CHAPTER 1
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INTRODUCTION

1.1 Introduction

The rapid evolution of technology in the last few decades has provided investment professionals with the capability to access and analyse tremendous amounts of financial data. Financial institutions such as stock markets produce huge datasets that build a foundation for approaching these enormously complex and dynamic problems with data mining tools. Data mining is the process of finding correlations or patterns among dozens of fields in large databases. It is the extraction of hidden predictive information from large databases, is a powerful new technology with great potential to help companies focus on the most important information in their data warehouses. Data mining tools predict future trends and behaviours, allowing business to make proactive, knowledge-driven decisions. The automated, prospective analyses offered by data mining move beyond the analyses of past events provided by retrospective tools typical of decision support systems.

Stock market forecasting includes uncovering market trends, planning investment strategies, identifying the best time to purchase the stocks and what stocks to purchase. There has been a critical need for automated approaches to effective and efficient utilization of massive
amount of financial data to support companies and individuals in strategic planning and investment decision making.

1.2 Portfolio management

Investment is the choice by the individual to risk his savings with the hope of gain. Rather than store the goods produced, or its money equivalent, the investor chooses to use that good either to create a durable consumer or producer goods, or to lend the original saved goods to another in exchange for either interest or a share of the profits.

Investment is commitment of fund to one or more assets that is held over some future time period. Investing may be very conservative as well as aggressively speculative. Whatever be the perspective, investment is important to improve future welfare. Funds to be invested may come from assets already owned, borrowed money, savings or foregone consumptions. By forgoing consumption today and investing in savings, investors expect to enhance their future consumption by increasing their wealth. Investment can be made to intangible assets like marketable investment, marketable securities or to real assets like gold, real estate etc. Generally it refers to investment in financial assets [3].

A stock market or equity market is a private or public market for the trading of company stock and derivatives of company stock at an
agreed price; these are securities listed on a stock exchange as well as those only traded privately.

A portfolio is simply a logical grouping of investments. It is important to recognize that portfolios can contain projects, programmes or even other portfolios. Different categories of investment need to be evaluated and managed differently, just as different questions need to be asked. A compliance/regulatory portfolio may need more scrutiny of costs, while a venture/growth portfolio may need more questions about potential benefits and risks. A portfolio of enterprise change programmes will need much more rigorous evaluation from a number of perspectives than, for example, a portfolio of behind-the-scenes IT changes [1].

Portfolio management ought to take place wherever investment decisions are being made; however, the views of the portfolio and the questions that need to be answered will depend on whose perspective affects the decisions. An enterprise’s alignment to corporate strategy may be a score used to determine ‘value’ at the board level, while alignment to IS/IT strategy will be of primary interest to the chief information officer.

A portfolio investment is a passive investment in securities. Jean et al [2] defines investment as the sacrifice of current consumption in order to obtain increased consumption at a later date. From this perspective, an investment is undertaken with the expectation that it will lead, ultimately, to a preferred pattern of consumption for the investor.
1.3 Scope of the research

Economically, it is nowadays a general notion that large amounts of capital is traded through stock market. The common characteristic of all stock markets is their uncertainty [1], which is relevant to their future states. This uncertainty is not desirable for investors but also inevitable whenever the stock market is chosen as the investment tool.

The need of the hour in the field of stock market behaviour is to accommodate specific efficiency criteria in addition to prediction accuracy, make co-ordinated multi resolution forecast; be able to explain the forecast and the forecasting model and be able to benefit from very subtle patterns with a short life time, and incorporate the impact of market players on market regularities. The investment decisions depends on uncovering market trends, planning investment strategies, identifying the best time to purchase the stocks and what stocks to purchase. This paves the way for the research in this field.

