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Theoretical Underpinnings and Policy Issues

Theories and techniques[1] in asset pricing and capital markets, developed so far, have assumed the attainment of two objectives, i.e. risk and return, while the literature in behavioural finance witnesses that individuals generally postulate multiple objectives. This assumption[2] of the attainment of two objectives in portfolio selection decisions, particularly in the present scenario of highly volatile stock markets, seems to have lost its relevance. Therefore, an attempt to study in a pedagogical manner the behaviour of individuals with regard to the objective(s) they postulate in their portfolio selection decisions has been done in Chaps. 4, 5 and 6. The primary objective of this chapter is to discuss the necessary aspects related to goal programming model and present a theoretical algorithm to be used for empirical testing.

2.1 Theoretical Underpinnings

2.1.1 Conceptual Framework for Multiple Objectives

Portfolio investment may be regarded as an instrument designed to achieve long-term goals of an individual, defined in financial terms. An

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individual may at a time direct his/her energies to the attainment of one or many goals simultaneously, sometimes even of conflicting nature. Most of the approaches, both mathematical and non-mathematical developed so far, have postulated the attainment of twin objective of risk and return during the time horizon of the portfolio investment.

Even the choice on the risk–return efficient frontier is a matter of controversy, since the numbers of distinct financial objectives proposed by various authors, when studied, are found to be as large as the number of authors themselves. For instance, the traditional economic theory of personal finance assumes either maximisation of return for a given level of risk or minimisation of risk for a given level of return in the mean–variance space.[3] Markowitz (1952, 1991) called it efficient frontier and referred to it as optimising behaviour of an investor. Roy (1952) considered the safety of minimum return to be the main goal. Similarly, Tobin (1958) focussed on right allocation among risky and risk-less financial assets as the primary objective. Lintner (1965) questioned all previous goal postulations and focussed on the diversification, and optimal diversification became the goal of portfolio management. Unsystematic risk was minimised using the diversification constraint. Treynor (1965) outlined maximisation of excess return to the beta as the goal of portfolio management. Jensen (1968) pointed to the creation of superior portfolios based on portfolio manager's forecasting ability. The risk-adjusted measure proposed by Jensen was based on average risk premium on the portfolio and the market. Samuelson (1970) gave the fundamental approximation theorem, representing goals in terms of means, variances and higher moments.

Sharpe's work (1967, 1971a, b) on linear programming-based portfolio management outlined maximisation of expected return and minimisation of portfolio beta for achieving corner portfolios. Sharpe's application of linear programming to portfolio selection gave a new direction to the theory of portfolio selection decision. Sharpe himself extended his study in 1971 by focussing on mean-absolute deviation characteristic lines for securities and portfolios and linear programming approximation for the general portfolio analysis problem. The linear fractional portfolio selection problem was later discussed by Faaland

and Jacob (1981). Young (1998) applied linear programming for minimising the losses for a given level of return. The resulting mini-max portfolio was as efficient and diversified as could be obtained by complex quadratic programming. Further, the model could include certain variables which could be an integer or of Boolean type.

Papahristodoulou and Dotzauer (2004) developed two linear programming models, namely maxi-min and minimisation of mean-absolute deviation for creating an optimal portfolio. A large number of authors have extended the existing linear programming models pointing out existing pitfalls and improving the same for better portfolio selection decisions. In all the examples, where linear programming has been applied to portfolio selection, a considerable attraction of the linear programming model lies in the fact that the model both allocates and evaluates simultaneously, and as a result it provides portfolios which are based on the utility function of the investors. But besides this attraction, there are some limitations associated with the use of linear programming or integer programming models in portfolio selection. The notable one is that standard linear/integer programming models optimises only a single objective function, while an investor postulates multiple objectives. This single objective function, which is optimised by linear programming or integer programming,[4] may be maximisation of return, minimisation of variance or any other, subject to a series of linear constraints related to diversification, investment budget, etc. Although risk–return optimisation can be a prerequisite for attraction, purchase and maintenance of a portfolio, but if solely followed may endanger the future of portfolio management service providers.

Further, in the literature on portfolio selection, where game theory,[5] simulation,[6] probability theory,[7] etc. have been applied, we found that the attainment of a single objective has been assumed. Mean return maximisation or minimisation of a particular risk measure or any other single objective attainment is often stated as the objective of investment management. This simplistic approach of modelling decision-making based on a single objective function is not desirable and sub-optimal. Models constructed with a specific objective in mind may be of little use in attaining some other goal(s). A portfolio, for instance, might be

very acceptable to an investor which seeks to achieve one goal but might be rejected, if the investor wishes to attain some other goal(s). Further, an investor might not seek to achieve the same goal all his life time or during the investment horizon.

Several authors, namely Lee, Lerro, Kumar, Philippatos, Ezzell, Shelton, Brigham, Hofflander, Singh, Kansal, and Mohan have argued that the portfolio managers should operate to pursue multiple goals sometimes even of conflicting nature.

For instance, Drucker (1959) has rightly stated that the search for one objective was not only likely to be as unproductive as the quest for the philosopher's stone, it was certain to do harm and to misdirect. In this connection, he has concluded that:

> To manage a business is to balance a variety of needs and goals. This requires judgement. The search for one objective is essentially a search for a magic formula that will make judgement unnecessary. But the attempt to replace judgement by formula is always irrational; all that can be done is to make judgement possible by narrowing its range and available alternatives, giving it clear focus, a sound foundation in facts and reliable measurements of the effects and validity of actions and decisions. And this, by the very nature of business enterprise, requires multiple objectives.

