I

Introduction

This chapter introduces the current Indian scenario, rationale of the study, problem statement, research objectives, research hypotheses, sources of data, plan of the study and limitations.

Portfolio selection in the broadest sense refers to investment of savings in an expectation of higher earnings in future by carefully choosing the right mix of assets. The discussion of choosing the right combination of assets has led to a wide range of research well documented in books related to Security Analysis and Portfolio Management. The path breaking works of Nobel Laureates Harry Markowitz, William F. Sharpe and Robert C. Merton; and phenomenal growth in the size of financial markets and business has evoked a tremendous interest of researchers globally in this field. Existing literature has focussed on either developing a theory or empirical testing existing models, considering return and risk as the two most important factors.

Over the years ever since the post world war II era, the economic environment, size of the economies, markets and transactions, evolution of stock markets and their operations, have undergone a tremendous change. Initially, research work was primarily a result of suggesting an approach to companies and their entrepreneurs to make investment of the surplus generated by them because of reconstruction of World War II torn economies. In today’s context the focus of investment has changed from investment of surplus to developing a mechanism to generate surplus by actively participating in stock markets. The size of the market has grown to such a large extent that Standard and Poor’s (S&P) downgrading the sovereign rating of United States of America (USA) from AAA to AA+ has resulted into turmoil in the stock markets world over resulting in a loss of over 7.5 trillion dollars in the market capitalization.

Stock markets have attracted banks, financial institutions, mutual funds and retail investors to participate in equities markets to either make quick capital gains or earn fixed income in the form of dividends and rarely to exercise control over the
companies. With a wide range of investors, the investment problem has assumed
magnanimous complexity taking into consideration the alternate goals and constraints
pursued by each class of investor.

The markets which are tested for efficiency and assumed to be perfect are
sometimes found to be rigged and influenced by large investors such as Foreign
Institutional Investors (FIIs), Qualified Institutional Buyers (QIBs), High Net Worth
Individuals (HNIs), promoters and mutual funds. In these circumstances there is a
need to substantiate and support the existing theories through empirical testing of an
approach which is capable of exploiting such market inefficiencies. The barriers
which existed in the past of transfer and trading no longer exist because of highly
sophisticated and developed electronic communications and computerization. The
manner in which these computer software advancements can be gainfully applied for
creating satisficing portfolios has been explored in the later part of this research work.

The literature on portfolio selection in recent years has grown so rapidly that it
has tended to diverge from rather than converge to a unified whole. The rapid growth
of the voluminous literature on portfolio selection is indicative of widespread interest
both amongst academic and business communities. Existing researchers have
emphasised on portfolio optimisation, diversification, capital asset pricing model,
market efficiency, utility analysis, investor’s psychology and bounded rationality. A
large number of scholars have focussed on efficiency in terms of mean and variance.
Some scholars have paid attention to dynamic portfolio selection with single objective
function and multiple constraints. Very few scholars have paid attention to the
problem of multiple goals and multiple constraints in stochastic environment.
Invariably, all of them have undertaken a multi-disciplinary approach of using a wide
variety of techniques available in disciplines like statistics, econometrics and
mathematics for ascertaining the optimal solution. The robustness of the solution has
also been tested using the Monte Carlo Simulation, the Bayesian approach etc. Goal
Programming model has also been used in the field of portfolio selection in the past
(see page 54 and 55) but this work is substantially different from the earlier works as
this work not only focuses on optimisation using goal programming but also focuses
on specific aspects of behavioural finance laying emphasis on goals and constraints of
individual investors.
Standard text books in the field of security analysis and portfolio management tend to cover topics like overview of financial markets, stock exchanges and regulations, services offered by financial intermediaries, alternate investment avenues, financial instruments and their valuation, economy, industry and company analysis, technical analysis, risk management, portfolio theory and management. Portfolio theory and management is often explained with reference to portfolio risk analysis, portfolio theory, mutual fund creation, management and evaluation. Since these topics have been covered in detail by existing textbooks, no effort is made in this research work to replicate the discussion on them.

