
Mumbai	14.33	85.67	100.00
Chennai	19.48	80.52	100.00
Kolkata	24.11	75.89	100.00
Average	18.49	81.51	100.00
Pearson's Chi-square: 7.89586, df=3, p=0.048232			

Source: Primary Data

Pearson's Chi-square test is used to test the significance of the difference of opinion by different brokers at different places regarding the trend identification by using single indicator. The test has found that there is a significant difference among the opinion of different brokers at different places at five percent level of significance since the p value (0.048232) is less than 0.05. Hence, the response emphasizes the view that single indicator may not be sufficient for analyzing the stock. Moreover, single indicator may give false trading signals in the market.

4.20 Importance of Market Indicators in Technical Analysis.

Market indicators provide the general trend of the market. In addition to the stock specific indicators, it provides supporting evidence with regard to the general perception of trend. Market indicators also provide the information about the sudden shift in the market sentiments. Opinions regarding the importance of market indicators are explained in table 4.19.

In table 4.19, while 92.98 percent of the brokers maintain that market indicators are essential for technical analysis, 7.02 percent do not. The respective percentages for Delhi, Mumbai, Chennai and Kolkata are 92.63 and 7.37, 94.33 and 5.67, 88.31 and 11.69, and 92.86 and 7.14.

Table 4.19

Importance of Market Indicators in Technical Analysis

Locations	Yes	No	Total
Delhi	92.63	7.37	100.00
Mumbai	94.33	5.67	100.00
Chennai	88.31	11.69	100.00
Kolkata	92.86	7.14	100.00
Average	92.98	7.02	100.00
Pearson's Chi-square: 3.43269, df=3, p=0.329614			

Source: Primary Data

To test the significance of the difference of opinion regarding the effectiveness of trading volume in analyzing the stock among various brokers at different places, Pearson's Chi-square test has been used. According to the analysis the study has found that there is no significant difference between the various brokers at various places regarding the effectiveness of trading volume at five percent level of confidence level, since the p value (0.329614) is greater than 0.05. Hence, it can be ascertained that market indicators are essential in the technical analysis.

4.21 Fundamental Analysis and Penny Stocks

Penny stock is a stock which is not widely known. It will be very difficult to understand the intrinsic value. The responses regarding the effectiveness of fundamental analysis in analyzing the penny stocks are given in table 4.20

Table 4.20
Fundamental Analysis and Penny Stocks

Locations	Yes	No	Total
Delhi	56.84	43.16	100.00
Mumbai	50.00	50.00	100.00
Chennai	42.86	57.14	100.00
Kolkata	55.36	44.64	100.00
Average	51.20	48.80	100.00
Pearson's Chi-square: 4.30295, df=3, p=0.230576			

Source: Primary Data

51.20 percent of the brokers in table 4.20 regard fundamental analysis as effective in analyzing penny stock, while 48.80 percent consider fundamental analysis to be not effective in analyzing the stocks. In Delhi, the former forms 56.84 percent and latter 43.16 percent. In Mumbai, they are 50.00 and 50.00, while in Chennai, they are 42.86 and 57.14 and in Kolkata, they make 55.36 and 44.64 percent respectively.

Pearson's Chi-square test is used to test the significance of the difference of opinion of different brokers at different places regarding the effectiveness of fundamental analysis in analyzing the penny stocks. The test has found that there is no significant difference between the opinions among the different participants at different places at five percent level of significance, since the p value (0.230576) is greater than 0.05. Hence, Fundamental analysis provides the information regarding penny stock.

4.22 Different Types of Indicators

Different technical analysis indicators are used in the stock market. Table 4.21 presents the different indicators used in the market.

Table 4.21

Different Types of Indicators

Location	MA	RSI	ROC	Bollinger Band	MA CD	Trend line	Fibo nacci	DM A	Volume	A/D	OBV	Total
Delhi	18.95	15.79	8.42	7.37	13.68	0	3.16	6.32	15.79	4.21	6.32	100
Mumbai	26	12.67	5.33	7.33	6.67	8	3.33	4	16.67	5.33	4.67	100
Kolkata	17.86	14.29	7.14	0	6.25	14.3	7.14	2.68	16.96	8.04	5.36	100
Chennai	25.97	15.58	10.4	2.6	10.39	11.7	1.3	5.19	15.58	1.3	0	100
Average	23.29	13.87	6.85	5.31	8.22	8.39	3.77	4.28	16.44	5.14	4.45	100

Source: Primary Data

According to table 4.21, among the respondents, 23.29 percent use Moving average indicator;13.87 percent use Relative strength Index; 6.85 percent use rate of change indicator; 5.31 percent use Bollinger bands; 8.22 percent use MACD

(Moving Average Convergence divergence); 8.39 percent use trend lines; 3.77 percent use Fibonacci techniques; 4.28 percent use DMA (Displaced or directional Moving average); 16.44 percent use trading Volume; 5.14 percent use advance decline ratio and 4.45 percent use OBV (On Balance Volume).

In Delhi, the corresponding percentages are 18.95, 15.79, 8.42, 7.37, 13.68, 0.00, 3.16, 6.32, 15.79, 4.21, and 6.32 respectively. The same for Mumbai are 26.00, 12.67, 5.33, 7.33, 6.67, 8.00, 3.33, 4.00, 16.67, 5.33, and 4.67. In Chennai, these numbers are 25.97, 15.58, 10.39, 2.60, 10.39, 11.69, 1.30, 5.19, 15.58, 1.30, and 0.00 respectively. The respective numbers for Kolkata are 17.86, 14.29, 7.14, 0.00, 6.25, 14.29, 7.14, 2.68, 16.96, 8.04, and 5.36.

4.23 Practical Difficulties in Technical Analysis

Technical analysis is a subject which is practical in nature and it is considered to be a real time analysis of stock. It focuses on the identification of trend through various tools and indicators of technical indicators. Table 4.22 presents the different practical difficulties in technical analysis.

Table 4.22

Practical Difficulties in Technical Analysis

Locations	Following all the indicators together	Not well known	Lack of proper guidance	Lack of material availability	No uniform platform	Total
Delhi	10.13	31.65	31.65	12.66	13.92	100.00
Mumbai	9.76	28.05	51.22	4.88	6.10	100.00
Kolkata	19.05	29.76	35.71	5.95	9.52	100.00
Chennai	11.90	23.81	47.62	7.14	9.52	100.00
Average	10.84	26.02	37.67	6.23	7.86	100.00

Source: Primary Data

It is evident from the table that while 10.84 percent of the brokers have practical difficulty in following all the indicators together, 26.02 percent feel that they are not well versed in technical analysis. 37.67 percent lack proper guidance, whereas

6.23 percent are short of material availability. According to 7.86 percent, there is no uniform pattern in analyzing the stock (subjectivity).

In the case of Delhi, these figures are 10.13, 31.65, 31.65, 12.66, and 13.92 respectively while in the case of Mumbai, these numbers are 9.76, 28.05, 51.22, 4.88, and 6.10. They are 19.05, 29.76, 35.71, 5.95, and 9.52 in the case of Kolkata. Whereas, Chennai registers percentages of 11.90, 23.81, 47.62, 7.14, and 9.52. It can be concluded that practical difficulty of technical analysis is mainly due to lack of proper guidance as well as awareness.

4.24 Preference of Technical analysis Over Fundamental analysis

Table 4.23 presents the opinion regarding the preference of technical analysis over fundamental analysis.

Table 4.23

Preference of Technical analysis over Fundamental Analysis

Locations	Current picture	Strengthen the decision	Quick glance of the market	Less time consuming	To know the entry and exist	Total
Delhi	21.05	31.58	12.63	18.95	15.79	100.00
Mumbai	22.33	29.33	11.33	17.33	19.67	100.00
Kolkata	20.54	37.50	20.54	10.71	10.71	100.00
Chennai	18.18	24.68	20.78	16.88	19.48	100.00
Average	21.23	30.65	14.55	16.27	17.29	100.00

Source: Primary Data

According to 21.23 percent of the brokers, fundamental analysis does not provide current picture of the market. 30.65 percent use technical analysis to strengthen their decision. 14.55 percent use technical analysis to get a quick glance of the market, 16.27 percent use technical analysis because it is less time consuming analysis, and 17.29 percent use technical analysis to understand the entry level and exist level of the market.

In Delhi, these figures are 21.05, 31.58, 12.63, 18.95, and 15.79 respectively. In Mumbai, the respective numbers are 22.33, 29.33, 11.33, 17.33, and 19.67. In Kolkata, these percentages are 20.54, 37.50, 20.54, 10.71, and 10.71 respectively. In Chennai, the corresponding figures are 18.18, 24.68, 20.78, 16.88, and 19.48. Brokers prefer technical analysis in order to strengthen the trading decision as well as to understand the real picture of the market.

4.25 General Criteria for Using Technical Indicators

Table 4.24 explains the opinion regarding the General Criteria for Using Technical Indicators

Table 4.24

General Criteria for Using Technical Indicators

Locations	Complete set of data	Too many indicators together	Clear eye on the trend	Mathematical angle in the decision	Total
Delhi	15.79	31.58	42.11	10.53	100.00
Mumbai	12.00	26.67	40.00	21.33	100.00
Kolkata	8.93	32.14	41.07	17.86	100.00
Chennai	12.99	28.57	46.75	11.69	100.00
Average	10.45	25.00	35.27	16.10	100.00

Source: Primary Data

According to the above table, 10.45 percent of the brokers maintain that the analyst should have a complete set of data. However, 25.00 percent are against analyst using too many indicators together. 35.27 percent want the analyst to have a clear eye on the trend. Whereas 16.10 percent would like them to have mathematical angle in the decision making process.

The figures for Delhi are 15.79, 31.58, 42.11, and 10.53 respectively. In the case of Mumbai, the corresponding percentages are 12.00, 26.67, 40.00, and 21.33. In Kolkata, the numbers are 8.93, 32.14, 41.07, and 17.86 respectively. In Chennai, they

are 12.99, 28.57, 46.75, and 11.69. Brokers and investors should have a clear eye on trend and use more indicators together to avoid false signals.

4.26 Conclusion

Since the Indian market is not informationally efficient, both technical and fundamental analyses are used by the brokers for analyzing stocks. Brokers have identical voice regarding technical analysis. It is important in analyzing the stock because it provides a real picture of the market but the fundamental analysis provides a one time picture of the market in a dynamic market and it is time consuming also. Technical analysis has been used by brokers in different equity and derivative markets. Further, it is effective in volatile markets as well. Brokers use different types of technical trading tools, patterns and indicators to identify the trend in the market. Technical analysis is effectively used by brokers in long term as well as short term analysis. However, technical analysis is not free from its practical difficulties. Analysis has shown that brokers use technical analysis for analyzing stocks because technical trading rules and patterns are effective in the market. Therefore, the study does not reject the hypothesis that technical analysis is important in the formulation of trading strategies.

Chapter 5

MOVING AVERAGE –A KEY TOOL FOR TECHNICAL ANALYSIS

This chapter discusses the importance of Moving Averages as tool for technical analysis and as an instrument for making an investment or trading decision, as well. More specifically, it analyses the opinion of market participants about moving averages. Technical analysis derives information about the market through technical indicators which include both stock specific indicators and market indicators. Moving Average is considered to be an important stock specific indicator.

5.1 Introduction

The term Stock Market is widely known and is considered to be the barometer of an economy, since it facilitates in channelizing savings into investments or productive purposes. Stock markets in industrially advanced countries are well developed and are working in the right direction. Compared to the stock market in the developed countries, emerging markets like Latin American markets and Asian markets are not so developed. This is due to the lack of transparency in operation, stringent rules and regulations, and the role of insiders. This ultimately leads to market inefficiency. However, performance wise, the emerging markets have shown better results than the developed and the other world market. As per MSCI (Morgan Stanley Capital International) emerging market index, the Latin American Index has risen to 63.01% and BRIC country's index has increased to 62.98%. However, the world index has risen only by 15.37% years to date.

Today, among the Asian stock markets, Indian market is considered to be more attractive because of its speedy growth and high capitalization rate after 2000. Developments are more attractive in Indian market compared to other emerging markets in the Asian, Latin American region. As per MSCI India index, 57.94% of growth was registered during the mid of July 2009 and it is more than MSCI emerging market index (31.86%) and emerging market Asia indices (39.63%).

5.2 Technical Analysis

In order to understand the status of the stock in the market stock analysis has been practiced by market participants since the inception of security trading. It became more professional as the security markets developed. The analysis used by the brokers can be broadly classified into two: fundamental analysis and technical analysis. The fundamental analysis concentrates mainly on the identification of the real or intrinsic value of the stocks and helps to take an investment decision. However, technical analysis focuses primarily on the performance of the stock in the market place. In the initial stages, a technical analysis of stocks was done by observing the price movements and market participants used different varieties of charts to understand the movement of stocks. Later, technical analysis added more variables like trading volume along with the price information.

Along with the basic tools of technical analysis such charts, technical analysts use technical indicators to track investor's sentiments. Generally, technical indicators are classified into two: leading indicators and lagging indicators. Leading indicators provide early signals of the market movement and create more opportunity to trade. Leading indicators are commonly used by the market professionals to understand the overbought and oversold positions in the market. Lagging indicators, otherwise called

trend following indicators, are those indicators which provide the movement of the market. Practitioners use this type of indicators in a trending market but not in side ways market. So, these types of market indicators are helpful in showing the market movements, providing best signal and helping the market practitioners to earn significant profit from the market.

5.3 Literature Review

James, Jr. (1968) analyses moving average tool as a stock investment strategy. This tool predicts the future price movement and acts as an aid to minimize the losses. The data is taken from the New York stock exchange for the period 1926-1960. Moving average is studied with different lengths and weights but the study focuses only on monthly moving average. In the analysis, a few of the decision rules beat the simple buy and hold philosophy, but in general, it is found that monthly moving average is not an effective tool in predicting the future price movement**.** Hudson, Dempsey and Keasey (1996) explain the predictive ability of technical trading rules. The study analyzes whether the investors are able to generate the excess return by using technical analysis in a costly environment. The data are taken from Financial Times Industrial ordinary Index, which is the longest daily series available in the U.K, from July 1935 to January 1994. Moreover, the study has used two important technical trading rules: moving average and trading range break out rules. The study has found that technical trading rules have predictive power. But after considering the transaction cost, it does not have significant profitability. Balsara, Carlson and Rao (1996) evaluate the superiority of mechanical trading rule over simple buy and hold strategy. The study is based on historical futures price data of different commodities and periods. The dual moving average rule is used in this study. Gold, Treasury bond,

Soybean and Japanese yen are the commodities used for the study. The study period is from 1979 to 1987 and it is found that mechanical trading rules are profitable in all time of the study. Flexible systems are the key to success in any technical trading program in the future market. Ratner and Leal (1998) show the profitability of technical trading strategies in the emerging equity markets in Asia and Latin America. The study includes ten equity markets, such as Argentina, Brazil, Chile, Mexico, India, Korea, Malaysia, Philippines, Taiwan and Thailand. The study uses the daily inflation adjusted returns for a period of thirteen years from 1982. The study analyses ten different variable moving average models and compares it with the buy and hold strategy. The study finds that technical trading rules are profitable only in three emerging markets: Taiwan, Mexico and Thailand. In the other markets, after considering the transaction costs, technical trading strategies did not show any significant profitability.

Yao, Tan and Poh (1999) explain the applicability of Artificial Neural Network with technical analysis in forecasting the share prices. The study conducted is based on Kuala Lumpur composite index for a period of seven years from 1984. Moving average, Momentum, Relative Strength Index, Stochastic and moving average of stochastic are the main technical indicators used as the inputs in this study. Significant profits were generated by using Artificial Neural Network on daily data but weekly data does not produce any significant profit. It also concludes that useful prediction can also be made without extensive market data and market knowledge.

5.4 Moving Average

Moving average is one of the simplest but useful tools in the armoury of a technical analyst. It has been considered as an important mechanical trading rule by

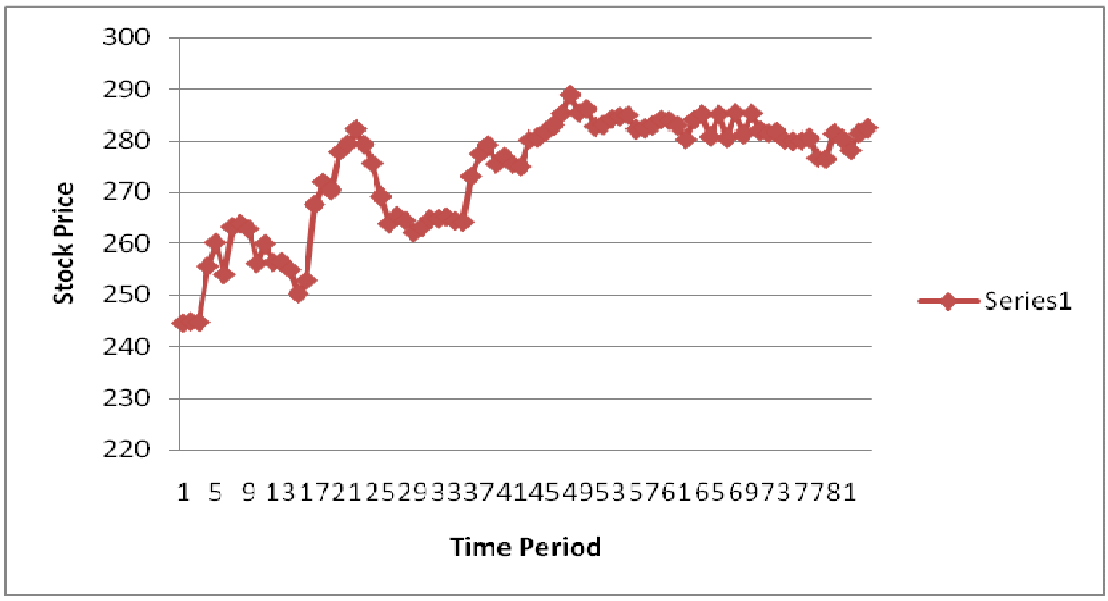
the market participants to understand the price movements as well as for predicting the future price. Basically, Moving Averages are lagging indicators which always lag behind the price. It smoothens the price series and corrects the major fluctuations in the price series and in that way, it can forecast the prices of stocks as well as the index. Moving Averages have a smoothening content of the price series. There are different types of Moving Averages: Simple Moving average, Exponential Moving average and MACD. Generally, two systems of moving average have been used in the market: one compares the short term and long term moving averages and the other compares the stock price and respective moving averages. However, comparison of the stock price and respective moving averages are common in the market place. A buy signal is generated when the current price of the stock or index are above its moving average. A sell signal is generated when the current price or index are lower than its moving average.

5.5 Simple Moving Average

Market participants use simple moving average as one of the important technical Indicators in the market. It acts as a bench mark for the technical analyst to interpret market movement as well as to predict the trend. Generally, moving average is calculated by using the closing price data but the calculation can also be done by using the open, high, low price data. The lag length of the moving average is not fixed; it depends upon the market and market practitioners. Moving averages are calculated as follows:

$$MA_{t,n} = 1/n\sum_{j=t-n}^{t-1} C_i$$

Ci is the closing price at time of t, n indicate the period of the moving average



Fig, 5.1.ABB Stock Chart

In the above Figure of ABB, moving average clearly shows the trend of that particular stock. It should be noted that when the market trends it can generate more signals, when the market does not trends the moving average may give misleading signals. The Important aspects of Moving Average are: it removes the noise in the market or smoothens the price information and gives a more accurate picture of the movement of stock in the market. Moving Average is also used to understand the correct action against its own historical trend.

In India, Market participants use different types of moving averages like simple moving average and weighted moving average to identify the market trend. Most of the practitioners use different types of Moving Averages together to obtain more clarity in the market.

5.6 Moving Average as a Technical Trading Rule

The present study examines the various versions of simple Moving average trading rules. Trading signal is identified by comparing the stock price and respective

moving averages. A buy signal is generated when stock price exceeds the respective moving averages and a sell signal is generated when the stock price does not exceed the respective moving average. The study has used six variations of simple moving averages like 5,10,20,50,100,200. While calculating long term moving average, 1% of band is introduced in order to avoid the noisy trading in the market and it ensures that the signals obtained by the moving averages are right. Whenever the band is introduced neutral signals are also generated. Neutral signal means that the signal falls in between the upper and the lower band of the long term moving average. In this situation, the reliability of the trend is doubtful and investors are advised not to invest in the market; instead they can hold some risk free asset. When the band introduces all the days it does not generate signals like short term moving average but it generates significant returns after removing the weak performance days.

5.7 Methodology

The study uses both primary and secondary data to analyze the importance of moving average as a technical indicator. The primary data is gathered from market participants through surveys and the secondary data (only the price statistics of the respective stocks) is collected from the National Stock Exchange. Secondary data analysis is discussed in detail in chapter six.

5.8 Primary Data Analysis

The primary data are collected from market participants to understand the importance of moving average as a technical indicator. The study uses the technique of Pearson’s Chi-square test and ANOVA for data analysis.

5.8.1 Different Moving Averages and the Market

Among the technical indicators, moving averages occupy a significant place. This indicator smoothens the data and clearly shows the trend of the market. It also shows the overbought and oversold position of the market. There are different kinds of moving averages used in the market. Opinions of brokers regarding the commonly used moving averages in the market are explained in table 5.1

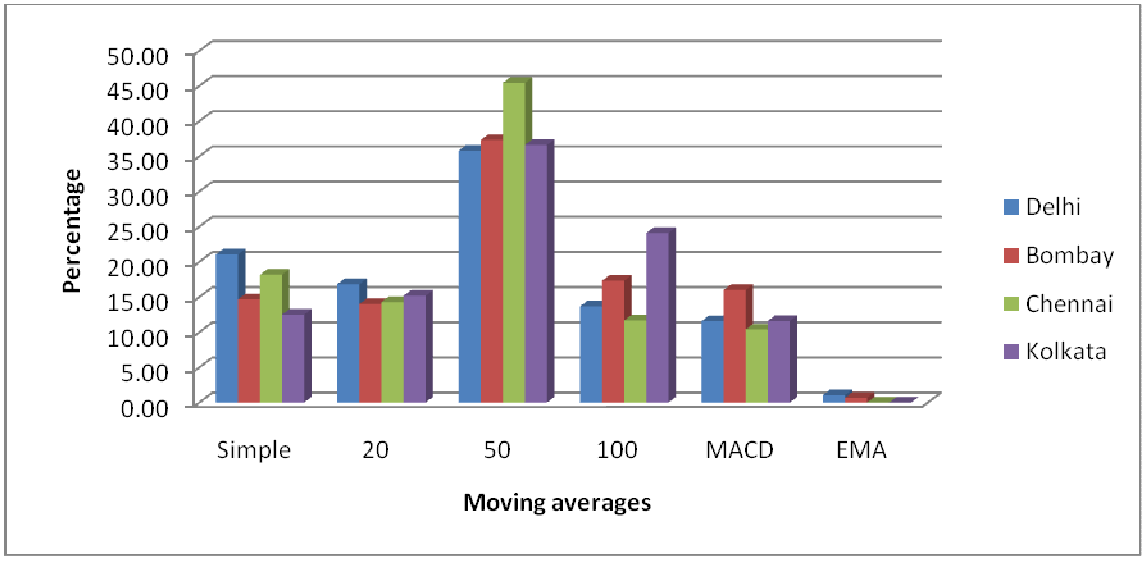
Table: 5.1

Different Moving Averages and the Market

Locations	Simple	20	50	100	MACD	EMA	Total
Delhi	21.05	16.84	35.79	13.68	11.58	1.05	100.00
Bombay	14.67	14.00	37.33	17.33	16.00	0.67	100.00
Chennai	18.18	14.29	45.45	11.69	10.39	0.00	100.00
Kolkata	12.50	15.18	36.61	24.11	11.61	0.00	100.00
Average	15.75	14.73	38.01	17.29	13.70	0.51	100.00
Pearson's Chi-square = 13.9315, df = 15, p = 0.530742							

Source: Primary Data

According to table 5.1, 15.75 percent of the market participants use simple moving average, 14.73 percent of them use 20 days moving average, 38.01 use 50 days moving average, 17.29 percent use 100 days moving averages,13.70 percent use MACD (Moving Average Convergence Divergence) and 0.51 percent use EMA (Exponential Moving Averages) for the analysis.



Fig, 5.2. Different Moving Averages and the Market

21.05 percent of the market participants in Delhi use the simple moving averages, 16.84 percent of them use 20 days moving averages, 35.79 percent of them use 50 days moving averages, 13.68 percent use 100 days moving averages, 11.58 percent use the MACD and 1.05 percent of them are using the EMA. In Mumbai these numbers are 14.67, 14.00, 37.33, 17.33, 16.00, and 0.67 respectively. The corresponding figures in Chennai are 18.18, 14.29, 45.45, 11.69, 10.39, and 0.00. In Kolkata the respective percentages are 12.50, 15.18, 36.61, 24.11, 11.61, and 0.00.

To test the significance of the difference opinion regarding the usage of different kinds of moving averages of different market participants at different places, Pearson's Chi-square test has been used. The test has found that there is no significant difference among the opinion of different market participants regarding the usage of moving averages at five percent level of significance, since the p value (0.530742) is greater than 0.05. So, the brokers use simple (which includes both five days and ten days moving averages), twenty days, fifty days, hundred days, two hundred days, MACD and EMA to identify the trend in the market. However, brokers use both fifty

and hundred days moving averages more, when compare to other types of moving averages. Fifty days moving average shows the medium term trend in the market whereas hundred days moving average shows the long term trend in the market.

5.8.2 Moving Average Analysis: Different Responses

The popularity of technical indicators depends upon its success in detecting the trend and taking correct trading recommendation. Moving average is considered to be the most widely used stock specific indicator in the market. Table 5.2 shows the opinion of brokers whether they benefited with the use of moving average analysis.

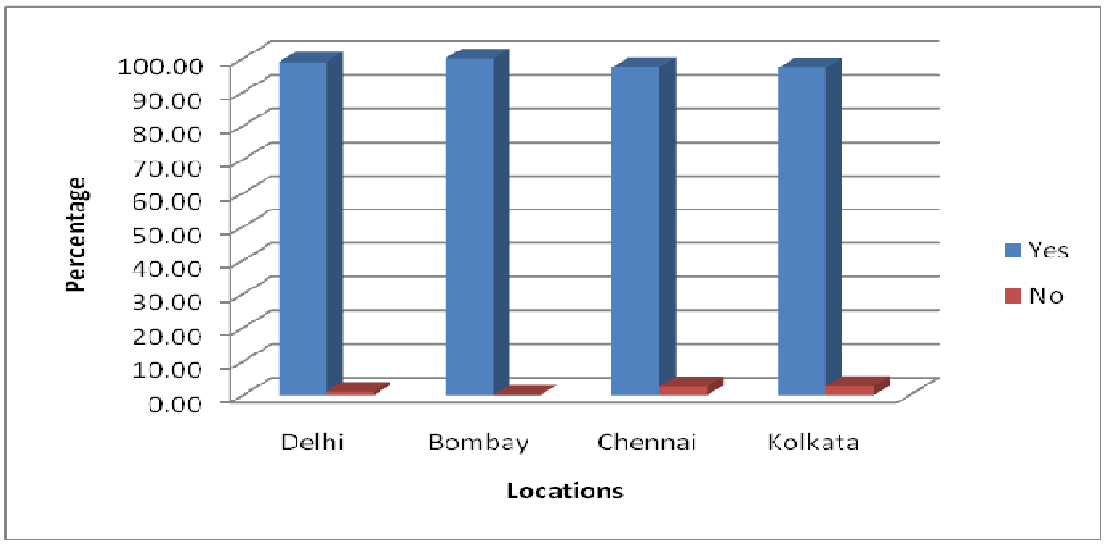
Table 5.2

Moving Average Analysis: Different Responses

Locations	Yes	No	Total
Delhi	98.95	1.05	100.00
Bombay	100.00	0.00	100.00
Chennai	97.40	2.60	100.00
Kolkata	97.32	2.68	100.00
Average	98.97	1.03	100.00
Pearson’s Chi-square: 7.98430, df=3, p=0.046355			

Source: Primary Data

The table shows that 98.97 percent of the market participants benefite from moving averages and 1.03 percent do not benefit from it.



Fig, 5.3. Moving Average Analysis: Different Responses

The corresponding percentages in Delhi, Mumbai, Chennai, and Kolkata are 98.95 and 1.05; 100 and 0.00; 97.40 and 2.60; 97.32 and 2.68 respectively.

Pearson's Chi-square test has been used to test the significance of different opinion by different market participants at different places regarding identification of benefit of moving average. The test finds that there is a significant difference among the opinion of different participants at different places at five percent level of significance, since the p value (0.046355) is less than 0.05. Therefore, it is evident that investors benefit from moving average analysis.

5.8.3 Applicability of Moving Averages in Different Markets

The features of different markets vary from each other. But technical analysis and its rule are the same for all the markets. Moving averages are one of the mechanical trading rules that help in identifying the continuation and reversal of trend. It also generates signals which help the investors to take the most appropriate investment decision. The opinions regarding the applicability of moving averages in different markets are explained in table 5.3

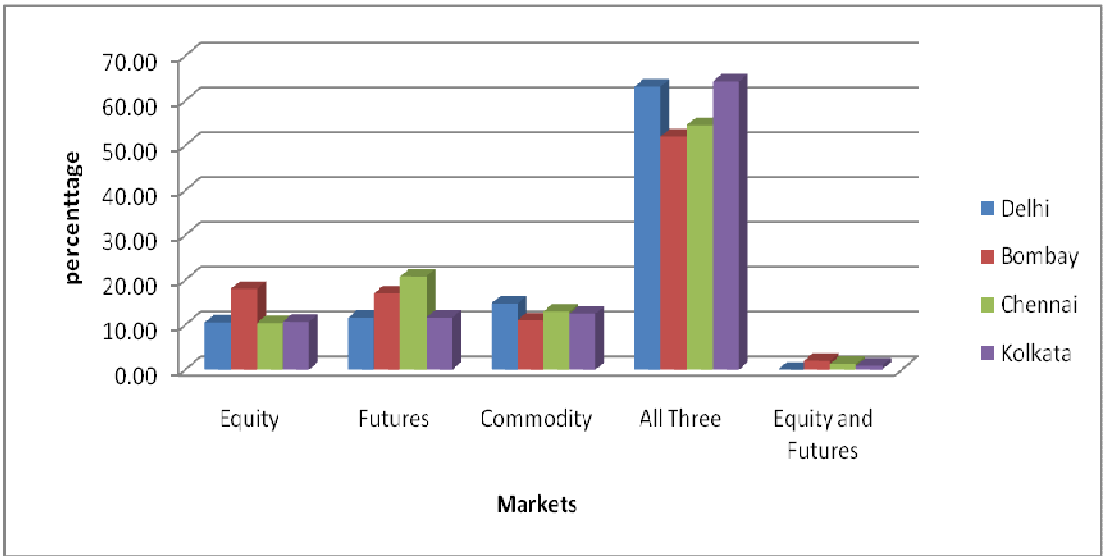
Table 5.3

Applicability of Moving Averages in Different Markets

Locations	Equity	Futures	Commodity	All Three	Equity and Futures	Total
Delhi	10.53	11.58	14.74	63.16	0.00	100.00
Bombay	18.00	17.00	11.00	52.00	2.00	100.00
Chennai	10.39	20.78	12.99	54.55	1.30	100.00
Kolkata	10.71	11.61	12.50	64.29	0.89	100.00
Average	14.38	15.58	12.16	56.51	1.37	100.00
Pearson's Chi-square: 15.7858, df=12, p=0.201311						

Source: Primary Data

Table 5.3 makes it clear that moving averages are believed to be applicable in equity market by 14.38 percent of brokers. Those who regard it as highly applicable in future markets form 15.58 percent of the respondents. 12.16 percent of them maintain that it is highly applicable in the commodity markets, 56.51 percent think that it is applicable in all the three markets and 1.37 percent hold that it is applicable in equity as well as future market.