Business in the context of the current research work would mean portfolio management services provided by wealth managers. A large number of authors have further suggested that investors pursue multiple objectives, namely:

1. Minimisation of risk
2. Minimisation of loss
3. Stability in returns
4. High average return
5. High short-term returns
6. High long-term returns
7. High past returns
8. Expected future performance
9. Opportunities for superior gains

10. Safety first and then gains
11. Future contingencies
12. Consumption needs
13. Tax savings
14. Volatility
15. Liquidity
16. Speculation.

The objectives enlisted above need not necessarily assume this order of priority. Very little or no attempt has so far been made to develop a mechanism to incorporate the problem of multiple objectives into a portfolio selection decision.

Therefore, on the basis of foregoing discussion, it may be observed that in the present aura of capital market changes, the development of techniques and theories of portfolio selection so far have erroneously postulated the attainment of single objective. Therefore, there is a need for developing a technique or theory of portfolio selection decision, postulating a multi-objective set. Since, in the present state of emerging stock market activity, while times and need change, so may the preferences of investor groups change and the technique and/or theory of portfolio selection decisions developed so far, postulating a single goal would be of little relevance.

2.1.2 Ordinal Ranking of Multiple Objectives

A goal programming (GP) model which provides a satisficing solution under the given constraints and priority structure of goals requires defining, quantifying and ordering of goals, depending upon their relative importance to the investor.

It has been empirically observed from the analysis of questionnaire for retail investor that investors postulate multiple goals in their portfolio selection decisions and rank them in order of preference. Also, each portfolio management firm (i.e. mutual fund) has its own set of multiple goals, ranked in its own way, depending upon its value judgement and situation.

How portfolio managers individually assign ordinal priorities to different objectives, they wish to attain in the portfolio selection decisions is not yet fully understood. Lee et al., who have applied GP to the decision problem with reference to optimising the portfolio selection for mutual funds have also felt a need for research in the development of a systematic methodology to generate information regarding the questions concerning the identification, definition and ranking of goals. Numerically, it is very difficult if not impossible to determine how much one objective is preferred to another. Therefore, our objective here is to use the model and framework developed by Agarwal (1978) and others.

2.1.3 Value Judgement

In actual practice, value judgements are used in decision-making. The value judgements constitute the set of premises form which conclusions of any theory are derived by the methods of logical inference. Facts, values and logic are thus the three elements in any piece of analysis based on value judgement, and there can be a rational argument with respect to each of these three elements. Further, value judgement has two essential features, i.e. prescriptivity and universalisation. The value judgements due to their prescriptive nature cannot be argued about yet should be internally consistent and logically compatible.

An ith investor F_1 uses his value judgement to order the elements of the set $G\frac{N}{i}$. Suppose this investor advances a value judgement "p", where "p" entails "q". If the investor is unwilling to accept "q", it is logically forced to abandon "p" or to modify it. It is also possible that instead of the investor being unwilling to accept "q", q conflicts with another value judgement "r" which the investor has explicitly introduced into the system. In such a case, the investor would be force to abandon (or modify) either "p" or "r".

The problems of rational choice have been discussed in the literature of economics, management science and mathematics in different contexts. The literature on orders, utilities and decision rules has followed mainly two trends, i.e. mathematical and pragmatic. Most of this work has been reviewed by Fishburn (1974).

The mathematical work in this area has developed along the path laid down by Hausdorff (1957). Hausdorff's work (1957) has played a key role in the development of latter work by Chipman (1960, 1971), Quine (1963), Fishburn (1970, 1971), etc. on ordinal numbers and cardinal numbers in set theory. This has been reviewed by Chipman and is primarily concerned with the existence of real-valued and lexicographic real-valued order-preserving representations for a weak order or linear order on a set "X". It includes discussion of necessary and sufficient conditions for one-dimensional utility and a number of examples in consumer[8] choice theory and on lexicographic expected utility.

Most of the non-mathematical work, on the other hand, derives its existence form economics and philosophy to consider ordered set of wants, needs, attributes or criteria and is primarily concerned with preference and choice theory. Some of the major contributions have come from Georgescu-Roegen (1936), Neumann and Morgenstern (1944), Friedman and Savage (1948), Edwards (1954), Simon (1955), Debreu (1959), Arrow (1959), Majumdar (1956), Banerjee (1964), Encarnacion (1964), Wright (1964) and Pattanaik (1971).

Georgescu-Roegen, with a lexicographic order in mind, asserts that "choice aims at satisfying the greatest number of wants starting with the most important and going down the hierarchy. Therefore, choice is determined by the least important want that could be reached".

In the theory of Games, Von Neumann and Morgenstern have attempted to measure utility up to a linear transformation, i.e. of measuring it from an arbitrary origin on an arbitrary scale. In the theory, they have adopted a cardinal approach. According to Von Neumann and Morgenstern, a man faced with choices involving risk will seek to maximise the mathematical expectation of his utility. Further, they consider a preference pattern not only among certain alternatives but also among alternative probability distributions. Graaff (1963) has called the Von Neumann and Morgenstern utility "nutility" and has pointed out its difficulties. Arrow, on the other hand, has very rightly pointed out that the results of Von Neumann and Morgenstern have been widely misunderstood.

Simon presents a behavioural model somewhat along the same line where the first acceptable or satisfactory alternative that is encountered

is adopted. Clarkson discusses some rather involved sequential selection-rejection procedures in the context of portfolio selection.

Debreu has suggested making precise the concept of preferences among a priori possible consumption plans to investigate the properties of preferences, to introduce a wealth constraint and to study the satisfaction of preferences under the two constraints, i.e. a priori possibility and wealth constraints.

