# Interrelationship of biases:
# effect investment decisions ultimately

**Atif KAFAYAT**
University Institute of Management Sciences PMAS AAU, Rawalpindi, Pakistan
Atif_kafayat@yahoo.com

**Abstract.** *The purpose of this study is to examine if investors of Islamabad Stock Exchange are indicating tendencies of irrational behavior when exposed to certain psychological dilemmas related to the financial world and what are interrelationships among these dilemmas, This study deals with three dilemmas i.e. self-attribution bias, overconfidence bias and overoptimism bias. The main purpose of the study is to empirically prove the relationship among the biases and their effect on the rational decision making of an investor. For this study quantitative method is used and a survey is conducted. For measuring the behavioral impact on decision making, Structural Equation Modeling is used on the collected empirical data to obtain the results. The findings of this study can be useful for individual investors, financial brokers, financial manager and other financial decision makers to improve their cognitive thinking process and make more rational decisions.*

**Keywords:** behavioral finance, self-attribution bias, overconfidence, overoptimism, rational decision making.

## 1. Introduction

Behavioral finance is somewhat an emerging but rapidly growing area of finance, which study people's economic decision-making behavior and the theory of cognitive psychology combined with the interpretation of the traditional finance and economics and. The basic presumption in behavioral finance is that, data structure combining with aspects of the market sector members influences the investment choices of investors and market results. The reasoning mechanisms don't function as computer rather; a person's mind frequently operates data utilizing sentimental channels or alternatives. Standard finance expects that finance sectors members, foundations, and even markets are discerning or rational. Those individuals make rational decisions and increase their wealth. Any individual who makes irrational decisions will suffer from poor results. Continuously with entry of time people figure out how to settle on balanced or rational choices or they retreat the business and any oversights that market members make are not corresponded with one another; hence the lapses don't have the quality to influence market costs. The efficient market hypothesis by (Fama, 1970) declares that the reasonable business sector investors have seized all known information and probabilities concerning doubt about what's to come into current costs. So no irrational decision may take place on their end and no irregularities can be found in efficient market. But one cannot challenge that there are no anomalies occurring in market. And behavioral Finance is the dimension of finance which conceives psychology related theories to elaborate the stock market anomalies.

According to (Shefrin, 2007) bias is nothing else yet the inclination towards failure. Bias is tendency to make decisions while the decision maker is already being subjected to an underlying credence or belief. There are so many biases in human psychology. This research focus on following three: (1) Self attribution; (2) Overconfidence and (3) Overoptimism. These biases lay impact on individuals in such a way that they frequently deed on an obviously silly way, routinely disregard conventional  ideas of risk aversion, and make foreseeable lapses in their conjectures and judgments. These biases play their part in shaping individual's choices, financial decisions in corporations and financial markets. Unreasonable choices hamper the investor's wealth and the execution of companies and additionally the productivity of business sector. Scholars have identified so many biases. (Kahnemann and Tversky, 1979) wrote a paper in which they stated different states of minds that may impact the investor's decision making process; they are risk aversion, regret aversion and self attribution and the locus of control. They based their study work on prospect theory.

Self-attribution bias make Individuals believe that their triumph is because of their prevalent abilities and skill set and they are alone responsible for their success and their failure is not their fault. (Hastorf et al., 1970) proved that individuals give credit of the good results on superior skills they think they possess, while blame different causes for their failures. In a similar study, (Gervais and Odean, 2001) studied that. When an investor gets favorable outcomes he/she credits this success to their personal abilities and thus overestimates their abilities and this overestimation leads to another bias called overconfidence.

Overconfidence is a bias which reflects the state of mind in which an individual overestimates his/her abilities or skill to perform a particular task. In their study of Overconfidence bias (Barber and Odean, 2001) found that it effects the rational decision making of investors and will lead the investor to trade in more risky security. (Gervais and Odean, 2001) studied that both overconfidence and overoptimism are personality traits which effect the decision making of an individual and that the overconfidence reinforces the overoptimism.

Overoptimism is the overestimation of the frequency of desired favorable results and underestimation of less favorable results (Shefrin, 2007). This overoptimism or excessive optimism bias is present in variety of fields of finance i.e. (Meinert, 1991) found that the main reason behind the debt problems is the overoptimism of corporate managers. Meinert also proved that every new product in market is embroidered with excessive optimism about its success. (Golden et al., 1994) studied the projection is effect with overoptimism bias and it is not surprising because most of companies are enthusiastic while launching new item, same can be applied on trading of IPO's. And overoptimism especially increases there, where the survival of individual or company is much dependent on favorable outcome. Investors are also influenced by overoptimism bias as it was studied by (Brown and Cliff, 2005) that the investor feelings do influence their ability to value a security. Overconfidence and overoptimism are a bit similar in nature, but they are not the same. An overoptimistic individual might not be overconfident about his/her abilities but yet optimistic about the occurrence of a desired positive outcome of their actions, while an overconfident person is sure about his/her ability, or the outcome of the event. So an overconfident individual is likely to be overoptimistic as well because he/she overestimate their abilities and they think that they have made the best decision which will generate them maximum positive results, thus they become overoptimistic about the outcome as well. So an overconfident individual is highly likely to be overoptimistic while an overoptimistic individual may or may not be overconfident (Baumeiste et al., 1989).