Fig, 5.4. Applicability of Moving Averages in different Market

The corresponding percentages of the four metros are: 10.53, 11.58, 14.74, and 63.16 for Delhi; 18.00, 17.00, 11.00, 52.00, and 2.00 for Mumbai; 10.39, 20.78, 12.99,

54.55, and 1.30 for Chennai; 10.71, 11.61, 12.50, 64.29, and 0.89 for Kolkata. Pearson's Chi-square test has been used to analyse the significance of different opinion by different market participants at different places regarding the applicability of moving average indicator in different markets. The test has found that there is no significant difference between the opinion among the different participants at different places at five percent level of significance, since the p value (0.201311) is greater than 0.05. So, the study has identified that moving averages are useful in Equity Market, Futures Market and Commodity Markets. However, Moving averages are more useful in both equity market and derivative markets.

5.8.4 Moving Averages in Technical Analysis

Moving averages are considered to be one of the most important stock specific indicators which are heavily used in technical analysis for taking an investment decision. Technical analysis analyzes a single stock or index by using different forms of moving averages. The opinions regarding the weight given to Moving averages in technical analysis are explained in table 5.4

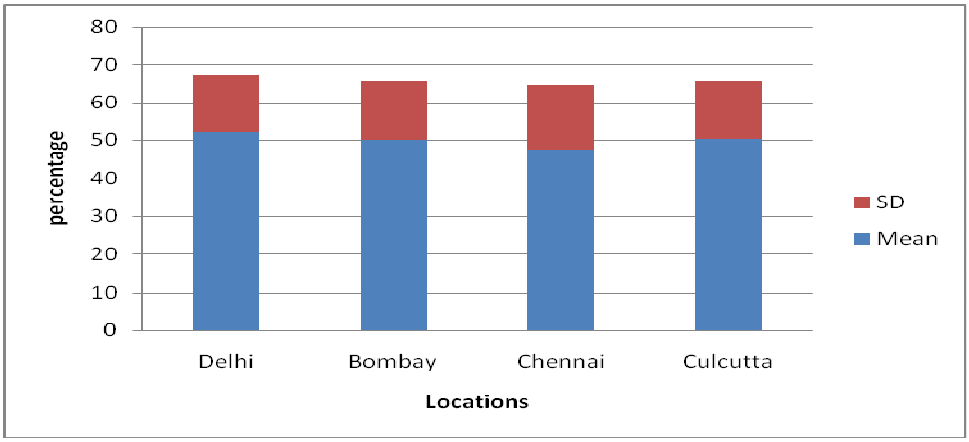
Table 5.4

Moving Averages in Technical Analysis

Locations	Number	Mean	SD
Delhi	95	52.11	15.24
Bombay	300	50.13	15.50
Chennai	77	47.53	17.01
Kolkata	112	50.31	15.48
Total	584	50.15	15.67
Sum of squares=893.7831,df =3,Mean square=297.9277,F=1.215015,p=0.303452			

Source: Primary Data

Table 5.4 shows that the Average weight given to moving average while doing technical analysis of stocks is 50.15 with a standard deviation of 15.67.



Fig, 5.5. Moving Averages in Technical Analysis

In Delhi, the market participants give an average weight of 52.11 with a standard deviation of 15.24 to moving averages, while performing the technical analysis of stock. In Bombay, it is 50.13 with a standard deviation of 15.5, in Chennai, it is 47.53 with a standard deviation of 17.01, and in Calcutta, it is 50.31 with a standard deviation of 15.48.

ANOVA test is applied to test the significance of difference of opinion by different market participants regarding the weight given to moving averages while doing technical analysis of stock. The test has found that there is no significant difference among the opinion of different market participants regarding the weight given to technical analysis in an investment decision at five percent level of significance, since the p value (0.303452) is higher than the 0.05. Hence, it is clear from the analysis that brokers do use Moving Averages in technical analysis while making an investment decision.

5.8.5 Usage of Different Types of Stock Specific Indicators

Stock specific indicators are used to identify the trend of the individual stock or index. Moving averages, relative strength index and rate of change are the important type of the stock specific indicators. Table 5.5 shows the opinion regarding the usage of different type of stock specific indicators.

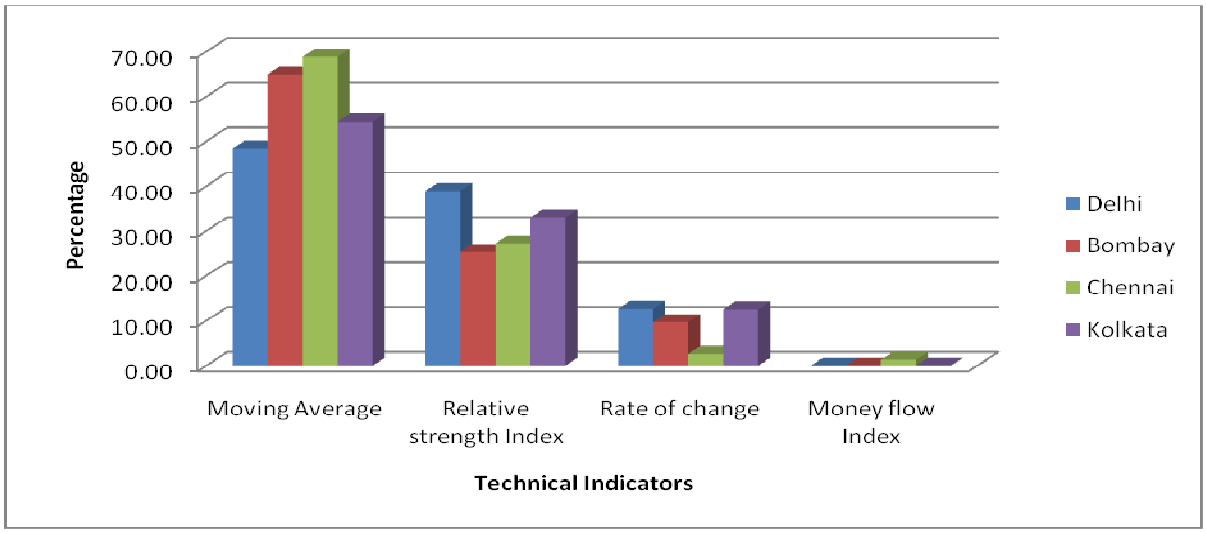
Table 5.5

Usage of different Type of Stock Specific Indicators

Locations	Moving Average	Relative strength Index	Rate of change	Money flow Index	Total
Delhi	48.42	38.95	12.63	0	100
Bombay	65.00	25.33	9.67	0	100
Chennai	68.83	27.27	2.6	1.3	100
Kolkata	54.46	33.04	12.5	0	100
Average	60.79	29.28	9.76	0.17	100
Pearson's Chi-square: 22.3941, df=9, p=0.007725					

Source: Primary Data

Table 5.5 shows that 60.79 percent use moving averages, 29.28 percent use relative strength index, 9.76 percent use rate of change and 0.17 percent use money flow index.



Fig, 5.6. Usage of different type of Stock specific Indicators

For Delhi the figures are 48.42, 38.95, and 12.63; for Bombay they are 65.00, 25.33, and 9.67; In the case of Chennai, they are 68.83, 27.27, 2.60, and 1.30; and for Calcutta they are 54.46, 33.04, and 12.50.

Pearson's Chi-square test has been used to test the significance of the different opinions by different brokers at different places regarding the usage of common stock specific indicators. The test has found that there is significant difference among the opinion among the different participants at different places at five percent level of significance, since the p value (0.007725) is less than 0.05. Moving averages and relative strength index are the two technical indicators used by the brokers in Indian Stock Market.

5.9 Conclusion

The primary data analysis has found that moving averages is one of the important technical indicators in the Indian stock market. Brokers give adequate weightage to moving averages while making an investment decision and they use different varieties of moving averages to identify the trend. However, varieties of simple moving average are the most commonly used moving averages in the market. Brokers use simple (which include both five days and ten days moving averages), twenty days, fifty days, hundred days, two hundred days, MACD and EMA to identify the trend in the market.

However, in comparison with other types of moving averages brokers mostly use both fifty and hundred days moving averages more. Fifty days moving average shows the medium term trend in the market whereas hundred days moving average shows the long term trend in the market. It should be noted that Brokers have

benefited from the usage of moving average in the market. The study has also found that brokers use moving averages in different markets like Equity market, Futures market and Commodity market effectively.

Chapter 6

Moving Average Analysis

The present chapter deals with the secondary data analysis of moving average trading rules. The study uses five variations of simple moving averages like 5,10,20,50, 100 and 200 days. The study compares the signals generated by moving average trading rules with the buy and hold trading strategy. Price information of different stocks is collected from the National Stock Exchange.

6.1 Introduction

Moving average trading rules are considered to be important technical indicators. The study examines the various versions of simple Moving average rules. Trading signal is identified by comparing the stock price and the respective moving averages. A buy signal is generated when stock price exceeds the respective moving averages and a sell signal is generated when the stock price falls below the respective moving average. While calculating long term moving average, 1% of band is introduced in order to avoid the noisy trading in the market and make sure that the signals obtained by moving averages are right. Whenever the band is introduced, neutral signal is also generated. Neutral signal means the signal that falls in between the upper and lower band of long term moving average. In this situation, the reliability of the trend is doubtful and investors are advised not to invest in the market, instead they can hold a risk free asset. When the band is introduced, it generates the significant returns after eliminating the weak performance days.

6.2 Methodology

The methodology of Brock *et al* (1992) is used to analyze the mean difference between Moving average trading rule and buy and hold trading strategy. The study assumes that the population has equal variances.

$$\frac{\mu_r - \mu}{(\sigma^2/N+\sigma^2/N_r)^{1/2}}$$

Where, μ_r and Nr are the mean return and number of signals (either buy or sell), μ and N are the unconditional mean and number of observations. σ^2 is the estimated variance for the entire sample. The return is calculated by using the following equation.

$$Rt = [In (Pt)-In (Pt-1)$$

In the equation, In (Pt) denotes the logarithm of closing price at the time of t, whereas, mean return is calculated by dividing total return with number of observation.

6.3 Data

The study focuses on the national stock exchange's Nifty Index for the period 2002-03 to 2006-07. National stock exchange is considered to be one of the premier stock exchanges in India. Nifty consists of fifty stocks but the study has included only thirty six stocks which formed part of the Nifty consciously during the period of study. Closing price data of each security has been taken and it covered 1259 daily observations. The data is collected from NSE website. The constituents of Nifty are taken because of its market value, capitalization, good return and consistent performance in the market.

6.4 Empirical Analysis

The study uses closing price information of thirty six stocks in the Nifty as already stated for the purpose of continuous analysis. In the analysis, various moving average trading rules, such as five-day, ten-day, twenty-day, fifty-day, hundred-day and two hundred-day are compared with buy and hold strategy of the respective stocks. Furthermore, the analyses includes the calculation of return and the variance of buy and hold strategy; calculation of different kinds of moving average and their comparison with the buy and hold strategy to understand whether moving average strategy earns superior return or not. Every moving average analysis is classified into two parts to bring more clarity into analysis.

Table 6.1 describes the mean return; standard deviation and variance of different stocks under buy and hold strategy. Most of the stocks have generated positive returns but few stocks have generated negative return.

6.5 Five-day Moving Average

Brokers use five- days moving average to understand the very short term trend in thee market. Five-day moving average analysis includes the calculation of five-day moving average, mean returns, identification of signals and comparison of signal returns with returns of buy and hold strategy. The analysis is explained in tables 6.2 and 6.3 respectively.

The first column presents the name of the stocks and second column gives the number of buy and sell signals generated by five day moving average rule, third column shows the mean returns for the various buy and sell signals, the fourth column

shows the returns comparison result of both buy and sell signals and the final column shows the t values of return comparison results.

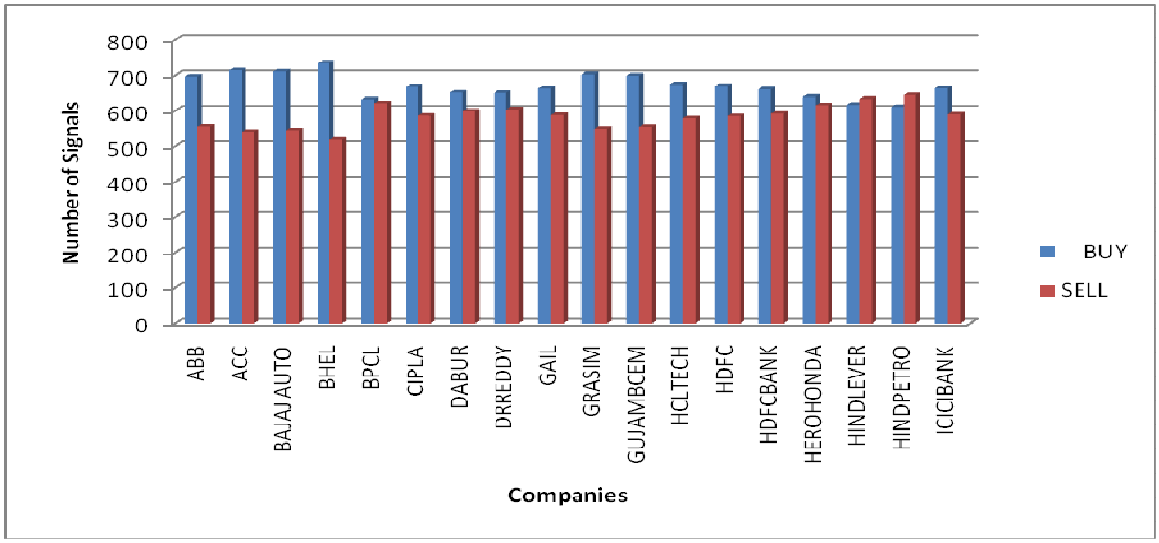
Table 6.2

Five-day Moving Average- Secondary Data Analysis part 1

Company	No. of signals		Mean return		Return Difference		t values	
	BUY	SELL	BUY	SELL	buy-hold	sell-hold	buy-hold	sell-hold
ABB	697	556	0.011	-0.009	0.0095	-0.011	*9.6836	*-11.195
ACC	714	540	0.010	-0.010	0.0091	-0.012	*9.2714	*-11.140
BAJAJ AUTO	710	544	0.010	-0.009	0.0094	-0.010	*5.8129	*-5.9675
BHEL	735	518	0.011	-0.011	0.0104	-0.012	*6.1528	*-6.7713
BPCL	632	621	0.012	-0.012	0.0135	-0.012	*7.3356	*-6.4909
CIPLA	668	586	0.010	-0.011	0.0109	-0.010	*5.0879	*-4.8055
DABUR	651	599	0.012	-0.012	0.0128	-0.012	*6.3818	*-5.9398
DRREDDY	650	603	0.010	-0.011	0.0113	-0.010	*6.1050	*-5.5504
GAIL	663	588	0.012	-0.011	0.0117	-0.011	*6.3550	*-6.0181
GRASIM	703	549	0.011	-0.010	0.0103	-0.011	*6.2159	*-6.2970
GUJAMBCEM	699	555	0.010	-0.012	0.0110	-0.012	*5.4489	*-5.5395
HCLTECH	674	578	0.014	-0.015	0.0143	-0.014	*7.1595	*-7.1048
HDFC	669	585	0.011	-0.010	0.0111	-0.011	*6.1247	*-5.7899
HDFCBANK	661	592	0.010	-0.009	0.0104	-0.009	*6.1668	*-5.6339
HEROHONDA	639	615	0.012	-0.011	0.0122	-0.011	*6.9384	*-6.2216
HINDLEVER	616	633	0.010	-0.010	0.0114	-0.009	*6.7324	*-5.7357
HINDPETRO	610	644	0.013	-0.012	0.0143	-0.011	*7.5609	*-6.4132
ICICIBANK	664	590	0.013	-0.010	0.0120	-0.011	*6.8652	*-6.4850

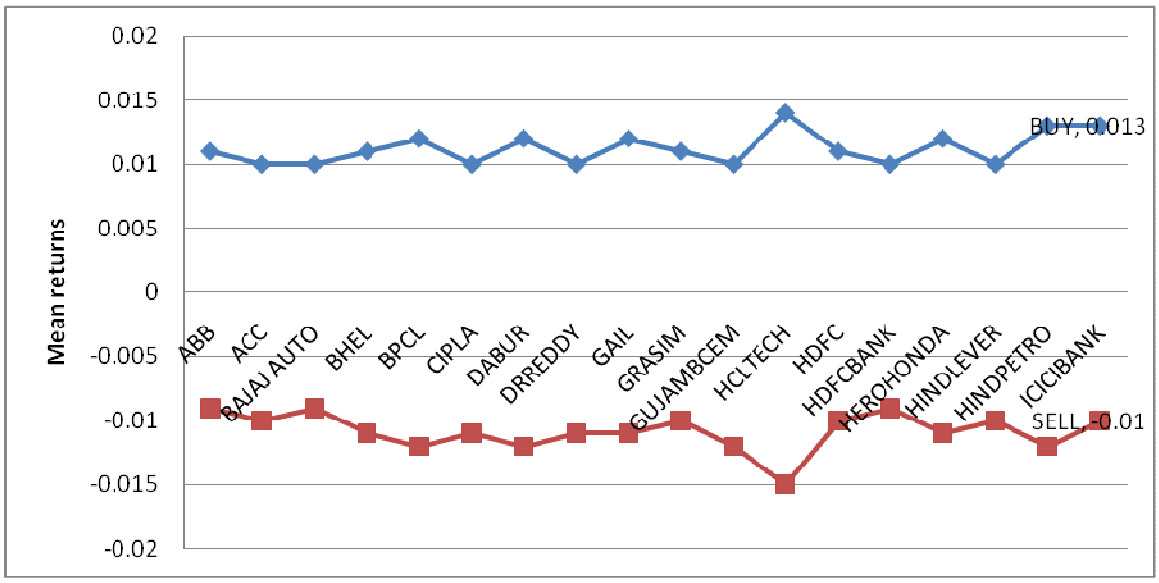
Source: Compiled data from NSE

Different stocks have generated different signals based on their respective demand and supply. The study shows that five-day moving average has generated more buy signals than sell signals. Stocks such as ACC, BHEL, BAJAJ AUTO, ABB, GRASIM, GUJAMBCEM, CIPLA, BPCL, HDFC and ICICIBANK have generated more buy signals. However, these stocks have generated less number of sell signals. BPCL, DRREDDY, HEROHONDA, HINDPETRO, HINDLEVER have generated more number of sell signals; at the same time, they have generated equally good numbers of buy signals as well.



Fig, 6.1 Signals generated by different Stocks

The entire buy mean returns have shown positive values which fall between 0.01 and 0.014. However, all the sell returns have shown negative values which fall between -0.015 and -0.009. GRASIM, HDFC, BPCL, DABUR, GAIL,HEROHONDA, HINDPETRO, ICICIBANK, HCLTECH stocks have generated the highest mean return in buy signals, ACC, BAJAJ AUTO, CIPLA, DRREDDY,GUJAMBCEM, HDFCBANK, HINDLEVER stocks have generated the lowest mean return in buy signals. ACC, GRASIM, HDFC, HINDLEVER, ICICIBANK, ABB, BAJAJ AUTO and HDFCBANK have shown the highest mean return in sell signals. HCLTECH, BPCL, DABUR, GUJAMBCEM, HINDPETRO, BHEL, CIPLA, DRREDDY, GAIL, HEROHONDA stocks have shown the lowest mean return in sell signals.



Fig, 6.2 Mean Returns of Different Stocks

Both buy mean returns and sell mean returns are compared with returns of buy and hold strategy and the comparison has identified that signal returns are better than the buy and hold returns. To test the statistical significance of the return difference, t ratio has been calculated and t ratio is found to be significant at 1%level.

The second part of five-day moving average analysis too shows that five-day moving average has generated more buy signals than the sell signals. The stocks of INFOSYS, M&M, RELIANCE, SBIN, SAIL, SUNPHARMA, and TATAPOWER have generated more buy signals than sell signals. However, almost all stocks have generated more than 550 sell signals. ITC, VSNL, WIPRO, SUNPHARMA, IPCL, RANBAXY have generated more numbers of sell signals.

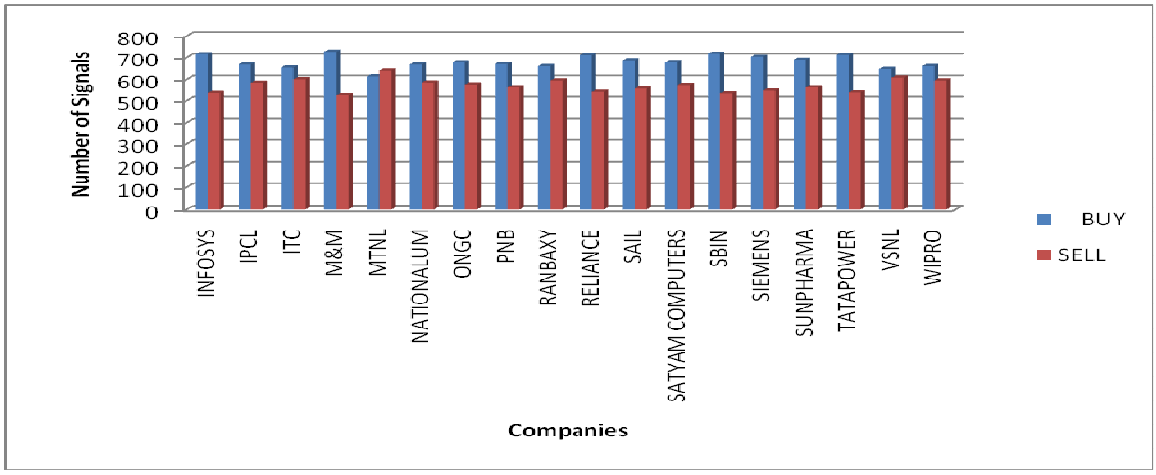
Table 6.3

Five-day Moving Average- Secondary Data Analysis part 2

Company	No. of signals		Mean return		Return Difference		t values	
	Buy	Sell	Buy	Sell	Buy-hold	Sell-hold	Buy-hold	Sell-hold
INFOSYS	716	538	0.0107	-0.013	0.0111	-0.012	*5.3717	*-5.6987
IPCL	667	585	0.0131	-0.012	0.0126	-0.012	*6.5412	*-6.3221
ITC	653	601	0.0102	-0.010	0.0107	-0.009	*5.2040	*-4.6928
M&M	727	527	0.0128	-0.012	0.0116	-0.014	*6.3546	*-6.9416
MTNL	614	639	0.0140	-0.012	0.0145	-0.012	*7.6212	*-6.5805
NATIONALUM	667	586	0.0136	-0.012	0.0132	-0.013	*6.8771	*-6.6726
ONGC	677	577	0.0114	-0.011	0.0111	-0.011	*6.3152	*-6.1022
PNB	669	564	0.0166	-0.014	0.0148	-0.016	*7.3696	*-7.5670
RANBAXY	659	595	0.0100	-0.011	0.0111	-0.010	*5.9668	*-5.5052
RELIANCE	711	543	0.0102	-0.011	0.0096	-0.018	*5.8754	*-6.0098
SAIL	686	558	0.0196	-0.016	0.0173	-0.019	*7.7726	*-8.0701
SATYAM COMPUTERS	678	575	0.0142	-0.014	0.0140	-0.014	*7.1989	*-7.1861
SBIN	718	536	0.0104	-0.010	0.0098	-0.011	*6.0268	*-6.2693
SIEMENS	703	549	0.0123	-0.010	0.0110	-0.012	*5.4354	*-5.5599
SUNPHARMA	689	564	0.0110	-0.011	0.0110	-0.011	*5.8231	*-5.7657
TATAPOWER	712	540	0.0114	-0.011	0.0107	-0.012	*6.3239	*-.5883
VSNL	646	608	0.0146	-0.013	0.0144	-0.013	*7.3347	*-6.799
WIPRO	659	595	0.0130	-0.014	0.0138	-0.013	*6.3818	***-1.55

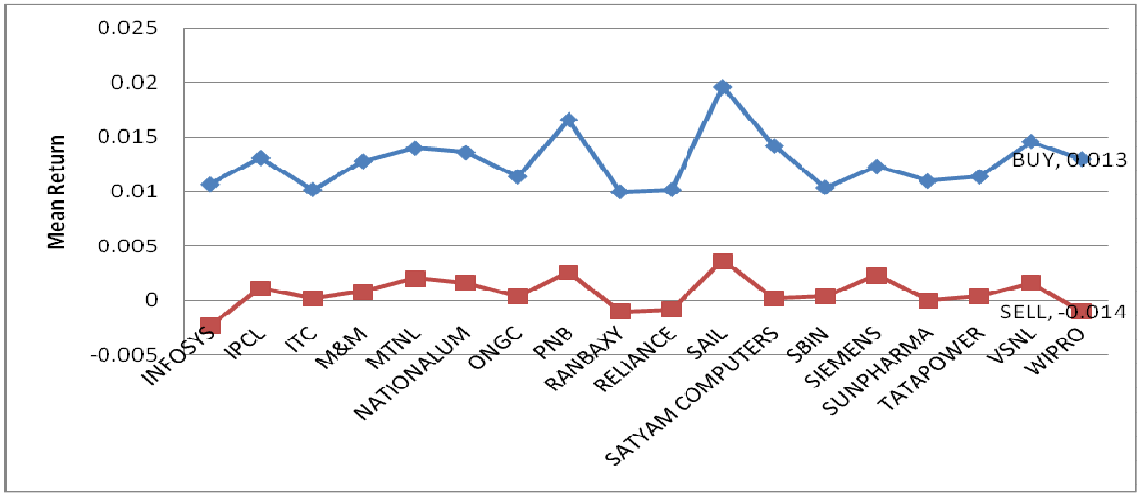
Source: Compiled data from NSE

The entire buy mean returns have shown the positive value, which falls between 0.01 and 0.0196. However, all the sell returns have shown negative value, which falls between -0.01 and -0.016. TATAPOWER, SIEMENS, M&M, WIPRO, IPCL, NATIONALUM, MTNL, SATYAM COMPUTERS, VSNL, PNB stocks have generated the highest mean return in buy signals, RANBAXY, ITC, RELIANCE, SBIN ,INFOSYS stocks have generated the lowest mean return in buy signals.



Fig, 6.3 Signals generated by different Stocks

ONGC, RANBAXY, RELIANCE, SUNPHARMA, TATAPOWER, ITC, SBIN, SIEMENS have shown the highest mean return in sell signals, while SAIL, PNB, SATYAM, WIPRO stocks have shown the lowest mean return in sell signals.



Fig, 6.4 Mean Returns of different Stocks

Both buy mean returns and sell mean returns have been compared with returns of buy and hold strategy and the comparison has identified that signal returns are better than buy and hold returns. To test the statistical significance of the return difference, t ratio has been calculated and the t ratio has been found to be significant at 1% level of significance. Of thirty six stocks, most of the stocks have generated a

good number of buy signals compared to sell signals. The company, BHEL, has generated the highest number of buy signals (735) compared to sell signals (518), whereas Hindustan Petroleum Company has generated less buy signals (610) in contrast to sell signals (644). All the buy signal returns have shown positive results, ranging from1.01% to 1.66% and all the sell signal returns show the negative results ranging from-1.68% to -0.93%. When the moving average signal returns has been compared with the buy and hold return, all the buy signals show the positive returns and sell signals show the negative returns. In order to test the significance, t values are calculated, for all company's t values are significantly different from zero at 1% level itself. So, the study of five-day moving average has found that the return obtained from moving average trading rule outperforms the return gained from the buy and hold strategy. It should be noted that the analysis has generated more buy signals than sell signals.

6.6 Ten-day Moving Average

Brokers use ten-day moving average to understand the short term trend in the market. Ten-day moving average analysis includes calculation of five-day moving average, mean returns, identification of signals and comparison of signal returns with returns of buy and hold strategy. The analysis is arranged in two parts and is explained in table 6.4 and 6.5 respectively.