Majumdar has tried to establish an edge of the Hicksian indifference-preference (ordinalist introspective hypothesis) both on operational and other grounds over the theories of Marshall, Samuelson (behaviourist ordinalists), Morgenstern and Neumann (behaviourist-cardinalists) and Armstrong (introspective cardinal-revivalist). Taking up the problems of measurement of utility, Mazumdar has attempted the ordinal measurement of the utility of an individual with a number of alternative situations an individual is faced with which would be ordinally measurable if these can be ranked by the individual in order of preference.

Arrow, for instance, has developed an impossibility theorem for a social welfare function and interpreted as the preference order for the ith individual or voter.[9] Similarly, Pattanaik looks at cases where each of a number of voters has a lexicographic preference order or the alternatives that are based on the salient dimensions or attributes of the alternatives.

A lot of literature both mathematical and pragmatic has appeared on the lexicographic ordering in the areas of preference and on rational choice. Very little attention seems to be given to the problem of ranking of multiple objectives applying lexicographic order in the decision-making process of investors. Agarwal developed a model based on preferences and has given an elaborate presentation which is very useful in ordinal ranking of objectives and assigning priorities. No attempt is made here to reproduce the model. However, one may refer to that work. The model has been used by us for assigning priorities.

In a portfolio selection decision, the decision-maker faces a number of potentially serious problems: Choice among a large number of alternative equities or mutual funds, interrelationships among alternative equities, i.e. complimentary or substitutive nature of the equities,

financial and non-financial constraints on investment in equities, unreliable or incomplete information, uncertainties regarding the true risk–return relationships of equities.

Each of the foregoing problems may require special consideration and may impose different constraints on the investment decision. In an attempt to provide a decision framework which considers the problems associated with the portfolio selection decision and yet remains tractable, numerous portfolio selection techniques and decision criteria have been proposed in the past. Some of the more simplistic portfolio selection techniques that have been suggested include Markowitz portfolio selection model, Sharpe single index model, capital asset pricing model and Elton, Padberg and Gruber model.

Most of these techniques have the shortcomings of considering that the investors postulate a single objective function in terms of risk and return. To alleviate this weakness, a number of authors like Lintner (1965), Cohen and Elton (1967) have suggested different approaches to portfolio management.

The portfolio and the linear programming models, although may deal effectively with some of the problems noted above but allow only one goal to be quantified and in that sense have limited value for problems involving multiple goals. Lee (1972) has very rightly concluded that a decision-maker applying linear programming could end up even under normal circumstances with another complex programming of the decision process. This might reduce the decision-maker's ability and objectivity. Consequently, this may lead to a local optimum rather than global optimum sought for an investor. The goal programming approach is one way in which some of these difficulties can be alleviated.

2.1.4 Goal Programming Model: Theoretical Framework

The goal programming model was first of all developed by Charnes and Cooper (1961) as an extension and modification of linear programming model. The concept of goal programming first emerged as an issue of unsolvable linear programming problems. Later, Ijiri (1965) studied the

detailed techniques of goal programming as developed by Charnes and Cooper. Ijiri reinforced and refined the concept of goal programming and developed it as a distinct mathematical programming technique and applied it to accounting and management control. In addition, goal programming has also been applied by Charnes and Cooper (1961) and Lee (1972) to production planning, financial decisions, marketing decisions, corporate planning, academic planning, municipal economic planning, medical care planning, advertising media planning, manpower planning, etc. Lee has suggested that goal programming may be applied to an almost unlimited number of managerial and administrative decision areas such as allocation problem, planning and scheduling problems and policy analysis. Agarwal (1987) has developed stochastic goal programming model for capital budgeting decisions under uncertainty. Agarwal (1988) developed a goal programming model for working capital management in firms. Agarwal et al. (2008, 2009 and 2011) have applied the goal programming approach for modelling multi-objective capital structure.

The goal programming model as developed and applied to date allows a simultaneous solution of a system of complementary and conflicting objectives rather than a single objective only. One of the primary advantages of this model is its avoidance of the necessity for converting a set of incommensurable objectives into a one-dimensional objective function.

The technique of goal programming is capable of handling decision problems that deal with (a) a single goal, (b) a single goal with multiple sub-goals, (c) multiple goals and (d) multiple goals with multiple sub-goals. The goal programming model does not require a common yardstick as linear programming model requires. It, instead, allows for an ordinal ranking of goals so that lower priority goals are considered only after higher priority goals have been satisfied to the fullest extent possible.

Goal programming model is especially useful in a situation where multiple goals are conflicting and hence cannot be fully achieved. Goal programming is also important to the decision-maker who is a "satisficer" rather than an "optimiser".

2.1.5 Formulation of a General Goal Programming (GP) Model

A goal programming problem consists in choosing a vector X such that

$$G_i = aX_i \tag{2.1}$$

in the presence of linear constraints on the goals

$$aX_i \leq h \tag{2.2}$$

$$X_i \geq 0 \tag{2.3}$$

where G_i refers to goals and X_i is assumed to be linearly related to the G_i variables. The vector G is of dimension (qxl), X is (nxl), h is (mxl) and a is (qxn) matrix of known coefficients.

A simple goal programming model may be specified in a linear programming format as follows:

$$\text{Minimise } z = \sum_{i=1}^{n} (p_i^+ + n_i^-) \tag{2.4}$$

Subject to

$$AX_i + n_i^- - p_i^+ = G_i \tag{2.5}$$

$$X_i, n_i^-, p_i^+ \geq 0 \,\forall\, i = 1, 2, N \tag{2.6}$$

where

p_i^+ = deviational variables above the specified goals
n_i^- = deviational variables below the specified goals
n = number of goals in the model
X = is constrained to be non-negative

This simple model facilitates the evaluation of projects predicting goals at the same priority level without any goal having to be achieved before any other goals, and therefore this model suffers from the limitation of

not incorporating priority coefficients to different objectives. Although when projects are to be evaluated without assigning any priorities to any goals, i.e. adopting the above model (2.4), suitable result would be achieved. Hawkins and Adams have applied the above model (2.4) to capital budgeting problem. The model can be improved if formulated to incorporate priority coefficients.