## 1.2. Problem identification

Peter L. Bernstein (2009) studied the evidence that shows persistent signs regarding illogicality, instability or inability of the individual to reach on rational choices and decision meanwhile they encounter uncertain situation. Behavioral finance answers the following question. "Why individuals commit systematic mistakes" or how the psychological phenomenon affect their ability to make decisions.

This current study has foundation in common biases which cause market anomalies and which affect the investment decisions and finding relationship in the biases so suggesting measures to overcome those mental shortcomings that allow irrational and suboptimal decision making. So in this study the identification of the most important biases that affect the human decision making and their interrelationships are empirically proved and further their individual and compound impact on the decision making are established. The investors, who are exposed from psychological phenomenon, will make irrational decisions and will suffer from suboptimal results. This research incorporates some of these phenomenons (biases) and also determines the relationship among these biases.

## 1.3. Problem statement

It is established that self-attribution, overconfidence and overoptimism effect rational Decision making. But theory says that there is a relationship among these biases (self-attribution, overconfidence and overoptimism) and there is not much research on this type of relationship. Here literature is lacking to give evidence on seminal reasons. So how these biases (self-attribution, overconfidence and overoptimism) are related to each other and how they affect rational decision making?

## 1.4. Research questions

The research questions for the study are:
1) Is there a relationship among self-attribution bias and overconfidence?
2) Is there a relationship between overconfidence and overoptimism?
3) How self attribution impact Rational Decision making?
4) How overconfidence impact Rational Decision making?
5) How overoptimism impact Rational Decision making?

## 1.5. Objectives of research

The purpose of research is to study that if investors show propensities of unreasonable conduct when they are presented to specific mental situations. To recognize the extent to which Pakistani stock exchange investors are showing irrational behavior in their investment decisions is main objective of the study.

Measuring the association among the biases and proving them that they are the causes of irrational decision making. In nutshell the main objectives of the study are:

- To find most important biases related to investors decision making.
- To empirically study the relationships among the most important biases.
- To find how each of the bias is affecting the investor's decision making.

## 1.6. Significance of research

A very few studies has been conducted in Pakistan on the financial misery and in the field of behavioral finance. This study can be used in understanding of how these financial decisions were made and what were the possible anomalies attached to these decisions. So through the results of the study rectifying the decisions and formulating the policies for future decisions can be generated. Stockholders and investors can use the findings of the study not only to manage the most suitable portfolio for them, but also able to choice the right companies for their stocks without exposing to biases and screening out the companies that are not suitable for their wealth maximization.

Similarly financial brokers can also use it to assess their customer that how much the customers are exposed to biases and how to treat them. So the study can help improve financial situation by rightfully acknowledging the risky situation and timely taking measures to cope with this situation. Existing work in this study has emphasized on identification of different heuristics and biases and their impact on the investment decision making. This research not only find the impact of such biases on investors decision making but also try to find the relationship among the biases and suggesting the key reasons why these exists and then suggesting measures to overcome this. All the study will be based on empirical evidence.

## 2. Literature review

## 2.1. Self-attribution bias

When people relate their success with their own abilities and skills and hold external forces or bad luck for their failures is self-attribution bias (Shefrin, 2007: p. 101). (Gervais and Odean, 2001) argued that people judge their skills not through self-examination but by assessing their accomplishments and failures. People mostly take too much credit for their own achievements, they also found that self-attribution bias affects the impression of people regarding their abilities and diverts them from learning from past successes. The motivational process e.g. self-enhancement and self-preservation combines with cognitive factors e.g. self-esteem and locus of control creates self-attribution bias. Chief operation officers (CEOs) suffering self-attribution bias credit the success of company

because of their abilities, while failures are attributed to economic situation, CEOs suffering from self-attribution bias tend to overestimate their capabilities and therefore invest in such projects which are risky (Malmendier and Tate, 2005).

## 2.2. Overconfidence bias

Overconfidence bias is failure to recognize the boundaries of one's knowledge (Russo and Schoemaker, 1992). The factors such as self-commitment to the project and self-declaration of proficiency are the causes of overconfidence in an investor. When individuals fail to comprehend the dubiety of their abilities fully, overconfidence tends to increase (Kahneman and Tversky, 1979). Psychological researchers have found how overconfidence bias affects the behavior of individuals. The decisions related to uncertain events are the ones which possess element of overconfidence.