The primary objective of this work is to develop and suggest multi-objective criteria to the problem of portfolio selection decision both under conditions of certainty and uncertainty by making use of the potentials of the goal programming approach. The general goals of investment pursued by investors include capital preservation, capital appreciation and cash inflow in the form of current income. It is the secondary objectives which make investors allocate their savings differently. They may consider factors like tax minimisation, marketability, liquidity, convenience and safety before making portfolio allocations.

1.1 Indian Scenario

Indian economy has been able to exhibit robust economic growth and steady fiscal consolation after liberalisation, privatisation and globalisation in 1991. The high rate of inflation in 2011-12 has however limited the benefits of this economic growth from reaching to the aam aadmi. In 2010-11, the savings rate was 32.3 per cent and it is crucial to mobilise this high savings rate for broadening and deepening of Indian financial markets.

Steady reforms, prudent regulations and a strong regulator have been instrumental in not only immunising the Indian stock markets from financial shock but also provide it which much needed dynamism. In 2011-12, (up to 31st December 2011), 30 new initial public offers (IPOs) were listed. Indian capital markets through initial public offers (IPOs), follow on public offers (FPOs) and right issues, was able to mobilise around Rs. 9,683 crore in 2011-12. This was much lower than Rs. 48,654 raised through equity public issues in 2010-11. Mutual Funds were able to mobilise Rs. 1,00,338 crore during 2011-12 (up to 30th November 2011).
The major reasons for movement of indices at the Indian capital markets have been the global recovery, portfolio rebalancing by Foreign Institutional Investors (FIIs) and financial performance of Indian Companies. Recovery from crises and consolation of gains can be observed from the performance of Indian Indices. While stocks have showed significant highs and lows with sometimes reaching the circuit filter levels, the volatility of indices has been largely range bound. Low returns offered by portfolios of companies listed in developed countries and weak future economic prospects has also contributed to the growth story of Indian capital markets.

The return on investment in real estate, gold and stock markets has been substantially higher than returns on banking deposits. Indices like Bombay Stock Exchange (BSE) Sensex and BSE 500 have earned high returns during the period of 2007-08 to 2011-12. BSE Sensex has given returns ranging from 9.9% (2010-11) to 80.5% (2009-2010). Negative returns of -37.9% (2008-09) and -20.4% (2011-12), were primarily because of the financial crises in United States and European Sovereign debt crises. BSE 500 has given returns within the range of 6.5% (2010-11) to 96.4% (2009-10).

Market capitalisation and Price to earnings (P/E) ratio, have steadily increased or remained stable from 2007-08 to 2010-11. The steady increase is a positive signal, as it shows the growing confidence of investors in equities market. The volatility figure has also not shown much variation contributing to an overall positive sentiment of stability in Indian equities market. Details related to index return, volatility, market capitalization and P/E (price-to-earnings) ratio are given in Table I.1.

| Table I.1 Index Returns, Volatility, Market Capitalization and P/E ratio |
|------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| **Index**              | **2007-08**     | **2008-09**     | **2009-10**     | **2010-11**     | **2011**        |
| **BSE Sensex**         |                 |                 |                 |                 |                 |
| Return (per cent)      | 19.7            | -37.9           | 80.5            | 9.9             | -20.4           |
| Market Capitalization  | 10,71,940       | 6,95,152        | 13,28,862       | 15,55,322       | 12,66,639       |
| (Rs Crore)             |                 |                 |                 |                 |                 |
| Daily Volatility       | 1.9             | 2.8             | 1.9             | 1.1             | 1.3             |
| P/E Ratio              | 20.1            | 13.7            | 21.3            | 21.2            | 16.4            |
| **BSE 500**            |                 |                 |                 |                 |                 |
| Return (per cent)      | 24.3            | -42.8           | 96.4            | 6.5             | -22.6           |
| Market Capitalization  | 19,96,839       | 11,68,850       | 24,44,151       | 27,76,847       | 21,66,947       |
| (Rs Crore)             |                 |                 |                 |                 |                 |
| Daily Volatility       | 2.0             | 2.6             | 1.8             | 1.1             | 1.2             |
| P/E Ratio              | 20.0            | 13.7            | 20.4            | 19.2            | 16.2            |