The weighted GP Portfolio selection model may be specified as follows:

$$\text{Minimise } z = \sum_{i=1}^{n} \left(\omega_i n_i^- + \omega_i p_i^+\right) \tag{2.7}$$

$$\text{Subject to } AX_i + n_i^- - p_i^+ = G_i \tag{2.8}$$

$$X_i, n_i^-, p_i^+ \geq 0 \,\forall\, i = 1, 2, \ldots, \text{N} \tag{2.9}$$

where the portfolio manager's dilemma is to find vector X_i which will be the weight of each security in the portfolio attempting to achieve G_i level of goals and X_i is assumed to be linearly related to the G_i variables. The vector G_i is of dimension (qxl), X is (nxl) and A is a (qxn) matrix of known coefficients.

p_i^+ = deviational variables above the specified goals
n_i^- = deviational variables below the specified goals
ω_i = priority coefficients assigned to goal i, where $\omega_i >>>>> \omega_{i+1}$
n = number of goals in the model
X_i = weight of each security

The goal programming model as specified above attempts to minimise deviational variables between the goals both sequentially and simultaneously allowing for both scalar weighting and ordinal ranking, instead of attempting to minimise or maximise the objective criteria as in linear programming. These deviational variables may be positive

or negative depending upon the explicit weightage and/or pre-emptive priority. If exact attainment of some goal G_i (where i = 1) is desired, both deviational variables, $\left(\text{i.e.}\, p_i^+ \text{and}\, n_i^-\right)$, must appear in the objective function, while if only under achievement is undesirable only n_i^- must appear in the objective function. If there is a solution for the objective function, then the values of $p_i^+ \text{and}\, n_i^-$ will be equal to zero.

As pointed out above, a goal programming model requires scalar weighting or ordinal ranking of goals depending upon their relativeimportance to the investor. The ranking of these goals is incorporatedin a goal programming model by assigning each a weight in the objective function. The weights are assigned to the deviational variables (i.e. p_i^+ and n_i^-), so that in the goal programming (GP) solution, goals of a lower rank are also satisfied. The weighted goal programming portfolio selection model formulations can be solved using softwares such as FORTRAN, POM, MATLAB and LINGO 12. The resultant solution would minimise the positive and negative deviations from the target aspirations levels for each of the identified goals.

Thus, it may be concluded from the foregoing discussion that a goal programming model whether in a linear programming format or in the generalised inverse format as suggested by Ijiri is capable of handling multiple goals simultaneously and in a multi-dimensional fashion. It also provides flexibility in the determination of the problem's solution whereby management can incorporate its individual preference and policies into the analysis through a system of pre-emptive policies.

2.1.6 Risk and Uncertainty

The problem of risk and uncertainty in economics is not new. The treatment of uncertainty in decision-making is traced as far back 1738 with Petersburg Paradox by Bernoulli (1954). But it is with the work of Knight (1921) that risk and uncertainty has been recognised as a pertinent area in economics. Knight states that the problem of risk

and uncertainty has been recognised and discussed primarily in three connections: (1) insurance, (2) speculation and (3) entrepreneurship. Knight for the first time had drawn a distinction between risk and uncertainty. Knight points out that uncertainty must be taken in a sense radically distinct from the familiar notion of risk from which it has never been separated. According to him, "risk" refers to those cases where a quantity is susceptible of measurement, while uncertainty refers to the cases of non-quantitative type. Risk, since the work of Knight, has primarily been recognised as referring to situations where the probability of occurrence of each outcome of a decision is not known. Miller (1977) is of the opinion that no such attention is paid to this distinction today because in either case the future is unknown. In the present work, Miller's assertion would be adopted irrespective of the distinction which exists between risk and uncertainty.

Ever since the work of Knight, many important contributions have come from several authors in the field of economics, portfolio selection and capital budgeting. Some of the important contributions are from Friedman and Savage (1948), Arrow (1951), Shackle (1955), Tobin (1958), Markowitz (1959), Egerton (1960), Farrar (1962), Lintner (1965) and Hirshleifer (1966), etc. No attempt is, however, made in the present work to present a comprehensive review of all decision theories dealing with uncertainty. Such comprehensive reviews are available in Arrow, Friedman and Savage, Farrar and Bernhard, etc.

Most of the literature on portfolio selection decision under risk and uncertainty can be classified as: (1) Simplistic approach, (2) Portfolio theory approach and (3) Mathematical programming approach. No attempt is made to review these approaches here. However, it is discovered while examining simplistic approach and portfolio theory approach that these have effectively introduced risk and uncertainty and according to Van Horne, they hold considerable promise for the evaluation of risk investments but are far from exact. Further, these approaches suffer from the limitations such as (1) considering a single objective function and (2) failing to provide a solution where there exists a problem of indivisibilities in the investments.

Therefore, a more recent approach has been to treat some of the model parameters as random variables. The major contributions in this third type of approach which may be referred as mathematical programming approach are yet to be made.