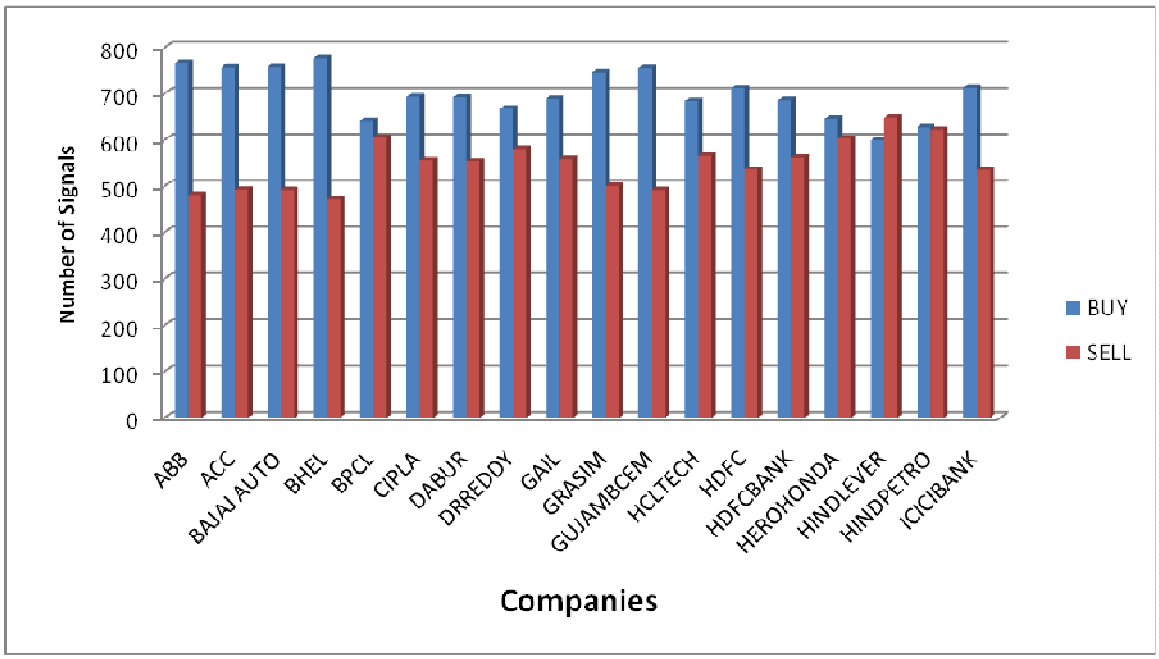
Table 6.4

Analysis of Ten-day Moving Average part 1

Company	No of signals		Mean return		Return difference		t values	
	Buy	Sell	Buy	Sell	buy-hold	sell-hold	buy-hold	sell-hold
ABB	767	482	0.008	-0.0072	0.006	-0.01	*6.3046	*-8.5313
ACC	756	493	0.0078	-0.0082	0.006	-0.01	*6.5504	*-8.5959
BAJAJ AUTO	757	492	0.0073	-0.0075	0.007	-0.008	*4.1665	*-4.5089
BHEL	777	472	0.0088	-0.0084	0.007	-0.01	*4.3964	*-5.0056
BPCL	642	606	0.0092	-0.0091	0.01	-0.009	*5.3224	*-4.5856
CIPLA	693	556	0.0069	-0.0088	0.008	-0.008	*3.6892	*-3.5109
DABUR	692	554	0.0088	-0.0089	0.009	-0.009	*4.4139	*-4.2980
DRREDDY	668	581	0.0074	-0.0084	0.008	-0.008	*4.4205	*-3.9754
GAIL	689	559	0.0089	-0.0082	0.008	-0.009	*4.6868	*-4.4677
GRASIM	746	501	0.0085	-0.0081	0.007	-0.009	*4.5766	*-4.9074
GUJAMBCEM	755	492	0.0077	-0.0103	0.008	-0.01	*4.0238	*-4.4627
HCLTECH	684	565	0.0099	-0.0106	0.01	-0.01	*5.0658	*-4.9271
HDFC	712	537	0.0081	-0.0082	0.008	-0.008	*4.3980	*-4.3310
HDFCBANK	686	562	0.0076	-0.0062	0.007	-0.007	*4.2418	*-3.7907
HEROHONDA	646	603	0.0095	-0.0086	0.01	-0.009	*5.4520	*-4.7944
HINDLEVER	600	649	0.0081	-0.0072	0.009	-0.007	*5.1247	*-3.9296
HINDPETRO	627	622	0.0093	-0.009	0.01	-0.008	*5.3134	*-4.4281
ICICIBANK	713	535	0.0091	-0.0078	0.008	-0.009	*4.7185	*-4.6890
*=Significant at 1% Level,**=Significant at 5% level,***significant at 10% level								

Source: Compiled data from NSE

Table 6.4 presents the ten-day moving average results. The first column presents the name of the stocks and the second column lists the number of buy and sell signal generated by the five day moving average rule, the third column contains the mean returns for various buy and sell signals, the fourth column shows the returns comparative result of both buy and sell signals and the final column gives t values of return comparison results.

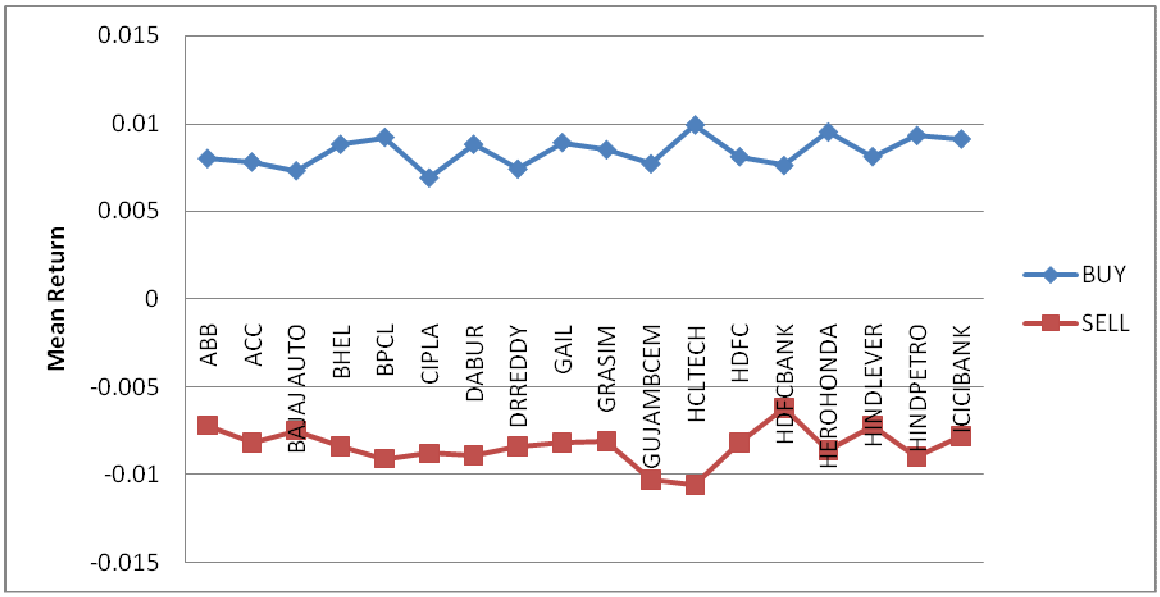


Fig, 6.5 Signals generated by different Stocks

The study shows that ten-day moving average generates more buy signals than sell signals. The number of buy signals ranges from 600 to 777. The stocks of GUJAMBCEM, GRASIM, HDFC, ICICIBANK, BAJAJ AUTO, ACC, ABB, and BHEL have generated more buy signals than the sell signals. However, the number of sell signals ranges from 472 to 649. CIPLA, GAIL, HDFCBANK, HCLTECH, DRREDDY, HEROHONDA, BPCL, HINDPETRO, HINDLEVER have generated more number of sell signals.

The entire buy mean returns have shown the positive values which fall between 0.0069 and 0.0099. However, all the sell returns have shown negative values which fall between -0.0106 to -0.0062. HDFC, HINDLEVER, GRASIM, BHEL, DABUR, GAIL, ICICIBANK, BPCL, HINDPETRO, HEROHONDA, HCLTECH stocks have generated the highest mean return in buy signals, while CIPLA, BAJAJ AUTO, DRREDDY, HDFCBANK, GUJAMBCEM stocks have generated the lowest mean

return in buy signals. HDFCBANK, ABB, HINDLEVER, BAJAJ AUTO, ICICIBANK, GRASIM, SIEMENS have shown the highest mean return in sell signals. CIPLA, DABUR, HINDPETRO, BPCL, GUJAMBCEM, HCLTECH stocks have shown lowest mean returns in sell signals.



Fig, 6.6 Mean Returns of different Stocks

Both buy mean returns and sell mean returns are compared with the returns of buy and hold strategy and the comparison shows that the signal returns are better than the buy and hold returns. To test the statistical significance of the return difference, t ratio is calculated and it is found to be significant at 1% level of significance.

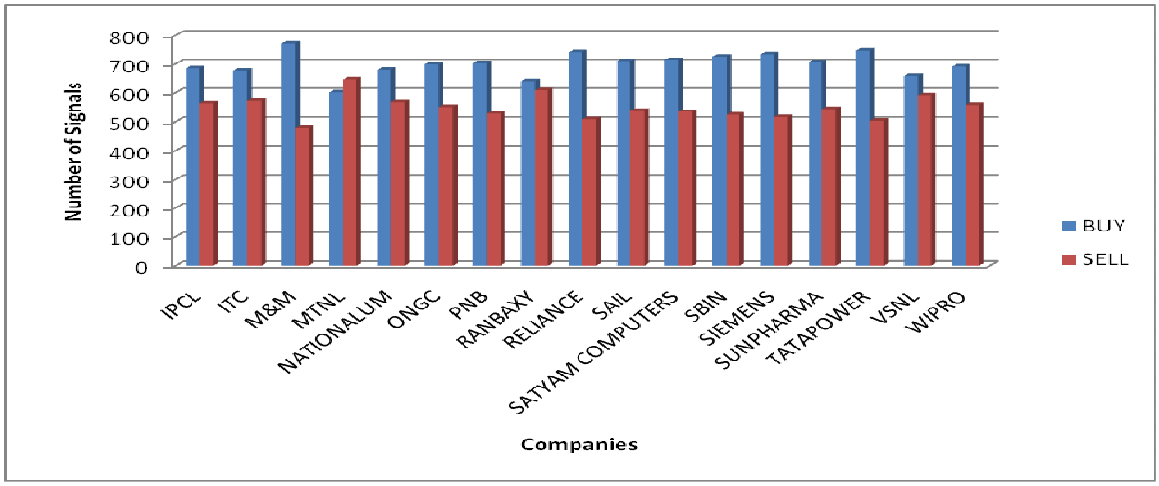
Table 6.5

Analysis of Ten-day Moving Average part 2

Company	No. of Signals		Mean Return		Return Difference		t values	
	Buy	Sell	Buy	Sell	buy-hold	sell-hold	buy-hold	sell-hold
INFOSYS	744	505	0.0076	-0.0102	0.008	-0.01	*3.8824	*-4.2455
IPCL	685	563	0.0101	-0.0096	0.01	-0.01	*5.0240	*-4.9588
ITC	677	572	0.0074	-0.008	0.008	-0.007	*3.9005	*-3.46513
M&M	771	478	0.0092	-0.0099	0.008	-0.011	*4.4774	*-5.24751
MTNL	601	647	0.0109	-0.0094	0.011	-0.009	*5.9220	*-4.78905
NATIONALUM	680	567	0.0104	-0.0099	0.01	-0.01	*5.2244	*-5.12200
ONGC	698	551	0.0081	-0.0079	0.008	-0.008	*4.4882	*-4.33255
PNB	702	527	0.0117	-0.0099	0.01	-0.012	*5.0163	*-5.32000
RANBAXY	641	608	0.0078	-0.0088	0.009	-0.008	*4.7247	*-4.02400
RELIANCE	741	508	0.0076	-0.0075	0.007	-0.008	*4.3008	*-4.42700
SAIL	709	538	0.0146	-0.0119	0.012	-0.014	*5.5819	*-5.92077
SATYAM COMPUTERS	714	534	0.0099	-0.0111	0.01	-0.011	*5.1013	*-5.32450
SBIN	726	523	0.0079	-0.0078	0.007	-0.008	*4.5318	*-4.60750
SIEMENS	734	515	0.009	-0.0079	0.008	-0.009	*3.8557	*-4.08182
SUNPHARMA	705	544	0.008	-0.0084	0.009	-0.008	*4.7854	*-3.88343
TATAPOWER	746	503	0.0079	-0.0082	0.007	-0.009	*4.3393	*-4.61860
VSNL	658	591	0.011	-0.01	0.011	-0.01	*5.5179	*-5.07027
WIPRO	691	558	0.009	-0.0114	0.01	-0.011	*4.6346	-1.16236
*=Significant at 1% Level,**=Significant at 5% level,***significant at 10% level								

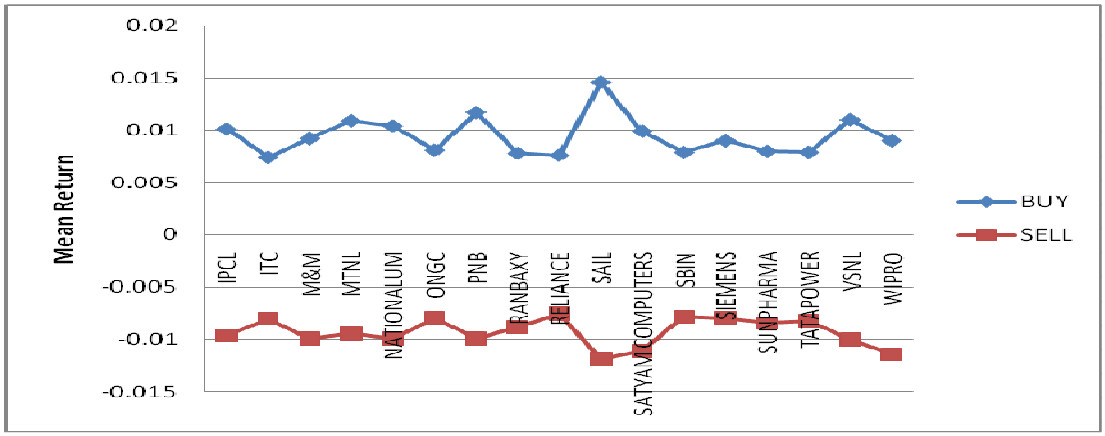
Source: Compiled data from NSE

Table 6.5 presents the ten-day moving average test results. The first column presents the name of the stocks and the second column lists the number of buy and sell signals generated by the five day moving average rule, the third column shows the mean returns of various buy and sell signals, the fourth column depicts the comparison of both buy and sell signal returns with the buy and hold returns of various stocks and the final column shows the t values of comparative return results.



Fig, 6.7 Signals generated by different Stocks

The study shows that ten-day moving average generates more buy signals than sell signals. The number of buy signals ranges from 601 to 771. The stocks of PNB, SUNPHARMA, SAIL, SATYAM COMPUTERS, SBIN, SIEMENS, RELIANCE, INFOSYS, TATAPOWER and M&M have generated more buy signals than sell signals. However, the number of sell signals ranges from 478 to 647. ONGC, WIPRO, IPCL, NATIONALUM, ITC, VSNL, RANBAXY, MTNL have generated more number of sell signals.



Fig, 6.8 Mean Returns of different Stocks

All the buy mean returns show the positive value which falls between 0.0074 and 0.0146. However, all the sell returns show negative value which fall between -0.0119 to -0.0075. SIEMENS, WIPRO, M&M, SATYAM COMPUTERS, IPCL,

NATIONALUM, MTNL, VSNL, PNB, SAIL stocks have generated the highest mean return in buy signals, ITC, RELIANCE, RANBAXY, SBIN, TATAPOWER stocks have generated the lowest mean return in buy signals. SUNPHARMA, TATAPOWER, ITC, ONGC, SIEMENS, SBIN, RELIANCE have shown the highest mean return in sell signals. SUNPHARMA, TATAPOWER, ITC, ONGC, SIEMENS, SBIN, RELIANCE stocks have shown the lowest mean return in sell signals. Both buy mean returns and sell mean returns have been compared with returns of buy and hold strategy and the comparison has shown that the signal returns are better than the buy and hold returns. To test the statistical significance of the difference in return t ratio has been calculated and the t ratio is found to be significant at 1% level of significance.

The Number of buy signals generated by the stocks is more than the sell signals. BHEL has generated more number of buy signals (777) whereas Hindustan lever has generated the less number of buys signals (600). BHEL has generated less number of sell signals (472), whereas Hindustan Lever has generated the highest number of sell signals (649). All the buy signals show positive returns, ranging from 0.74% to 1.17%, while all the sell signals show negative returns, ranging from -1.14% to –0.62%. Hence, the study of ten-day moving average argues that the return obtained from the moving average trading rule outperforms the return obtained from the buy and hold strategy. It should be noted that the analysis generates more buy signals than sell signals.

6.7 Twenty-day Moving Average

Brokers use Twenty-day moving average to understand the short term trend in the market. Twenty-day moving average analysis includes calculation of twenty-day moving average, mean returns, identification of signals and comparison of signal

returns with returns of buy and hold strategy. The analysis has been arranged in two parts and is explained in table 6.6 and 6.7, respectively.

Table 6.6 presents the twenty-day moving average test results. The first column presents the name of the stocks and the second the number of buy and sell signal generated by the five day moving average rule. The third column shows the mean returns for various buy and sell signals and the fourth the comparison of both buy and sell signal return with the buy and hold returns of various stocks. The final column shows the t values of return comparison results.

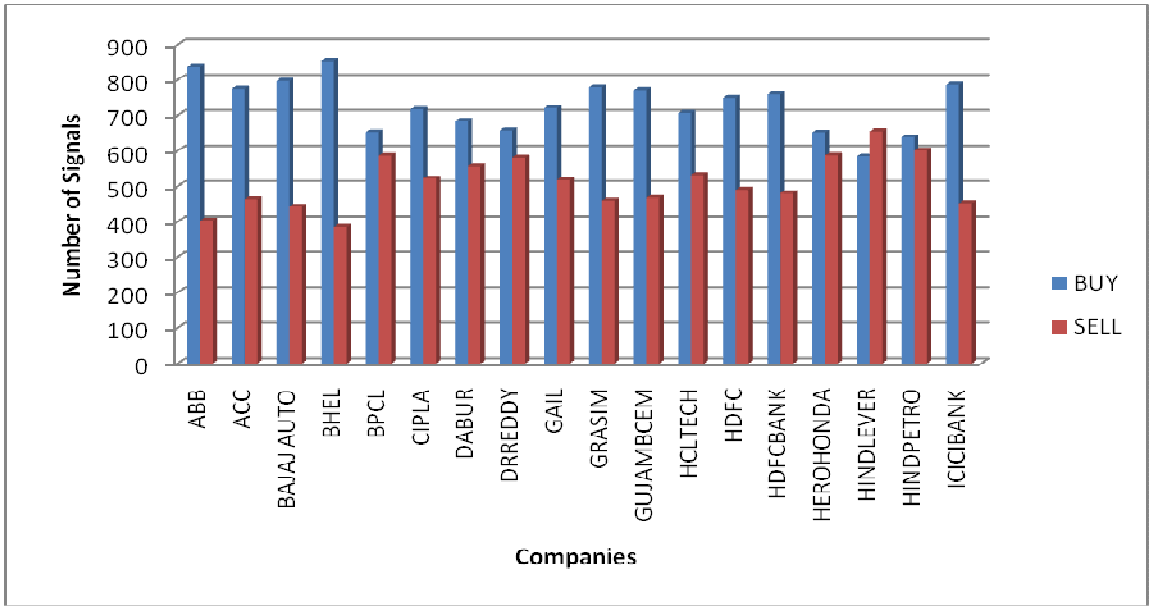
Table 6.6

Analysis of Twenty-day Moving Average part 1

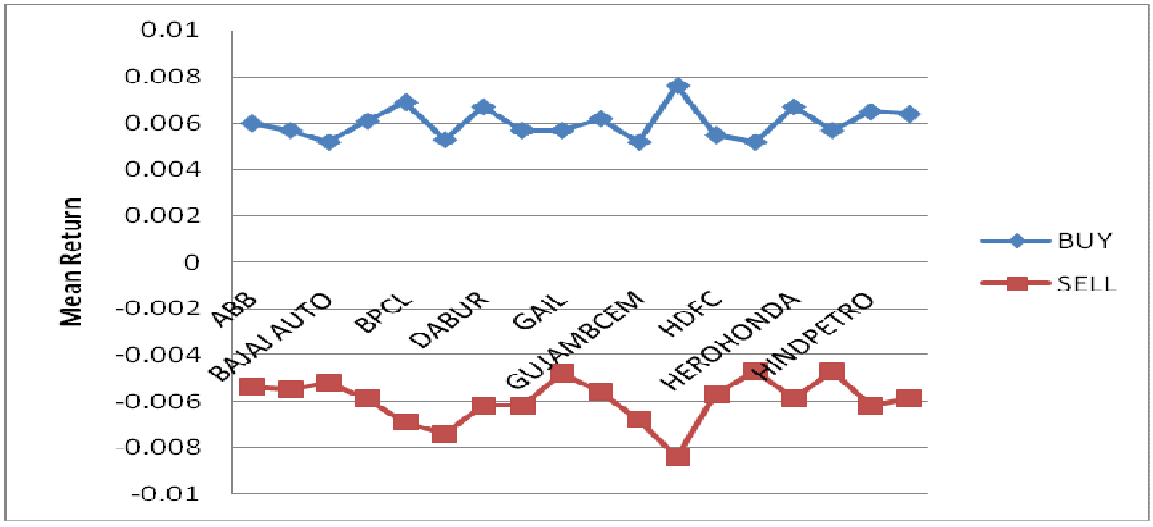
Company	**No of signals**		**Mean return**		**Return difference**		**t values**	
	Buy	Sell	Buy	Sell	buy-hold	sell-hold	buy-hold	sell-hold
ABB	836	403	0.006	-0.0054	0.0037	-0.0076	*3.96743	*-6.4037
ACC	776	463	0.0057	-0.0055	0.0042	-0.0069	*4.39242	*-6.0733
BAJAJ AUTO	797	442	0.0052	-0.0052	0.0045	-0.0059	*2.90854	*-3.1201
BHEL	854	385	0.0061	-0.0059	0.0046	-0.0074	*2.87542	*-3.4621
BPCL	653	586	0.0069	-0.0069	0.0075	-0.0064	*4.13213	*-3.3648
CIPLA	717	522	0.0053	-0.0074	0.0061	-0.0065	*2.94166	*-2.7919
DABUR	684	555	0.0067	-0.0062	0.0066	-0.0063	*3.33661	*-2.9952
DRREDDY	658	581	0.0057	-0.0062	0.0064	-0.0055	*3.49860	*-2.8659
GAIL	721	518	0.0057	-0.0048	0.0053	-0.0052	*2.94300	*-2.6141
GRASIM	780	459	0.0062	-0.0056	0.0052	-0.0066	*3.23089	*-3.4275
GUJAMBCEM	772	467	0.0052	-0.0068	0.0054	-0.0067	*2.76907	*-2.8746
HCLTECH	707	532	0.0076	-0.0084	0.0078	-0.0083	*3.961177	*-3.8343
HDFC	749	490	0.0055	-0.0057	0.0053	-0.0059	*3.015991	*-2.9220
HDFCBANK	759	480	0.0052	-0.0047	0.0047	-0.0052	*2.917857	*-2.7774
HEROHONDA	652	587	0.0067	-0.0059	0.0068	-0.0059	*3.87373	*-3.2313
HINDLEVER	584	655	0.0057	-0.0047	0.0064	-0.0041	*3.69714	*-2.4438
HINDPETRO	638	601	0.0065	-0.0062	0.0071	-0.0056	*3.81128	*-2.9403
ICICIBANK	787	452	0.0064	-0.0059	0.0054	-0.0069	*3.262634	*-3.4468
*=Significant at 1% Level,**=Significant at 5% level,***significant at 10% level								

Source: Compiled data from NSE

The study shows that twenty-day moving average generates more buy signals than sell signals. The number of buy signals ranges from 584 to 854. The stocks of HDFCBANK, GUAMBCEM, ACC, GRASIM, ICICIBANK, BAJAJ AUTO, ABB and BHEL have generated more buy signals than sell signals. However, the number of sell signals ranges from 385 to 655. HCLTECH, DABUR, DRREDDY, BPCL, HEROHONDA, HINDPETRO, HINDLEVER have generated more number of sell signals.



Fig, 6.9 Signals generated by different Stocks



Fig, 6.10 Mean Returns of different Stocks

The entire buy mean returns show the Positive values which fall between 0.0052 and 0.0076. However, all the sell returns show negative values and it fall between -0.0084 and -0.0047. ABB, BHEL, GRASIM, ICICIBANK, HINDPETRO, DABUR, HEROHONDA, BPCL, HCLTECH stocks have generated the highest mean returns in buy signals, whereas BAJAJ AUTO, GUJAMBCEM, HDFCBANK,CIPLA and HDFC stocks have generated the lowest mean return in buy signals. GRASIM, ACC, ABB, BAJAJ AUTO, GAIL, HDFCBANK, HINDLEVER have shown the highest mean returns in sell signals, whereas HCLTECH, CIPLA, BPCL, GUJAMBCEM stocks have shown the lowest mean returns in sell signals.

Both buy and sell mean returns are compared with returns of buy and hold strategy and the comparison has found that signal returns are better than buy and hold returns. To test the statistical significance of the difference in return, t ratio has been calculated and it is found to be significant at 1% level of significance.

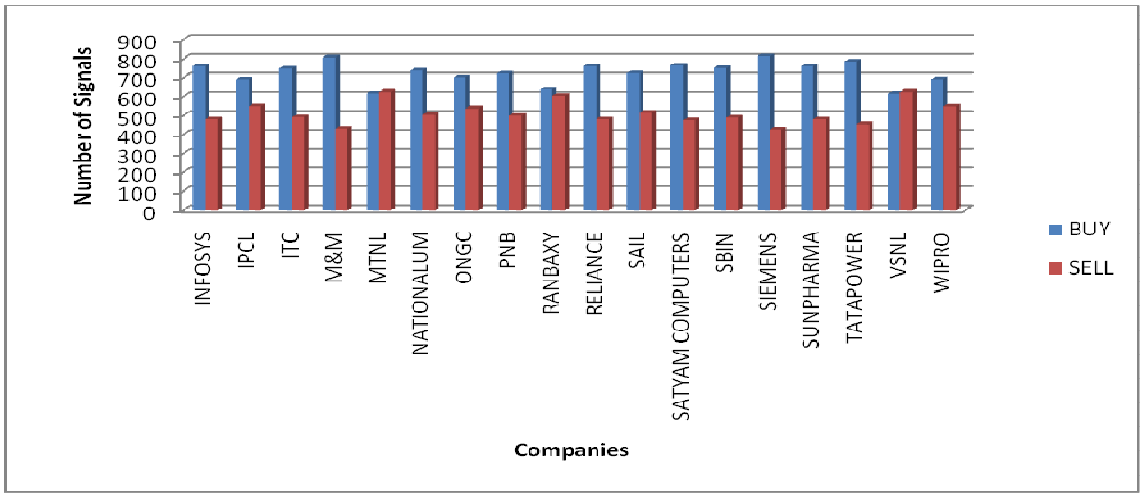
Table 6.7 presents twenty-day moving average test results. The first column presents the name of the stocks and the second column presents the number of buy and sells signals generated by five day moving average rule. The third column shows the mean returns for various buy and sell signals, the fourth the return’s comparative result of both buy and sell signals, and the final column shows the t value of returns comparative results.

Table 6.7

Analysis of Twenty-day Moving Average part 2

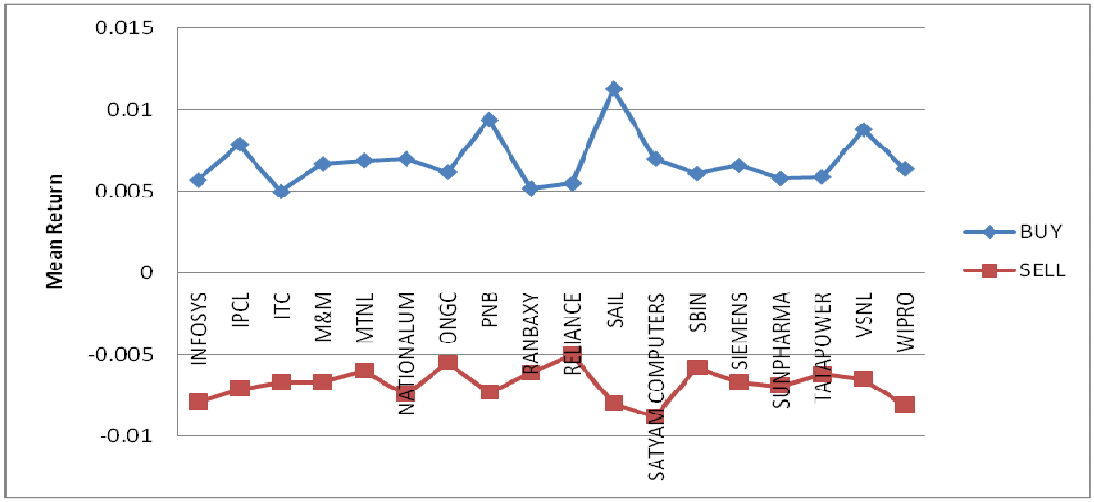
Company	No of signals		Mean return		Return difference		t values	
	Buy	Sell	Buy	Sell	buy-hold	sell-hold	buy-hold	sell-hold
INFOSYS	760	479	0.0057	-0.0079	0.006	-0.008	*2.96562	*-3.2083
IPCL	691	548	0.0079	-0.0071	0.0074	-0.008	*3.89778	*-3.7342
ITC	747	491	0.005	-0.0067	0.0055	-0.006	*2.81769	*-2.7308
M&M	807	432	0.0067	-0.0067	0.0056	-0.008	*3.14923	*-3.6196
MTNL	616	623	0.0069	-0.006	0.0074	-0.006	*3.88962	*-2.9244
NATIONALUM	736	503	0.007	-0.0074	0.0066	-0.008	*3.54921	*-3.7026
ONGC	702	537	0.0062	-0.0055	0.0059	-0.006	*3.36956	*-3.0566
PNB	721	499	0.0094	-0.0073	0.0076	-0.009	*3.88531	*-4.0434
RANBAXY	636	603	0.0052	-0.0061	0.0063	-0.005	*3.33952	*-2.5984
RELIANCE	760	479	0.0055	-0.005	0.0049	-0.006	*3.06712	*-2.9800
SAIL	722	516	0.0113	-0.008	0.009	-0.01	*4.09897	*-4.2546
SATYAM COMPUTERS	764	474	0.007	-0.0088	0.0069	-0.009	*3.66096	*-4.0841
SBIN	750	489	0.0061	-0.0058	0.0055	-0.006	*3.42672	*-3.4435
SIEMENS	812	427	0.0066	-0.0067	0.0053	-0.008	*2.72753	*-3.3113
SUNPHARMA	760	479	0.0058	-0.0069	0.0058	-0.007	*3.15536	*-3.2299
TATAPOWER	786	453	0.0059	-0.0062	0.0053	-0.007	*3.20934	*-3.4638
VSNL	615	623	0.0088	-0.0065	0.0085	-0.007	*4.28475	*-3.3982
WIPRO	692	547	0.0064	-0.0081	0.0072	-0.007	*3.39135	-0.7919
*Significant at 1% Level, **Significant at 5% level, ***significant at 10% level.								

Source: Compiled data from NSE



Fig, 6.11 Signals generated by different Stocks

The study shows that twenty-day moving average generates more buy signals than the sell signals. The number of buy signals ranges from 615 to 812. The stocks of SBIN, INFOSYS, RELIANCE, SUNPHARMA, SATYAM COMPUTERS, TATAPOWER, M&M and SIEMENS have generated more buy signals than the sell signals. However, the numbers of sell signals ranges from 427 to 623 NATIONALUM, SAIL, ONGC, WIPRO, IPCL, RANBAXY, MTNL, VSNL have generated more number of sell signals.