Source: BSE and Economic Survey 2011-11
I.2 Raison d'être of the study

An individual is routinely faced with the need to make portfolio selection decisions and most often these decisions tend to be guided by the multiple objectives and constraints being pursued by that individual. An individual would not keep all the savings in only one form say cash. An individual investor tends to allocate the savings in a manner that it gives rise to a portfolio. This raises the issue and need to understand optimum portfolio selection decisions.

This research work raises the issue of optimum portfolio selection decisions specifically in the context of equities. To appropriately manage one’s equity portfolio, decisions need to be made as to which stock should be selected and what weight it should have in the portfolio. Systematic portfolio selection decision making involves an integrated process of risk profiling through a self constructed questionnaire and investment allocation using goal programming portfolio selection model. Effective portfolio selection decision making involves a mix of understanding the individual investor’s decision making process and application of sophisticated investment models for portfolio creation.

The possibility of earning high returns by investing in equity portfolio is accompanied by high return variability. Managing this risk-return paradox by incorporating multi-objective criteria has largely remained unexplored in current academic literature and hence provides the rationale for undertaking research in this field. Using multi-objective portfolio selection criteria, an investor is able to choose a “satisficing” portfolio within a range of efficient portfolios lying in the feasible region. This research study is relevant in current scenario as:

1. This work with the help of a self constructed close ended questionnaire for retail investor - QRI (Annexure 1) tries to understand the behaviour, priorities and needs of individual investors while creating an equity portfolio. This questionnaire was constructed with the help of knowledge gained during the review of literature. Issues raised in the questionnaire deal with broader academic issues of risk measurement, behavioural biases, investor preferences, goals, risk tolerance and investment strategy. These issues have been raised with the view to understand perspective of individual investors. The questionnaire enables us to record psychological evidence on investor’s
behaviour which is an important cognitive resource for future studies in this field.

2. This work further collected primary data by constructing an open ended questionnaire for expert opinion - QEO (Annexure 2). Most of the questions in this questionnaire were based on empirical findings of our survey on individual investors. Discussions with (1) investment experts at national and international conferences; (2) investors during the course of data collection for the questionnaire for retail investor - QRI (Annexure 1) and (3) with instructors who conduct investor awareness programs also contributed in finalising some questions in this questionnaire. Responses to QEO contribute significantly to academic literature as they not only substantiate the research findings from the survey but also provide the practitioner's perspective for this academic exercise. This methodology of seeking expert’s opinion is not only unique but also contributes in reducing the gap between academics and industry.

3. This work undertakes an empirical investigation of the goal programming portfolio selection model formulations which integrate existing portfolio selection theories. We provide a goal programming portfolio selection model which is capable to incorporate investor’s heterogeneous beliefs and alternate stock market scenarios. Discussions on how new goal programming portfolio selection model formulations can be developed to yield satisficing portfolios provides insights into ways to provide enhanced downside risk protection. This field of investigation in portfolio selection assumes prime importance especially after series of financial crises in countries like United States of America (USA), Iceland, Greece etc and its contagion on performance of other stock markets.

4. This work suggests alternative portfolio selection possibilities in Indian equities market. This exhibits application of existing international literature in the field of goal programming portfolio selection to equities listed on Indian stock markets. Quantitative and qualitative comparison of alternate goal programming portfolio selection models enables researchers to rank these
model formulations in terms of their operational efficiency based on factors like company level diversification, industry level diversification, budget constraint, risk-return etc.

The above mentioned analysis is expected to be of immense use and interest to individual investors, relationship managers, brokerage houses, wealth managers, business analysts, financial advisors, mutual fund managers, portfolio management service providers, high net worth individuals, qualified institutional buyers (QIBs), banks, large institutional investors, foreign institutional investors (FIIs) and Ph.D. Scholars in the field of security analysis and portfolio management.