2.2 Policy Issues

2.2.1 Portfolio Selection: Challenges Ahead[10]

Indian capital markets are experiencing a range of reconstruction measures involving innovation and upgradation of the current system. Changes such as smart order routing, algorithmic trading, rising dominance of options over the cash and futures market, world-class trading and settlement mechanism, mobile-based trading and the possibility of listing of exchanges are some of the emerging issues in current-day capital markets. This raises the issue of a need for a self-regulatory body for primary and secondary capital markets along the lines of Association of Mutual Funds in India (AMFI) for ensuring better governance in capital markets.

Securities and Exchange Board of India (SEBI) notified guidelines for trading on small and medium-sized enterprises (SMEs) platform in May 2010, but not many SMEs have come forward for listing on the SME platform till date. There is a need to provide the right stimulus to promote and activate this SME Exchange before it fails like the Over the Counter Exchange Market of India (OCTEI). Careful examination of the growth model of NASDAQ (USA) and Alternate Investment Market (UK) is also recommended to prevent any possibility of failure of this SME Exchange.

The cost of execution of trade still remains very high. Our transaction costs are extremely high as compared to other countries such as Japan, United States of America (USA), Germany, Australia, Singapore, Russia, Brazil and United Kingdom (UK) who have lowered their transaction cost. Rationalisation of stamp duty and securities transaction costs is recommended.

A need to fill the existing regulatory gaps is also felt by many analysts. For example, on the issue of listing of exchanges, the Bimal Jalan committee's recommendations opposed the listing of stock exchanges. On the contrary, exchanges such as BSE and Multi Commodity Exchange of India (MCX) have been supporting the listing of exchanges as they will get the desired funding for technological improvement and will be able to compete with exchanges such as National Stock Exchange (NSE). SEBI has cleared commodity exchange MCX's IPO plan in September 2011. The possibility of similar actions by BSE, NSE and regional bourses and its possible impact on the equities market largely remain un-researched and uncertain.

In a seminar organised by Assocham on capital markets,[11] thought-provoking developments in the Indian capital market were outlined by Thunuguntla. Four issues raised by him in ASSOCHAM Report (2011) were higher volumes of options market as compared to combined volumes of cash market and futures market, increasing ratio of market capitalisation to GDP and trading volumes to GDP, and lastly, a high percentage (30% approximately) of all the total listed shares not being traded even for a single day in a year. The analysis was undertaken with the help of turnover data in ₹ Crores from both BSE and NSE from 2000 to 2011 for cash market, futures market and options market.

In financial year (FY) 2000, the percentage share of the total turnover was 100% in the cash market which slowly and slowly decreased to 27.8%, with the increase in the percentage share of futures market peaking to a high of 62.9% in 2008 and with options market having a share of 9.3%. From 2009 onwards, an "Era of options" was seen emerging with a decrease in the percentage share of both cash market and the futures market and a substantial rise in the percentage share of the options market. For FY 2011, it was shown that only 13.8% for cash market, 29% for futures market and 57.2% for options market were the percentage shares in the trading volumes. The reason for the observed phenomenon is that the brokerage and security transaction tax (STT) is charged on the premium portion and not in the entire open interest in the options market. From this analysis, one may question, are the cash markets in danger? Also if the trading in the cash market reduces to new low then what will futures and options trade on with

almost no significant trading in the underlying asset, i.e. equities in cash market. This area needs to be focused on by providing the right stimulus to the cash market by rationalisation of the brokerage fees, securities transaction tax (STT) and stamp duty as applicable currently to the cash market.

The second observation made in the report relates to "Market cap to GDP ratio". "Market cap to GDP ratio" represents the current market capitalisation of the listed shares as the percentage of the gross domestic product. The ratio shows the importance of capital market as the source of capital vis-à-vis the total value of goods and services produced in a country. The ratio has shown a steady rise from 23.28 in 2002–2003 to 132.47[12] in 2010–2011, representing the increasing attractiveness of listing on the BSE.

Thirdly, trading volumes in cash market-to-GDP ratio has increased from 39.33 in 2002–2003 to 71.39 in 2010–2011, whereas the trading volumes in the futures and options (F&O) market-to-GDP ratio has increased from a mere 17.95 (2002–2003) to 445.91 in FY 2010–2011. Aggregating the two, the trading volume in the cash and F&O markets-to-GDP ratio has increased from 57.28 in 2002–2003 to 517.30 in 2010–2011. This phenomenal increase in trading volumes is a result of the high returns that are being offered by securities listed on BSE and NSE.

Another area of concern is that as high as 32% of the listed shares are not trading even for a single day in a year. Hence, this raises a very important issue of liquidity in our capital markets. Out of 4975 listed companies, 1603 did not trade even in a single day and 385 companies traded for less than 100 days in a year. How will the Government and Security and Exchange Board of India (SEBI) tackle these illiquid stocks and how will retail investors protect themselves from investing in such companies is an area which requires much greater attention.

Ministry of corporate affairs, SEBI, National Stock Exchange (NSE), Bombay Stock Exchange (BSE) and many professional bodies such as Institute of Chartered Accountants of India (ICAI) have initiated steps for educating investors through investor awareness programs. Most of these programs guide small investors to be more realistic in terms of the returns they expect from the equity portfolio rather than being swayed

away by promises of high returns with almost no risk. Equities offer returns over long periods which can neither be called risk-free nor guaranteed by any financial advisor. One of the reasons for many investors not participating in the equity markets is that either their expectations are too high or they wait for some financial advisor to guarantee their unrealistic expectations.

Investors often get convinced of the superior selection and timing skills of wealth managers with which they can deliver high returns on a regular basis. This was also observed in response to question number three of the questionnaire for the retail investor. This opinion gets cemented when it is supported with data from past years. Most investors consider that it is either a choice of earning a low return with absolute safety or high returns with high risks. The convexity of the risk–return trade off results in equities offering returns which may be moderate with risks ranging from moderate to high. The activity of investment in equities needs to be seen as a regular activity and as a way of earning normal returns rather than supernormal returns.