Fig, 6 .12 Mean Returns of different Stocks

The entire buy mean returns show positive value and they fall between 0.005 and 0.0113. However, all the sell returns show negative value, which fall between -0.005 and -0.0088. MTNL, NATIONALUM, SATYAM COMPUTERS, IPCL, VSNL, PNB, SAIL stocks have generated the highest mean return in buy signals, whereas ITC, RANBAXY, RELIANCE, INFOSYS and SUNPHARMA stocks have generated the lowest mean return in buy signals. VSNL, TATAPOWER, RANBAXY, MTNL, SBIN, ONGC, and RELIANCE have shown the highest mean return in sell signals, while HCLTECH, CIPLA, BPCL and GUJAMBCEM stocks have shown the lowest mean return in sell signals.

Both buy and sell mean returns have been compared with the returns of buy and hold strategy and the comparison identifies that the signal returns are better than the buy and hold returns. To test the statistical significance of the return difference, t ratio has been calculated and it is found to be significant at 1% level of significance.

The number of buy signals generated by the stocks is more than the sell signals. BHEL has generated more number of buy signals (812), whereas Hindustan lever has generated less number of buy signals (584). BHEL has generated less number of sell signals (385) whereas Hindustan Lever has generated the highest number of sell signals (655). All the buy signals show positive returns, ranging from 0.005% to 0.0113% and all the sell signals show negative returns, ranging from -0.0088% to -0.0047%. Thus, the study of twenty-day moving average has identified that returns obtained from moving average trading rule outperform the returns from the buy and hold strategy. It should be noted that the analysis has generated more buy signals than sell signals.

6.8 Fifty-day Moving Average

Fifty-day moving average is considered to be an important indicator which provides the medium term trend in the market. Fifty-day moving average analysis includes calculation of fifty-day moving average, mean returns, identification of signals and comparison of signal returns with returns of buy and hold strategy. The analysis is arranged in two parts and is explained in table 6.8 and 6.9, respectively.

Table 6.8 presents the fifty-day moving average test results. The first column presents the name of the stocks and the second column gives the number of buy and sell signal generated by the five day moving average rule. The third column lists the

mean returns for various buy and sells signals and the fourth column shows the return's comparative result of both buy and sells signals. The final column shows the t values of difference in return

Table 6.8

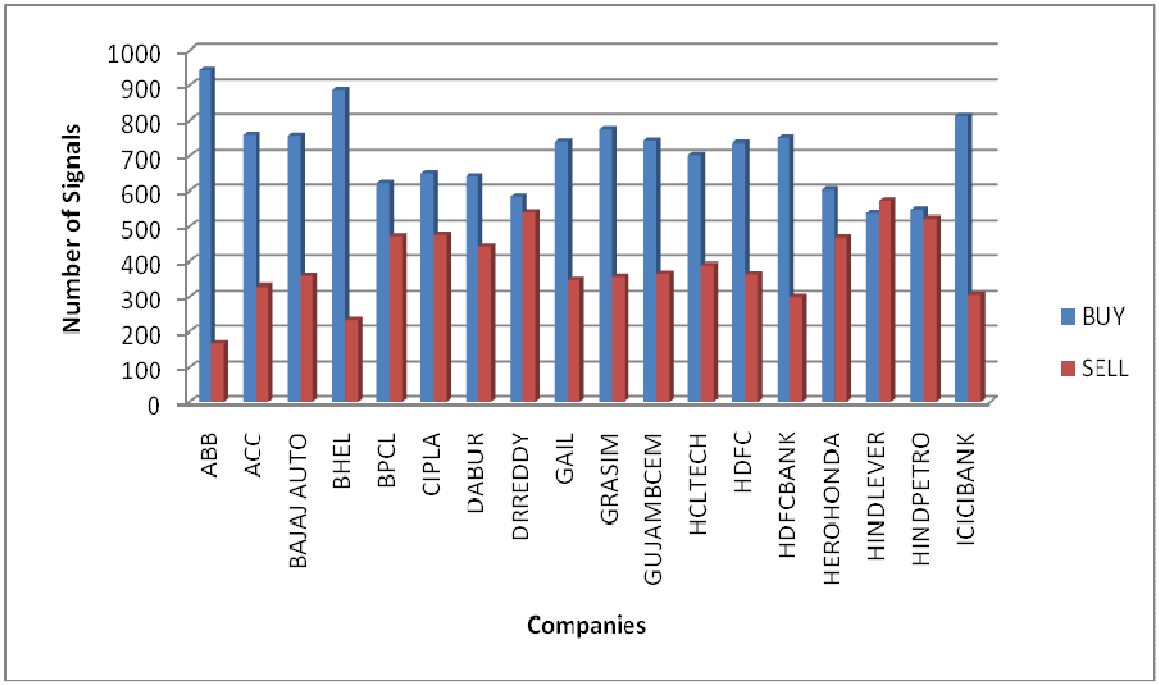
Analysis of Fifty-day Moving Average part 1

Company	No of signals		Mean return		Return difference		t values	
	Buy	Sell	Buy	Sell	buy-hold	sell-hold	buy-hold	sell-hold
ABB	942	168	0.0041	-0.0053	0.0019	-0.0076	**2.1279	**-4.4312
ACC	759	329	0.0047	-0.0053	0.0033	-0.0067	*3.3686	**-5.1499
BAJAJ AUTO	756	359	0.0041	-0.0037	0.0034	-0.0044	**2.1284	**-2.1460
BHEL	886	234	0.0044	-0.0041	0.0029	-0.0056	**1.8219	**-2.1576
BPCL	622	470	0.0047	-0.0051	0.0053	-0.0045	**2.8676	**-2.2105
CIPLA	651	474	0.004	-0.0059	0.0048	-0.0051	**2.2485	**-2.1014
DABUR	642	443	0.0058	-0.0051	0.0056	-0.0053	**2.7864	**-2.3128
DRREDDY	585	538	0.0044	-0.0043	0.0051	-0.0036	**2.6553	**-1.8025
GAIL	739	347	0.0045	-0.0046	0.004	-0.0051	**2.2689	**-2.1884
GRASIM	776	356	0.0046	-0.0032	0.0036	-0.0042	**2.2271	**-1.9992
GUJAMBCEM	742	365	0.0041	-0.0058	0.0043	-0.0056	**2.1484	**-2.1934
HCLTECH	702	389	0.0054	-0.0067	0.0055	-0.0065	**2.8098	**-2.6808
HDFC	736	363	0.0041	-0.0045	0.0039	-0.0047	**2.1975	**-2.0957
HDFCBANK	751	299	0.0041	-0.0036	0.0036	-0.0041	**2.2188	**-1.8311
HEROHONDA	603	467	0.0047	-0.0041	0.0047	-0.004	**2.6237	**-2.0533
HINDLEVER	536	573	0.0041	-0.0036	0.0048	-0.0029	**2.6787	**-1.6747
HINDPETRO	546	522	0.0055	-0.0047	0.0062	-0.0041	*3.1560	**-2.0436
ICICIBANK	812	306	0.0043	-0.0037	0.0034	-0.0046	**2.0547	**-1.9973
*=Significant at 1% Level,**=Significant at 5% level,***significant at 10% level								

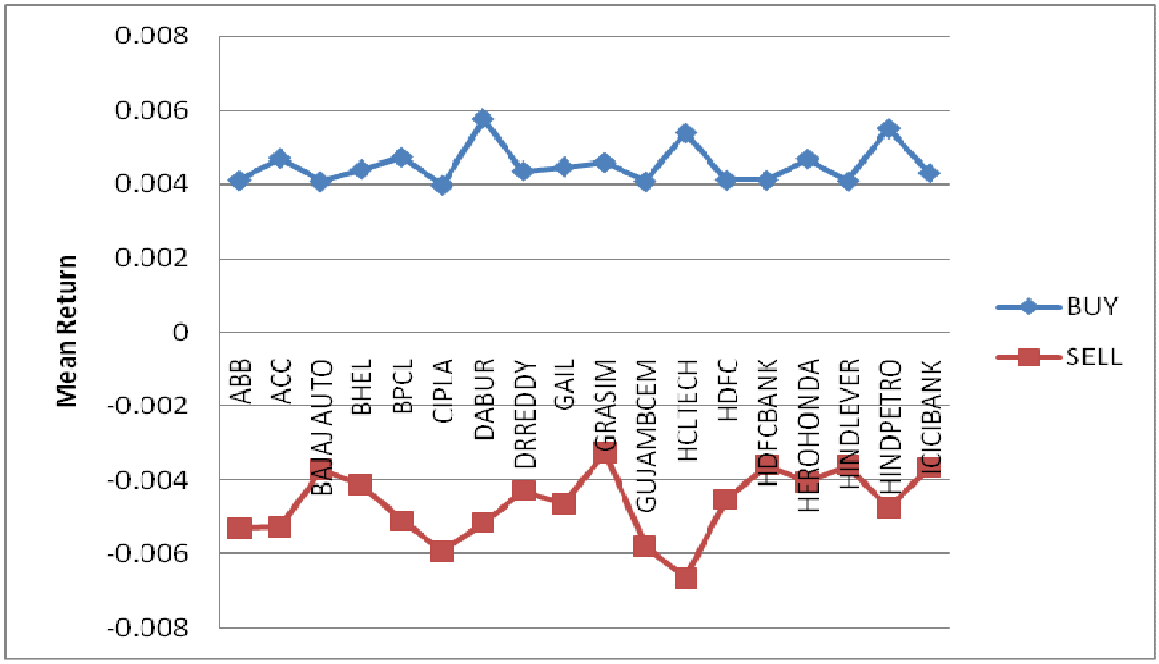
Source: Compiled data from NSE

The study shows that twenty-day moving average has generated more buy signals than sell signals. The number of buy signals ranges from 532 to 942. The stocks of HDFCBANK, BAJAJ AUTO, ACC, GRASIM, ICICIBANK, BHEL, and ABB have generated more buy signals than the sell signals. However, number of sell

signals ranges from168 to 573. DABUR, HEROHONDA, BPCL, CIPLA, HINDPETRO, DRREDDY, HINDLEVER have generated more number of sell signals.



Fig, 6.13 Signals generated by different Stocks



Fig, 6.14 Mean Returns of different Stocks

All the buy mean returns show positive values, which fall between 0.00397 and 0.00576. However, all the sell returns show negative values, which fall between -0.00665 and -0.00323. GRASIM, HEROHONDA, ACC, BPCL, HCLTECH, HINDPETRO, DABUR stocks have generated the highest mean return in buy signals, whereas CIPLA, BAJAJ AUTO, GUJAMBCEM, HINDLEVER stocks have generated the lowest mean return in buy signals. DRREDDY, BHEL, HEROHONDA, BAJAJ AUTO, ICICIBANK, HDFCBANK, HINDLEVER have shown the highest mean return in sell signals, whole HCLTECH, CIPLA, GUJAMBCEM, ABB, ACC stocks have shown the lowest mean return in sell signals.

Both buy mean returns and sell mean returns are compared with returns of buy and hold strategy. The comparison has identified that the signal returns are better than the buy and hold returns. To test the statistical significance of the return difference, t ratio has been calculated and it is found to be significant at 5 % level of significance.

The second part of the analysis also shows that fifty-day moving average generates more buy signals than sell signals. The number of buy signals ranges from 563 to 844. The stocks of SATYAM COMPUTERS, ITC, SUNPHARMA, RELIANCE, M&M, TATAPOWER and SIEMENS have generated more buy signals. However, INFOSYS, NATIONALUM, SAIL, IPCL, WIPRO, VSNL, RANBAXY, MTNL have generated more number of sell signals and the number of sell signals ranges from 308 to 561.

Table 6.9

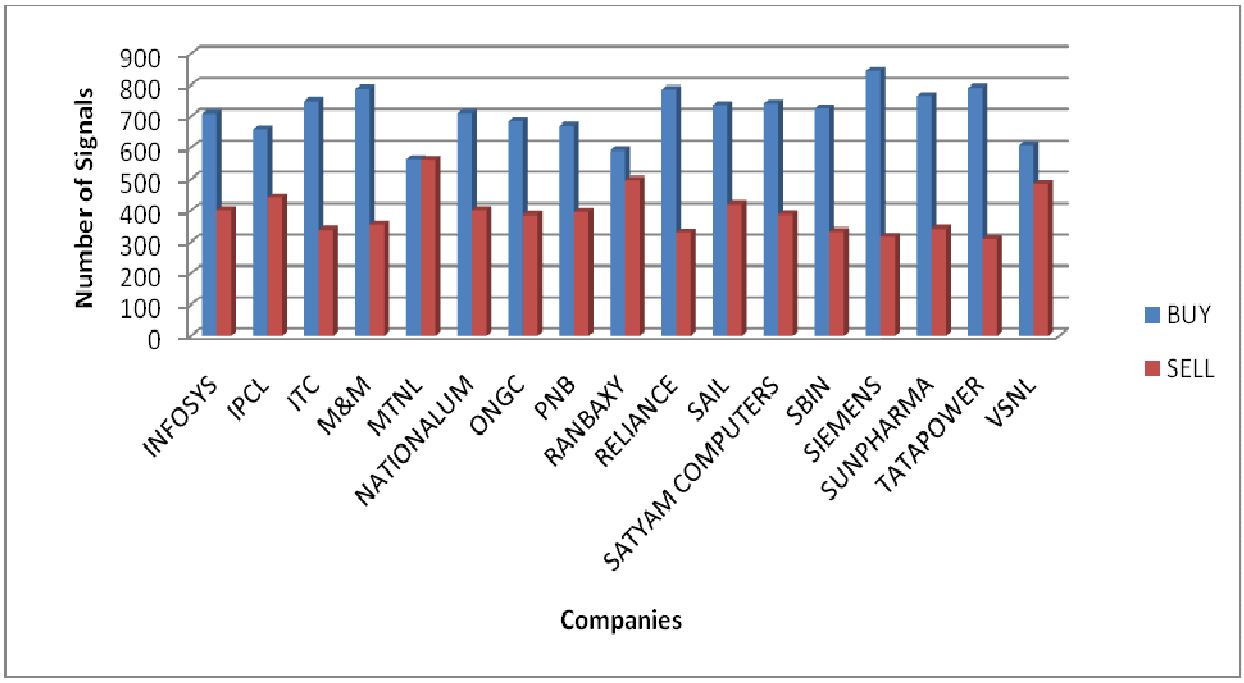
Analysis of Fifty-day Moving Average part 2

Company	No. of signals		Mean return		Return differences		t values	
	Buy	Sell	Buy	Sell	Buy-Hold	Sell-Hold	Buy-Hold	Sell-Hold
INFOSYS	709	401	0.0043	-0.0056	0.0047	-0.0052	**2.2674	**-2.0767
IPCL	659	441	0.0053	-0.0051	0.0048	-0.0056	**2.4894	**-2.5310
ITC	749	338	0.0035	-0.0062	0.004	-0.0057	**2.0566	**-2.1828
M&M	788	354	0.0056	-0.0046	0.0045	-0.0057	**2.5255	**-2.4270
MTNL	563	561	0.005	-0.0042	0.0055	-0.0037	**2.7944	**-1.8930
NATIONALUM	710	401	0.0049	-0.0055	0.0044	-0.0059	**2.3671	**-2.5873
ONGC	684	386	0.0041	-0.0035	0.0038	-0.0038	**2.1545	**-1.7603
PNB	670	395	0.007	-0.0039	0.0052	-0.0057	**2.5987	**-2.3343
RANBAXY	591	497	0.0036	-0.0048	0.0047	-0.0037	**2.4024	**-1.7951
RELIANCE	786	331	0.0041	-0.0042	0.0035	-0.0048	**2.2231	**2.2192
SAIL	736	419	0.0074	-0.0063	0.005	-0.0087	**2.3233	*-3.2840
SATYAM COMPUTERS	742	387	0.0048	-0.0058	0.0046	-0.006	**2.4465	**-2.5182
SBIN	725	333	0.0044	-0.0046	0.0039	-0.0051	**2.3729	**-2.3851
SIEMENS	844	316	0.005	-0.005	0.0037	-0.0063	*1.94735	**-2.3139
SUNPHARMA	764	342	0.004	-0.0055	0.004	-0.0055	**2.1957	**-2.2691
TATAPOWER	792	308	0.0048	-0.0054	0.0042	-0.006	**2.5517	**-2.6275
VSNL	608	485	0.0063	-0.0046	0.006	-0.0048	*3.02413	**-2.2424
WIPRO	665	468	0.0044	-0.0064	0.0053	-0.0055	**2.4515	-0.5608
*=Significant at 1% Level,**=Significant at 5% level,***significant at 10% level								

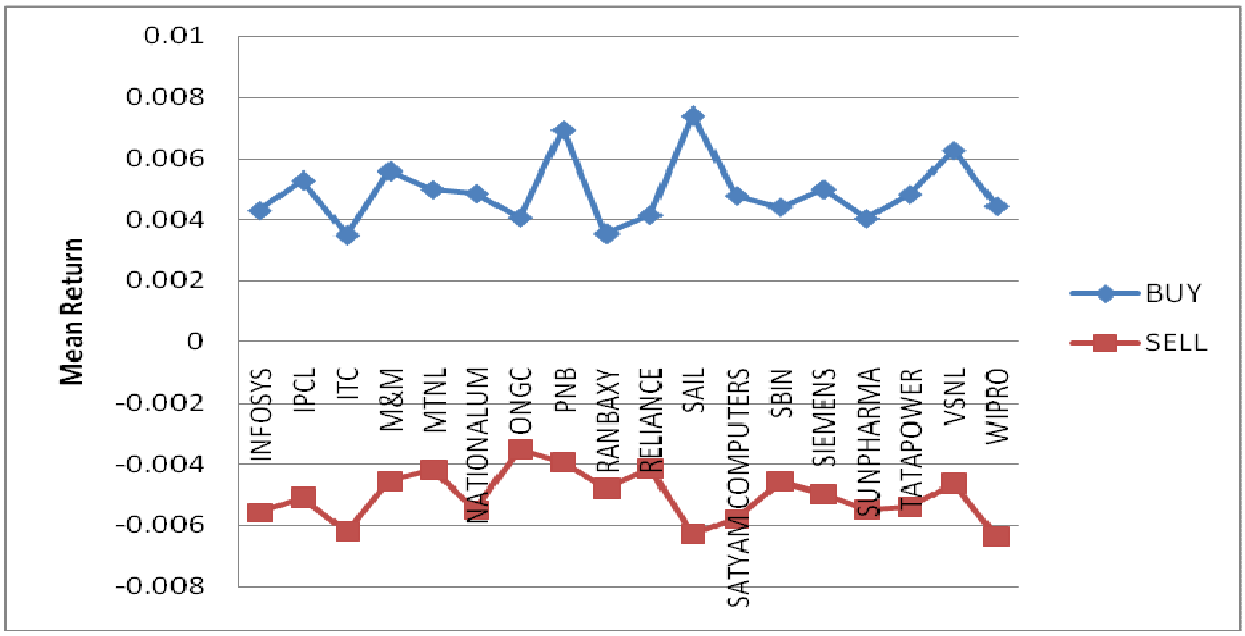
Source: Compiled data from NSE

The entire buy mean returns show positive values and they fall between 0.0035 and 0.007423. However, all the sell returns show negative values, which fall between -0.00639 and -0.0035. MTNL, SIEMENS, IPCL,M&M, VSNL, PNB, SAIL stocks have generated the highest mean return in buy signals whereas ITC, RANBAXY, SUNPHARMA, ONGC and RELIANCE stocks have generated the lowest mean return in buy signals. VSNL, SBIN, M&M, MTNL, RELIANCE, PNB have shown the highest mean return in sell signals. WIPRO, SAIL, ITC, SATYAM

COMPUTERS, INFOSYS, NATIONALUM stocks have shown the lowest mean return in sell signals.



Fig, 6.15 Signals generated by different Stocks



Fig, 6.16 Mean Returns of different Stocks

Both buy and sell mean returns are compared with returns of buy and hold strategy and the comparison has identified that signal returns are better than buy and hold returns. To test the statistical significance of the difference in return, t ratio has been calculated and the ratio is found to be significant at 5 % level of significance.

The number of buy signals generated by the stocks is more than sell signals. ABB has generated more number of buy signals (942), whereas Hindustan lever has generated less number of buy signals (536). Hindustan Lever Company has generated the highest number of sell signals (610) and ABB has generated the lowest number of sell signals (644). All the buy signals show positive returns, ranging from 0.0035 % to 0.007423 % and all the sell signals show negative returns, ranging from -0.00665 % to - -0.00323 %. Thus, the study of Fifty-day moving average has shown that return obtained from the moving average trading rule outperforms the return obtained from the buy and hold strategy. It should be noted that the analysis generates more buy signals than sell signals.

6.9 Hundred-day Moving Average

Hundred-day' simple moving average is considered to be an important indicator which provides long term trend in the market. The study includes the identification of signals, calculation of signal returns, calculation of buy and hold return and comparison of signal returns with buy and return. The analysis is arranged in two parts and is explained in table 6.10 and 6.11.

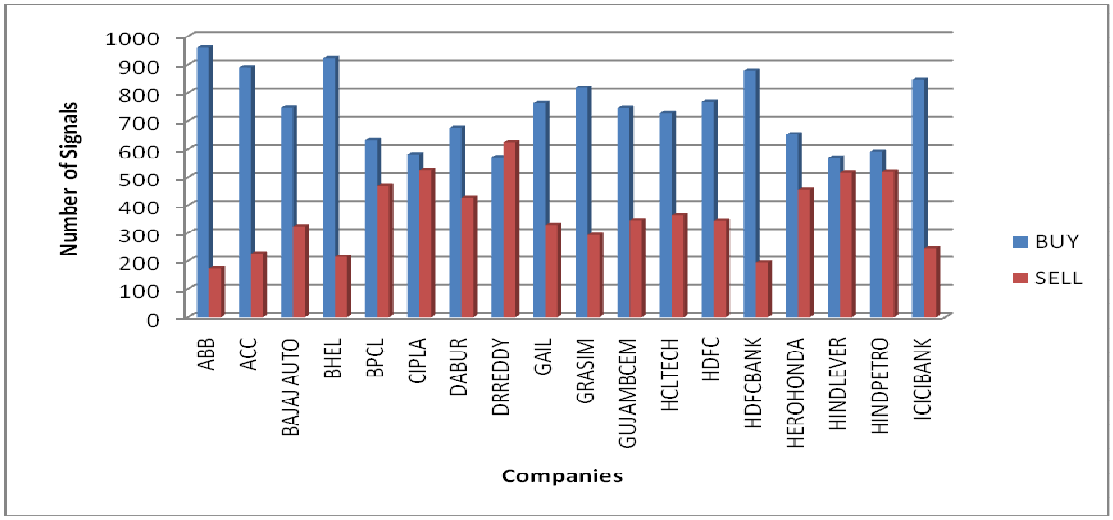
Table 6.10

Analysis of Hundred-day Moving Average part 1

Company	No. of signals		Mean return		Return difference		t values	
	Buy	Sell	Buy	Sell	Buy-Hold	Sell-Hold	Buy-Hold	Sell-Hold
ABB	959	174	0.00311	-0.0014	0.0008	-0.0037	0.9175	**-2.1877
ACC	890	227	0.00313	-0.00357	0.0017	-0.005	**1.8196	*-3.3112
BAJAJ AUTO	749	324	0.00362	-0.00233	0.0029	-0.003	**1.8346	***-1.4184
BHEL	922	215	0.00342	-0.00169	0.0019	-0.0032	1.2245	-1.178
BPCL	631	467	0.0029	-0.00336	0.0035	-0.0028	**1.8851	***-1.3642
CIPLA	581	524	0.0032	-0.00375	0.0041	-0.0029	**1.8187	-1.2418
DABUR	676	426	0.00445	-0.00329	0.0043	-0.0035	**2.1679	***-1.4887
DRREDDY	571	623	0.00286	0.00257	0.0036	0.0033	**1.8610	**1.7628
GAIL	765	329	0.00321	-0.00252	0.0028	-0.003	***1.5798	-1.254
GRASIM	818	293	0.00355	-0.00283	0.0026	-0.0038	**1.6128	**-1.6760
GUJAMBCEM	748	345	0.00325	-0.00397	0.0034	-0.0038	**1.7353	***-1.4590
HCLTECH	727	363	0.00376	-0.00528	0.0039	-0.0051	**2.0075	**-2.0586
HDFC	769	344	0.00286	-0.00267	0.0026	-0.0029	***1.5059	-1.2606
HDFCBANK	879	194	0.00269	-0.0026	0.0022	-0.0031	***1.3983	-1.1614
HEROHONDA	652	454	0.00342	-0.00275	0.0034	-0.0027	**1.9694	***-1.3729
HINDLEVER	569	516	0.00251	-0.00216	0.0032	-0.0015	**1.8286	-0.8193
HINDPETRO	591	519	0.00323	-0.00333	0.0039	-0.0027	**2.0192	***-1.3424
ICICIBANK	848	246	0.00339	-0.00348	0.0024	-0.0045	***1.4840	**-1.7541
*=Significant at 1% Level,**=Significant at 5% level,***significant at 10% level								

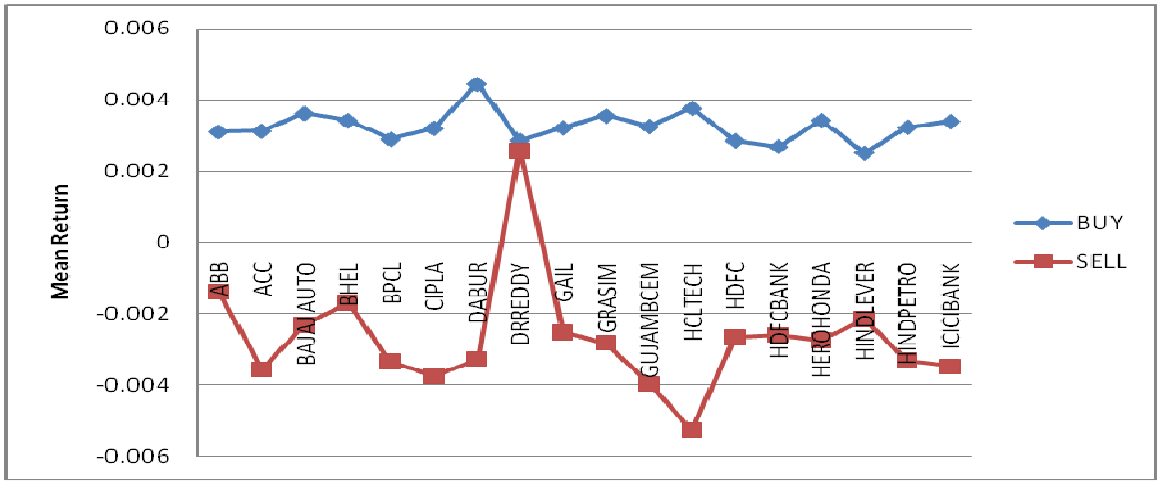
Source: Compiled data from NSE

Table 6.10 presents the hundred-day moving average test results. The first column presents the name of the stocks and the second column provides the number of buy and sell signal generated by the five day moving average rule. The third column shows the mean returns for various buy and sells signals, the fourth columns gives the returns comparison result of both buy and sell signals and the final column accounts the t values of return comparative results.



Fig, 6.17 Signals generated by different Stocks

The study shows that hundred-day moving average generates more buy signals than sell signals. The number of buy signals ranges from 569 to 959. The stocks of GAIL, HDFC, GRASIM, ICICIBANK, HDFCBANK, ACC, BHEL, ABB have generated more buy signals. However, DABUR, HEROHONDA, BPCL, HINDLEVER, HINDPETRO, CIPLA, DRREDDY have generated more number of sell signals and the number of sell signals ranges from 174 to 623.



Fig, 6.18 Mean Returns of different Stocks

The entire buy mean returns show positive values and they fall between 0.002509 and 0.004446. However, all the sell returns show negative value and they

fall between -0.00528 and 0.002574. BHEL, HEROHONDA, GRASIM, BAJAJ AUTO, HCLTECH, DABUR stocks have generated the highest mean return in buy signals, HINDLEVER, HDFCBANK, HDFC, DRREDDY, BPCL stocks have generated the lowest mean return in buy signals while HDFC BANK, GAIL, BAJAJ AUTO, HINDLEVER, BHEL, ABB and DRREDDY have shown the highest mean return in sell signals. HCLTECH, GUJAMBCEM, CIPLA, ACC, ICICIBANK, BPCL, HINDPETRO stocks have shown lowest mean return in sell signals.

Both buy and sell mean returns are compared with returns of buy and hold strategy and the comparison has found that the signal returns are better than buy and hold returns. To test the statistical significance of the difference in return, t ratio has been calculated and the ratio is found to be significant at 5 % and 10 % level of significance.

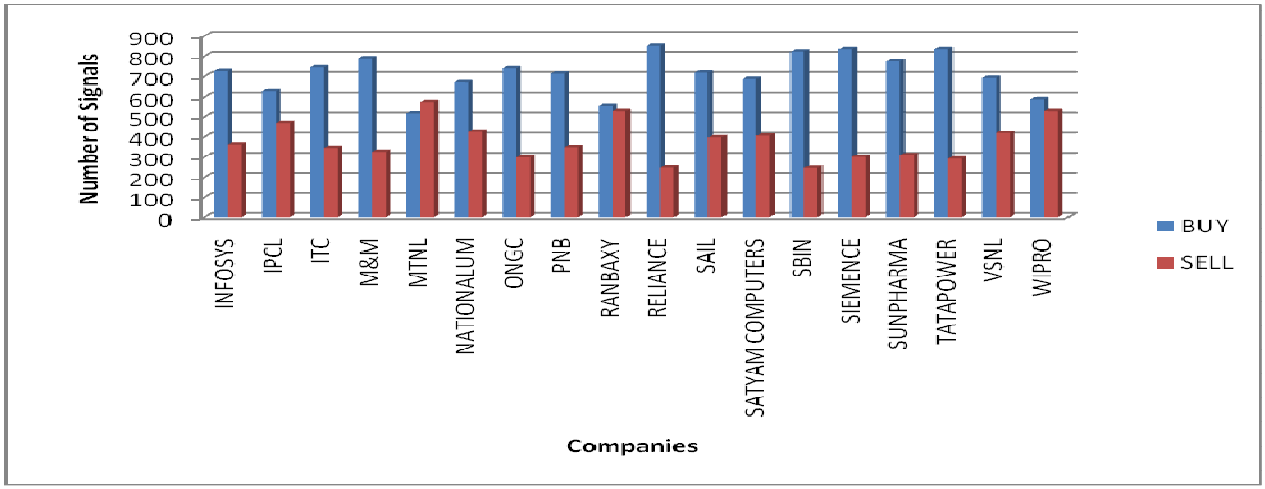
The second part of the study shows that the hundred-day moving average generates more buy signals than sell signals. The stocks of ITC, SUNPHARMA, M&M, SBIN, SIEMENS, TATAPOWER, and RELIANCE have generated more buy signals than sell signals and the number of buy signals ranges from 517 to 851. However, SATYAM COMPUTERS, VSNL, NATIONALUM, IPCL, RANBAXY, WIPRO, MTNL have generated more number of sell signals and the number of sell signals ranges from 247 to 545.

