Chapter 2

BEHAVIORAL FINANCE AND PORTFOLIO MANAGEMENT: REVIEW OF THEORY AND LITERATURE

2.1 Introduction

The financial crisis of 2007-2008 spurred the relevance of understanding the human behavior. The researchers found that the root cause of the financial crisis is not a fundamental phenomenon. It is due to psychological distortion in judgment. The excessive optimism and the confirmation bias acted as the driving force behind the crisis.

The studies show that individuals’ behavior is different from what modern financial theories draw for rational human behaviors (Fernandes, Pena, & Benjamin, 2009). Harry Markowitz formulated the first portfolio theory, in the title of “Modern Portfolio Theory” which was the first systematic financial theory (Markowitz, 1952). Modern portfolio theory evaluates return and risk of assets, using mean-variance pattern; and represents a normative pattern for portfolio selection. A normative pattern...
was generated by evaluating the performance of security and forecasting of returns. But contrary to the expectation, there was a huge gap between the available return and actually received return. This gap was called as “market anomalies” by the researchers (Latif, et al., 2011)\(^3\); (Agrawal & Tandon, 1994)\(^4\). They call it in different names such as January effect, weekend effect, turn of the effect and so on which were grouped into three basic types’ namely fundamental anomalies, technical anomalies and calendar anomalies. Frankfurter & McGoun (2001)\(^5\) found that these anomalies were affecting the stock market because of the failure of traditional finance in incorporating the qualitative aspects of the phenomenon in the combination of the quantitative aspects. Hence an alternative approach name behavioral finance was developed, which incorporates psychological and sociological issues while investigating market anomalies and defining portfolio.

Although MPT and the EMH were considered as successful in financial market analysis, the behavioral finance model has been developed as one of the alternative theories for standard finance. Behavioral finance examines the impact of psychology on market participants’ behavior and the resulting outcomes in markets, focusing on how individual investors make decisions: in particular, how they interpret and act on specific information. Investors do not always have rational and predictable reactions when examined through the lens of quantitative models, which means that investors’ decision-making processes also include cognitive biases and affective (emotional) aspects. The behavioral finance model emphasizes investor behavior, leading to various market anomalies and inefficiencies. This new concept for finance explains individual behavior
and group behavior by integrating the fields of sociology, psychology, and other behavioral sciences. It also predicts financial markets.

Summarizing financial behavioral researches, subjective irrational behavior hypothesis could be divided into two groups: theory of cognitive bias (Festinger, 1957)\(^6\) and prospect theory (Kahneman & Tversky, 1979)\(^7\). The basic idea of cognitive theory was that behavior of an individual is determined by his/her own mind, i.e. contemplation and self-perception determines both behavior and emotions (Beck, 2011)\(^8\). On the other hand, the prospect theory describes how investors perceive profit and loss. Value function was developed from prospect theory based on experiments and empirical investigations (Kahneman and Tversky 1979)\(^9\). The value function states that people view gains and losses differently and loss makes a greater emotional impact on investors than gain.

### 2.2 Evolution of Behavioral Finance

Behavioral finance has a long and checkered history. It existed since the end of the nineteen century but emerged as a separate discipline towards the last quarter of twentieth century. The brief details about the evolution and development of behavioral finance extracted from the book Behavioral finance (Sulphay, 2011, pp. 46-48)\(^10\) were as follows:

- In 1895, the French psychologist Gustave Le Bon wrote a book “The crowd: A study of the popular mind”. This book remains the first ever and the greatest material about traditional behavior written in social psychology. He incorporated the theories of herd behavior and crowd psychology in the individual behavior (Gustave, 1895)\(^11\). In this book, Gustave
Le Bon claims that there were several characteristics of crowd psychology: "impulsiveness, irritability, incapacity to reason, the absence of judgment of the critical spirit, the exaggeration of sentiments, and others."

- In 1912, another book was published – “The psychology of the stock market” (Selden, 1912). It was a brilliant piece of literature which presented the idea that stock price movements were, to a very great extent dependent on the attitude of the investors and traders. This was the first book which applied behavioral concepts in the stock market investment.

- In an article published in Journal of Finance, Professor Burrell proposed a scientific approach to investment decisions (Burrell, 1951). The article titled “The possibility of experimental approach to investment analysis” postulates how men behave in the market and its reflection in the stock market operations. Later in 1957, Festinger Leoan introduced “a theory of cognitive dissonance”. It was a book published under the discipline of social psychology which introduces the concept of cognitive dissonance (Festinger, 1957).

- From 1973 onward, Daniel Kahneman and Amos Tversky together published a series of articles introducing new theories and concepts which help Behavioral Finance to evolve as a new discipline. Independently and or with authors they introduced a number of concepts. Some of their concepts and their prominent articles were listed below:
Heuristics:
- Kahneman & Tversky, Judgement under uncertainty: Heuristics and Biases, 1974, pp. 1124-1131

Prospect Theory:
- Kahneman & Tversky, Prospect Theory: An analysis of decision under risk, 1979, pp. 263-291

Mental accounting and Framing:
- Tversky & Kahneman, Rational Choice and the framing of decisions 1986, pp. 251-278

Hot Hands:

The concept of “over reaction” was introduced in 1985 by De Bondt WFM and Richard Thaler, which was explained as the tendency that can lead to disproportionate reaction to certain news in market (De Bondt & Thaler, 1985). Shefrin H and Statsman M published in the Journal of Finance the article, established that investors have a tendency to hold on to the losers and sell winner, thus introduced the concept “regret aversion” (Shefrin & Statsman, 1985).
In 1998, Olsen R, was published in Finance Analyst Journal, was a comprehensive depiction of the foundation and justification underlying behavioral finance were presented (Olsen R, 1998)\textsuperscript{17}.

In 2000 Shiller RJ introduced the concept of anchoring through their work “Irrational Exuberance” (Shiller R. J., 2000)\textsuperscript{18}.

The first portfolio theory incorporated by behavioral factors, an extension of Capital Asset Pricing Model was introduced by Shefrin and Statsman in 2000 through their seminal work “Behavioral Portfolio Theory” (Shefrin & Statsman, 2000)\textsuperscript{19}. In 2009 Fernandes, J; Pena, J I; Benjamin, T classified behavioral bias into cognitive bias and emotional bias in the work “Behavioral Finance and Estimation of risk in stochastic portfolio optimization”, (Fernandes, et al., 2009)\textsuperscript{20}.