I.3 Problem Statement

An individual during his/her lifetime earns and spends the available earnings. It is rare that the money income of one period exactly balances the consumption desires of that period. Sometimes, there is more money than the current desire to spend and at other times the desire to consume is more than what one can afford. These imbalances result in either shortages or excess of money available to an individual. To overcome shortages one may borrow. To handle excess cash one may lend. This lending is nothing but a trade off of present consumption for a higher level of future consumption. The excess money which is intentionally or unintentionally saved is invested to make it increase over time.

In other words, investment is current commitment of rupees for a period of time in order to derive future payments which should compensate the investor for the time the funds are committed, the expected rate of inflation and the uncertainty of future payments. This problem of making positive gains coupled with heterogeneous investor beliefs and choices further complicates in understanding the applicability of existing asset pricing relationships. From the insights gained while reviewing literature on portfolio selection and prior experience of writing M.Phil. Dissertation on “Dynamics of Investor’s Behaviour: An Analytical Study in Indian Securities Market”, the following research problems are outlined:

1. There exists very limited empirical evidence on perceptions individual investors carry about (1) equity portfolio selection; (2) most liked feature of equity portfolio; (3) advantages of professional portfolio managers expertise; (4) comparison of portfolio performance; (5) preference among alternate asset
classes; (5) preference amongst portfolio goals and constraints; (6) choice amongst different mutual fund types; (7) effect of investor’s demographics on portfolio objectives; (8) effect of macroeconomic factors on timing selection of equity for the portfolio; (9) effect of correlation with other equities and benchmarking, on individual decision making; (10) company variables affecting portfolio creation; (11) preference for holding period; (12) effect of market capitalisation; (13) presence of impact investing and (14) perceptions about relationship between spot and futures market. This problem is resolved by soliciting responses to questionnaire for retail investor - QRI (Annexure 1).

2. Rarely opinion of industry experts is sought for understanding the manner in which they solve portfolio selection issues related to (1) multiple objectives attainment; (2) contradictory goals management; (3) factors affecting goals; (4) acceptance of mathematical model formulation; (5) effect of demographic factors; (6) multiple goals and constraints management; (7) quantitative and qualitative company factors considered; (8) arbitrage between spot and futures market and (9) effect of systematic factors on the functioning of equities market.

Extensive academic discussion on some of the above mentioned issues is available through research papers and professional magazines some of which have been cited in the chapter on review of literature. However, opinion of industry experts on these issues largely remains unavailable especially in the Indian context. This problem is resolved by soliciting responses to questionnaire for expert opinion - QEO (Annexure 2).

3. Till date very limited focus has been given to the objectives which an individual investor wishes to achieve through his investment. Findings analysing the effect of demographics like age, gender, marital status, responsibility, occupation and annual income on investment goals often give contradictory results and are based on small sample size.

It is important to include the impact of investor’s behaviour within the portfolio modelling framework, as they are the one for whom the portfolio is being created. Majority of the focus has been to incorporate all these variables taken together as one variable namely risk tolerance of an investor.
Classification according to risk tolerance often results in recommending portfolios for three categories of investors namely risk averse, risk lover and risk neutral. This ignores the heterogeneity of investing community arising due to demographic variables. It is important to disintegrate the risk tolerance of an investor and identify the effect of demographic factors on risk tolerance of an investor. This problem is investigated by testing five hypotheses.

4. Little attention has been given to explicitly modelling the predictive utility of demographics. Dependence or independence of the following portfolio variables and demographics remains largely unexplored: (1) Gain sought from a portfolio and Professional level of the investor; (2) Goals pursued by investor and Age, Income and Family Responsibility of the investor; (3) Constraints faced by investor and Occupation, Income and Family Responsibility of the investor; (4) Macroeconomic factors considered for timing equity selection for the portfolio and Educational Qualification of the investor and (5) Market Capitalisation and Annual Income of the investor.