Table 6.11

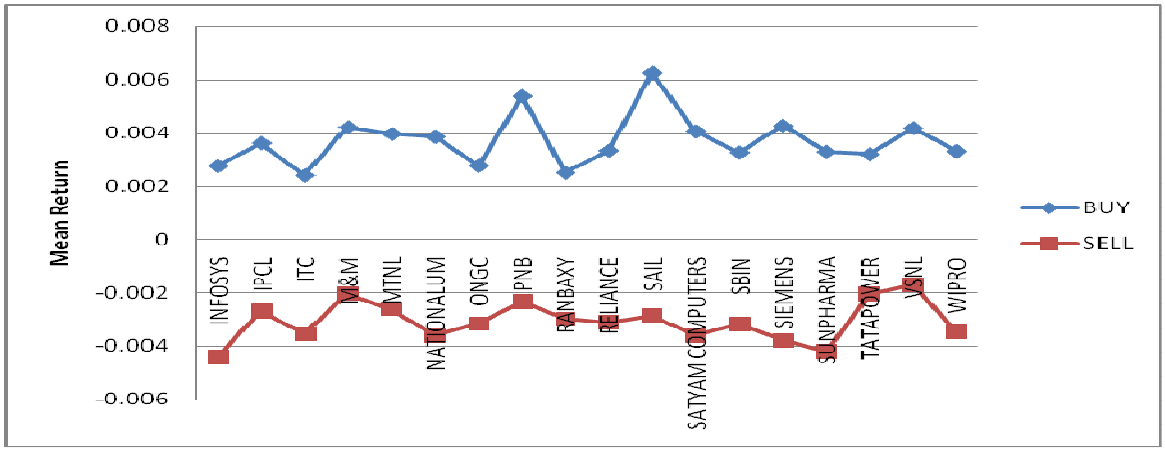
Analysis of Hundred-day Moving Average part 2

Company	No of signals		Mean return		Return difference		t values	
	Buy	Sell	Buy	Sell	Buy-Hold	Sell-Hold	Buy-Hold	Sell-Hold
I NFOSYS	725	362	0.00276	-0.00442	0.0031	-0.0041	***1.5092	***-1.5533
IPCL	628	470	0.00362	-0.00269	0.0031	-0.0032	***1.5827	***-1.4776
ITC	743	345	0.00241	-0.00355	0.0029	-0.0031	***1.4771	-1.177
M&M	789	326	0.00422	-0.00205	0.0031	-0.0032	**1.7166	***-1.3208
MTNL	517	575	0.00396	-0.00261	0.0044	-0.0021	**2.1910	-1.1009
NATIONALUM	672	426	0.00385	-0.00361	0.0034	-0.004	**1.7904	**-1.8018
ONGC	738	298	0.00277	-0.00317	0.0025	-0.0035	***1.4498	***-1.4501
PNB	713	349	0.00537	-0.00234	0.0036	-0.0041	**1.8472	***-1.5954
RANBAXY	557	528	0.00251	-0.00299	0.0036	-0.0019	**1.8274	-0.9352
RELIANCE	851	248	0.00334	-0.00312	0.0027	-0.0037	**1.7553	***-1.54358
SAIL	718	398	0.00625	-0.00288	0.0039	-0.0053	**1.7694	**-1.9537
SATYAM COMPUTERS	688	406	0.00406	-0.00362	0.0039	-0.0038	**2.0044	**-1.6264
SBIN	822	247	0.00327	-0.00318	0.0027	-0.0037	**1.7336	***-1.5415
SIEMENS	834	301	0.00427	-0.0038	0.003	-0.0051	***1.5533	**-1.8416
SUNPHARMA	773	309	0.00329	-0.00421	0.0033	-0.0042	**1.7958	**-1.6772
TATAPOWER	834	292	0.0032	-0.00207	0.0025	-0.0027	***1.5782	-1.1599
VSNL	693	420	0.00418	-0.00171	0.004	-0.0019	**2.0642	-0.8495
WIPRO	589	528	0.00331	-0.00347	0.0042	-0.0026	**1.8474	-0.2822
*=Significant at 1% Level,**=Significant at 5% level,***significant at 10% level								

Source: Compiled data from NSE



Fig, 6.19 Signals generated by different Stocks



Fig, 6.20 Mean Returns of different Stocks

The entire buy mean returns show the positive value and it falls between 0.00241 and -0.00625. However, the entire sell returns show negative value and it falls between -0.00442 and -0.00171. SATYAM COMPUTERS, VSNL, M&M, SIEMENS, PNB, SAIL stocks have generated the highest mean returns in buy signals, while ITC, RANBAXY, INFOSYS, ONGC, TATAPOWER, SBIN stocks have generated the lowest mean returns in buy signals. IPCL, MTNL, PNB, TATAPOWER, M&M, VSNL have shown the highest mean return in sell signals. INFOSYS, SUNPHARMA, SIEMENS, SATYAM COMPUTERS, NATIONALUM stocks have shown the lowest mean returns in sell signals.

Both buy and sell mean returns are compared with returns of buy and hold strategy and the comparison has shown that the signal returns are better than the buy and hold returns. To test the statistical significance of the difference in return, t ratio has been calculated and the ratio is found to be significant at and 10 % level.

Hundred-day moving average generates more number of buy signals than sell signals. ABB has generated more number of buy signals (959) and less number of sell signals (174). MTNL has shown less number of buy signals (517), whereas DRREDDY has shown more number of sell signals (623). All the buy signals show

positive returns, ranging from 0.00241% to 0.00625%. At the same time all the sell signals show negative returns ranging from -0.00528 to 0.002574. Hence, the study of hundred-day moving average has found that the return obtained from the moving average trading rule outperforms the return from the buy and hold strategy. It should be noted that the analysis has generated more buy signals than sell signals.

6.10 Two Hundred-day Moving Average

Two hundred-day simple moving average is considered to be an important technical indicator which provides long term trend in the market. The study includes the identification of signals, calculation of signal returns, calculation of buy and hold returns and comparison of signal returns with buy and return. The analysis is arranged in two parts and is explained in table 6.12 and 6.13.

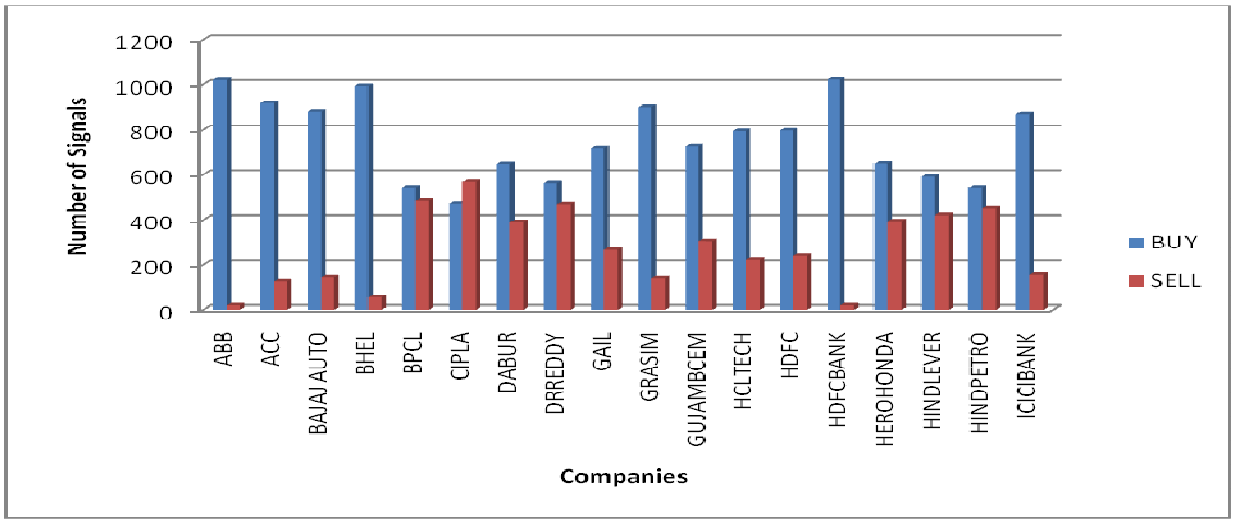
Table 6.12 presents two hundred-day moving average test results. The first column presents the name of the stocks and the second column provides the number of buy and sells signals generated by the five day moving average rule. The third columns explains the mean returns for the various buy and sell signals, fourth column is the comparative result of both buy and sell signals and the final column gives the t values of return comparative results.

Table 6.12

Analysis of Two Hundred-day Moving Average part 1

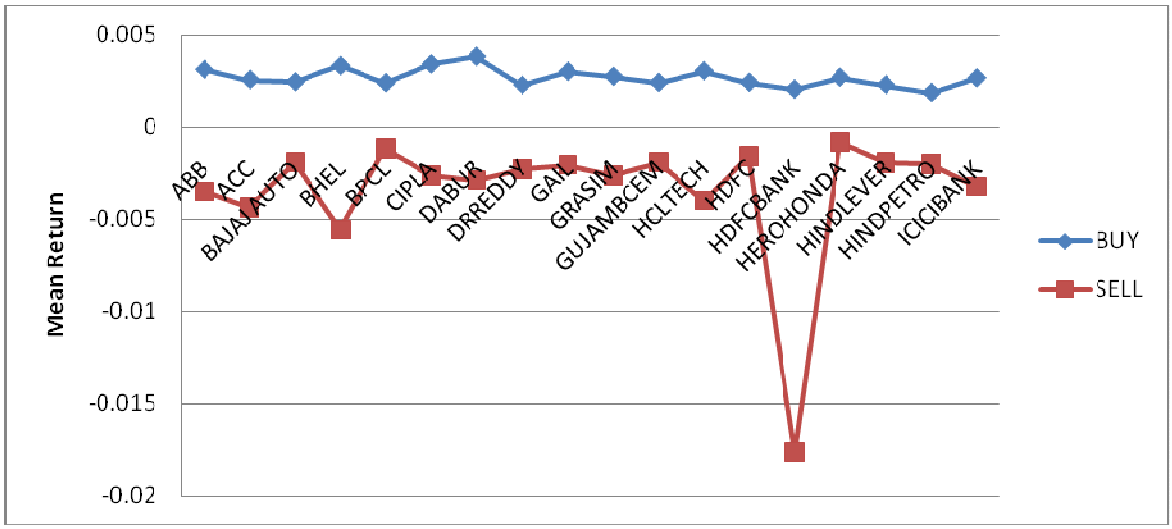
Company	No. of Signals		Mean Return		Return Difference		T Values	
	BUY	SELL	BUY	SELL	Buy-Hold	Sell-Hold	Buy-Hold	Sell-Hold
ABB	1020	18	0.00311	-0.0035	0.0008	-0.0058	0.9343	-1.1697
ACC	917	125	0.00255	-0.00437	0.0011	-0.0058	1.2065	**-2.9505
BAJAJ AUTO	880	143	0.00243	-0.00193	0.0017	-0.0026	1.1393	-0.8706
BHEL	992	55	0.00331	-0.00558	0.0018	-0.0071	1.18	***-1.405
BPCL	542	484	0.00237	-0.00117	0.0029	-0.0006	***1.5192	-0.2933
CIPLA	470	569	0.0034	-0.00264	0.0043	-0.0018	**1.7695	-0.7876
DABUR	649	390	0.00381	-0.00289	0.0036	-0.0031	**1.8234	-1.2735
DRREDDY	563	467	0.00226	-0.00229	0.003	-0.0016	***1.5391	-0.752
GAIL	720	264	0.003	-0.00205	0.0026	-0.0025	***1.4287	-0.9657
GRASIM	899	139	0.00273	-0.00266	0.0017	-0.0037	1.1241	-1.162
GUJAMBCEM	729	305	0.00239	-0.00191	0.0026	-0.0017	1.2893	-0.6335
HCLTECH	794	222	0.00303	-0.004	0.0032	-0.0039	**1.6753	-1.265
HDFC	797	240	0.0024	-0.0016	0.0022	-0.0018	1.2566	-0.6859
HDFCBANK	1022	18	0.00202	-0.01762	0.0015	-0.0182	1.0094	**-2.1858
HEROHONDA	651	393	0.00268	-0.00083	0.0027	-0.0008	***1.5440	-0.3871
HINDLEVER	590	420	0.00228	-0.00195	0.003	-0.0013	**1.7161	-0.6537
HINDPETRO	542	449	0.00184	-0.00203	0.0025	-0.0014	1.2553	-0.6598
ICICIBANK	869	155	0.00264	-0.00323	0.0017	-0.0042	1.026	-1.3571
*=Significant at 1% Level,**=Significant at 5% level,***significant at 10% level								

Source: Compiled data from NSE



Fig, 6.21 Signals generated by different Stocks

The study shows that two hundred-day moving average generates more buy signals than sell signals. The stocks of ICICIBANK, BAJAJ AUTO, GRASIM, ACC, BHEL, ABB, HDFC BANK have generated more buy signals than sell signals and the number of buy signals ranges from 470 to 1022. However, HEROHONDA, HINDLEVER, HINDPETRO, DRREDDY, BPCL, CIPLA have generated more number of sell signals and the number of sell signals ranges from 18 to 569.



Fig, 6.22 Mean Returns of different Stocks

The entire buy mean returns show the positive values and it fall between 0.001839 and - 0.003814. . However, the entire sell returns show negative values and it fall between -0.01762 and -0.00083. ICICIBANK, HEROHONDA, GRASIM, GAIL, HCLTECH, ABB, BHELCIPLA, DABUR stocks have generated the highest mean return in buy signals, HDFCBANK, HINDPETRO, DRREDDY, HINDLEVER, BPCL stocks have generated the lowest mean return in buy signals. GAIL, HINDPETRO, HINDLEVER, BAJAJ AUTO, GUJAMBCEM, HDFC, BPCL, HEROHONDA have shown the highest mean return in sell signals. HDFCBANK, BHEL, ACC, HCLTECH, ABB, ICICIBANK stocks have shown the lowest mean return in sell signals.

Both buy and sell mean returns are compared with returns of buy and hold strategy. The comparison has identified that the signal returns are better than the buy and hold returns. To test the statistical significance of the return difference, t ratio has been calculated and the ratio is found to be significant at 10 % level of significance.

Table 6.13

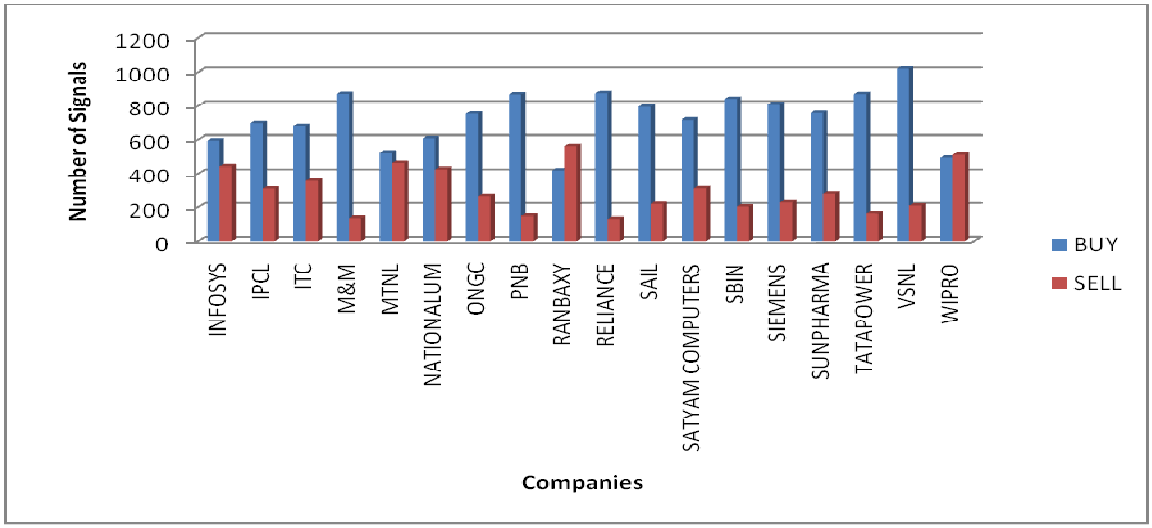
Analysis of Two Hundred-day Moving Average part 2

Company	No of Signals		Mean Return		Return Difference		t Values	
	Buy	Sell	Buy	Sell	Buy-Hold	Sell-Hold	Buy-Hold	Sell-Hold
INFOSYS	594	440	0.00177	-0.00164	0.0021	-0.0013	0.9611	-0.5344
IPCL	701	312	0.00293	-0.00189	0.0024	-0.0024	1.2753	-0.9506
ITC	683	355	0.00185	-0.00273	0.0024	-0.0022	1.1618	-0.8677
M&M	871	137	0.00341	-0.00377	0.0022	-0.0049	1.3004	***-1.399
MTNL	521	460	0.00396	-0.00213	0.0044	-0.0017	2.2003	-0.7889
NATIONALUM	608	426	0.0026	-0.00049	0.0022	-0.0009	1.1003	-0.4103
ONGC	753	266	0.00192	-0.00202	0.0016	-0.0023	0.9603	-0.9247
PNB	868	149	0.00317	-0.00478	0.0014	-0.0065	0.7789	**-1.7823
RANBAXY	420	562	0.0027	-0.00207	0.0038	-0.001	**1.7390	-0.4923
RELIANCE	875	133	0.00257	-0.0035	0.0019	-0.0041	1.2689	-1.2973
SAIL	796	220	0.00449	-0.00184	0.0021	-0.0042	0.9976	-1.2328
SATYAM COMPUTERS	719	314	0.00292	-0.00233	0.0027	-0.0025	***1.4366	-0.9717
SBIN	839	203	0.00217	-0.00127	0.0016	-0.0018	1.0362	-0.6937
SIEMENS	808	229	0.00355	-0.00225	0.0023	-0.0035	1.171	-1.144
SUNPHARMA	758	281	0.00248	-0.00085	0.0025	-0.0009	***1.3400	-0.3354
TATAPOWER	869	162	0.00256	-0.00171	0.0019	-0.0024	1.1967	-0.782
VSNL	1019	210	0.0026	-0.00179	0.0024	-0.002	***1.3942	-0.6696
WIPRO	493	511	0.00294	-0.00319	0.0038	-0.0023	***1.5815	-0.2477
*=Significant at 1% Level,**=Significant at 5% level,***significant at 10% level								

Source: Compiled data from NSE

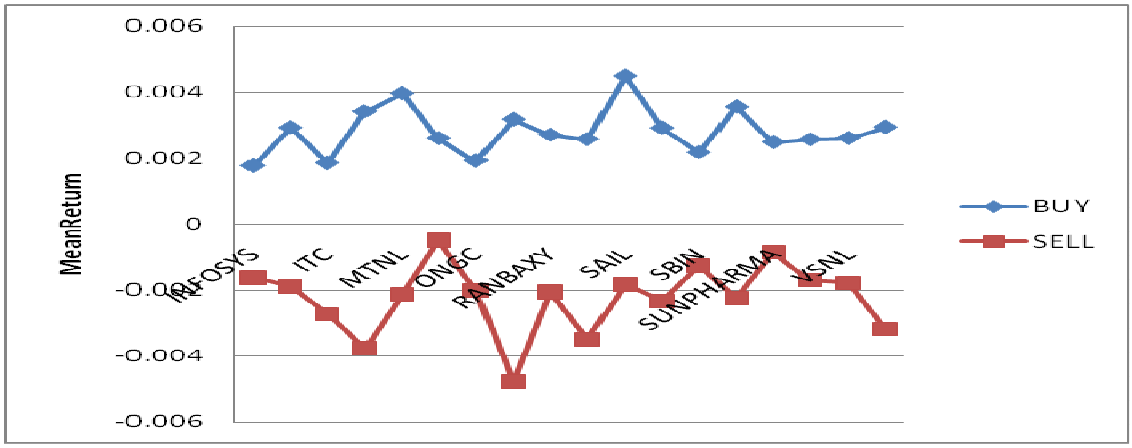
The second part of the analysis shows that the two hundred-day moving average has generated more buy signals than sell signals. The number of buy signals ranges from 420 to 1019. The stocks of SIEMENS, SBIN, PNB, TATAPOWER, M&M, RELIANCE, and VSNL have generated more buy signals than sell signals.

However, number of sell signals ranges from 133 to 562. IPCL, SATYAM COMPUTERS, ITC, NATIONALUM, INFOSYS, MTNL, WIPRO, RANBAXY have generated more number of sell signals.



Fig, 6.23 Signals generated by different Stocks

The entire buy mean returns have shown positive values which falls between 0.001768 and - 0.004491. However, all the sell returns have shown negative values, which falls between - 0.00478 and -0.00049. SATYAM COMPUTERS, IPCL, WIPRO,PNB, M&M SIEMENS, MTNL,SAIL stocks have generated the highest mean return in buy signals, INFOSYS, ITC, ONGC, SBIN, SUNPHARMA, TATAPOWER stocks have generated the lowest mean return in buy signals. IPCL, SAIL, VSNL, TATAPOWER, INFOSYS, SBIN, SUNPHARMA, NATIONALUM have shown the highest mean return in sell signals. PNB, M&M, RELIANCE, WIPRO, ITC, SATYAM COMPUTERS stocks have shown the lowest mean return in sell signals.



Fig, 6.24 Mean Returns of different Stocks

Both buy and sell mean returns have been compared with the returns of buy and hold strategy and the comparison has shown that the signal returns are better than the buy and hold returns. To test the statistical significance of the return difference, t ratio has been calculated and the ratio has been found to be significant at and 10 % level of significance.

Two Hundred-day moving average generates more number of buy signals than sell signals. HDFC has generated more number of buy signals (1022), while WIPRO has generated less number of sell signals (493). CIPLA has shown less number of buy signals (569), whereas ABB HDFC BANK has shown more number of sell signals (18). All the buy signals have shown positive returns, ranging from 0.00241% to 0.00625%. At the same time, all the sell signals have shown negative returns ranging from -0.00528 to 0.002574. So, the study of two hundred-day moving average has identified that the return obtained from moving average trading rule outperforms the return from the buy and hold strategy. It should be noted that the analysis has generated more buy signals than sell signals.

6.11 Conclusion

Moving average trading rules are used by brokers to understand the price movements in the market. It is considered to be one of the stock specific indicators in the market. The secondary data analysis has examined whether the simple moving average trading rules outperform the buy and hold strategy. The study has analyzed various simple moving average trading rules such as five-day, ten-day, twenty-day, fifty-day hundred-day and two hundred-day. The entire moving average trading rules outperform the buy and hold strategy. However, Short term moving averages such as five-day, ten-day and twenty-day moving averages are more profitable than long term moving averages. The study shows that moving average trading rules are profitable and supports the findings of Ratner and Leal (1999). Hence, the study has identified that Indian market is informationally inefficient and mechanical trading rules can outperform buy and hold strategy.

The primary data analysis shows that moving average trading rules have been used by brokers. Further, secondary data analysis shows that moving average trading rules outperform the buy and hold strategy. So, the study does not reject the hypothesis that Moving average plays an important role as a technical indicator.

Table 6.1

Analysis of Buy and Hold strategy

Company	Mean Return	S.D	Variance
ABB	0.002286373	0.020824	0.000434
ACC	0.001449598	0.021031	0.000442
BAJAJ AUTO	0.000706242	0.034366	0.001181
BHEL	0.001481617	0.036471	0.00133
BPCL	-0.00057308	0.037739	0.001424
CIPLA	-0.00086725	0.0446	0.001989
DABUR	0.000165023	0.041417	0.001715
DRREDDY	-0.00072929	0.038256	0.001464
GAIL	0.000445585	0.038213	0.00146
GRASIM	0.000999802	0.035235	0.001242
GUJAMBCEM	-0.00017694	0.042793	0.001831
HCLTECH	-0.00014721	0.04183	0.00175
HDFC	0.000238201	0.037978	0.001442
HDFCBANK	0.000535459	0.034995	0.001225
HEROHONDA	-2.2222E-05	0.03623	0.001313
HINDLEVER	-0.00067829	0.034505	0.001191
HINDPETRO	-0.00063993	0.038435	0.001477
ICICIBANK	0.000986171	0.036504	0.001333
INFOSYS	-0.00034012	0.044072	0.001942
IPCL	0.000515705	0.040082	0.001607
ITC	-0.00050462	0.042647	0.001819
M&M	0.001163954	0.039151	0.001533
MTNL	-0.00047068	0.038686	0.001497
NATIONALUM	0.000428248	0.039983	0.001599
ONGC	0.000283285	0.036965	0.001366
PNB	0.001723797	0.042093	0.001772
RANBAXY	-0.00110234	0.038833	0.001508
RELIANCE	0.000622587	0.03488	0.001217
SAIL	0.0023766	0.046809	0.002191
SATYAM	0.000174261	0.04083	0.001667
SBIN	0.000560793	0.034846	0.001214
SIEMENS	0.001284141	0.043003	0.001849
SUNPHARMA	2.91784E-05	0.039781	0.001583
TATAPOWER	0.000653769	0.036186	0.001309
VSNL	0.000226013	0.040469	0.001638
WIPRO	-0.00084239	0.045024	0.002027

Sources: Compiled data from NSE

Chapter 7

RELATIVE STRENGTH INDEX - A CRITERION

7.1 Introduction

Revolutionary changes have taken place in the modern financial market and it has created a greater competitive and complex situation as never before. Investment opportunities have also increased and as a result, investors look for better returns. Consequently, fund managers and financial intermediaries also try to provide better return for their investments. As a part of the globalization and liberalization policy, nations have opened up to offer better investment opportunities. To exploit this opportunity in various financial markets, timing and information are extremely important.

A paradoxical relationship exists between market efficiency and market analysis because once the market is efficient, it reflects the true price of securities and there is no point in analyzing the stock to earn the superior return. The question of market efficiency has been much discussed in the academic literature. According to efficient market theory, market is efficient and nobody can outperform the market. On the other hand, technical trading school, which emerged years before the modern financial theory, has questioned the existence of efficient market theory. According to technical analysts, the analysis of stocks or index is beneficial when technical indicators outperform the simple buy and hold strategies. But most of the academic literatures are extremely skeptical about technical analysis and its effectiveness in the market.

The concept of fair value has also been criticized by the market participants. The concept of fair value or intrinsic value states that a share or scrip should be

purchased when its price is below the fair value and sells it when its price is above its fair value. However, in real market situation, calculation of intrinsic value is very difficult and time consuming. During the Bull Run, the actual market price will always be above the fair value and during the Bear Run it will be always below the fair value. Hence, it is illogical to use this yardstick for a dynamic financial environment. It is technical analysis which can easily identify the movement of the market by using charts, pattern and technical indicators.

7.2 Review of Literature

Most of the earlier literatures argue that technical analysis is futile. These studies are based on the U.S financial data before the introduction of financial deregulation during the late 70s and early 80s. However, studies after the financial deregulation hold that technical trading is beneficial. Brock, Lakonishok and LeBaron (1992) show that simple technical trading rules can outperform the buy and hold strategy. The study uses the moving average trading rule and trading range breakouts for the analysis purpose. This particular work resulted in a paradigm shift from the existing belief. In their (1992) survey of technical analysis, Taylor and Allen found that 90% of the respondents use some form of technical trading strategies. Isakov and Hollistein's (1999) study on the profitability of technical trading rules shows that in the Swiss stock market, the most profitable rules appear to be the double moving averages with one and five days. The analysis uses moving average with band, relative strength index and stochastic indicator. The study examines moving average with Oscillators like Relative strength index stochastic indicators and finds that the simple moving average rules perform better than the oscillators. Financial advisors, according to Twibell (2005), employ technical analysis not because of scholarly

studies but because of their viability in the market (qtd.in Ming and Hwa). The profitability of technical trading strategies is examined by Nam, Washer and Chu (2005) by identifying the asymmetric dynamic process of stock returns. The daily return series of S&P 500 market index from 1/3/1929 to 31/12/1998 is used in the study. The study finds that the asymmetry in the return is the main cause for profitability of trading strategies. Market professionals cannot negate the usefulness of technical trading strategies in the stock market investment.

7.3 Trading Rules

Technical trading rules have significant role to play in technical analysis. According to Stephan .J. Taylor, trading rules are the method of converting the history of prices into investment decision. It provides an insight into future price movements and also shows when to buy and sell and thereby take a healthy trading decision. Fama (1970) argues that technical analysis has no practical value since the market is efficient. He points out that those trading rules have no practical value.

7.4 Relative Strength Index

Analyzing the relative strength of the securities in the markets started much earlier. The relative strength index helps the traders identify the price continuation and reversal. The basic concept behind the relative strength analysis is that certain securities or scripts perform better than the other securities in the market. Levy (1967) has found that the return generated by using this strategy is better than the simple buy and hold strategy.

Relative strength index, developed by Welles Wilder in his book '*New Concept in Technical Trading System'* (1978) is completely different from relative

strength analysis. It is price momentum indicator and a kind of Oscillator that provides a complete picture of the market by analyzing the velocity of the price movements. It compares the internal strength of the securities and not the relative strength of the different securities. It is also called internal strength index. Generally, 14 days relative strength index is calculated. It is calculated by using the following formula

$$RSI = 100-100/(1+RS)$$

$$\text{Relative Strength} = (\text{average gain/average loss})$$

When average gain is greater than the average loss, Relative Strength will be greater than one and RSI will increase always. If the average gain is less than the average loss, RS will be less than one and RSI will decline. Usually Relative Strength Index is measured on 0 to 100 Scales. If the relative strength index is above 70, it is an indication of the over bought position. When the RSI value is less than 30, it is indicative of the oversold position. During the over bought positions, the traders have to sell the security but in oversold position the traders have to buy the securities.

7.5 Methodology

The study uses both primary and secondary data to verify the importance of relative strength index as a technical indicator. The primary data has been collected from brokers through survey and the secondary data (only the price statistics of the respective stocks) is collected from the National Stock Exchange.