The references above were only about a few works and there were large number of other works by experts, economists, cognitive and social psychologists who have enriched the discipline through their contributions.

2.2.1 Behavioral Finance as a Discipline

Victor Ricciardi and Helon K Simon (2000)\textsuperscript{21} defines Behavioral Finance as an interdisciplinary science derived from psychology, sociology and finance. Figure 2.1 demonstrates the important interdisciplinary relationships which integrates traditional finance with behavioral finance with respect to psychology and sociology. It explains and increases the understanding of the reasoning pattern of investors, including the emotional processes and the degree to which the emotions influences the decision making process. Essentially, behavioral finance attempts to explain the
what, why, and how of finance and investment, from a human perspective”. Shefrin H.(2000)\(^\text{22}\) however, mentioned the difference between cognitive and affective (emotional) factors: “cognitive aspects concern the way people organize their information, while the emotional aspects deal with the way people feel as they register information”. In fact human minds register facts and emotions at different parts of the brains as memories.

**Psychology**: is the scientific study of behavior and mental processes along with how these processes are affected by a human being’s physical, mental state and external environment

**Sociology**: is the systematic study of human behavior and groups. The field focuses primarily on the influence of social relationships on people’s attitudes and behavior

**Finance**: discipline concerned with determining value and making decision. The finance function allocated capital, including the acquisition, investing and managing resources


*Figure 2.1: Behavioral Finance as an Interdisciplinary Science*
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The table 2.1 exhibits the various topics which is continuously examined and verified by various research scholars.

<table>
<thead>
<tr>
<th>Table 2.1: Behavioral Finance Topics</th>
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<tr>
<td>Anchoring</td>
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<td>Chaos Theory</td>
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<td>Cognitive Errors</td>
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<td>Loss Aversion</td>
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<td>Over-reaction</td>
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<td>Mental Accounting</td>
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<td>Groupthink Theory</td>
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<td>Prospect Theory</td>
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<td>Affect (Emotions)</td>
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<td>Illusions of Control</td>
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<td>Downside Risk</td>
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<td>Below Target Returns</td>
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Source: (Ricciardi & Simon, What is Behavioral Finance?, 2000)

Bloomfield(2006)\textsuperscript{23} stated that no behavioral alternative would ever rival the coherence and power of the traditional efficient market theory because psychological forces are too complex. Therefore, he emphasized that behavioral researchers should devote themselves to the standard science suggested by their new paradigm and perspective. For example, behavioral researchers can document and refine the understanding of how psychological forces influence individuals’ behavior in financial settings, and how those patterns of behavior affect the market.

Zaleskiewicz (2006)\textsuperscript{24} focused on normal investment behavior introducing important concepts from these two growing fields of research:
behavioral finance and the psychology of investing. He discussed three major topics in his essay: investors’ errors from cognitive psychology, emotions in individual investors’ behavior, and investors’ preferences toward risk and ambiguity. He also admitted that behavioral finance has become more a norm than an extravagance, meaning that the difference between the terms finance and behavioral finance will ultimately disappear.

Byrne & Brooks (2008) also applied the behavioral finance concept to key areas in the financial field such as limits of arbitrage, behavioral asset pricing theory, behavioral corporate finance, evidence of individual investor behavior, and behavioral portfolio theory.

2.2.2 Driving Forces of Investor Behavior

Irrational behavior of investor builds the foundation for behavioral finance. According to Shefrin H. (2007) “hope and fear” are two factors which lead people to behave irrationally. He puts forth the concept as “emotional time line” which is shown in Figure 2.2:

![Figure 2.2: Investors Emotion Timeline](source)

The fear ultimately leads to regret; and hope ultimately to pride. These are the two emotions that can often make investor irrational. The field of investor behavior explains the psychological and sociological aspects of decision making. The two key topics of investor behavior were: Behavioral Finance micro and Behavioral Finance macro. The macro level explains the role of financial markets and “anomalies” in the Efficient Market Hypothesis. The micro level recognizes the various biases affecting the investment decision. Investor behavior examines the cognitive factors (mental processes) and affective (emotional) issues during investment management process. In practice, individuals make judgments and decisions that are based on past events, personal beliefs, and preferences.

2.2.3 Key Themes in Behavioral Finance

The four key themes of behavioral finance were: a) heuristics; b) framing; c) emotions and d) market impact.

a). **Heuristics** are the mental shortcuts that simplify the complex methods ordinarily required to make judgments (Nofsinger, 2011)\(^{27}\). That is the shortcut used by the brain to reduce the complexity of information analysis (Kahneman, Tversky, & Solvic, 1982)\(^{28}\), (Simon H., 1956)\(^{29}\). Psychologist use the term “heuristics” as rule of thumb and “judgment” as assessment. One of a good example of heuristic which normally affects in decision making is consideration of “past performance is the best predictor of the future performance”. Researchers have listed out more than 50 biases. Some of the familiar heuristics are representativeness, availability, anchoring and adjustment, familiarity, overconfidence, status quo, loss and regret aversion, ambiguity aversion, conservatism and mental accounting.
- **Representativeness heuristics**: Representativeness refers to judgments based on overreliance on stereotypes, a part of cognitive bias. The basic principles of representativeness was proposed by psychologist Daniel Kahneman and Amos Tversky (1973)\textsuperscript{30} and analyzed in a series of papers reproduced in the collection edited (Kahneman, Tversky, & Slovic, 1990)\textsuperscript{31}. Representativeness is a heuristic which will lead the investor to make predictions that are insufficiently relative. Representativeness is defined as the tendency of investor to buy stock that represents desirable qualities such as strong earnings, high sales growth and good management (Shefrin H., 2000)\textsuperscript{32}.

- **Anchoring and adjustment** is a psychological heuristic that influences the way people intuit probabilities. It refers to a decision making process where quantitative assessments are required and these assessments may be influenced by suggestions. Investors will fix some reference points (anchors), for example the past winning stock prices. If someone is asked to estimate a value with unknown magnitude, he/she begin by envisioning with these “anchor” and after adjust it up or down in order to reflect the subsequent information and analysis.