2.2.2 Capital Market Penetration

Unfortunately, the successes of the capital markets are being shared among a select few. The investor's penetration is extremely low with about only 1.8 Crore (approx.) having demat accounts in a country having a population of 120 Crore (approx.) people. Greater participation of all citizens is not only in their interest but good for the stock exchanges also. With greater participation, a reduction in the volatility of share prices may also be observed as a few dominant players will not be able to manipulate the price of a security.

Active participation by retail investors cannot be achieved till demat account opening form is simplified. Current procedure of account opening is not only cumbersome but also dangerous for less educated individuals as it requires more than fifty signatures on account opening booklet. The opening of demat account should be as simple as the opening of a bank account, and sale and purchase of equities should be as simplified as opening or breaking of a fixed deposit. Trading being

limited to shares in electronic form acts as a deterrent for many investors who are not computer savvy. Existing Know Your Customer (KYC) norms have limited the participation in the equities market, to only those who have Permanent Account Number (PAN) and a bank account with cheque facility. Attempts need to be undertaken for ensuring the participation of unbanked and non-taxpaying population in India.

2.2.3 Security Lending and Borrowing

Security lending and borrowing (SLB) scheme introduced on the NSE in April 2008 needs to be revamped. It has received a very low response rate on account of complex regulations and high costs, and is limited to futures and options markets only. Using SLB scheme, lenders of equity can earn returns on their lending with very less risk. While borrowers of equity may sell the borrowed equity in spot market when the stock prices are high (say ₹ 200) and take a buying position in the futures market at a lower price (say ₹ 180). At the expiry of the futures contract, equity borrowers would purchase the equity in the futures market and return it to the lender. In this way, both lenders and borrowers can earn a positive spread by trading simultaneously in spot and futures markets.

2.2.4 Initial Public Offer (IPO) Underperformance

The underperformance of initial public offers (IPOs) for two to three years after the listing is an important issue emerging from many research studies cited in the review of the literature. Discussions with some of the brokers and capital market players on the issue revealed the role of merchant bankers in the pricing of the issue. Most of the IPOs end up being overpriced because of existing competition between merchant bankers. Listing day high gains are present because of the enthusiasm of the market participants after which slowly the shares move towards its intrinsic value and result in gains only in the long run.

Some brokers recommended that before going in for an IPO, an investor should analyse how have other IPOs performed, which were issued by the same merchant banker. However, IPOs do not much erode

the wealth of individual investors, since the current rate of oversubscription of IPOs results in individual investors being allotted a much smaller proportion of shares as compared to what they had actually applied for. This does raise another important issue on whether retail investors deserve a much larger pie of allotment or not? The answer to this question is highly subjective, but it does need much more deliberations.

2.2.5 Pledging of Shares

Recently, a lot of discussions are taking place relating to the pledging of shares by the promoters. Extensive pledging raises the issue of safety and stability in prices of shares held by shareholders. The pledging of shares involves mortgaging a part of their holding in the company by the promoters for meeting the working capital requirements of the company or other long-term financing activities. Under the formal system of the pledge, the pledger and the pledgee inform the depository participant to electronically lock the pledged shares. These shares can neither be sold nor purchased without the consent of the pledgee, but the pledgee has the right to sell the shares without the permission of the pledger. When such formal route of creating a pledge is not followed then, it is referred to us an informal pledge.

During the bull-run, pledging of shares does not create problems. However, in the case of a market downfall, the bankers and financers demand further security which may be paid in cash or more stockholding. This may expose a company to threat of takeover by the financiers. This also exposes the pledgers to short sellers as when the share price goes down and in case the pledger is unable to meet the margin call, the pledge's financial institution may sell the shares resulting in further stock price fall. This provides arbitrage opportunities to many short sellers who track companies with high percentage of pledged shares and have fewer amounts of cash available with them.

Promoters do not like to share the information on the amount of pledged shares, as it conveys a negative signal in the market. Promoters follow innovative ways to circumvent the requirement of declaring the right amount of pledged shares. Some promoters transfer their shares

to a separate demat account and undertake a "negative lien" on it. The shares are then pledged to NBFCs (Non-Banking Finance Company) or and to other financiers. Alternatively, some promoters create a special purpose vehicle (SPV) and transfer some shares to this SPV. The SPV is directly or indirectly under the control of the promoters. Money is then raised by pledging the shares of the so-called SPV. There also exists several loop holes in the current system such as holding of shares by promoters in benami accounts, use of margin accounts for trading in one's own share which is technically not treated as a pledge and many other methods which make it very complicated to determine the exact amount of pledged shares. For example, the shares being traded by promoters under margin trading may get sold by the broker in case the share price crashes.

Before taking the sell decision, it is important to note that in case of a company managed by joint promoters, which one of them has pledged their shares should be ascertained. The purpose of pledging and the economic strength of the promoter by way of economic interests in other companies also need to be qualitatively analysed before making a final call. Also, the extent of short selling in F&O segment and the extent of promoter pledging should also be analysed simultaneously and not in isolation.

2.2.6 Relevance of Free Cash Flow

Free cash flow (FCF) generated by the company is an additional variable that needs to be analysed for picking stock for one's portfolio. This variable adds to the existing list of variables PE (price-to-earnings) multiple, return on equity, dividend yield, sales growth and profit growth. Free cash flow refers to that cash which is available to be paid as cash dividends to the shareholders. FCF is surplus cash available after meeting all the requirements related to working capital and capital budgeting decision of a firm. Free cash flow as a variable has the advantage of not being manipulated using unfair means.