7.6 Primary Data Analysis

The primary data is collected in order to study the importance of moving average as a technical indicator and for their analysis, the techniques of Pearson's Chi-square test and ANOVA are used.

7.6.1 Relative Strength Index and Trend Identification

Relative strength index is one of the stock specific indicators used to measure the relative strength of the individual security. It is widely used by the market professionals to understand the buy or sell signals. It also provides an indication of price oscillation of a particular period of time. The opinion regarding the trend identification by using the relative strength index is explained in table 7.1

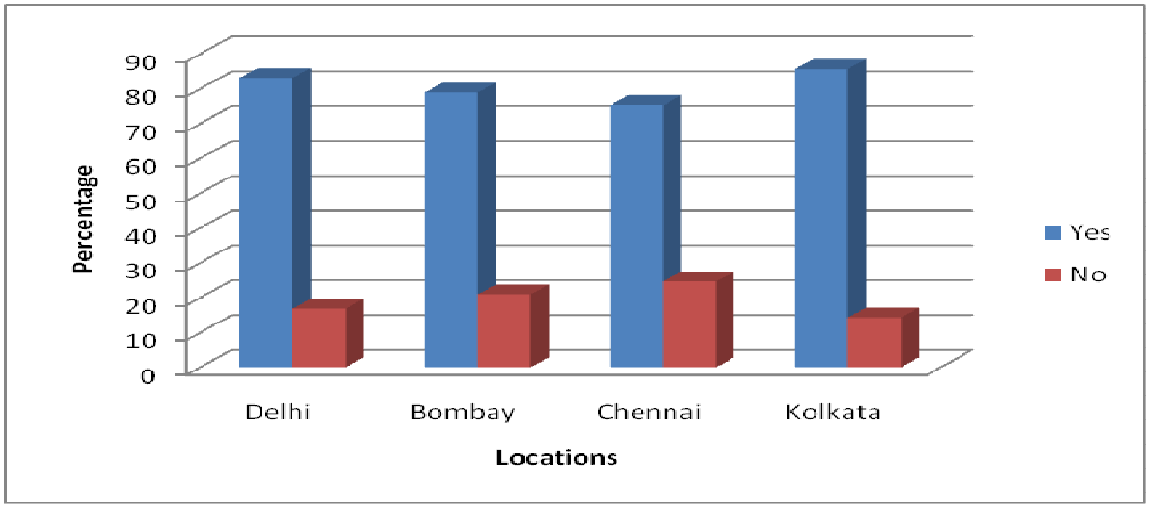
Table 7.1

Relative strength index and Identification of Trend

Locations	Yes	No	Total
Delhi	83.16	16.84	100
Mumbai	79.00	21.00	100
Chennai	75.32	24.68	100
Kolkata	85.71	14.29	100
Average	80.48	19.52	100
Pearson's Chi-square: 4.10781, df=3, p=0.250076			

Source: Primary Data

According to table 7.1, 80.48 percent of brokers agree that relative strength index is highly useful in identifying the trend of the market, while the remaining 19.52 percent deny this.



Fig, 7.1 Relative strength index and Identification of Trend

While 83.16 percent in Delhi believe that RSI shows the clear trend of the market, 16.84 percent do not. In Mumbai, the former form 79.00 percent, while the latter form 21.00 percent. In Chennai, the corresponding percentages are 75.32 and 24.68, and in Kolkata, they are 85.71 and 14.29.

Pearson's Chi-square test is used to test the significance of different opinion by different brokers at different places regarding the trend identification, by using the relative strength index. The test has found that there is no significant difference between the opinion among the different participants at different places at five percentage level of significance, since the p value (0.250076) is greater than 0.05. So the study identifies that Relative strength index has been used by the brokers at different places to identify the clear trend in the market.

7.6.2 Relative Strength Index Analysis: Different Responses

Relative strength index is a stock specific indicator that shows the movement of price of a stock and identifies the overbought and oversold position of a particular security. Moreover, relative strength index helps the investors to take correct investment decision. The opinion of brokers about whether they benefited in and the benefit from of relative strength index analysis are explained in Table 7.2.

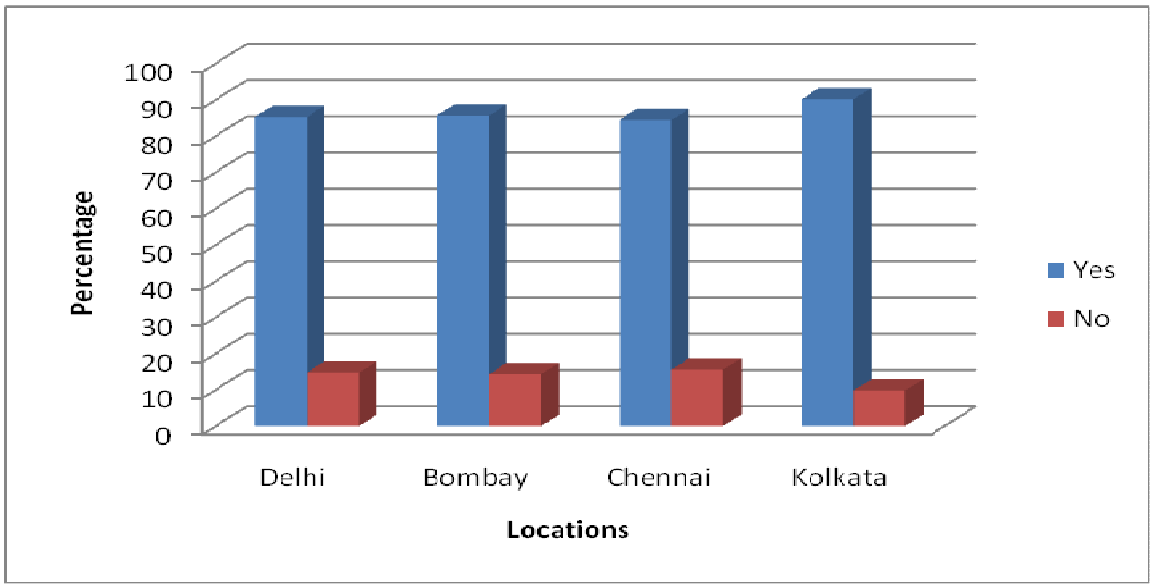
Table 7.2

Relative Strength Index Analysis: Different Responses

Locations	Yes	No	Total
Delhi	85.26	14.74	100
Mumbai	85.67	14.33	100
Chennai	84.42	15.58	100
Kolkata	90.18	9.82	100
Average	86.30	13.70	100
Pearson's Chi-square: 1.84463, df=3, p=0.605277			

Source: Primary data

86.30 percent of the brokers in the table 7.2 consider RSI as beneficial, whereas the remaining do not.



Fig, 7.2 Relative Strength Index Analyses: Different Responses

In Delhi, Mumbai, Chennai, and Kolkata the corresponding percentages are 85.26 and 14.74, 85.67 and 14.33, 84.42 and 15.58, and 90.18 and 9.82 respectively.

Pearson's Chi-square test is used to test the significance of different opinion by different brokers at different places regarding whether they receive any benefit from relative strength index analysis. The test finds that there is no significant difference between the opinion among the different participants at different places at five percentage level of significance, since the p value (0.605277) is greater than 0.05. The study has found that relative strength index is beneficial to brokers in predicting the trend of the market.

7.6.3 Usefulness of Relative Strength Index in Different Markets

Relative strength index is used to identify the trend in the market. The opinion regarding the usefulness of relative strength index is explained in table 7.3

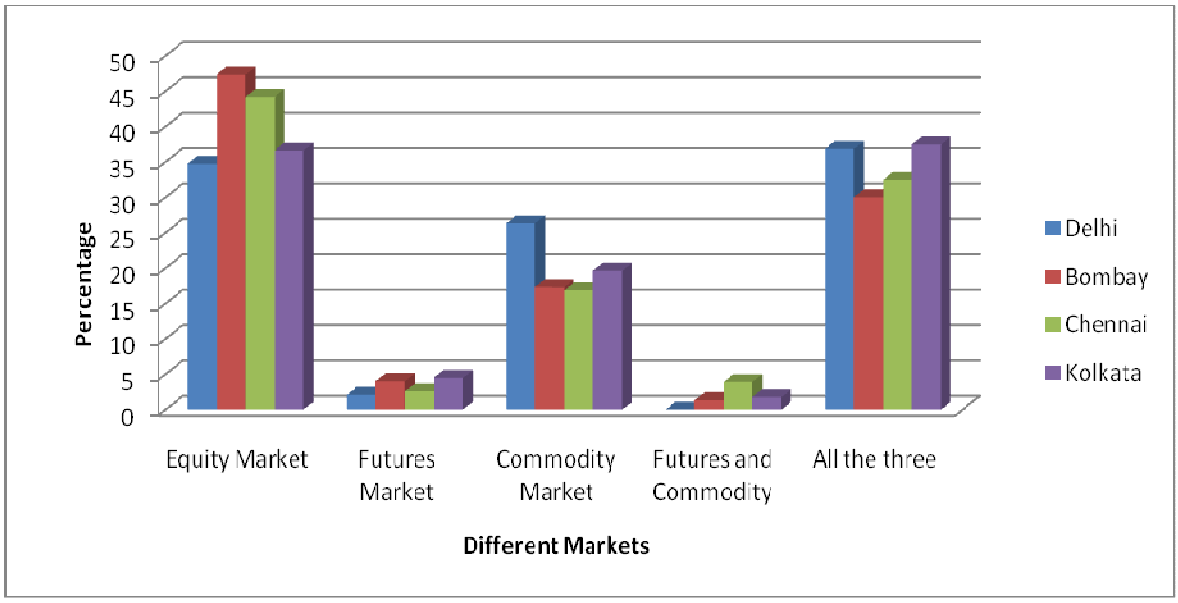
Table 7.3

Usefulness of Relative Strength Index in Different Markets

Locations	Equity Market	Futures Market	Commodity Market	Futures and Commodity	All the three	Total
Delhi	34.74	2.11	26.32	0.00	36.84	100.00
Mumbai	47.33	4.00	17.33	1.33	30.00	100.00
Chennai	44.16	2.60	16.88	3.90	32.47	100.00
Kolkata	36.61	4.46	19.64	1.79	37.50	100.00
Average	42.81	3.60	19.18	1.54	32.88	100.00
Pearson's Chi-square:14.6759, df= 12, p=0.2608						

Source: Primary data

As is evident, among the brokers, 42.81 percent regard RSI as useful in equity markets, 3.60 percent consider it to be useful in Futures markets, 19.18 percent think that it is useful in commodity markets, 1.54 percent believe that it is useful in commodity and future markets, and 32.88 percent maintain that it is useful in equity, futures and commodity market.



Fig, 7.3 Usefulness of Relative Strength Index in Different Markets

In Delhi, 34.74 percent of the brokers have felt that relative strength index is useful in equity markets; 2.11 percent of the brokers have felt that relative strength index is useful in Futures markets; 26.32 percent of the brokers have informed that relative strength index is useful in commodity markets; none of the brokers have informed that relative strength index is useful in both commodity and futures markets and 36.84 percent of the brokers have informed that relative strength index is useful in equity, futures and commodity market together. In Mumbai, 47.33 percent of the brokers have informed that the relative strength index is useful in equity markets; 4.00 percent of the brokers have informed that relative strength index is useful in futures markets; 17.33 percent of the brokers have opined that relative strength index is useful in commodity markets; 1.33 percent of the brokers use it in both commodity and futures markets and 30.00 percent of the brokers have informed that relative strength index is useful in equity, future and commodity market together.

In Chennai, 44.16 percent of the brokers have informed that relative strength Index is useful in equity markets; 2.60 percent of the brokers have informed that relative strength index is useful in future markets; 16.88 percent of the brokers have informed that relative strength index is useful in commodity markets; 3.90 percent of the brokers have informed that relative strength index is useful in both commodity and futures markets and 32.47 percent of the brokers have informed that Relative strength Index is useful in equity, future and commodity market as well.

In Kolkata, 36.61 percent of the brokers have informed that relative strength index is useful in equity markets; 4.46 percent of the brokers have informed that relative strength index is useful in futures markets; 19.64 percent of the brokers have informed that relative strength index is useful in commodity markets; 1.79 percent of

the brokers have informed that relative strength index is useful in both commodity and futures markets and 37.50 percent of the brokers have informed that relative strength index is useful in equity, futures and commodity market together.

Pearson's Chi-square test has been used to test the significance of different opinions of different brokers at different places regarding the usefulness of relative strength index. The test has found that there is no significant difference between the opinion among the different participants at different places at five percentage level of significance since the p value (0.2608) is greater than 0.05. Hence, the study concludes that relative strength index is more useful in equity markets compared to future and commodity market.

7.6.4 Weight Given to Relative Strength Index as a Stock Specific Indicator

Relative Strength index shows the price oscillation in the market. The opinion of brokers regarding the significance accorded by them to relative strength index as a stock specific indicator is explained in table 7.4

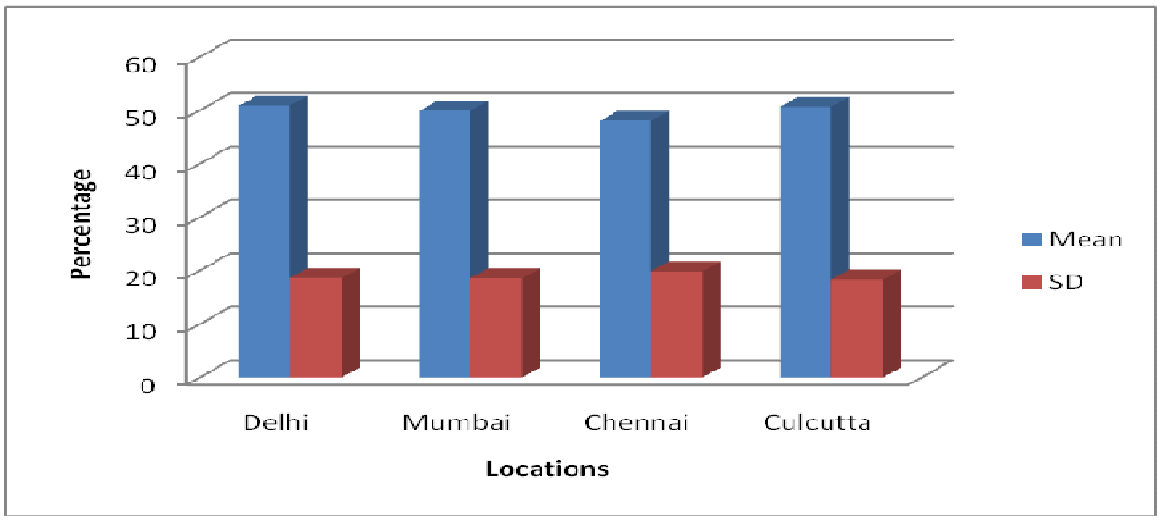
Table 7.4

Weight given to Relative Strength index as a Stock Specific Indicator

Locations	Number	Mean	SD
Delhi	95	50.84	18.59
Mumbai	300	49.89	18.56
Chennai	77	47.99	19.84
Kolkata	112	50.63	18.31
Total	584	49.93	18.66
Sum of squares 424.3803 df =3 Mean Square= 141.4601 F=0.405018 p=0.74945			

Source: Primary data

The table shows that an average weight of 49.93 is given to relative strength index as a stock specific indicator with a standard deviation of 18.66.



Fig, 7.4 Weight given to Relative Strength index as a Stock Specific Indicator

In Delhi, the average weight given to the relative strength index as a stock specific indicator is 50.84with a standard deviation of 18.59. In Mumbai, the average weight given to the relative strength index as a stock specific indicator is 49.89, with a standard deviation of 18.56. In Chennai, the average weight given to relative strength index as a stock specific indicator is 47.99 with a standard deviation of 19.84. In Kolkata, the average weight given to the relative strength index as a stock specific indicator is 50.63with a standard deviation of 18.31.

ANOVA test has been applied to test the significance of the opinion of different brokers regarding the average weight given to the relative strength index as a stock specific indicator. The test has found that there is no significant difference among the opinion of different brokers at five percent level of significance, since the p value (0.74945) is higher than the 0.05.

7.6.5 Accuracy of Relative Strength Index

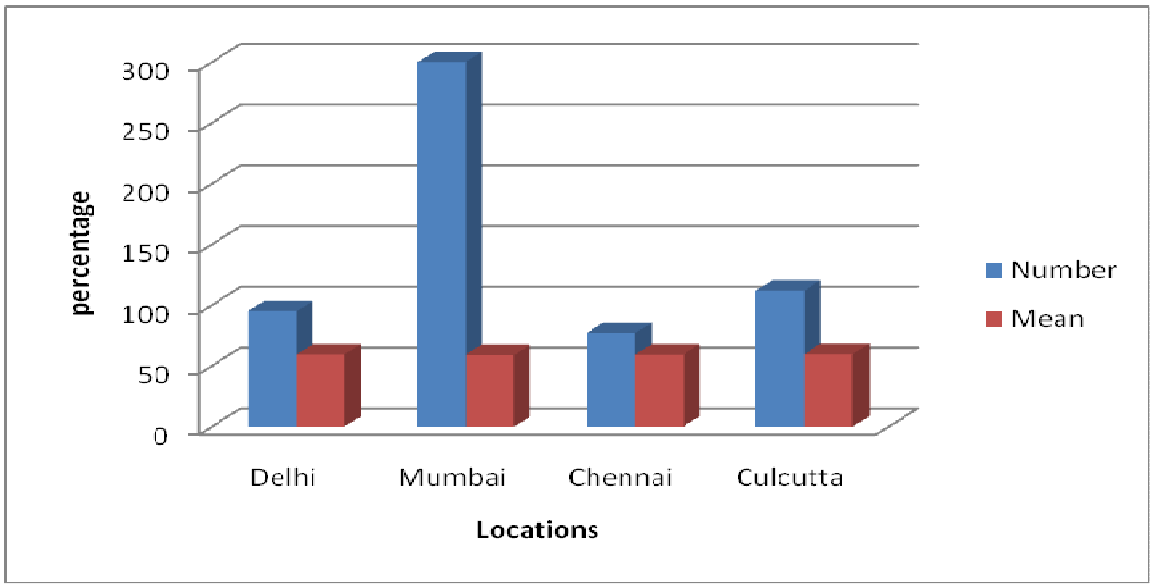
The success of a technical indicator lies in the accuracy of predicting the market. The opinion of brokers regarding the accuracy of relative strength index is explained in table 7.5.

Table 7.5
Accuracy of Relative strength index

Locations	Number	Mean	SD
Delhi	95	59.45	17.59
Mumbai	300	59.04	17.82
Chennai	77	59.29	19.83
Kolkata	112	59.71	19.78
Total	584	59.27	18.4
Sum of squares=40.70849, df =3, Mean Square=13.5695, F=0.039887, p=0.989366			

Source: Primary data

The table shows the average rate of accuracy of 59.27 shows by RSI in identifying the trend in the market with a standard deviation of 18.4.



Fig, 7.5 Accuracy of Relative strength index

In Delhi, the average rate of accuracy shown by RSI in identifying the trend in the market is 59.45, with a standard deviation of 17.59. In Mumbai, the average rate of accuracy shown by RSI in identifying the trend in the market is 59.04 with a standard deviation of 17.82. In Chennai, it is 59.29 with a standard deviation of 19.83, while in Kolkata, it is 59.71 with a standard deviation of 19.78.

ANOVA test has been applied to analyze the significance of difference of opinions of different brokers regarding the average rate of accuracy shown by RSI in identifying the trend in the market. The test has found that there is no significant difference among the opinion of different brokers at five percent level of significance, since the p value (0.989366) is higher than the 0.05.

The primary data analysis shows that relative strength index is used as an important stock specific indicator in stock market. Moreover, it is seen that RSI is used in different sub markets of stock exchanges and has been proved useful but the degree of usage differs from market to market. The study also found that Relative strength index is beneficial to the brokers in predicting the trend of the market. It is used to identify the trend with a considerable amount of accuracy. However, brokers give considerable weight to relative strength index as a stock specific indicator while analyzing the stocks.

7.7 Secondary Data Analysis

The study is based on National Stock Exchange's nifty for a period of five years starting from 2002-03 to 2006-07. The study takes only thirty six stocks to facilitate continuous analysis of stocks. The closing price data of each security has been taken for and it constitutes a total observation of 1259 for each stock. The data has been collected from the NSE website. The constituents of nifty have been taken because of their market value, capitalization, good return and consistence performance in the market.

T ratio has been calculated to test the mean difference between relative strength index trading rule with the strategy of buy and hold. The study took the same

methodology of Brock *et al* (1992) to analyze the mean difference. The study assumes that the population has equal variances

$$\frac{\mu_r - \mu}{(\sigma^2/N+\sigma^2/N_r)^{1/2}}$$

Whereas μ_r and Nr are the mean return and number of signals of the buys and sells,μ and N are the unconditional mean and number of observations. σ^2 is the estimated variance for the entire sample.

7.7.1 Empirical Analysis

In the analysis, the study explains the basic statistics of companies selected for the study and. Table 6.1(Chapter six) contains the buy and hold returns of various companies and their standard deviations and variances. The return is calculated using the following equation.

$$Rt = [In (Pt)-In (Pt-1)]$$

Here, In (Pt) denotes the logarithm of closing price at the time of t. The analysis is arranged into two parts and is explained in tables no 7.6, 7.7 respectively. The return generated for almost all companies are positive. At the same time, companies also show negative return.

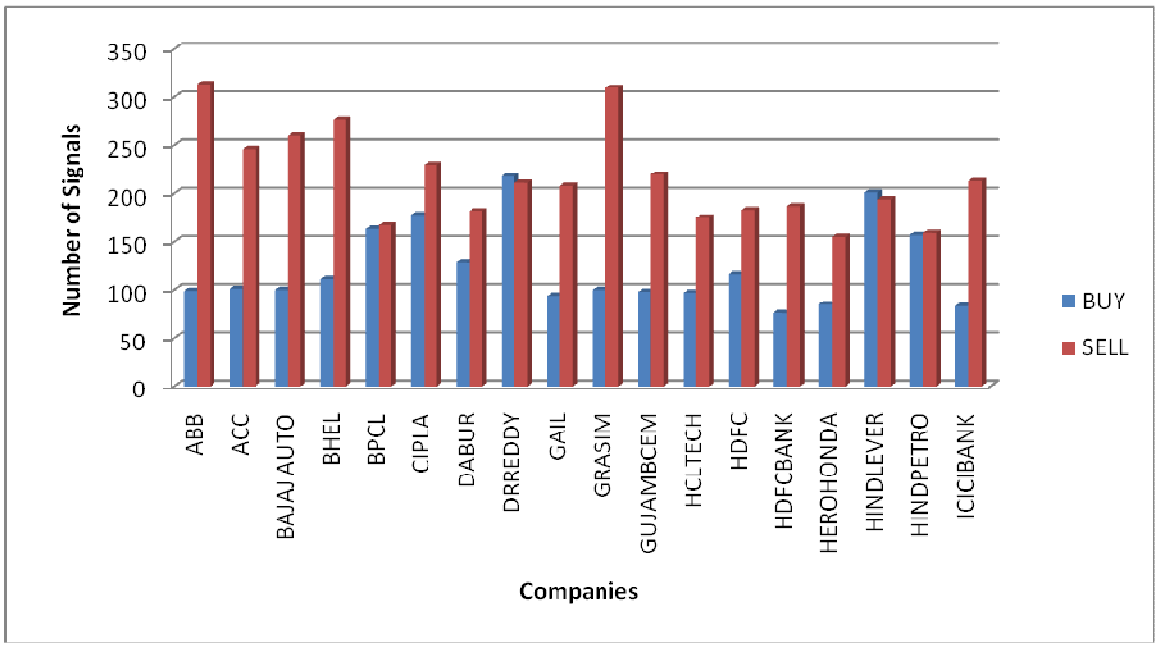
Table 7.6

Secondary Data Analysis of Relative Strength Index Part 1

Company	No. Of Signals		Mean Returns		Return Difference		t values	
	BUY	SELL	BUY	SELL	buy-hold	sell-hold	buy-hold	sell-hold
ABB	99	314	-0.0099	0.0089	-0.012	0.00666	*-5.6122328	*5.07711
ACC	101	246	-0.0081	0.0093	-0.009	0.00792	*-4.3974596	*5.40233
BAJAJ AUTO	100	260	-0.0090	0.0089	-0.009	0.00826	*-2.7445565	*3.53233
BHEL	111	277	-0.0099	0.0095	-0.011	0.00806	*-3.1664972	*3.33066
BPCL	163	167	-0.0110	0.0107	-0.010	0.01132	*-3.3230577	*3.64433
CIPLA	178	230	-0.0150	0.0088	-0.014	0.00974	*-3.9732824	*3.04822
DABUR	128	182	-0.0118	0.0125	-0.012	0.01234	*-3.1377233	*3.75752
DRREDDY	218	211	-0.0092	0.0099	-0.008	0.01070	*-3.0492640	*3.76232
GAIL	94	208	-0.0116	0.0103	-0.012	0.00987	*-2.9579196	*3.45234
GRASIM	100	310	-0.008	0.0088	-0.009	0.0078	*-2.6394006	*3.49491
GUJAMBCEM	98	220	-0.0174	0.0094	-0.017	0.00959	*-3.8494960	*3.06924
HCLTECH	97	175	-0.0162	0.0115	-0.016	0.01171	*-3.6463378	*3.47035
HDFC	116	183	-0.0111	0.0106	-0.0114	0.01036	*-3.0988803	*3.44866
HDFCBANK	76	187	-0.0124	0.0108	-0.0129	0.01029	*-3.1362309	*3.75355
HEROHONDA	85	155	-0.0093	0.0108	-0.0093	0.01084	*-2.3044688	*3.51775
HINDLEVER	201	194	-0.0094	0.0087	-0.0087	0.00947	*-3.3335202	*3.55820
HINDPETRO	157	159	-0.0112	0.0136	-0.0106	0.01424	*-3.2639738	*4.40267
ICICIBANK	83	213	-0.0094	0.0100	-0.0104	0.00903	*-2.5271870	*3.33984
*=Significant at 1% Level,**=Significant at 5% level,***significant at 10% level								

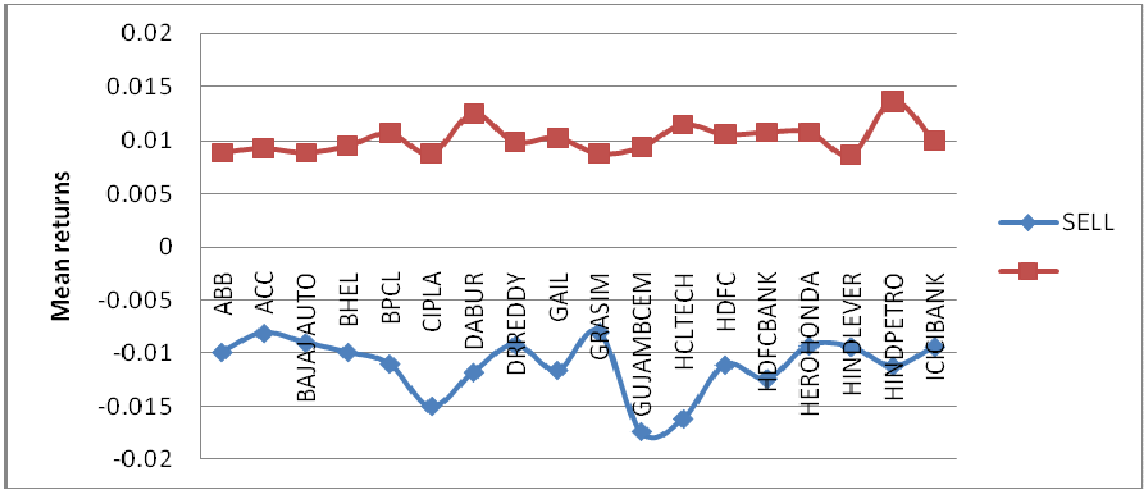
Source: Compiled data from NSE

Column (1) represents the name of the first eighteen companies taken for the analysis while Column (2) lists the name of the buying and selling signal generated by different companies. Column (3) represents the mean return of the buy and sell signal calculated by dividing the total return in the buy signal period and sell signal period, with the number of buy and sell signal, respectively. Column (4) shows the return difference of both buy signals and sells signals with the buy and hold returns. Column (5) indicates the t statistics of the differences in returns.



Fig, 7.6 Secondary Data Analysis of relative strength Index part 1

Different companies generate different signals based on their demand and supply of the particular stocks. The study shows that more sell signals have been generated than buy signals. The company ABB, GRASIM, BHEL ACC, BAJAJ AUTO, ICICIBANK, and GUJAMBCEM have generated more sell signals. However, these stocks have generated less number of buy signals compared to the sell signals. DRREDDY, HINDLEVER. HINDPETRO, HDFC, DABUR, BHEL, BPCL have generated more number of buy signals, at the same time they have an equally generated good number of sell signals.



Fig, 7.7 Mean returns of different Stocks

All the buy mean returns have shown the negative value which falls between -0.0174 to -0.008. However, all the sell returns have shown positive value and which falls between 0.0087 to 0.0136. HINDLEVER BHEL, ABB, ACC, GRASIM, HEROHONDA stocks have generated the highest mean returns in buy signals, while DABUR, HCLTECH, HDFC, HDFCBANK, CIPLA, GUJAMBCEM stocks have generated the lowest mean return in buy signals. DABUR, HDFC, BPCL, HCLTECH, HINDPETRO stocks have shown the highest mean return in sell signals. ABB, ACC, GRASIM, BHEL, CIPLA, DRREDDY, BAJAJ AUTO stocks have shown the lowest mean return in sell signals.

Both buy mean returns and sell mean returns have been compared with returns of buy and hold strategy. The comparison has found that sell returns are shown better than the buy returns. To test the statistical significance of the differences in return, t ratio has been calculated and t ratio has been found to be significant at 1%level.