- **Availability** is a judgmental heuristics which arises when people use the ease of imagining an outcome in their judgments of probabilities. This bias may lead to ignoring (or underweighting) risks that cannot be imagined or overestimating risks that can be imagined very vividly.
• **Mental accounting** describes people’s tendency to categorize and evaluate economic outcomes by grouping their assets in a number of nonfungible mental accounts. The people mentally allocate wealth over three classifications: current income, current assets and future income. The propensity to consume is greatest from the current income account while the future income is treated more conservatively (Shefrin H., 2000)\(^{33}\).

• **Overconfidence**: Overconfidence bias is a bias in which people demonstrate unwarranted faith in their own intuitive reasoning, judgments, and/or cognitive abilities. This overconfidence may be the result of overestimating knowledge levels, abilities, and access to information. The main facets of overconfidence are “miscalibration of knowledge” and “better than average”. Overconfident investor underestimates the variance of risky asset and trade more aggressively (Kourtidis et al., 2010)\(^{34}\), (Giardini, et al., 2008)\(^{35}\); (Caballe & Sakovics, 2003)\(^{36}\) through overestimating information (Glaser & Weber, 2007)\(^{37}\).

In a published article of Brad Barber and Odean, “Boys will be boys: Gender, overconfidence and Common stock investment”, listed out the characteristics of overconfident investors (Barber & Odean, 2001)\(^{38}\) as follows:

i). Overconfident investors overestimate their ability to evaluate their investment avenues.

ii). Overconfident investors’ trade excessively based on their intuitive reasoning and by overestimating knowledge.
iii). Because of overestimating their abilities, overconfident investors may underestimate their downside risks.

iv). Overconfident investors hold undiversified portfolios.

- **Status Quo Bias**, coined by Samuelson & Zeckhauser(1988)[39] is an emotional bias in which people do nothing (i.e. maintain the “status quo”) instead of making a change. People were generally more comfortable keeping things the same than with change and thus do not necessarily look for opportunities where change is beneficial. Given no apparent problem requiring a decision, the status quo is maintained.

- **Regret aversion**: is a human tendency to feel the pain of regret for having made errors, even small errors. Regret is an emotion experienced for not having made the right decision. If one wishes to avoid the pain of regret, one may alter one’s behavior in ways that would in some cases be irrational. Regret theory may help explain the fact that investors, as explained in the section covering loss aversion, defer selling stocks that have gone down in value and accelerate the selling of stocks that have gone up in value (Shefrin & Statman, 1984)[40]. The theory may be interpreted as implying that investors avoid selling stocks that have gone down in order not to finalize the error they make and in that way avoid feeling regret. They sell stocks that have gone up in order not to feel the regret of failing to do so before the stock later fall.

b) **Framing**: Framing deals with the way people code events. Framing separates form from substance and thus deals with perceptions.
Framing has been defined as a decision maker’s view of the problem and possible outcomes (Ackert & Deaves, 2010). People exhibit frame dependence, either due to cognitive or emotional reasons. The cognitive aspects concern the way people organize their information while emotional aspects deal with the people the way they register the information.

c) Emotions and Self-Attributes: Emotions, such as fear, hope, anger, regret, pride, worry, excitement, guilt and mood may also influence investment decision making. These emotions determine the risk tolerance level of an investor. According to Nofsinger (2011), the influence of emotions on decision is larger for more complex and uncertain situations. Damsio (1994) even finds that without emotions, reasonable decisions are impossible.

d) Market impact: the effect of cognitive errors and biases of individuals and group of people affecting the market prices, being covered under market impact. The behavioral finance assumes that the market anomalies create fluctuations in security prices. The behavioral finance assumes the investors are irrational in the process of “choosing and selecting” their investment avenues. They will react according to the new pieces of information. In these conditions their decision may undergo mispricing due to limit to arbitrage. This will affect the market price to deviate from the fundamental values. It has been identified by various researchers that the deviation from the fundamental values are the main empirical anomalies which lead to a reevaluation of the efficient market hypothesis.
2.2.4 Theories Related with Behavioral Finance

The study of individual (otherwise termed as retail) investor is important in two aspects. At micro level the individual investor behavior affects the well being of households and at macro-level the retail behavior appears systematic and therefore affects prices (Barber, T, & N, 2009a)\textsuperscript{44}, (Barber, T, & N, 2009b)\textsuperscript{45}.

In the modern finance theory, behavioral finance is a new paradigm, which seeks to appreciate and expect systematic financial market influence of psychological decision making (Olsen R A, 1998)\textsuperscript{46}. Behavioral finance is an academic field that applies behavioral concepts to the portfolio investment. It is an interdisciplinary approach that incorporates insights from economics, psychology and sociology. However, in traditional financial theory, investors are considered to tend towards risk aversion at all times. (Shyan-Rong Chou, 2010)\textsuperscript{47}.

There are mainly two theories relating the investors behavioral aspects

1) Standard finance / Expected utility theory
2) Behavioral finance / Prospect theory

2.2.4.1 Standard Finance

Standard finance is a prescriptive theory built by Markowitz in 1952. Standard finance is the body of knowledge built on the pillars of the arbitrage principles of Miller and Modigliani, the portfolio principles of Markowitz, the capital asset pricing theory of Sharpe, Lintner and Black and the option-pricing theory of Black, Scholes, and Merton (Statsman, 1999)\textsuperscript{48}. Standard finance theory is designed to provide mathematically elegant explanations of financial questions that are often complicated. These
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Risk Model and Portfolio Selection: A Behavioral Approach for Optimization of Returns

Approaches consider markets to be efficient and are highly analytical and normative. And the theory focuses on wealth maximization.

2.2.4.2 The Prospect Theory

Prospect theory is a mathematically formulated alternative to the theory of expected utility maximization. The utility theory offers a representation of truly rational behavior under certainty. According to the expected utility theory investors are risk averse. Risk aversion is equivalent to the concavity of the utility function, i.e. the marginal utility of wealth decreases. Every additional unit of wealth is valued less than the previous equivalent increase in wealth. Despite the obvious attractiveness of this expected utility theory, it has long been known that the theory has systematically failed to predict human behavior, at least in certain circumstances. Kahneman and Tversky present in Prospect Theory (1979)\textsuperscript{49}, the following experimental evidence to illustrate how investors systematically violate the utility theory, shown in Figure 2.3.