Free cash flows (FCF) may ultimately be retained by the firm or distributed as dividend. After 2008 financial crisis, cash has become one of the important variables for determining the stability of a firm during

the recession. Companies maintaining high FCF also prevent themselves from any possibility of bankruptcy-related cost in near future. Also, the times interest earned (TIE) ratio for such companies also tends to be high.

Various ratio analyses may also be carried out using FCF. For example, the ratio of FCF-to-sales shows the extent to which revenue is converted into cash. Hence, the firms with a high ratio are expected to perform better. Alternatively, the ratio of market capitalisation-to-FCF may be used for determining over and under valuation. A low ratio will indicate that the equity is undervalued, and a high ratio will show vice versa. However, it must be noted that low figure of FCF does not mean that a firm is not suitable for investments.

For firms with low FCF, further analysis needs to be carried out. This may involve understanding which stage of the growth curve does a firm lie on. Growth firms are those firms whose expected rate of return on the investment opportunity is higher than the cost of capital. Even a low FCF is justified for firms making a large amount of capital investments.

A firm with a very high value of FCF, on the one hand, represents good security and on the other hand represents a firm with very low investment opportunity. Hence, quantitative analysis of FCF needs to be combined with qualitative analysis of stage of life cycle of the company and industry. Use of FCF as a method of equity selection is justified as (1) FCF makes available cash to pursue research and development or avail of any other opportunity of merger, acquisition or joint venture which may arise; (2) it provides a hedge against recession; (3) it provides the ability to pay high dividends. The information effects of paying dividends have been widely discussed in the existing literature by Walter and Gordon; and (4) a steady rise in FCF shows enhanced managerial performance by increasing productivity and optimum use of resources.

2.2.7 Intra-Day Trading

For those individuals who are interested to undertake risky bets and get involved in intra-day trading must take care that the amount used for intra-day trading should not be so significant that its loss

results in bankruptcy of an individual. This can be ensured by investing in liquid shares which may be a large cap or index-based securities. Diversification as the principle is suitable for a long-term portfolio but not for the portfolio in which securities are bought and sold on a daily basis. Hence, it may be advisable for those individuals who act as day traders to limit themselves to two to three securities at the point of time.

Securities may be carefully analysed using technical analysis and research report from various brokerage houses. Reference point must be pre-decided so as to clearly define entry and exit points.

Loss limit should be also pre-decided. This ensures weeding out emotion out of day trading. Mixing of trading goals should not be attempted, i.e. securities kept for intra-day trading should not be included in the long-term portfolio as these stocks may become worthless in the long run and vice versa.

Hence, the role should be clearly defined by an individual to be an investor or an intra-day trader. Individuals who act as day traders should strive to be satisfied with target returns and let not greed take over their investment strategy.

2.2.8 Quantitative and Qualitative Analysis

Quantitative analysis as followed by Nathan (2011) shows the increasing relevance of multi-criteria portfolio creation. Nathan has developed a ranking methodology[13] for finding ET (Economic Times) Wealth top 100 stocks. Filters are used for selecting equities out of 3000 listed equities. For this first filter, only actively traded equities are considered. The second filter is based on market capitalisation and on revenues. Only companies with market capitalisation and revenues of 500 crores and above are selected. The third filter focuses on the popularity of the equity among research analyst, and for this each equity passing through the filter must have been tracked by at least five analysts. The fourth filter is focused on the expectation of growth, revenues and net profit in last four quarters along with positive net worth.

Further, these stocks have been ranked on four variables. The first variable is growth percentage, including three sub-variables, namely

revenues, net profit and earnings per share (the higher the better for each of the sub-variables). The second factor is based on valuation ratio, including PE (price-to-earnings) ratio, PB (price-to-book) ratio, PEG (price/earnings-to-growth) ratio and dividend yield (for PE ratio, PB ratio and PEG ratio, the lower the better and for dividend yield, the higher the better). The third factor is the risk focusing on downside risk and bear beta (the lower the better).The last factor is the rating factor which includes a number of analysts tracking a particular security and consensus rating (the higher the better for each parameter). Finally, an overall rank is given on the basis of filters and four principals created.

The discussion on the methodology followed for finding ET (Economic Times) Wealth top 100 stocks clearly shows that nowadays analysts are focussing on a number of desirable characteristics of a particular equity before including it to be a part of the portfolio.

Investors should not only go for the quantitative analysis but also take care of qualitative issues related to how the capital has been utilised and how others in the same industry are utilising their capital. Also, an attempt should be made to analyse the working capital management by the company. Qualitative factors such as the professional expertise of board of directors must also be checked.

2.2.9 Value Investing, Growth Investing and Momentum Investing

When an investor selects an investment advisor, he looks for advice which will help him to make good the previous losses and undertake gainful future investments. Alternatively, some investors may be invested to save now for a better future tomorrow, and for some it involves undertaking financial planning for post-retirement life. Invariably, all investors look at not only protecting the capital but also making suitable returns. Most of the analysts recommend investors to check the fundamentals of the security before investing, but what are these fundamentals? For this, three commonly identified investing styles include value investing, growth investing and momentum investing. Investment advisors should discuss their investing style with their clients before recommending portfolios.

Value investing involves investing in equities whose current market price is lower than their fundamental value. The concept was developed by Benjamin Graham and David Dodd. Warren Buffet also follows the concept of value investing. However, value investing involves picking up securities which are popular neither among the analysts nor among the investors. These securities may also suffer on account of low liquidity. Hence, these securities are essentially meant for long term. Value investing involves looking at equities with either low price-to-earnings or price-to-book ratio and high dividend yields. Low PE ratio or PB ratio is often achieved by a company with good track record. Hence, value investing is often also regarded as a conservative investment.