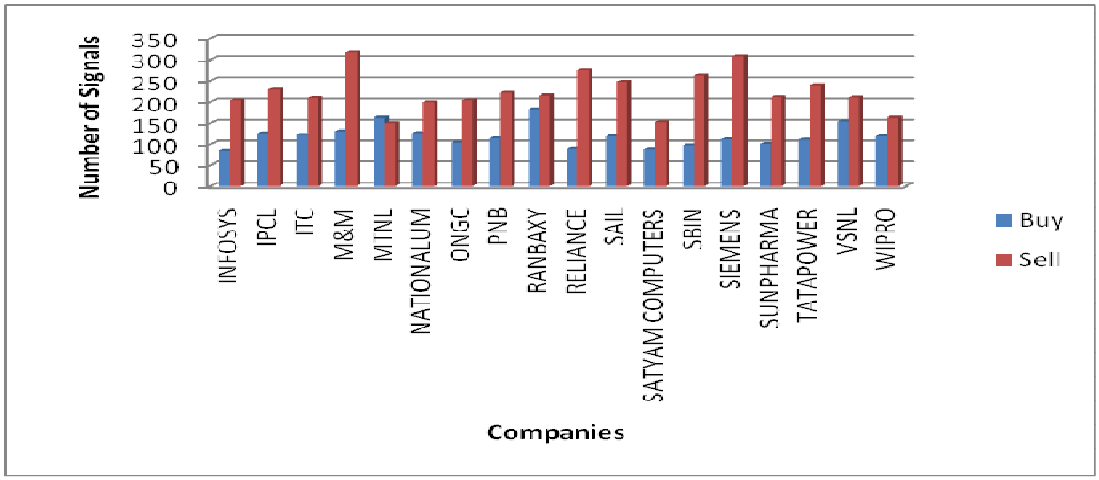
Table 7.7

Secondary Data Analysis of Relative Strength Index part 2

COMPANY	No of Signals		Mean Return		Return Difference		t values	
INFOSYS	84	204	-0.025	0.01	-0.025	0.01034	*-5.1287323	*3.1095
IPCL	126	229	-0.016	0.0106	-0.016	0.01009	*-4.4721050	*3.5059
ITC	122	210	-0.016	0.0081	-0.015	0.00862	*-3.9475770	*2.7129
M&M	131	318	-0.012	0.0103	-0.013	0.0092	*-3.8591072	*3.7534
MTNL	162	150	0.0122	0.0148	-0.011	0.01528	*-3.6348065	*4.5748
NATIONALUM	127	199	0.0145	0.0131	-0.013	0.00942	*-3.2865927	*3.12209
ONGC	104	204	-0.0129	0.0098	-0.010	0.01539	*-2.8592026	*5.7111
PNB	113	221	-0.010	0.0156	-0.011	0.01395	*-2.8593995	*4.54625
RANBAXY	183	215	-0.012	0.0073	0.0117	0.0084	*-3.8271960	*2.93123
RELIANCE	89	274	-0.010	0.0080	-0.011	0.00739	*-2.9935061	*3.18080
SAIL	118	247	-0.0126	0.0211	-0.014	0.01881	*-3.3271591	*5.77694
SATYAM COMPUTERS	88	152	-0.0237	0.0115	-0.0239	0.01132	*-5.3229821	*3.23142
SBIN	97	263	-0.0124	0.0089	-0.0130	0.00836	*-3.5471310	*3.54234
SIEMENS	111	308	-0.015	0.0108	-0.0169	0.00954	*-3.9791994	*3.49283
SUNPHARMA	101	212	-0.0158	0.0104	-0.0158	0.01045	*-3.8632302	*3.54102
TATAPOWER	110	240	-0.0148	0.0088	-0.0154	0.00814	*-4.3033082	*3.19576
VSNL	154	211	-0.0140	0.0159	-0.0143	0.01574	*-4.1409887	*5.23123
WIPRO	118	162	-0.021	0.0096	-0.0210	0.01050	*-4.8622493	0.628582
*=Significant at 1% Level,**=Significant at 5% level,***significant at 10% level								

Source: Compiled data from NSE

Column (1) represents the name of the remaining eighteen companies which are taken for the analysis and column (2) provides the name of the buying and selling signal generated by different companies. Column (3) lists the mean return of the buy and sell signal, which is calculated by dividing the total return in the buy signal period and sell signal period with the number of buy and sell signal, respectively. Column (4) shows the return difference of both buy signal and sell signal with the buy and hold return while Column (5) indicates the t statistics of the difference in return.



Fig, 7.8 Signals generated by different Stocks Part 2

The signals generated by the remaining eighteen companies also show more sell signals rather than buy signals. RANBAXY, MTNL, VSNL, NATIONALUM have shown the highest number of buy signals while RELIANCE, SATYAM COMPUTERS, INFOSYS; SAIL have shown the lowest number of buy signals. M&M, Reliance, SIEMENS, SBIN, TATAPOWER have shown the highest number of sell signals whereas MTNL SATYAM COMPUTERS, WIPRO, NATIONALUM, ONGC have shown the lowest number of sell signals.

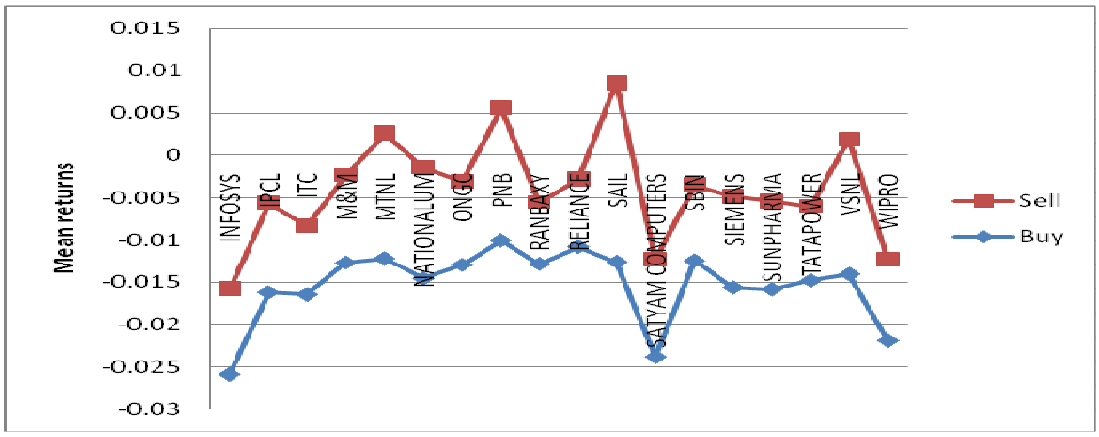


Figure: 7.9 Mean returns of different Stocks

Almost all buy mean returns have shown the negative value which falls between -0.025 to 0.0145. But, all the sell returns have shown positive value which fall between 0.0073 and 0.0211. NATIONALUM, MTNL, RANBAXY, PNB,

RELIANCE stocks have generated the highest mean returns in buy signals, while INFOSYS, ITC, IPCL, SATYAM COMPUTERS stocks have generated the lowest mean returns in buy signals. NATIONALUM, WIPRO, VSNL, SATYAM COMPUTERS, SAIL, PNB and MTNL stocks have shown the highest mean returns in sell signals, while ANBAXY, ONGC, SBIN, TATAPOWER, WIPRO, RELIANCE stocks have shown the lowest mean return in sell signals.

The returns generated by the relative strength index rules have been compared in the table with the returns of buy and hold strategy. The comparison has shown that the signal returns have superiority over the buy and hold returns. However, buy returns do not have as much attractiveness as sell return shows. To test the statistical significance of the difference in return, t ratio has been calculated and it is found to be significant at 1% level.

The study has thus found that relative strength index trading rule outperforms the buy and hold strategy. The comparisons of both buy and sell returns generated by the trading rule outperform the buy and hold strategy. The study has shown that relative strength index has generated more sell signals than buy signals. The reason is the period of the study. During the period Indian market has shown an uptrend, where the market has created more sell signals than buy signals.

7.8 Conclusion

Relative strength index has not been discussed in the academic literature, despite it being one of the important Oscillators which are used in the market to understand the market movement and to predict the price of the stock or index. Moreover, the study identifies that RSI has been used in different sub - markets of stock exchanges and has been proved useful, but the degree of usage differs from

market to market. The study also identifies that relative strength index is beneficial to the brokers in predicting the trend of the market. It is used to identify the trend with a considerable amount of accuracy. However, brokers give considerable weight to relative strength index as a stock specific indicator while analyzing the stocks. The analysis agrees that signal returns generated by the relative strength index outperforms the buy and hold strategy. Both primary data analysis and secondary data analysis have shown that brokers use relative strength index in the market for analyzing the stocks and it outperforms the buy and hold strategy. Hence, the study does not reject the hypothesis that relative strength index plays an important role as stock specific indicator.

Chapter 8

TECHNICAL ANALYSIS AND TRADING VOLUME

Technical analysis is concerned with analyzing past price statistics to predict future price movements. However, brokers of today use trading volume along with the past price statistics to make an investment decision, since it is considered to be an important element in the stock market. Hence, technicians have started using trading volume as a corroborative evidence to predict the future price. This chapter deals with the importance of trading volume in taking an investment decision and discusses its informative content to predict the future price of asset.

8.1 Price and Volume

Price–volume relationship in the financial market is widely debated among the academic and investor communities. The initial work on price-volume relationship by Granger and Morgenstern (1963) concludes that there is no correlation between price and volume. However, later studies have found that there is a significant relationship between price and volume. According to C.C Ying (1966), Price and volumes of sales in the stock market are joint products of a single market mechanism. Hence, price volume analysis in the market is essential to understand market dynamics

Jonathan M Karpoff (1987) identifies four major reasons for the importance of price volume analysis in the financial market. They are: a) The Volume provides an insight into the structure of financial market, b) It is important for event studies that use a combination of price and volume data, c) Price Volume relationship is critical to the debate over the empirical distribution of Speculative prices d) Price Volume relationship has significant implication for research on future markets. The existing

literature on price- volume comes in three forms: (a) Its relation with bid-ask spread (b) its relation to price changes and (c) its relation to information.

The present study focuses on the information based relationship of price and volume. The study analyzes whether volume can predict the future price movement and whether it contains the useful information to foresee the future price movement. There are numerous studies on price volume relationship. However, most of them concentrate on the developed markets.

8.2 Review of Literature

The study done by Blume, Easley and O'Hara (1994) shows that trading volume has price sensitive information. Granger and Morgenstern (1963), C.C Ying (1966), Crouch (1970), Clark (1973), Epps & Epps (1976), and Harris (1983) also support that trading volume has price sensitive information. However, most of these studies are based on developed markets in the U.S and U.K. and a very few studies such as Moosa and Loughani(1995), Basci, Ozyildirim and Aydogan(1996),Pisedtasalasai and Gunasekarage (2007) are based on the emerging market. The later studies also support the fact that trading volume has price sensitive information. In the emerging markets, obtaining information on fundamentals is riskier owing to the reliability and availability of the information. Moreover, they are not properly organized. Speculation, rumours and excessive noise in the information are characteristics features of emerging markets and they are prevalent in almost all the emerging markets which ultimately result in deviating from fundamental values.

Almost all of these studies are related to price changes. However, theses studies are either related to volume and absolute price changes or volume and price change per se and some studies are related to bid-ask spread. Information related

studies on trading volume are very few in the emerging markets, especially studies on technical analysis and trading volume. Antoniou, Ergul, Holmes and.Priestley (1997) provide a clear linkage between technical analysis, trading volume and market efficiency. Technical analysts believe that history of past prices reflects the information on future price movement. They also believe that technical analysis is a pervasive activity as it can be seen in all levels of analysis. This apparent paradox has been analyzed by considering the past prices and volume.

Wang (2002) brings out the relationship between price and volume. Price and volume are two important variables in the analysis of market operation. The behaviour of volume is closely related to the behaviour of price through which investors can learn a great deal about price as well as economic fundamentals. Wang's study shows that the hedging portfolio has a considerable forecasting power in predicting the future returns of market portfolio. The study shows the link between economic fundamental and the dynamic properties of asset returns and volume. Interaction between price and quantities in equilibrium earn an ample set of implication for any asset pricing model.

8.3 Technical Analysis and Market Efficiency

Technical analysis and the concept of market efficiency contradict each other. Technical analysis predicts future market price movement based on the past market statistics. It indicates that past market statistics contain the information regarding the future price movement. On the other hand, market efficiency concept holds that current price fully reflects the information and nobody can make abnormal profit (Fama, 1970). This seminal paper argues that current price reveals the fundamental or intrinsic value of the security. But it should be noted that the fundamental value may differ due to various externalities. Moreover, it is very difficult to calculate the

intrinsic value of a security. Fama's work remained unquestionable for a long time. However, during the 1990's many notable works on technical analysis and market efficiency Neftci (1991) and Brock *et al* (1992) emerged. Efficient market hypothesis completely opposes technical analysis even though it is a pervasive activity. Brown and Gennings (1989) observe that if the investors are homogeneously informed, the technical analysis has no value. But in the competitive market environment, it is not possible to inform every investor equally. If the price adjustment process is not immediate, the market statistics will contain information, Blume, Easley and O'Hara (1994). Most of the time, in the market environment, price adjustment is not quick because of the inability of the system for the information dissemination.

8.4 Technical Analysis and Trading Volume

According to behavioral finance literature, investors focus on past price to make effective investment decision. Price statistics of a security may or may not provide quality of trading information but the volume provides a clear insight into trading activity. The combination of past price information and volume activity gives clear information about future price movement.

In the science of technical analysis, volume plays as important role as any other basic indicators. Technical analysts analyze the volume to confirm trend and trend reversal. An increase in volume in conjunction with the movement of stock price, improves the strength of market move. Volume is the outcome of trading process. At the same time, it is considered to be one of the useful technical indicators of the market. Kraus and Stoll (1972) as well as Hess and Frost (1982) argue that large volume of sale and purchase of a security causes the increase and decrease in price. It is not necessary to have information along with the transaction. Price cannot

obtain complete information from the market and volume provides the quality information from the market. Volume includes almost all information which can influence the trading strategies of investors.

Volume analysis has therefore become an integral part of technical analysis. It is the processes through which traders learn about fundamentals. Traders use volume data to modify their belief, which describes market as well as its influence on the market. If all the investors have complete information, technical analysis has no value[1] . But in the actual market, the situation is altogether different and investors get different market signals. Price and volume analysis play a crucial role in technical analysis of stock, especially for those which are less widely traded.

It should be noted that the use of non price information along with the past price may enable the traders to predict the future price movement. Most of the time, price alone cannot give the real picture of stock price movement. If the traders analyze the price with the volume, they can distinguish the signal, noise as well as news in the market. The finding of the empirical study by Young (2000) was a turning point in the price volume relationship as well as in technical analysis. His contribution is as follows

a) Price and volume rise- it signals an uptrend.
b) Price declines but the volume rises- It signals a downtrend.
c) Price is rising but the volume is declining hence it signals the weak uptrend.
d) Price is declining and the volume also is declining. It signals a weak downtrend.

[1] Brown, D.P. and R.H. Jennings (1989), On Technical Analysis, Review of Financial Studies

Informed traders do not require technical analysis but for uninformed traders technical analysis is necessary to understand the signals based on the market price. Technical analysis uses volume to confirm the trend as well as to anticipate the future price movement.

8.5 Methodology

The study uses both primary and secondary data to understand the impact of trading volume on share price. The primary data is collected from brokers through survey and the secondary data (which include price and volume data of respective stocks) are collected from National Stock Exchange.

8.6 Primary Data Analysis

The primary data is collected from brokers to examine whether they use volume analysis in the real market place. The study uses Pearson's Chi-square test and ANOVA test to understand whether there is any significant difference of opinion among different brokers at different places.

8.6.1 Impact of Trading Volume on Share Price

Volume is considered to be one of the indicators of technical analysis. It provides a meaningful insight into the movement of share price. The movements of share price with good support of volume indicate that particular price movement has strengthed. If the volume is not supported with the price it is an indication of lack of strength in the trend. Opinion regarding the impact of trading volume on share price is described in table 8.1

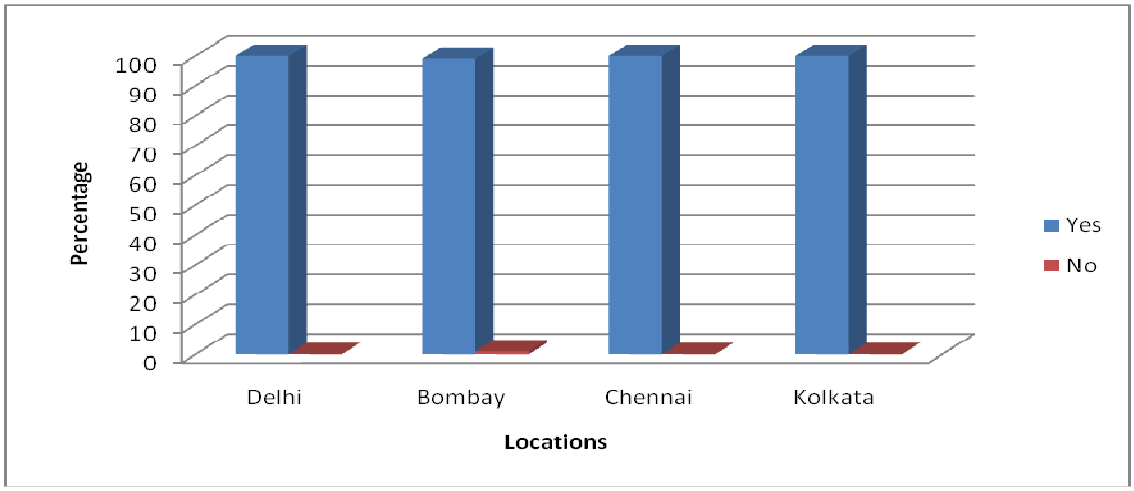
Table 8.1

Impact of Trading Volume on Share price

Locations	Yes	No	Total
Delhi	100.00	0.00	100.00
Bombay	99.00	1.00	100.00
Chennai	100.00	0.00	100.00
Kolkata	100.00	0.00	100.00
Average	99.49	0.51	100.00
Pearson's Chi-square: 2.85466, df=3, p=0.414593			

Source: Primary data

In table 8.1, 99.49 percent of the brokers hold that trading volume has an impact on share price while 0.51 percent of the brokers feel that it does not. In Delhi, Chennai, and Kolkata all the brokers think trading volume has an impact on share price. In Bombay, 99.00 percent of them hold the same view.



Fig, 8.1 Impact of Trading Volume on Share price

To test the significance of the difference of opinion of brokers regarding the impact of trading volume on share price, Pearson's Chi-square test is used. The test reveals that there is no significant difference among the opinion of brokers at five percent level of significance, since the p value (0.414593) is greater than 0.05. So, the study concludes that trading volume has an impact on the share price

8.6.2 Degree of Impact of Trading Volume on Share Price

Trading Volume determines the strength of the price movement of a particular script. It has some amount of informational content. Hence, technicians give great importance to trading volume in technical analysis. The opinion regarding the degree of impact of trading volume is explained in table 8.2

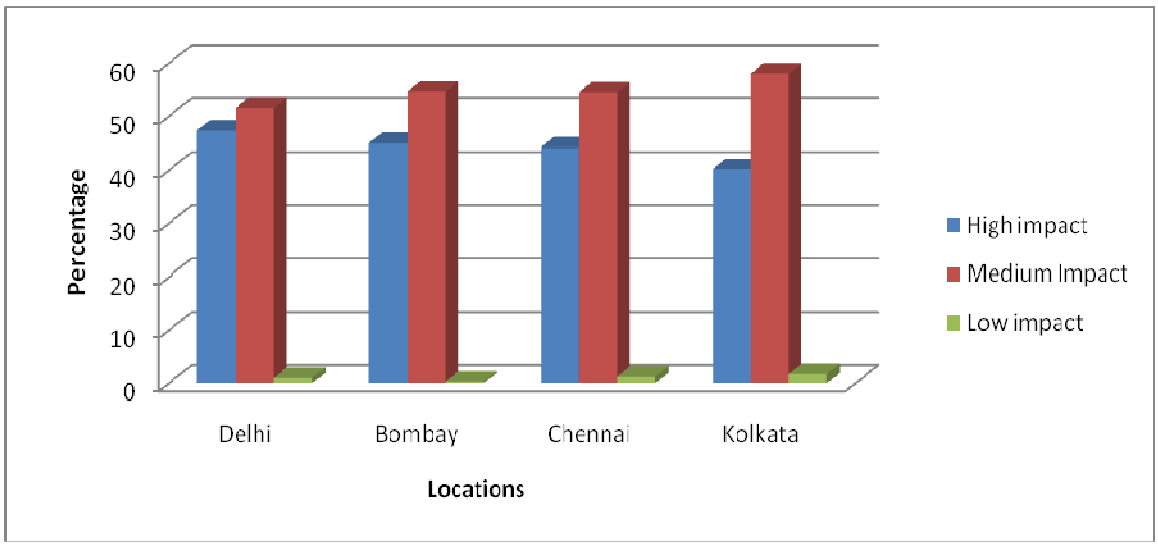
Table 8.2

Degree of Impact of Trading Volume on Share Price

Locations	High impact	Medium Impact	Low impact	Total
Delhi	47.37	51.58	1.05	100.00
Bombay	45.00	54.67	0.33	100.00
Chennai	44.16	54.55	1.30	100.00
Kolkata	40.18	58.04	1.79	100.00
Average	44.35	54.79	0.86	100.00
Pearson's Chi-square: 3.36672, df=6, p=0.761605				

Source: Primary Data

While 44.35 percent of the brokers in table 8.2, are of the view that trading volume has high impact on share prices, 54.79 percent of them think it has medium impact and the remaining 0.86 percent of them think that it has only low impact.



Fig, 8.2 Degree of impact of trading volume on Share Price

In the four metros, the corresponding percentages are: In Delhi, 47.37, 51.58, and 1.05; In Mumbai, 45.00, 54.67, and 0.33; in Chennai, 44.16, 54.55, and 1.30; and In Kolkata, 40.185, 58.04, and 1.79.To test the significance of the difference of opinion of brokers regarding the impact of trading volume on share price, Pearson's Chi-square test is used. The test reveals that there is no significant difference among the opinion of brokers at five percent level of significance, since the p value (0.761605) is greater than 0.05. Trading volume has medium impact on the share price.

8.6.3 Effectiveness of Trading Volume Analysis

As already stated, trading volume is a market indicator which shows the strength of a particular scrip or share. The effectiveness of trading volume analysis mainly depends upon the ability of the analyst in analyzing. It is a kind of indicator which provides the reliability of price movement of the stock. The response regarding the effectiveness of trading volume is explained in table 8.3

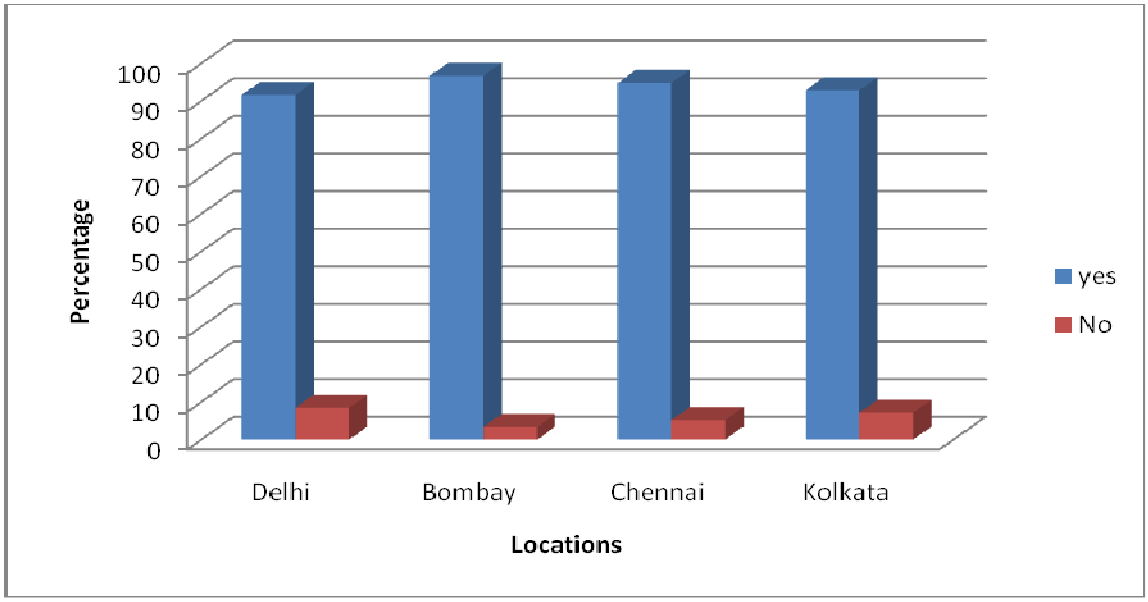
Table 8.3

Effectiveness of Trading Volume Analysis

Locations	Yes	No	Total
Delhi	91.58	8.42	100.00
Bombay	96.67	3.33	100.00
Chennai	94.81	5.19	100.00
Kolkata	92.86	7.14	100.00
Total	94.86	5.14	100.00
Pearson's Chi-square: 5.03052, df=3, p=0.169599			

Source: Primary Data

94.86 percent of the brokers in table felt that trading volume is effective in analyzing the stock, whereas 5.14 percent do not.



Fig, 8.3 Effectiveness of Trading Volume Analysis

The corresponding percentages for Delhi are 91.58 and 8.42 and for Mumbai they are 96.67 and 3.33. For Chennai and Kolkata they are 94.81 and 5.19, and 92.86 and 7.14 respectively.

To test the significance of the difference of opinion about effectiveness of trading volume in analyzing the stock among various brokers at different places, Pearson's Chi-square test is used. As per the analysis, the study finds that there is no significant difference among the opinion of brokers at various places regarding the effectiveness of trading volume at five Percent level of confidence. Since the p value (0.169599) is greater than 0.05, volume analysis is highly effective in the market.

8.6.4 Trading Volume and the Influence of Share Price

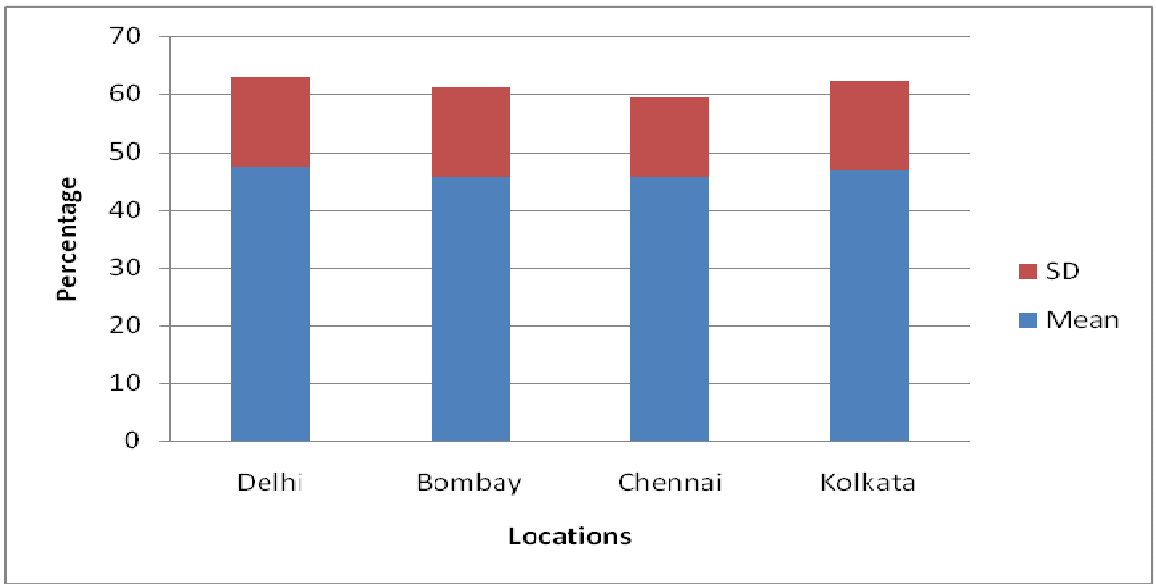
Trading volume is an important market indicator used by technical analysts for taking an investment decision. Generally, trading volume is used to confirm the trend in the market. The opinion of brokers regarding the quantity of trading volume required to influence the share price is shown in table 8.4.

Table 8.4
Trading Volume and the Influence of Share Price

Locations	Number	Mean	SD
Delhi	95	47.54	15.38
Bombay	300	45.70	15.41
Chennai	77	45.84	13.39
Kolkata	112	46.84	15.35
Total	584	46.24	15.12
Sum of squares:298.4614, df=3, Mean Square=99.48712, F=0.433901 p=0.728809			

Source: Primary Data

The table shows that an average trading volume of 46.24 is necessary to influence the share price with standard deviations of 15.12. In Delhi, it is indicated that an average trading volume of 47.54 is necessary to influence the share price with standard deviations of 15.38 while in Bombay, an average trading volume of 45.7 is necessary to influence the share price with a standard deviations of 15.41. In Chennai, an average trading volume of 45.84 is necessary to influence the share price with standard deviations of 13.39, whereas in Calcutta, an average trading volume of 46.84 is necessary to influence the share price with standard deviations of 15.35.



Fig, 8.4 Trading Volume and the Influence of Share Price

The ANOVA test is applied to understand the significance of the difference of opinions of different brokers regarding the average trading volume necessary to influence the share price. The test finds that there is no significant difference among the opinion of different brokers at five percent level of significance, since the p value (0.728809) is higher than the 0.05.

The primary data analysis finds that trading volume has an impact on share price. Trading volume does not have high impact on share price but it always has a medium impact on share price. However, there should be a considerable amount of change in the trading volume to influence share price. Moreover, the study finds that trading volume analysis is effective while making an investment decision.

8.7 Secondary Data Analysis

The data consist of thirty six individual stocks in Nifty for a period of five years (2002-2007). The remaining fourteen stocks in Nifty are excluded from the analysis as those stocks do not have continuous history during the five year of study period in the Nifty. The closing price data and volume are considered for the analysis. The turnover is taken to represent the volume since it reduces the variation in the series. Total 1259 observations of each stock are taken to test the causal relationship between price and volume and vice versa. The study uses Granger Causality test to identify the causality between the price and trading volume.

8.7.1 Granger Causality Test

Granger (1969) introduced the concept of causality test, which became Granger Causality later. Now, it is used as a standard tool in econometric analysis. This test measures the causality between two variables. Regression analysis does not provide the direction of the influence or causality. However, Granger causality test

identifies both unilateral and bilateral causality between two different variables. If the variable 'X' causes variable 'Y' and the variable 'Y' does not cause the variable 'X', there exists unilateral granger causality. At the same time, if two variables cause each other, there is bilateral Granger causality. It should be noted that data set should be stationary before the application of Granger causality test.