![Figure 2.3: Kahneman & Tversky’s Value Function](image-url)
Kahneman and Tversky defined the value function on gains and losses, rather than on total wealth. It is found that the graph is concave in the domain of gains and convex in the domain of loses. The graph is considerably steeper for losses than for gains. The graph also shows that that human mind gives a loss of X units more importance than for a gain of X units. In short human mind accepts a sure gain even when the expected value of the gain is considerably more. As loss has more value, an investor will take gamble with more expected loss instead of a sure loss. Kahneman and Tversky found that people are risk lovers for losses and risk averse for gains.

Thaler, et al. (2003) \(^5^{0}\) considered prospect theory as the most successful tool in capturing experimental results. They argued that prospect theory should not be considered as a normative theory in finance: It only tentatively seeks to capture people’s behavior in preferring risky gambles. Thaler, et al (2000) \(^5^{1}\) also regarded prospect theory as an excellent example of a behavioral economic theory because it integrates the theoretical components of finance with several important psychological features.

Many of the behaviors of investors are the outcomes of prospect theory. The theory describes how people frame and value a decision under uncertainty. Initially the investors frame the choices in terms of potential gains and losses by keeping a reference point.

2.3 Behavioral Factors Influencing Investor Decision Making

Behavioral finance theories were based on cognitive psychology which suggests that the decision making processes are subject to several cognitive illusions. The prospect theory grouped the cognitive illusions
into two groups: Illusion based on heuristic decision making process and illusion caused by adoption of mental frames. The literature provides sufficient evidence regarding the relationship of behavioural factors and investment decision making (Pasewark & Riley, 2010)\textsuperscript{52}, (Ricciardi & Simon, 2000)\textsuperscript{53} and (Statsman M., 1999)\textsuperscript{54}.

Howard Raiffa, introduced the idea that there are three approaches to the analysis of decision making. Normative analysis focus on the idea that the actual decision strive to approximate return; Descriptive analysis is concerned with the manner in which real people actually make decisions; and Prescriptive analysis deals with practical advice and help people to use rational decisions (Raiffa, 1968)\textsuperscript{55}.

According to Hilbert (2012)\textsuperscript{56} retail investors were more influenced by behavioral bias such as herding, overconfidence and reinforcement bias as compared to their institutional counterpart. The study was justified by Suresh (2013)\textsuperscript{57}. He found that various financial traits and biases such as hindsight bias, loss aversion, endowment effect, mental accounting, disposition effect and anchoring, which help the individual in sound financial decision making.

Gokhan, (2011)\textsuperscript{58} found that the gender aspect has interaction with five of the financial behavioral factors such as overreaction, herding, cognitive bias, irrational thinking and overconfidence. And he also pointed out that the level of individual savings has an interaction with four of the financial behavioral factors (overreaction, herding, cognitive bias and irrational thinking).
Shefrin H (2000) notes that investors were prone to commit specific errors which were called as psychological biases and emotions which affect their investment decisions.

Chandra (2008) explored the impact of behavioral factors and investor’s psychology on their decision-making, and examined the relationship between investor’s attitude towards risk and behavioral decision-making. He found that that the investment decision-making is influenced by behavioral factors like greed and fear, cognitive dissonance, heuristics, mental accounting, and anchoring.

Nelson Maina Waweru (2008) investigated the role of behavioral finance and investor psychology in investment decision-making at the Nairobi Stock Exchange (NSE) with special reference to institutional investors. Using a sample of 23 institutional investors, the study established that behavioral factors such as representativeness, overconfidence, anchoring, gambler's fallacy, availability bias, loss aversion, regret aversion and mental accounting affected the decisions of the institutional investors operating at the NSE. Moreover, these investors made reference to the trading activity of the other institutional investors and often exhibited an institutional-herding behavior in their investment decision-making.

From the various topics listed in Table 2.1, the following behavioral biases are selected for the study:

- Overconfidence
- Representative bias
- Mental accounting
2.3.1 Overconfidence

Overconfidence is a cognitive bias. It is the tendency to overestimate one’s own skills and predictions for success (Titman, et al., 2000). Kahneman and Tversky (1979) have provided a theory that describes how decision-makers actually behave when confronted with choices under uncertainty.

Trinugroho (2011) found that investors who are overconfident show high expectations and will tend to practice aggressive and excessive trading strategy. The result of the research shows that those with high overconfidence have higher trading activity than low overconfidence investors. The other result shows that among high overconfidence investors, there is no trading activity difference between pre and post bad news, whereas among low overconfidence investors, the existence of bad news cause trading activity to decrease in the post bad news period. It was found that the investment returns of high overconfidence investors are significantly lower than that of the low overconfidence investors.

According to Abreu & Medes (2012) there exists a positive association between the frequency of trading and investor confidence. The study concluded that overconfident investors trade more frequently.

Menkhoff, et al. (2010) studied whether the degree of overconfidence depends on experience and professionalism. They divided the investor groups into investment advisors and institutional investors. The study
found systematic difference in overconfidence between the investors group. Investment experience too has influential role on overconfidence. On the, contrary Terrnace, et al. (2001)\textsuperscript{67} found experience can reduce overconfidence.

Glaser & Weber (2007)\textsuperscript{68} found that the investors with experience are confident of their investment skills and past performance of their trade. They empirically build a behavioral finance model by combining the economic and the psychological variables such as judgment bias. Their study concluded that the psychological phenomena actually drive the economic behavior of an investor. Grinblat and Kelohar (2006)\textsuperscript{69} analyzed the psychological attributes such as sensation seeking and overconfidence in the individual trading activity. They found that overconfident investors are prone to sensation seeking and trade more frequently.

David and Dorla A (2005)\textsuperscript{70} found out the extent of a trader’s overconfidence using experimental bidding data. They also investigated the level of overconfidence. The variables that distinguish overconfident bidding include traditional financial variables such as expected value and standard deviations and nontraditional financial variables such as self attribution bias and feedback. But they also found that experience did not reduce overconfidence.

Bruno Biais, et al. (2005)\textsuperscript{71} measured the degree of overconfidence in judgment and self monitoring as personality traits to evaluate the trading performance in an experimental asset market. They found that high self monitors are expected to behave strategically and achieve superior results. Their study shows that mis-calibration reduces and self monitoring enhances
trading performance. They also found that psychological variables are strong for men but nonexistent for women.

Kahneman & Riepe (1998)\textsuperscript{72} pointed out the importance of overconfidence for financial decision taking. Overconfidence combined with optimism, produces overestimation of individual knowledge, exaggeration of the ability to control events, and risk underestimation.