5. Empirical evidence on testing the efficiency of portfolio selection models is limited to a select few models like the Capital Asset Pricing Model (CAPM), Fama and French Three Factor model and few others. There is a need for empirical investigation of other operationally efficient models and to develop a model based on the information gained during investigations. This problem is resolved by providing empirical illustration of two existing international goal programming portfolio selection model formulations and proposing a new goal programming portfolio selection model.

1.4 Research Objectives

The research objectives are framed keeping into account the research synopsis, review of literature and critical comments from reviewers of national and international journals. The research objectives mentioned in the Ph.D. synopsis aimed at (1) undertaking an empirical analysis of existing goal programming portfolio selection models; (2) empirically testing the advantages of diversification and the extent to which it can help in creating optimal portfolios; (3) identifying and understanding the priorities associated with multiple objectives pursued and
constraints faced by an individual investor while creating an equity portfolio; (4) understanding of prevailing portfolio selection practices; (5) identifying portfolio selection strategies and how can they be applied in Indian securities market for superior gains; (7) adapting alternate goal programming portfolio selection models to suit the needs of Indian securities market and (8) Developing a sensitivity model which will help optimize portfolio selection decision under risk and uncertainty in a multi-objective framework. On the basis of the above mentioned research objective frameworks, the main objectives pursued in this work are:

1. To undertake a psychometric analysis for understanding retail investor’s attitude towards portfolio management, asset allocation, multiple goals and constraints, mutual fund selection, macroeconomic factors, equity selection variables and risk.

2. To understand and investigate the relationship between portfolio goals, portfolio constraints, macroeconomic factors, equity selection and individual investor’s demographics with the help of statistical techniques like percentage analysis, mean variance analysis, factor analysis and contingency analysis.

3. To collect and analyse the opinions of practitioners and renowned academic experts on issues related to present and future developments in equity portfolio selection. Expert opinion is sought on issues related to multiple goal perusal, factors affecting portfolio goals, quantitative and qualitative variables affecting equity selection, arbitrage opportunities between the futures and options (F&O) market and the spot market, conclusions from factor and contingency analysis.

4. To find an algorithm that optimises across multiple objectives while creating an equity portfolio. The sub-objectives for achieving this objective include:
   1. To test the efficiency of Lee and Lerro (1973) and Kumar, Philippatos and Ezzell (1978) algorithm in optimising portfolio selection across multiple objectives;
   2. Improve the existing algorithm by the use of quartiles and minimisation of undesirable deviations in place of Maximum and Minimum aspiration level and exact goal attainment;
   3. Recommend investment portfolios for alternate market outlooks;
4. Compare resultant portfolios with portfolios on Markowitz’s efficient frontier;

5. Use Sharpe, Treynor and Excess return to unsystematic risk ratio for comparing the investment portfolios.

5. To raise emerging policy issues related to the field of equity portfolio selection. These issues are based on debates in media, discussions at national level conferences and interactions with retail investors while undertaking the survey.

I.5 Research Hypotheses

For the purpose of modelling the predictive utility of demographics in explicitly affecting the portfolio selection behaviour, the following five hypotheses have been constructed. These hypotheses are based on existing research works recently undertaken by Chaubey and Dimri (2009), Jasmeen (2009), Sudhakar and Kumar (2010), Kumar (2010) and Raj and Murugan (2011).

Hypothesis 1 (H₁): The hypothesis focuses on the relationship between the professional level of investors and gain sought from portfolio

\[ H₀: \text{Gain sought from portfolio is independent of professional level} \]
\[ Hₐ: \text{Gain sought from portfolio is not independent of professional level} \]

Hypothesis 2 (H₂): The hypothesis focuses on the relationship between the portfolio goals pursued by investors and demographics (age, annual income and family responsibility)

Sub-Hypothesis A. Portfolio Goals and Age

\[ H₀: \text{Portfolio goals are independent of investor’s age} \]
\[ Hₐ: \text{Portfolio goals are not independent of investor’s age} \]