Investment strategies and the size of investment through the investment vehicles must determined for the safe investment. In order to ensure this, it is important that the constant checking of the final markets is necessary. Picking up the funds and estimating the weights to be invested on each fund should be discussed in a dynamic manner. The stock market is a network which provides a platform for almost all major economic transactions in the world at a dynamic rate called the stock
value, which is based on market equilibrium. Predicting this stock value offers enormous arbitrage profit opportunities which are huge motivations for research in this area. Knowledge of a stock value beforehand by even a fraction of a second can result in an arbitrage opportunity for profit. Similarly, a probabilistically correct prediction can be extremely profitable in the amortized case. This attractiveness of finding a solution has prompted researchers, in both industry and academia to find a way past the problems like volatility, seasonality and dependence on time, economy’s and rest of the market [4]. However, stock forecasting is still severely limited due to its non-stationary, seasonal and general unpredictable nature. Predicting forecasts from just the previous stock data is an even more challenging task since it ignores several outlying factors.

1.4 Problem Formulation

The unaddressed issues in the stock market predictions are

- Methodology for adopting the dynamic nature of the stock market
- Novel methods for Stock Trend prediction.
- Model for minimizing the risk and maximization of the returns
- Decision making for the portfolio determination

Decision making in investment is a challenging job. The systematic way to make the investment and to keep track of the investment to yield a positive output is through proper asset allocation and appropriate
portfolio management. A formal model for an efficient portfolio was given by Markowitz [2]. This model is based on return of an asset is its mean return and the risk of an asset is the standard deviation of the asset returns. It aims to find an optimal allocation of capital among a set of assets by simultaneously minimizing the risk and maximizing the return of the investment. Risk was quantified such that investors could analyze risk return choices. Moreover, risk quantification enabled investors to measure risk reduction generated by diversification of investment. So diversification of investment is essential to create an efficient portfolio [3].

To create the efficient portfolio and manage it, we need to have:

i) Diversification - helps to identify the stock from various or less correlated stocks.

ii) More stable portfolio - the insensitivity towards the daily changes of the market. This is an ideal situation but it more or less could be achieved by the deployment of new theories.

iii) Less risk – to condense the possibility that actual future returns will be different from expected return, to reduce the volatility and to reduce the standard deviation from the asset returns.

iv) Rely on correlations between the stocks to overcome the dependency on expected returns as the expected returns are tough to predict in the dynamic market situations.
Thus the problem is formulated in such a way that the methodology must be able to find the diversified and more stable portfolio with less risk and results with more returns.

1.5 Proposed Methodology

The stock market province is dynamic and impulsive. The different approaches, techniques like statistical, technical analysis are applied in order to predict the market to identify the trend and futuristic. The research outcomes prove at various points that the above said techniques are not enough to provide deeper analysis in predicting stock market prices.

Methods based on the Econometrics, Statistics, Machine Learning, Heuristics and Data Mining Methods are used to predict the market behaviour and investment decisions. A novel approach for the portfolio creation using the association based PSO adopted K-Means is presented. Then the NARX and the MOPSO model have been employed to carry over the efficient determination of the portfolio. The data from the Nifty from March 2010 to October 2010 has been used. The stocks from various sectors are used to build the portfolio. The ANN (Artificial Neural Network) is broadly accepted Data mining technique by finance area to detect the affiliation among the non-linear variables. The Artificial Neural Network models have been broadly used in finance and
economics, particularly for time series forecasting and performance measurement.

Figure 1: Framework for the proposed methodology

1.6 Thesis organization

This dissertation is divided into six chapters.

Chapter 2 presents a detailed literature review in the area of existing practices in the stock market prediction techniques, portfolio management, data mining techniques used in stock market behaviour predictions, Multi objective optimization.

Chapter 3 discusses the concept and implementation of prediction of the Stock Market Behaviour and Investment Decision Making using Benchmark Algorithms for Naive Investors.
Chapter 4 explains Portfolio determination using PSO adopted Clustering technique.

Chapter 5 discusses the theory and the enhancement of the portfolio determination using Multi objective Optimization.

Chapter 6 elucidates Semi-Supervised Clustering for the portfolio determination.

Chapter 7 summarizes the contributions of the thesis by all the above techniques for stock market trend behaviour and portfolio management. Suggestions for future work are also included.