Growth investing, on the other hand, involves identifying equities which are expected to grow at meteoric rates. This may involve investing in new-age equities belonging to information technology, real estate, etc. Investors preferring growth investing do not mind investing in equities with high PE (price-to-earnings) ratio and PB (price-to-book) ratio. However, these are the securities which trickle down the maximum in case of a crisis or other systematic risk. This investment strategy tends to focus on securities which are popular among investors and analysts.

Momentum investing involves focusing on technical analysis for devising a right strategy and deciding the right time of investment. Momentum investing can be regarded as a trading strategy rather than investing strategy. Choice of investment strategy depends upon the risk tolerance of investors in both value and growth investing, resulting in both gains and losses.

2.3 Summary and Conclusions

An attempt has been made to introduce the theoretical framework of goal programming which can be used to accommodate multiple objectives of investors. A large number of authors like Markowitz, Roy, Tobin, Lintner, Treynor, Jensen, Samuelson, Sharpe, Faaland, Jacob, Young, Papahristodoulou and Dotzauer, and others have identified the objectives of portfolio management which include (1) Minimisation of risk; (2) Minimisation of loss; (3) Stability in returns; (4) High average

return; (5) High short-term returns; (6) High long-term returns; (7) High past returns; (8) Expected future performance; (9) Opportunities for superior gains; (10) Safety first and then gains; (11) Future contingencies; (12) Consumption needs; (13) Tax savings; (14) Volatility; (15) Liquidity and (16) Speculation. In the light of these objectives, a case for the relevance of multi-objective framework for portfolio selection decisions has been discussed in detail.

Existing frameworks related to covariance, linear regression, game theory, simulation or probability theory have over emphasised on the risk–return objective thereby missing on certain rational and irrational aspects of investor's decision-making. Discussion on the issue of ordinal ranking and value judgement further clarifies the concepts and relevance of goal programming portfolio optimisation. Finally, a general goal programming model which may be used for scalar weighting and/or pre-emptive priority is explained. The goal programming portfolio selection model enables the simultaneous solution of a system of complementary and conflicting objectives, thereby giving a solution which is more practical and closer to real-world situations. The section on policy issues in portfolio selection raises issues related to capital market penetration, initial public offer (IPO) underperformance, pledging of shares, relevance of free cash flow, intra-day trading, quantitative and qualitative analysis, value investing, growth investing and momentum investing. For improving the governance of Indian capital markets, a need for a self-regulatory body in equities market has been expressed. A need for providing stimulus to the SME Exchange and security lending and borrowing (SLB) scheme is recommended. Rationalisation of transaction costs and taxes in equities market will prevent the shift of volume from cash market to options market. Existing regulatory gaps related to the listing of exchanges also needs to be fixed. Investor awareness programs should not only educate investor as regards stock market fundamentals but also help individuals build rationale expectations of returns from equities.

Capital market penetration is extremely low, and hence steps need to be taken for inclusion of a large segment of unbanked and non-taxpaying population. For greater investor participation, we have recommended

easing of Know Your Customer (KYC) norms and simplification of the demat account opening form. The issue of increasing illiquidity of stocks listed on Indian bourses is also a matter of great concern requiring regulatory intervention. Initial Public Offers (IPOs) underperformance in the short run also raises the issue of revamping the procedure of issuing IPOs. Special focus has to be laid on the role and responsibilities of merchant bankers in IPO pricing. Innovations in pledging of shares have added considerable unsystematic risks to certain equities. Ways and means to counter this risk also needs to be devised to prevent loss of investor's wealth. Quantitative and qualitative analysis along with disclosure on investment style is recommended for ensuring greater transparency in the field of wealth management.

Notes

1. Both mathematical and non-mathematical.
2. This is one of the assumptions made in most of the existing literature on portfolio selection decision, besides other assumptions, such as perfect capital markets and rationality of investor.
3. Earlier works on portfolio focussed on investment decisions that would essentially maximise the present value of all future dividends that would accrue on the equities included in the portfolio.
4. For example, integer programming algorithm for portfolio selection developed by Faaland (1974).
5. Bell and Cover (1988) created game theoretic optimal portfolios having both good short-term and long-run performance. This was achieved by maximising conditional expected log return.
6. Jacobs et al. (2005) created fast algorithms suitable for short selling and long-term investment. It was an improvement over existing factor, scenario and mixed models which focussed only on long-term investment. The conditioned versions of critical line algorithm focussed on creating mean–variance efficient portfolios.
7. Browne (2000) solved probability maximising games, one of which involved an investor trying to maximise the probability of outperforming the other by specific return percentage. Their work was focussed on stochastically dynamic portfolios in continuous time.

8. In our case, consumer would be an investor.
9. Arrow's work is subject to the condition that no individual shall be a dictator. It is then shown that all conditions other than the non-dictatorship condition imply that some individual is a dictator.
10. Research paper titled "Portfolio Selection Theories: Review, Synthesis and Critique" was presented at the 64th All India Commerce Conference (AICC) organised by Indian Commerce Association, 13–15 December 2011, Department of Commerce, School of Management, Pondicherry University, Pondicherry, India.
11. ASSOCHAM's 6th Annual Summit on "Capital Markets – Key to Double Digit Growth" on Thursday, 26 May, 2011, Hotel Le-Meridian, New Delhi.
12. The ratio was calculated using BSE market capitalisation only.
13. A detailed explanation of the methodology is available on www.wealth.economictimes.com.

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