2.3.2 Representative bias

Representativeness refers to judgments based on stereotypes, a part of cognitive bias. The basic principles of representative biases were proposed by psychologist Daniel Kahneman and Amos Tversky. They analyzed in a series of papers reproduced in the collection edited by Kahneman, Tversky & Slovic (1990)\textsuperscript{73}. Representative bias is a heuristic which generates severe biases. Shefrin H. (2000)\textsuperscript{74} explains the representative bias as the tendency of investor to buy stock that represent desirable qualities such as strong earnings, high sales growth and good management.

Dhar & Kumar (2001)\textsuperscript{75} finds significant heterogeneity in investor belief and trading style based on past price movements of stock and its current performance.

Kahneman & Tversky (1992)\textsuperscript{76} show that when people try to determine the probability that a data set A was generated by a model B, or that an object A belongs to class B, they often use the representative heuristic. This means that they evaluate the probability by the degree to which A reflects the essential characteristics of B. For example in the stock market, investors might classify some stock as growth stock based on
a history of consistent earnings growth or using patterns and charts to predict the future or based on the fundamental analysis. This nature can be categorized as a nature of overconfidence which can be traced to be “representative heuristics”.

2.3.3 Mental accounting

Mental accounting is the cognitive process of assigning financial events into categories making financial decisions and evaluation outcomes (Thaler R. H., 1999)\textsuperscript{77}. It describes the tendency of people to place particular events into different mental accounts based on superficial attributes (Shiller, 1998)\textsuperscript{78}. For example, an investor may keep his investment for retirement savings in one mental account and investment for down payment on a house in another mental account. The main idea underlying mental accounting is that decision-makers tend to separate the different types of gambles they face into separate accounts, and then apply the decision rules of prospect theory to each account by ignoring possible interaction between the accounts. Mental accounting can result in “good money being thrown after bad money” by a continuous operation of non-profitable ventures in the hope that recovery will somehow take place. It may also explain ‘framing’ which is beneficial to investors with imperfect self-control.

The concept of mental accounting is same as Prospect theory of Kahneman & Tversky (1979)\textsuperscript{79}, which implies that the individual will deconstruct their investment problem into local decision with their cognitive simplicity.
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Thaler (1999)\textsuperscript{80} identifies the process of mental accounts in three components: (1) how outcomes are perceived and experienced, (2) how activities are assigned to specific accounts, and (3) how often accounts are evaluated. Shefrin & Statman (2000)\textsuperscript{81} illustrate how mental accounting affects investors’ perception of portfolio risk. To implement portfolio theory, the investor will consider three important characteristics of each potential investment- its expected return, level of risk, and its correlation with other investments. Since, correlation is how each investment interacts with the others and mental accounting is the tendency to overlook the interaction between investments, investors have difficulty relating to this form of diversification. As a result, investors assume higher risk than needed to achieve higher return.

2.3.4 Regret aversion

There is a human tendency to feel the pain of regret for having made errors, even small errors. It’s a feeling of ex post remorse about a decision that leads to a bad outcome. If one wishes to avoid the pain of regret, one may alter one’s behavior in ways that would in some cases be irrational. Regret theory explain the fact that investors, defer selling stocks that have gone down in value and accelerate the selling of stocks that have gone up in value (Shefrin & Statman, 1984)\textsuperscript{82}. The theory may be interpreted as implying that investors avoid selling stocks that have gone down in order not to finalize the error they make and in that way avoid feeling regret. They sell stocks that have gone up in order not to feel the regret of failing to do so before the stock later fall.
Huang & Zeelenberg (2012) explained that when the return on investment exceeded prior expectations, the effect of foregone investment on regret disappeared in speculative investors. Fogel & Berry (2006) found that investors reported regrets about holding a losing stock for longer than about selling a winning stock too soon.

### 2.3.5 Herd behavior

Herd behavior is a form of heuristics where individuals are led to conform to the majority of individuals, present in the decision-making environment, by following their decisions. However, herd behavior, as with other heuristics, may lead people astray when they follow e.g. a general market trend. In experimental settings people often tend to show excessive confidence about their own judgments. Lin (2012) found that herding is a behavior that follows the majority decision instead of relying on movements of stock price.

“Heuristics “in the dictionary definition refers to the process by which people find things out of themselves by trial and error. Through trial and error processes the people leads to develop the thumb rules. Heuristics can also be defined as the “use of experience and practical efforts to answer questions or to improve performance”. Due to the fact that more and more information is spread faster and faster, life for decision-makers in financial markets has become more complicated. This implies increased use of heuristics which is often a mostly inevitable approach, but not always beneficiary (Hubert Fromlet, 2001).

Heuristics may help to explain why the market sometimes acts in an irrational manner, which is opposite to the model of perfectly informed
markets. The interpretation of new information may require heuristic decision-making rules, which might later have to be reconsidered. The whole market can initially react in the wrong way.

2.4 Investors Psychology of Risk Tolerance and Decision Making

In behavioral finance, risk tolerance has an important role in determining investment decision process. It is considered to be a subjective matter (emotions and cognitive issues) and individual behavior plays a fundamental role in definition evaluating and explaining risk (Ricciardi, 2004)\textsuperscript{87}, (Ricciardi, 2008a)\textsuperscript{88} and (Roszkowski & Davey, 2010)\textsuperscript{89}. The behavioral finance incorporates the idea of risk as investor specific and a multi-dimensional decision making process (Swisher & Kasten, 2005)\textsuperscript{90}, (Ricciardi, 2008)\textsuperscript{91} and (Yang & Qiu, 2005)\textsuperscript{92}. Ritter (2003)\textsuperscript{93} mentions that investment decision is based on individual attribute of investor and psychological bias.

Risk tolerance as defined in various studies were as follows:

“the amount of risk that an individual is willing to accept in the pursuit of goal”, (Roszkowski & Davey, 2010)\textsuperscript{94}

“Maximum amount of uncertainty someone is willing to accept when making a financial decision”, (Grable, 2008)\textsuperscript{95}

“The degree of risk to which an individual is willing to accept a less favorable investment result in order to pursue a more favorable investment outcome” (International Organization for Standardization, 2005)\textsuperscript{96}
Financial risk tolerance is one of the key elements that should be considered in making investment decisions for both investment managers and investors. Measuring of financial risk tolerance and determining the factors that affect financial risk perceptions of individual investors have been of interest of research and discussion for long years. Individuals financial risk tolerance is assumed to be a primary determinant of choice behavior in an investment/portfolio selection.