8.7.2 The Stationary Test

In econometric analysis the selected data set should be stationary in nature. Otherwise it may bring out the spurious relationships or correlation among the variables. Generally, the price data obtained from stock market is not stationary. However, there are many tests to make a series of stationary or unit root. Augmented Dickey Fuller test is used to test the stationarity of the closing price data.

$$\Delta Yt = \beta 1 + \beta 2t + \delta\, Yt\text{-}1 + \acute{\alpha}i \Sigma\, \Delta\, Yt\text{-}i + \varepsilon t$$

Where, εt=error term and $Yt\text{-}1=(Yt\text{-}1 - Yt\text{-}2)$

Augmented dickey fuller test is a version of dickey fuller test and it is used for complicated set of time series models. ADF test removes the autocorrelation among the variables and tests the stationarity status of the time series. In Indian market, price series of stocks have shown non stationarity. The stationarity test results are shown in table 8.5. So, return is calculated to make the price series stationary by using following equation.

$$Rt = [In\ (Pt) - In\ (Pt\text{-}1)$$

In (Pt) denotes the logarithm of closing price at the time of t. and it is stationary in all the cases.

8.7.3 Causal Relation between Trading Volume and Stock Price

The Granger causality test is used to test the causal relationship between trading volume and stock price. Causal relationship means whether changes in stock price cause changes in trading volume and vice versa. In analysis, the stock price and trading volume have regressed each other. The Lag length is determined according to Akaike information criterion. Table 6.6 has shown the lag length along with the test result. The study uses the following equation of Granger Causality for the purpose of analysis.

$$V_t = \lambda 0 + \sum_{i=1}^{m} \lambda_i R_{t-i} + \sum_{j=1}^{n} \delta j V_{t-j} + \varepsilon_{1t}$$

$$R_t = \gamma_0 + \sum_{i=1}^{m} \gamma_i R_{t-i} + \sum_{j=1}^{n} \beta j V_{t-j} + \varepsilon_{2t}$$

Causality from return to volume is tested by putting λi =0 as null hypothesis and Granger causality from trading volume to return is tested by putting the null hypothesis βj =0. To test these joint hypothesis, F test is used which measures the overall significance of the estimated regression co-efficient. If the calculated value is more than the critical value, the null hypothesis will be rejected. If the calculated value is less than the critical value, the null hypothesis will be accepted.

8.7.4 Trading Volume on Share Price

Table 8.6 explains the Granger causality test results (trading volume on share price). Ciner (2002) has shown that volume contains the information to predict the future price movements. Chen (2008) finds that a long term relationship exists between the share price and trading volume.

Table 8.6

Granger Causality Tests (Trading Volume on Price)

S.No	STOCKS NAME	F STATISTICS	LAG
1	ACC	42.8128994994431*	7
2	BAJAJAUTO	95.8249764702482*	9
3	BHEL	64.092795321323*	9
4	BPCL	1.605175536	7
5	SIEMENS	3.20075671970827**	12
6	CIPLA	2.98249601104626***	9
7	DABUR	49.2934033528028*	5
8	DRREDDY	11.3257593982928*	9
9	GAIL	3.46746194304564**	6
10	GRASIM	54.2877243413373*	9
11	GUJAMBCEM	1.486639598	7
12	HCLTECH	14.1922542534191*	7
13	HDFC	32.8731773851932*	8
14	HDFC BANK	41.2734408991784*	7
15	HEROHONDA	3.07446299482345***	7
16	HINDPETRO	0.894070824	7
17	HINDLEVER	8.89203208992294*	5
18	ICICIBANK	2. 51011044777703***	7
19	INFOSYS	37.6225569951432*	12
20	IPCL	2.7596918995352***	6
21	ITC	33.7531148933392*	10
22	M&M	0.654695038	8
23	MTNL	15.9106790125744*	5
24	NATIONALUM	1.833483265	5
25	ONGC	20.1357458539631*	8
26	PNB	2.8560672049963***	7
27	RANBAXY	21.5202287580674*	9
28	RELIANCE	4.37053531453287**	8
29	SAIL	2.53736953046169***	4
30	SATYAMCOMPUTERS	33.3868282117774*	8
31	SBIN	0.628460523	8
32	SUNPHARMA	24.4444916108832*	8
33	TATAPOWER	2.618760183209127***	6
34	VSNL	16.0059456223665*	7
35	WIPRO	40.8394131946961*	10
36	ABB	42.8128994994431*	10
*Significant at 1% level, ** significant at 5% level, *** significant at 10% level			

Source: Compiled data from NSE

Therefore, the study began with the hypothesis that trading volume granger causes the share price in Indian stock market since the other studies are based on foreign markets. The Stocks of ABB, ACC, BAJAJAUTO, BHEL, DABUR,

DRREDDY, ONGC SUNPHARMA, VSNL, GRASIM, HCLTECH, HDFC, HINDLEVER, INFOSYS, ITC, MTN, RANBAXY, SATYAMCOMPUTERS, WIPRO, HDFC BANK are significant at one percent level itself. A Few stocks such as BPCL, GUJAMBCEM, HINDPETRO, M&M NATIONALUM and SBIN are not significant even in ten percent level.

As per the analysis, there is no bilateral causal relationship between price and volume, though only a unilateral relationship exists between price and trading volume. The F statistic is highly significant in almost all stocks in the case of volume causing price. Hence, the study rejects the null hypotheses that trading volume does not cause the price (V to R -βj =0)

8.7.5 Share Price on Trading Volume

Table 8.7 explains the Granger causality test results (share price on trading volume). The study began with the hypothesis that the share price does not granger cause trading volume. BAJAJAUTO, BHEL, BPCL, DABUR, RELIANCE are a few number of stocks significant at 1% level of significance. However, DRREDDY, GAIL, GRASIM, GUJAMBCEM, HCLTECH, HDFC, HDFC BANK, HEROHONDA, HINDPETRO, HINDLEVER, ICICIBANK, SAIL, SATYAMCOMPUTERS, SBIN, NATIONALUM, ONGC, PNB, RANBAXY have shown that share price does not granger cause the trading volume, since F statistics is highly insignificant in the case of price causing volume. The study accepts the null hypothesis that the price does not cause trading volume (R to V - λi =0). Hence, the price does not have any causal relation with trading volume.

Table 8.7

Granger Causality Tests (Price on Trading Volume)

S.N	STOCKS NAME	F STATISTICS	LAG
1	ACC	2.007860748	7
2	BAJAJAUTO	13.0199877624004*	9
3	BHEL	8.4359100247523*	9
4	BPCL	6.70731764714792*	7
5	SIEMENS	0.06952473	12
6	CIPLA	2.46024413283621***	9
7	DABUR	8.82997135954791*	5
8	DRREDDY	1.090440311	9
9	GAIL	2.072788942	6
10	GRASIM	0.124284067	9
11	GUJAMBCEM	0.199706746	7
12	HCLTECH	2.267967949	7
13	HDFC	2.15654722	8
14	HDFC BANK	0.096927108	7
15	HEROHONDA	1.025279739	7
16	HINDPETRO	1.187272363	7
17	HINDLEVER	2.219883966	5
18	ICICIBANK	0.469002391	7
19	INFOSYS	3.51000609477651**	12
20	IPCL	0.008145464	6
21	ITC	1.423932752	10
22	M&M	0.382955872	8
23	MTNL	4.71315241108813**	5
24	NATIONALUM	0.694915526	5
25	ONGC	0.881699458	8
26	PNB	0.102309563	7
27	RANBAXY	0.120104019	9
28	RELIANCE	10.9991020933148*	8
29	SAIL	0.249711395	4
30	SATYAMCOMPUTERS	0.584260081	8
31	SBIN	1.90786145	8
32	SUNPHARMA	1.22326867	8
33	TATAPOWER	0.211037672	6
34	VSNL	1.448228719	7
35	WIPRO	1.114476227	10
36	ABB	2.007860748	10

*Significant at 1% level, ** significant at 5% level, *** significant at 10% level

Source: Compiled data from NSE

The study investigates the casual relationship between the price and trading volume in the National Stock Exchanges (NSE). As per this analysis, trading volume granger causes price in almost all stocks, which means that trading volume contains

the information on future price movement. Hence, the price and volume relationship is not contemporaneous but it is a lagged relationship.

8.8 Conclusion

Price and volume information is important in an investment decision. In technical analysis, trading volume plays an important role in predicting the future price movements. Past price analysis is the key in technical analysis but volume gives an assurance of the trend given by the past price movement. So, trading volume is a powerful indicator in the market. The study shows that trading volume has considerable impact on share price. At the same time, trading volume analysis is really effective in the Indian market condition. So, trading volume can predict the future price movements. The study questions the concept of market efficiency introduced by Fama (1970) and it shows that the emerging Indian market is informationally inefficient and volume can predict the future price movement. The primary and secondary data analysis show that trading volume influences share price, even though it does not reject the hypothesis that trading volume does have an effect on share price. Therefore, it can be concluded that trading volume contains price sensitive information.

Table 8.5

Augmented Dickey-Fuller Test on Price Series

S.No	STOCKS NAME	TEST STATISTIC
1	ACC	0.540326708
2	BAJAJAUTO	-0.503425569
3	BHEL	0.053328383
4	BPCL	-1.943245869
5	SIEMENS	-1.797868389
6	CIPLA	-1.717745996
7	DABUR	-1.964102783
8	DRREDDY	-2.308462405
9	GAIL	1.304500153
10	GRASIM	0.713118652
11	GUJAMBCEM	1.799749868
12	HCLTECH	1.485576772
13	HDFC	0.212546471
14	HDFC BANK	0.226223517
15	HEROHONDA	0.949103544
16	HINDPETRO	2.462057175
17	HINDLEVER	1.945024615
18	ICICIBANK	0.522050074
19	INFOSYS	2.205882172
20	IPCL	1.45293826
21	ITC	1.80667109
22	M&M	0.962992946
23	MTNL	2.946047326
24	NATIONALUM	1.579072877
25	ONGC	1.654658215
26	PNB	-1.309645941
27	RANBAXY	1.178658854
28	RELIANCE	0.629304158
29	SAIL	0.126131943
30	SATYAMCOMPUTERS	1.563579595
31	SBIN	0.848850553
32	SUNPHARMA	-0.834767991
33	TATAPOWER	-0.979969
34	VSNL	-0.841446542
35	WIPRO	-2.077595489
36	ABB	0.608611544

Source: Compiled data from NSE

SUMMARY AND SUGGESTIONS

The premise of Technical Analysis that future price trends can be predicted by using past price statistic was met with severe criticism in the 20th from many experts like Eugine F. Fama (1970). According to him, market is informationally efficient and nobody can make any superior return out of it. During the last phase of the 1980s and in the beginning of 1990s, numerous studies emerged and they all support the validity of technical analysis. Moreover, technical analysis directly contradicts the random walk theory which indicates that market is informationally efficient and all the information is processed effectively in the market. In financial market, there are two types of efficiencies: informational efficiency and operating efficiency. If the market is informationally efficient, there is no necessity for any kind of analysis as no information is privy and nobody can outperform the market.

The manipulation of price and the misbehavior in the market are the two major hindrances in the development of stock market which is very common in every emerging market. Since Indian market is an emerging market, there are many loopholes in the rules and regulations of the stock exchanges; especially in trading and settlement. So, some form of manipulation is prevalent in the Indian stock market. Moreover, market participants use either technical or fundamental analysis to analyze the stock. This is an indication that the market is still informationally inefficient and contradicts the theory of efficient market.

Maximization of return with minimal risk is the aim of every astute investor. However, simple buy and sell of securities do not result good return. Therefore, market professionals analyze the stocks for better return and at the same time, there are people who come without any analysis and get trade in the stock market.

Basically, there are two schools of thought that analyze the stocks: technical and fundamental analysis. The study has found that fundamental analysis is not adequate or sufficient for analyzing stocks and there should be a mix of fundamental and technical aspect of stock for their investment decision or trading decision. However, technical analysis is important in analyzing stocks. Market professionals use technical analysis for the following reasons: (a) to understand the price oscillation, (b) to understand the trend of the market, (c) to understand the support and resistance level of the price, (d) to understand the real picture of the market, and (e) to understand the price movements. They also believe that price movements are often ahead of fundamental development. At the same time, some do not agree with the usage of technical analysis. Certain analysts believe that the country's economic condition is important. They also believe that external factors may influence trading decision.

Indian stock market was not so developed during the pre- liberalization era. It had problems associated with trading and settlement. However, in the post-liberalization era Indian stock market is considered to be a balanced market among the emerging markets in the world. Now, it is flooded with huge amount of money and players. Technical analysis is widely used in Indian stock market and traders immensely benefit from it. Technical analysis uses technical indicators, which are the basic elements of technical analysis, and provides signals for technical analyst pertaining to the movement of the stock price. However, profitability of technical analysis depends upon the identification of the trend in the initial phase itself and the analyst has to take decision based on that trend.

The prediction of price in the volatile market is a highly difficult task and one of important contribution of technical analysis is that it helps to predict the price of

the shares in the volatile market. Moreover, identification of trend amidst volatility is a tedious task because there is a fear of false signal in the market. The false signal may lead to wrong decisions by the market participants and may ultimately undermine the credibility of technical analysis. There is a belief that technical analysis is good for short run and fundamental analysis is good for long run analysis of stocks. However, the study has identified that technical analysis works in short run as well as in long run. Yet, brokers mostly use technical analysis for short run analysis.

The analysts are increasingly using technical analysis in both equity market and derivative market. Every market has its own features and specialties but the features of technical analysis are one and the same in all type of markets. The study has shown that the participants in all the market use technical analysis but the degree of usage vary from market to market. Therefore, technical analysis is a pervasive activity and it is applicable to all types of analysis and markets. The study also shows that brokers use different types of technical tools such as candlestick charts, line charts and bar charts, for analyzing stocks. This helps the investors and market professionals to take right decision at the right time. Moreover, brokers use technical trading patterns to understand the right direction of the market.

The study also identifies that brokers use both market and stock specific indicators to obtain a clear trend in market. Market indicators provide a general trend in the market, whereas stock specific indicators provide the changes in individual stock's trend. The study also states that single indicator is not adequate for predicting the trend. If the traders use more than one indicator together they get better results than one gets with the use of single indicator. Therefore, the study does not reject the hypothesis that technical analysis is important in the formulation of trading strategies.

Moving averages, relative strength index, rate of change indicator, Bollinger bands, MACD (Moving Average Convergence divergence), trend lines, Fibonacci techniques, DMA (Displaced or directional Moving average), trading volume, advance decline ratio and OBV (On Balance Volume) are the different types of technical indicators used by the market professionals to analyze the stock. Moving average is one of the important stock specific technical indicators. This indicator smoothen the data and clearly shows the trend of the market. The study states that market professionals use simple (which include both five days and ten days moving averages), twenty days, fifty days, hundred days, two hundred days, MACD (Moving Average Convergence and divergence) and EMA (exponential moving average). Moreover, the study shows how brokers benefit from moving average analysis and also identifies how they successfully use moving average trading rule in both equity and derivative markets.

Moving average trading rule is used in the market to understand market movement and predict the price of the stock or index. When moving average rules are compared with the buy and hold strategy, the former is shown to outperform the buy and hold strategy, especially in the short run. The returns generated by the five days, ten days twenty days and fifty day moving average rules outperform the buy and hold strategy. But in the case of long term moving averages like hundred days and two hundred days, moving averages do not show good results. Hence, the study does not reject the hypothesis that moving average plays an important role as a technical indicator.

Relative strength index is one of the stock specific indicators which measure the relative strength of the particular security. The study argues that brokers use

relative strength index to understand the overbought or oversold positions of stock and the relative strength index also shows clear trend in the market. The study also shows that brokers use relative strength index in equity market and derivative markets. Moreover, relative strength index trading rule outperforms the buy and hold strategy. Hence, the study does not reject the hypothesis that relative strength index plays an important role as stock specific indicator.

The study shows that trading volume is considered to be one of the market indicators of technical analysis. It provides a meaningful insight into the movement of share price. Trading volume determines the strength of the price movement of particular script. The study also shows that trading volume has informational content so technicians give great importance to trading volume in technical analysis. The movements of share price with good support of volume indicate that particular price movement has strength and, if the volume is not supported with the price, it is an indication of the lack of strength in the trend and hence the impact of volume on the share price. Trading volume determines the strength of the price movement of a particular script. Effectiveness of trading volume analysis depends mainly upon the ability of analyst in analyzing the trading volume. It is a kind of indicator which provides the reliability of price movement of the stock. The impact of trading volume on the share price varies from high level to medium level. Thus, volume contains certain informative content on the movement of price. The price and volume relationship is not contemporaneous but is a lagged relation. Hence, the trading volume can predict the future price movements. The study questions the concept of market efficiency introduced by Eugne F Fama (1970). The study has shown that the emerging Indian market is informationally inefficient and that volume also can predict

the future price movement. The study does not reject the hypothesis that trading volume does have an effect on share price.

The importance of technical analysis has not assuaged the practical difficulty that market professionals have to deal with. They have practical difficulty in following all the indicators together, lack of proper guidance, they are in short of material, and there is no uniform platform for analyzing the stock (subjectivity).

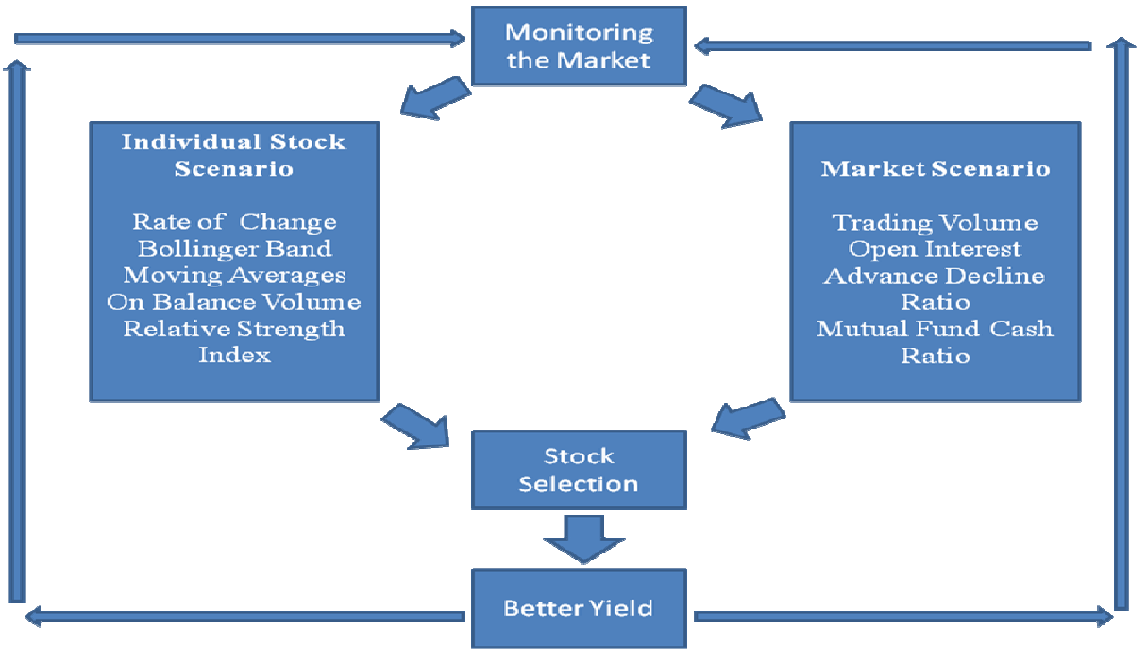
Suggestions

Stock market trading is a dynamic activity. Technical analysis is an integral part of the investment analysis and it helps to track the changes in stock market trading. An astute investor cannot ignore the importance of technical analysis. Hence, investors and brokers have to use a mix of both fundamental and technical analysis while making an investment decision. It is important to note that monitoring the market and intelligent stock selection are the key in earning better returns in the market. As far as active investors are concerned, they have to monitor the market before entering the market. Both market and stock specific indicators should be used in the examination of market. Market indicators show the general trend in the market whereas the stock specific indicators show the changes in the individual stocks. Particularly, market indicators like trading volume and open interest in derivative market are highly useful market indicators in the market. Open interest is highly important in India because almost 75 percentage of the trade takes place in the derivative market. Moreover, systematic application of stock specific indicators such as moving averages and relative strength index can lead to better yields.

Stock selection is another important step to attain better yield. An investor has to use fundamental and technical analysis as and when required. However, investors

should use more technical analysis and it provides real time position of stocks in the market. Hence, an investor should make investment strategies which would accommodate both technical and fundamental analysis, especially during the selection of the stock. Many experts advise the investors to go for long term or hold investment without doing any trade in the market. However, holding of investment for long term may not give good return. So, continuous monitoring of the investment in the market is highly essential. Technical analysis helps in keeping track of the investment in the market and the investors can earn better return from the market. Misconception about technical analysis is due to the lack of experience in the market and the lack of knowledge in the subject as well. Hence, proper education and guidance should be given to investors and analyst to help them earn better by using technical analysis.

Model for better Trading Yield



According to the new model proposed, monitoring of market is highly essential for traders and investors before actually going into the market for trading. At the outset, traders or investors should be aware of the position of the particular stock or scrip in the market as well as the general condition of the market. Market participants can use stock specific indicators such as moving averages, relative strength index, on balance volume and rate of change to track the changes in individual share prices. To understand the general condition of the market, indicators such as trading volume, open interest, advance decline ratio, mutual fund cash ratio etc. can be used. Once the traders are aware of the situation of stocks in the market and the general market environment, they can do the scrip or stock selection by which they can achieve better yield from the market.

Future Research

There are various unexplored areas in technical analysis which includes indigenous trading rules, basic charting techniques such as candlestick charting and technical indicators such as on balance volume, open interest etc. Moreover, Relationship between behavioral finance and technical analysis, implication of artificial neural networks on technical analysis are some of the topics of interest for the further study.

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Market Participant's perception on Technical Analysis

Instructions:

a) This Questionnaire intends to collect the Market participant's response regarding the Technical Analysis.
b) Please make a tick (✓) mark on the respective boxes
c) Provide your answers according to your practical experience
d) Information Provided by you will be kept confidential and use only for my research work

1. 'Traders are using the news rather than technical analysis for trading'

   a) Yes ☐ b) No ☐ c) Partially agree ☐

2. Do you think in Indian market information is processed effectively?

   a) Yes ☐ b) No ☐

3. What type of analysis do you use for analyzing the stocks?

   a) Fundamental analysis ☐ b) Technical analysis ☐ c) Both ☐

   d) None of the above ☐

4. Do you think technical analysis is important in analyzing the stock?

   a) Yes ☐ if yes why .....

   .....

   b) No ☐ if No why .....

   .....

5. Does technical analysis work in Indian conditions?

   a) Yes ☐ b) No ☐

6. How many times did you find technical indicators profitable in your analysis?

   a) Never found ☐ b) Sometimes ☐ c) Most of the times ☐

7. Do you think technical analysis is effective in prediction in a volatile market?

   a) Yes ☐ b) No ☐

8. What weight do you give to technical analysis in an investment decision (give your answer in%)

9. Do you think manipulation is more prevalent in Indian market?

   a) Yes ☐ b) No ☐

10. Does the technical analysis work in the short run?

    a) Yes ☐ b) No ☐

11. In your opinion which market is using technical analysis successfully?

    a) Equity market ☐ b) Futures market ☐ c) Commodity market ☐

    d) All of the above ☐ e) None of the above ☐

12. What types of technical tools are more effective in the market?

    a) Bar chart ☐ b) Line chart ☐ c) Candlestick ☐ d) Others, Please specify.....

13. Technical analysis method is more useful in?
    a) Short term analysis ☐ b) Long term analysis ☐ c) Intraday analysis ☐ d) All of these ☐
14. Do you think fundamental analysis is adequate for analyzing the stocks?
    a) Yes ☐ b) No ☐
15. Do you think patterns head and shoulders, double bottom, double top etc. give clear trend in the market?
    a) Yes ☐ b) No ☐
16. Do you think market indicators like volume, open interest, put call ratio themselves show the clear trend?
    a) Yes ☐ b) No ☐
17. What are the stock specific indicators you naturally use?
    a) Moving average ☐ b) Relative strength index ☐ c) Rate of change ☐
    d) Any other, Please specify .....
18. Do you think any single indicator is enough for predicting the trend?
    a) Yes ☐ b) No ☐
19. What are the commonly used technical indicators in Indian stock market?

20. Rank the following technical indicators according to their predictability and use?
    a) Moving average ☐
    b) Relative strength index ☐
    c) Moving average Convergence Divergence (MACD) ☐
    d) Bollinger Bands ☐
    e) On Balance Volume (OBV) ☐
    f) Rate of Change (ROC) ☐
    h) Money Flow Index (MFI) ☐
21. Which kind of moving averages are commonly using in the market?
    a) Simple moving average ☐ b) 20 days moving average ☐ c) 50 days moving average ☐
    d) 100 days moving average ☐ e) MACD ☐ f) Others, Please specify ☐
22. Among the moving averages which is the highly used.

23. What weight do you give Moving averages while you are doing the technical analysis of a stock (Please give your answer in %)

24. Does the moving average found benifited in your analysis. a) Yes ☐ b)No ☐
25. In which market moving averages are really applicable.
    a) Equity market ☐ b) Futures market ☐ c) Commodity market ☐
    d) All of the above ☐
26. Does the trade volume have any impact on share price?
    a) Yes ☐ b) No ☐
27. If Yes, Mention the degree of impact
    a) High Impact ☐ b) Medium Impact ☐ c) Low impact ☐
28. According to you what percentage of change in trading volume is necessary to influence share price? (Please give your answers in %)

29. Do you think trading volume analysis is effective. a) Yes ☐ b)No ☐
30. Do you think market indicators are essential in technical analysis?
    a) Yes ☐ b) No ☐
31. If yes which indicators would you consider more?
    a) Mutual fund cash ratio ☐ b) Activities in bond market ☐ c) Put- call ratio ☐
    d) Open interest in derivatives ☐ e) Market Volume ☐ f) Advance declining Ratio ☐
    g) All of the above ☐
32. Do you think fundamental analysis is effective in the case of Penny stocks?
    a) Yes ☐ b) No ☐
33. What weight do you give for RSI while you are doing the technical analysis of a stock. (answer in %)

34 Do you think RSI shows a clear trend in the market?
    a) Yes ☐ b) No ☐
35. If Yes, What is the possible rate of accuracy? (give your answer in %)

36. Does the RSI found benefited in your analysis. a) Yes ☐ b)No ☐
37. In which market RSI is highly useful.
    a) Equity market ☐ b) Futures market ☐ c) Commodity market ☐
    d) All of the above ☐
38. Do you use Derivatives in trading?
    a) Yes ☐ b) No ☐
39. If so, which of the following?
    a) Futures ☐ b) Options ☐ c) Both ☐

40. For What purpose do you use derivatives

a) Hedging ☐ b) Speculation ☐ c) Arbitrage ☐

41. Is there any practical difficulty in technical analysis?

a) Yes ☐ b) No ☐

If yes, please mention the difficulties

42. If fundamental analysis is so perfect why do people often prefer technical analysis?

43. What are the general criteria for using technical indicators?

44. How far technical analysis is used by the analysts in India?

Background Information:

a)Name of the Firm:.....

b)Year of Establishment..... c)Number of Customers.....

Personal Information:

d)Age ☐ e)Experience(yrs) ☐ d)Educational qualifications .....

THANK YOU

Azhar.A, Research scholar, School of Management Studies, University of Hyderabad.

List of securities included for the analysis		
Company	**Industry**	**Symbol**
ABB Ltd.	Electrical Equipment	ABB
ACC Ltd.	Cement And Cement Products	ACC
Bajaj Auto Ltd	Automobiles -	BAJAJ-AUTO
Bharat Heavy Electricals Ltd.	Electrical Equipment	BHEL
Bharat Petroleum Corporation Ltd.	Refineries	BPCL
Siemens Ltd.	Electrical Equipment	SIEMENS
Cipla Ltd.	Pharmaceuticals	CIPLA
Dabur India Ltd	Personal Care - Indian - Large	DABUR
Dr Reddys Laboratories Ltd	Pharmaceuticals	DRREDDY
Gail (India) Ltd.	Gas	GAIL
Grasim Industries Ltd.	Cement And Cement Products	GRASIM
Gujarath Ambuja Cement Ltd	Cement And Cement Products	GUJAMBCEM
Hcl Technologies Ltd.	Computers - Software	HCLTECH
Hdfc Bank Ltd.	Banks	HDFCBANK
Housing Development Finance Corporation Ltd	Finance - Housing - Large	HDFC
Hero Honda Motors Ltd.	Automobiles - 2 And 3 Wheelers	HEROHONDA
Hindustan Unilever Ltd.	Diversified	HINDUNILVR
Hindustan Petroleum Corporation Ltd	Refineries	HINDPETRO
Icici Bank Ltd.	Banks	ICICIBANK
Infosys Technologies Ltd.	Computers - Software	INFOSYSTCH
Indian Petrochemicals Corporation Ltd	Petrochemicals - Polymers - Large	IPCL
I T C Ltd.	Cigarettes	ITC
Mahindra & Mahindra Ltd.	Automobiles - 4 Wheelers	M&M
Mahanagar Telephone Nigam Ltd	Telecommunications	MTNL
National Aluminium Co. Ltd.	Aluminium	NATIONALUM
Oil & Natural Gas Corporation Ltd.	Oil Exploration/Production	ONGC
Punjab National Bank	Banks	PNB
Ranbaxy Laboratories Ltd.	Pharmaceuticals	RANBAXY
Reliance Industries Ltd.	Refineries	RELIANCE
Steel Authority Of India Ltd	Steel - Larg	SAIL
Satyam Computer Services Ltd	Computers - Software - Large	SATYAMCOMP
State Bank Of India	Banks	SBIN
Sun Pharmaceutical Industries Ltd.	Pharmaceuticals	SUNPHARMA
Tata Power Co. Ltd.	Power	TATAPOWER
Videsh Sanchar Nigam Ltd	Telecommunications	VSNL
Wipro Ltd	Computers - Software - Large	WIPRO

List of Securities excluded from the analysis		
Company	**Industry**	**Symbol**
Zee Entertainment Enterprises Ltd	Entertainment - Electronic Media	ZEEL
Tata Steel Ltd	Steel - Large	TATASTEEL
Tata Motors Ltd	Automobiles	TATAMOTORS
Tata Consultancy Services Ltd	Computers - Software - Large	TCS
Suzlon Energy Ltd	Electric Equipment - Gensets / Turbines	SUZLON
Sterlite Industries (India) Ltd	Metal - Copper / Copper Alloy Products	STER
Reliance Petroleum Ltd	Refineries	RPL
Reliance Communication Ltd	Telecommunications - Service Provider	RCOM
Reliance Infrastructure Limited	Power Generation And Supply	BSES(REL)
Maruti Suzuki India Ltd	Automobiles - passenger cars	MARUTI
Larsen & Toubro Limited	Engineering - Turnkey Services	LT
Bharti Airtel Ltd Industry	Telecommunications - Service Provider	BHARTIARTL
Shipping Corporation of India Ltd	Shipping Corporation of India Ltd	SCI
Reliance Capital Ltd.	Finance	RELCAPITAL