Sub-Hypothesis B. Portfolio Goals and Annual Income

\[ H₀: \text{Portfolio goals are independent of investor’s annual income} \]
\[ Hₐ: \text{Portfolio goals are not independent of investor’s annual income} \]

Sub-Hypothesis C. Portfolio Goals and Family Responsibility

\[ H₀: \text{Portfolio goals are independent of investor’s family responsibility} \]
\[ Hₐ: \text{Portfolio goals are not independent of the investor’s family responsibility} \]
Hypothesis 3 (H₃): The hypothesis focuses on the relationship between the portfolio constraints faced by investors and demographics (occupation, annual income and family responsibility)

Sub-Hypothesis A. Portfolio Constraints and Occupation
H₀: Portfolio constraints are independent of investor’s occupation
Hₐ: Portfolio constraints are not independent of investor’s occupation

Sub-Hypothesis B. Portfolio Constraints and Annual Income
H₀: Portfolio constraints are independent of investor’s annual income
Hₐ: Portfolio constraints are not independent of investor’s annual income

Sub-Hypothesis C. Portfolio Constraints and Family Responsibility
H₀: Portfolio constraints are independent of investor’s family responsibility
Hₐ: Portfolio constraints are not independent of investor’s family responsibility

Hypothesis 4 (H₄): The hypothesis focuses on the relationship between the qualification of investors and macroeconomic factors considered for timing selection of equities for inclusion in portfolio

H₀: Macroeconomic factors considered for timing selection of equities in portfolio is independent of investor’s qualification
Hₐ: Macroeconomic factors considered for timing selection of equities in portfolio is not independent of investor’s qualification

Hypothesis 5 (H₅): The hypothesis focuses on the relationship between market capitalisation and annual income of investors

H₀: Market capitalisation of companies included in portfolio is independent of the annual income of investors
Hₐ: Market capitalisation of companies included in portfolio is not independent of the annual income of investors

I.6 Research Methodology

a) Questionnaire for retail investor (QRI)

A questionnaire of seventeen questions was constructed for soliciting responses from retail investors. Retail investors are those individual investors who trade in equities market for making personal gains. An attempt has been
made with the help of survey to collect primary data and empirically examine whether or not individuals postulate the attainment of multiple objectives. Responses to this self administered close ended questionnaire were collected personally by taking the questionnaire to various corporate houses in Delhi and National Capital Region (NCR) and from investors participating in investor awareness programs conducted by Bombay Stock Exchange in North India. The questionnaire consists of five sections with focus on issues related to portfolio goals and constraints, portfolio analysis and social investing. Responses to 512 questionnaires have been analysed using percentage and mean-standard deviation analysis.

b) Factor and Contingency Analysis

Responses to the questionnaire for retail investor have also been analysed using factor and contingency analysis. Factor analysis has been performed to identify and reduce the number of factors mentioned in question number nine (Annexure 1). The analysis revealed that there are mainly four factors namely timing, security, knowledge and life cycle which affect portfolio objectives.

With the help of contingency analysis [Chi-Square Test ($\chi^2$) of Independence] the above mentioned five hypotheses have been tested. The purpose of contingency analysis was to uncover the relationship between portfolio variables and demographics.

c) Questionnaire for expert opinion (QEO)

An open ended questionnaire (Annexure 2) of thirteen questions has been constructed to understand practitioner’s perspective of handling portfolio management problems. It was intended to conduct structured personal interviews for getting responses to this questionnaire. However, owing to complexity of issues raised in the questionnaire, the experts responded to this questionnaire on email. The responses were collected from three industry experts working as Chief Executive Officer (Pension Fund), Chief Strategist and Head of Research/Director (Brokerage Firms) and two renowned international academicians. The main issues raised in this questionnaire were
related to generalisation of the findings from questionnaire for retail investor, portfolio management problems, emerging policy and regulatory issues.

d) **Goal Programming Portfolio Optimisation**

The conceptual framework for using goal programming method for portfolio selection decisions has been discussed in detail. An attempt has been made to provide the rationale for multi-objective portfolio optimisation and goal programming framework as the one of the ways for achieving “satisficing” solutions. Empirical analysis for two existing models by Lee and Lerro (1973) and Kumar, Philippatos and Ezzell (1978) provide further insights as regards multi-objective portfolio optimisation. Model improvements are also recommended by suggesting Quartile 3 ($Q_3$) - Quartile 1 ($Q_1$) Minimum Un-desirable deviation model.