There are several techniques to measure financial risk tolerance. Of them mainly four methods are used for measuring/assessing financial risk tolerance in literature. They are (a) assessing actual behavior (for example, portfolio allocations may be used to infer attitudes to risk), (b) asking about investment choices, (c) asking a combination of investment and subjective questions, and (d) asking hypothetical questions with carefully specified scenarios (Faff, et al., 2008)\textsuperscript{97}; (Wang & Hanna, 2007)\textsuperscript{98} (Hallahan, et al., 2004)\textsuperscript{99}. Financial risk tolerance of investors can be measured accurately by using a questionnaire, if it is developed in accordance with psychometric principles (Roszkowski, et al., 2005)\textsuperscript{100}.

The literature suggests that a person’s demographic and socioeconomic profile are of importance while assessing the risk tolerance level (Suganya & Parvathi, 2014)\textsuperscript{101}; (Bashir, et al., 2013)\textsuperscript{102} (Cesarin, et al., 2008)\textsuperscript{103}; (Mayfield, et al., 2008)\textsuperscript{104}, (Rajarajan 2003)\textsuperscript{105}; (Shobhana & Jayalakshmi 2005)\textsuperscript{106} (Rajarajan V., 1997)\textsuperscript{107} and (Rajarajan.V, 1998)\textsuperscript{108}. Financial risk tolerance is considered to be a key element while determining optimum portfolio selection (Sung & Hanna, 1996)\textsuperscript{109} and important aspect which takes care of various of investment avenues (Nicolosi, et al., 2009)\textsuperscript{110}. The
actual risk tolerance can be determined by understanding and establishing the relationship between risk tolerance and demographic characteristics. The demographic characteristics are the most widely investigated determinant of financial risk tolerance as it varies from investors to investors.

Faff, et al. (2008)\textsuperscript{111}, Wang & Hanna (2007)\textsuperscript{112}, Hallahan (2008)\textsuperscript{113}, Grable (2008)\textsuperscript{114} and Hira (2007)\textsuperscript{115}, found the significance of age while assessing financial risk tolerance as risk tolerance changes with change in age. A second demographic factor that is frequently argued to determine risk tolerance is gender. The majority of the studies examined the relationship between gender and risk tolerance and have found demographic variables were significant in determining the financial risk tolerance of an investor, (Vrieling, 2013)\textsuperscript{116} (Faff, et. al 2008)\textsuperscript{117}; (Grable, 2008)\textsuperscript{118}; (Yao & Hanna, 2005)\textsuperscript{119}. Very few studies have reported high financial risk tolerance for males in comparison to that of females are (Dohmen et al., 2010)\textsuperscript{120}, (Gillian & Chatterjee, 2011)\textsuperscript{121} and (Van de Venter & Michayluk, 2009)\textsuperscript{122}. However, the studies founds that there was no significant difference in financial risk tolerance between males and females are (Andersen, Harrison, Lau, & Rutström, 2008)\textsuperscript{123}, (Geetha & Vimala, 2014)\textsuperscript{124}, and (Jain & Mandot, 2012)\textsuperscript{125}.

Another factor that seems to influence risk tolerance is an individual’s marital status. It is assumed that single individuals are more risk tolerant than married individuals, because they have less responsibilities than married people, particularly in respect to dependents, and face less social risk, which is defined as the potential loss of esteem in the eyes of
colleagues and peers, when undertaking risky investments (Hallahan, et al., 2008)\textsuperscript{126}, (Yao & Hanna, 2005)\textsuperscript{127}, (Hallahan, et al., 2004)\textsuperscript{128} and (Grable, 2000)\textsuperscript{129}.

Number of children and financial dependents also has impact on financial risk tolerance. As the dependents increase the ‘survival need’ make them reduce resource from risky investments (Faff, et al., 2008\textsuperscript{130}) and (Hallahan, et al., 2004).\textsuperscript{131}

Income and wealth are important factors that have an impact on the level of risk tolerance. It is assumed that financial risk tolerance increases with income and wealth (Watson & McNaughton, 2007)\textsuperscript{132}. However Morvin & Suarez (1983)\textsuperscript{133} have found that households in the upper wealth group show a trend of decreasing relative risk aversion.

The level of education is another factor that influences an individual’s willingness to take financial risk. It is assumed that higher level of attained education is associated with increased levels of risk tolerance, because education plays an important role in the level of understanding of risks inherent to the financial investment and therefore higher education encourages taking more financial risk (Al-Ajmi, 2008)\textsuperscript{134} (Christiansen, et al., 2006)\textsuperscript{135} (Gilliam, et al., 2010)\textsuperscript{136}, (Grable & Joo, 2004)\textsuperscript{137}.

In a study Bennet & Selvam (2013)\textsuperscript{138} identified the factors influencing Stock Specific Factors on investors’ sentiment. The stock specific factors identified are psychological factors, past price performance, price earning, recommendation of financial advisors, quality of management and financial characters. The study reveals that the above mentioned
variables do not have much influence on investors’ sentiment in India. Kaur & Vohra (2012)\textsuperscript{139} also states that there exists significance of demographic variables with respect to investor behavior. They also pointed out stock fundamentals such as beta, past return, risk, earnings per share and firm size will affect the investment decision of investors.

Lutfi (2010)\textsuperscript{140} explored the relationship between demographic factors, such as gender, age, marital status, education, income, and family members, and investor’s risk tolerance as well as investment preference. Using a sample of 84 investors, the study shows that demographic factors explain investor’s risk tolerance and investment preference. The results also reveal a significant relationship between investors’ risk tolerance and their investment preferences. Huei (2011)\textsuperscript{141} has conducted a study among the investors of Taiwanese stock market and found that personal characteristics and demographic characteristics have a meaningful influence on the behavioral prejudices in investment.

Dash (2010)\textsuperscript{142} conducted a study to find out which factors affect individual investment decision and also the differences in the perception of Investors. The study found that investors’ age and gender predominantly decide the risk taking capacity of investors.

Lovric, et al. (2008)\textsuperscript{143} presented description model of investor behavior in which investment decisions are seen as an iterative process of interaction between the investor and the investment environment. Mittal & Vyas (2008)\textsuperscript{144} explored the relationship between various demographic factors and the investment personalities exhibited by the investors.
Empirical evidence suggested that factors such as income, education and marital status affect an individual’s investment decision.

Hvidkjaer (2008)\textsuperscript{145} analyzed the relationship between the investor trading behavior and the cross section of future stock returns. The study found that there exist systematic components of investor behavior and future returns. Feng & Seasholes (2008)\textsuperscript{146} studied the investment behavior of men and women by using the sample from the Republic of China. They found out that men have large average portfolios than women and place larger trades.

Roszkowski & Grable (2005)\textsuperscript{147} has conducted the survey to determine how effective the financial advisors are in estimating the financial risk tolerance level of their clients. Their study was multifaceted: a) to determine how effective the financial advisors are in estimating the risk tolerance level; b) representing the judgmental process through multiple regression models using items from a risk tolerance test and demographic characteristics.

Weber, et al. (2002)\textsuperscript{148} presented a psychometric scale that assesses risk taking in five content domains. The five content domains taken for the study was financial; health and safety, recreational, ethical and social. The study was conducted among the American Graduate Students to identify the risk taking and the risk perception among the five content domains. And they found out that the women appeared to be more risk averse in all domains except social risk. Melanie Powell (1997)\textsuperscript{149} in her study ‘in identification of gender difference’ identifies that females are less risk
seeking than males irrespective of framing risk propensity and strategy in financial decision making.

2.5 Behavioral Portfolio Selection and Management

Markowitz portfolio theory may establish a deterministic model for optimal asset and portfolio allocation. But it does so under a highly unrealistic set of behavioral assumptions. For each individual client, investment decision making is based as much on perceptions, attitudes, belief and experience as on economic criteria. Antonides & Van Der Sar (1990)\textsuperscript{150} stresses that: “Individual investment decision making can be seen as the outcome of the confrontation between expectations and preferences, given the restrictions imposed by the budget and the market. Our information and beliefs determine the possible outcomes foreseen and their subjective probabilities, and our wants or desires determine the values or utilities of the possible outcomes After all, the perception of economic phenomena is governed by psychological factors”.

Diversification and risk management techniques are crucial concepts in the portfolio theory. However the prior studies proved that the overconfident investors hold undiversified portfolio, as they are confident in the abilities. Most of the investors fail to diversify as they determine risks at individual asset level instead of comparing at the portfolio level (De Bondt, 1998)\textsuperscript{151}. Psychologists found that the investment decisions are influenced by psychological and emotional factors. A better understanding of these factors will help in defining an optimum portfolio by selecting the best investment options (Chira & Thornton, 2008)\textsuperscript{152} and (Iman, 2011)\textsuperscript{153}. 

\textit{Risk Model and Portfolio Selection: A Behavioral Approach for Optimization of Returns}
Behavioral Portfolio Theory (BPT) emphasizes the role of behavioral preference in portfolio selection and the investors’ investment avenue (Shefrin & Statsman, 2000)\textsuperscript{154}. BPT explains why the investor investing with multiple objectives such as future requirement of family, retirement saving and fund for meeting emergency. Graham, et. al (2009)\textsuperscript{155} found the significance of demographic variable while designing the investors preference in designing portfolio. From the previous literature review the following biases are important in determining the portfolio selection and evaluation.

1) Probability Weighting and Anchoring (reference point) (Kahneman & Tversky, 1979)\textsuperscript{156}
2) Mental accounting (Thaler R. H., 2000)\textsuperscript{157}
3) Representative biases
4) Lack of diversification (Goetzmann & Kumar, 2008)\textsuperscript{158}
5) Insufficient savings due to lack of self control (Benartzi & Thaler, 2007)\textsuperscript{159}.

The first aspect of portfolio management is to identify the investment strategy. That is whether an investor prefers fundamental analysis, technical analysis or personal intuition. Investors using fundamental analysis examine relevant factors such as balance sheets, Profit or loss statements, return on investments, dividends, industry conditions etc., that affect the future stock price movements. In contrast, investors relying on technical analysis only study the past stock price movements, believing that historical data provides indications for future stock price developments. This stage can be identified the reference point set by investor (Anchor) (Shleifer & Summers, 1990)\textsuperscript{160}.
Investment objectives were embedded in investors’ preferences. A key implication of behavioral portfolio theory is that investors whose goals involve high aspirations act as if they have a high tolerance for risk, implying that investors who set high aspiration levels in combination with an associated high probability of achieving those levels, will tend to choose risky portfolios (Shefrin and Stastman 2000)\(^{161}\). Risky portfolios were portfolios that are more exposed to market risk and overweight small firms (Barber and Odean, 2001)\(^{162}\).

Shanmugham & Ramya (2012)\(^{163}\) reported psychological and sociological factors dominate economic factors in investment decision making process. They apply theory of reasoned action and theory of planned behavior to explain individual investor behavior. Waweru, et al. (2008)\(^{164}\), Evans (2006)\(^{165}\) and Kahneman & Tversky(1979)\(^{166}\) shows that investment decisions were guided and affected by psychological, emotional and behavioral factors.

Mohanta & Debasish (2011)\(^{167}\) studied the investment preference of investors in different investment avenues for fulfilling financial, social and psychological need. While selecting any financial avenue, the investor prefers the benefits such as safety and security, getting periodic return or dividends, high capital gain, secured future, liquidity, easy purchase, tax benefit, meeting future contingency etc.

The behavioral framework links investments objectives to trading behavior. In this regard, investors saving for retirement or building a financial buffer and investors who invest to speculate or exercise a hobby lie at opposite ends of a continuum (Barberis & Xiong, 2008)\(^{168}\) and (Grinblatt
& Keloharju, 2006). To experience these positive emotions such investors will trade more frequently than other investors.

The following literature provides sufficient evidence regarding the relationship of behavioural factors and investment decision making (Pasewark & Riley, 2010), (Ricciardi & Simon, 2000) and (Statsman, 1999). These studies were conducted on different types of investors like individual, groups, institutions, etc.

Arvid Hoffmann et al. (2010) analyzes how systematic differences in investors’ investment objectives and strategies have an impact on the portfolios they select and the returns they earn. Based on the findings from behavioral finance they developed hypotheses which were tested using a combination of transaction and survey data involving a large sample of online brokerage clients. By testing the hypothesis they found that investors who rely on fundamental analysis have higher aspiration and turnover. They will take more risk, are more overconfident and outperform investors who rely on technical analysis. And these findings provide support for the behavioral approach to portfolio theory and shed new light on the traditional approach to portfolio theory.