**I.7 Sources of Data**

The study uses both primary and secondary data for the purpose of its analysis. With the help questionnaire for retail investors and questionnaire for expert opinion primary data has been collected. Qualitative and quantitative techniques have been applied to analyse the responses received to these questionnaires.

Secondary data has been used for empirical testing of goal programming portfolio selection model formulations. Empirical analysis has been performed on eleven year monthly and annual data for companies part of Bombay Stock Exchange (BSE) Sensex on 1.4.2010. This data was collected from Centre for Monitoring Indian Economy (CMIE) Prowess database.

**I.8 Plan of the Study**

This research work has seven chapters including the present one. Chapter I introduces the reader to current equity market scenario, rationale of the study, research objectives, hypotheses, methodology, sources of data, research plan and possible limitations. Chapter II relates to theoretical underpinning and policy issues, which builds a case for multiple objectives perusal by retail investors, ordinal ranking of multiple objectives, framework for goal programming portfolio selection, formulation of a general goal programming model, risk and uncertainty. Chapter III reviews recent literature and has been mainly divided into two sections: one on international research and the other on research conducted in India.
In Chapter IV, research methodology has been discussed with focus on research design, questionnaire for retail investor, questionnaire for expert opinion, statistical techniques used and modelling framework for goal programming portfolio selection model. Sampling design, sources for data collection, the limitations and assumptions made for the current survey have also been discussed. Chapter V on Empirical observations discusses findings from questionnaire for retail investor and questionnaire for expert opinion. Chapter VI discusses the results of factor analysis, contingency analysis [chi-square test ($\chi^2$) of independence] and empirical illustration of goal programming portfolio selection model formulations. Finally, Chapter VII discusses summary and conclusions of the study and some potential areas of further research.

I.9 Limitations of the Study

The results and analysis presented henceforth must be interpreted in the light of the following limitations: (1) This research endeavour raises specific issues related to portfolio selection decisions and in an attempt to keep our research area focussed some critical research issues may have been ignored. These research areas may be investigated and included in future researches in this field; (2) The study suffers from the assumptions of models that have been used for the purpose of goal programming analysis; (3) Analysis of investment portfolios is based on ex-post data which may not be representative of the future scenario; (4) The securities for forming alternate portfolios have been taken from Bombay Stock Exchange (BSE) and hence has excluded analysis of securities listed on National Stock Exchange (NSE) and (5) The study has used geometric mean for representing expected capital gains. Hence, the findings are based on a conservative estimate of the expected return on the portfolio.

I.10 Summary and Conclusions

Portfolio selection involves finding solution to a variety of conflicting and non-commensurable objectives pursued by investors. However, till date most of the academic experts and practitioners have often used deterministic models with single objective to resolve the portfolio selection problems. This often results in providing solutions which may turn out be disappointing in the real world situations. To overcome this problem Ignizio (1978) said “This approach, known as goal programming, although far from a panacea, often represents a substantial
improvement in the modelling and analysis of multi-objective problems. The present state-of-the-art in this field now permits the systematic analysis of a class of (deterministic) multi-objective problems that may involve either linear or nonlinear functions or continuous or discrete variables”.

This chapter has attempted to provide a brief outlook of the changing paradigms of portfolio selection problem internationally and in India. Discussion on rationale of the study, problem statement, research objectives, research hypotheses, sources of data and plan of the study provide the justification for using the goal programming approach for finding practical and realistic solutions to real world portfolio selection problems. A greater understanding of the unified approach, model and philosophy provided by the general goal programming model can be gained from the discussion in the next chapter on Theoretical Underpinnings and Policy Issues.