Shyan-Rong Chou, et al. (2010) in their study attempts to establish a model by which to measure attitudes and behavior towards investment risk. They have taken a sample of Taiwanese investors to determine their past investment experience as an anchor. Empirical results found no difference by gender to investor propensity to take risk, nor in cognitive perception of such. However, higher and lower perceptions of risk were indicated by investors according to their personal investment experience.
Investors with little experience in stocks and structured notes were found to have significantly heightened perception of risk. Thus the model proposed is relevant in finding a positive correlation between experience and propensity of risk, though the understanding of such remains uncertain. In respect to financial products other than mutual funds, investor propensity and perception of risk tend to show a negative correlation. Similarly, investor perceptions of risk and expected returns indicate a significant negative correlation. Finally, when positive information is presented, investor perception on structured notes is lower with higher expected remuneration.

2.5.1 Investment Preference and Investment Strategies

Individual investors are especially prone to heuristic driven bias. The findings of De Bondt (1998) were: (1) investors were excessively optimistic about the future performance of investment they owned; (2) they were overconfident; (3) their stock price forecast were anchored on past performance; and (4) they underestimated the degree to which their stock moved in tandem with the market, i.e. they underestimate beta.

Wall (1993) exhibits a pyramid structure to address the investors preference associated with security, potential and aspiration. The movement from bottom to top involves more risky asset and right to left involve higher yield. At the bottom of the pyramid are securities designed to provide investor with safety.
An investment strategy refers to various heuristics used by investors to evaluate their investment avenue for their investment. Analyzing the investment strategy refers to how an investor differ from other in their decision making process. It shows the effect of various market factors which affecting the investment decision process and the strategies used to evaluate such market factors. Strategy is fundamentally about choice, a commitment to undertake one set of actions rather than another for choice in the face of trade-offs (Porter, 1996). DeBondt & Thaler (1995) states that the financial market influences the investors’ behavior. They
pointed out the investors may have over-or under-reaction to price changes extrapolates past trend to future; focuses on seasonal price cycles. Waweru, et al. (2008)\textsuperscript{179} identifies the factors of market have impact on investors decision making. The study states that price changes, past trends of stocks, market information and other fundamental aspects of underlying stock will affect the decision making of an investor. Carparrelli, et al (2004)\textsuperscript{180} shows the impact of herding which affects the decision making of the investors. In general market factors are the external factors influencing the decision making process. The various strategies used by investors to evaluate the market factors is considered as investment strategy/tools of the investors. Some of the investment tools (strategies) used by the investors were summarized below:

\textbf{2.5.1.1 Financial statement analysis:} It is considered as a quantitative indicator used to comprehensively evaluate the financial aspects of the firm. At the company level financial statement analysis is the part of fundamental analysis dealing with examination of financial data to evaluate the intrinsic value of the securities. Bennet et al. (2011)\textsuperscript{181} and Quershi & Hunjra,( 2012)\textsuperscript{182} explained in their study that the significance of financial tools in decision making of the investors. Khanifar et al. (2012)\textsuperscript{183} found, financial statements and midterm reports are considered more important than economy market and industry related factors by analysts at Tehran Stock Exchange.

\textbf{2.5.1.2 Corporate Social Regulations:} According to Bennet et al. (2011)\textsuperscript{184} factors influencing stock selection decision are: fundamental, market factors, earning, decision making, industry related corporate governance, positioning,
image building, goodwill and industry competition factors. It shows the socially responsible characteristic of investing dealing with non financial consideration. The studies of Ghoul et al. (2011)\textsuperscript{185} and Godfrey et al. (2009)\textsuperscript{186} states that corporate responsible behavior of the firm reduces risk and decreases cost of capital (Bassen et al., 2006)\textsuperscript{187}. This increases the investors' confidence on investment.

2.5.1.3 **Technical chart analysis**: It is the tool and technique used to study the price and the volume movement of the securities to predict the future price. When the fundamental analysis deals with the intrinsic value of the securities based on investors estimation, technical analysis deals with price fluctuations. Lo, et.al (2000)\textsuperscript{188} states that the general goal of technical analysis is to identify and extract the price pattern. The tools such as charting, daily price fluctuations and trading volume were used in technical analysis. The visual summary of technical analysis provides forecast of security prices regarding the investment decision of buy or sell (Edwards et al., 2007)\textsuperscript{189}.

2.5.1.3 **Opinion analyst**: Opinion analyst explains the herding affect of the investors to follow others actions. The effect of herd affect is due to the investors' tendency to extract useful and reliable information. It is a trust heuristic and a non conventional tool used by the investor in their decision making process. Investors tend to seek advises from the experts because of asymmetries of information. The recommendations given in the financial experts and updates in print media helps the investors in their decision making (Monit, et al., 2014)\textsuperscript{190}. 

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While analyzing the character of an investor, it is evident that the investors are interested in finding the optimization of returns. The optimization of return can be generated by minimizing the risk of their investment. There are series of academic research in the field of portfolio management using various index models extensively for optimizing the return. Each of the models developed makes an assumption about why stocks covary together so to simplify the inputs to the portfolio selection problem. Each model leads to a unique ranking of stocks, such that if a stock enters an optimal portfolio, any higher ranked stocks must also enter the optimal portfolios. However, different models perform differently toward forecasting correlations, fitting in historical data and the accuracy of predictions. Therefore, the model selections are of interest because models vary in both reducing and simplifying the inputs needed to perform portfolio analysis and increase the accuracy with which correlations and covariance’s can be forecast.

2.6 Conclusion

It is very evident that the investors behave irrationally. The irrational behavior is mainly due to bias that was generated from past experiences or heuristic. However, emotional and cognitive biases play a vital role in the decision making process. In conclusion, the common behavior of an investor can be categorized as follows: Investors often do not participate in all investment avenues; they exhibit loss-averse behavior; they use past performance as an indicator of future performance; they behave on status quo.
References


Chapter 2


Chapter 2


Behavioral finance and portfolio management: review on theory and literature


Chapter 2


Behavioral finance and portfolio management: review on theory and literature


Behavioral finance and portfolio management: review on theory and literature


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