Overconfidence bias appears in the form of excessive optimism and better than average effect. Overconfidence bias can be very harmful on financial decisions; In a resembling research (Odean, 1998) proved that the investors with overconfidence will over-value their knowledge, thus they will invest actively. But investing actively does not guarantee favorable outcomes. (Barber and Odean, 2001) studied in their study that the investors who trade frequently earn much less profit then those investors who trade in frequently, thus overconfidence bias is dangerous for those type of investors.

## 2.3. Over optimism bias

Over optimism is the overestimation of positive results and underestimation of negative results (Shefrin, 2007). People are overoptimistic when they believe that they will not be exposed to future events and things will not go beyond their control and people also think that there is high probability that positive event will happen to them and negative events will happen to others (Weinstein, 1980). In further notification he asserted that people have tendency to believe that it is less likely that they will suffer from an undesired situation then the others. He studied that overoptimism bias is in many domains and age groups. Individuals are overoptimistic before an event e.g. people before start of their holidays were expecting more fun and enjoyment but during that same holidays they express less enjoyment. Individuals are overoptimistic when asked about to anticipate their estimation of their future experiences. Overoptimism is also present in business environment. Entrepreneurs are extremely optimistic regarding their future outcomes when compare to investors. The overoptimism bias particularly affects the financial decision making, the main cause of debt problems today are due to overoptimism of financial managers (Meinert, 1991). He gave most emphasis on the literature identifying behavioral decision-making attributes that are likely to have systematic effects on financial market behavior. He said even though the

field is new and evolving, a number of potential psychological decision attributes have been identified. These include the following: Decision makers' preferences tend to be multifaceted, open to change, and often formed only during the decision process itself.

Decision makers appear to be adaptive, in the sense that the nature of the decision and the environment in which the decision is made contribute to their selection of a decision process or technique. Decision makers seek satisfactory, rather than optimal, solutions. (Olsen, 1998) through empirical evidence suggests that these contribute to the following investment-related characteristics: Excessive stock-price volatility and bubbles in prices, Follow-the-leader or herding behavior among investors, misestimating of the risk of loss, Selling winning investments too early and selling losing investments too late, Differing preferences among investors for cash dividends, Belief in the value of time diversification (that risk diminishes with time), Popular investments earning poorer than desired returns, Investors mistaking "good" companies for "good" investments, Asset prices appearing to over- or under react to new market information, Individual investors holding poorly diversified portfolios, and a superior short-run and inferior long-run performance of initial public offerings (Olsen, 1998).As a result of poorly diversified portfolio the investor suffers loses both in short-term and long-term time periods. This happens because the investor suffers from different biases and select portfolio which they think are profitable.

## 2.4. Self-attribution and overconfidence relationship

Self-attribution bias also builds up an individual's overconfidence (Miller and Ross, 1975); (Wolosin and Till, 1973) and (Schneider et al., 1979). Individual exposed to self-attribution bias think that they have more abilities then average, known as "Batter then average effect" (Taylor and Brown, 1988); (Svenson, 1981). As self-attribution enhances overconfidence, so the subjects who suffer from this bias will be overconfident in their decisions and judgments. Self-attribution bias affects the ability of a person to estimate his/her abilities and also affects the learning from past performances of that person to estimate his/her abilities and also affects the learning from past performances of that person. (Gervais and Odean, 2001) worked on the effects of previous performances of the investors on their behavior, and found that success strengthens the overconfidence. When an investor is successful, he/she credit this success with their own capabilities and skills and firms their beliefs regarding their ability too much, as a result they become overconfident. It was found that People suffering from self-attribution bias become more overconfident after a success and it affects the conception about own capabilities as it hinders the evaluation of past performance, this leads to overconfidence (Seppälä, 2009).

In a research conducted on managers it was found that managers who succeed may become overconfident because of a self-attribution bias, (Malmendier and Tate, 2005) write that they had found that for overconfidence, CEO's overestimation of skills and self-attribution accounts for. In investment agents (brokers) biased self-attribution was found to bringing excessive optimism. When confronted with uncertainty investors tend to be increasing biased self-attribution, which ultimately induce overconfidence in them (Yosef and Kumar, 2012). It was found that individuals become more overconfident instead of going for self-assessment when affected by self-attribution bias (Cova et al., 2001).

(Tversky, 1995) studied that overconfidence generates from Phenomena like self-enhancement, locus of control and carelessness of predictability correctness, all these are the roots of overconfidence in an individual. Investors are overconfident about the events which they hope will generate positive outcomes and will personify them (Weinstein and Klein, 2002); (Weinstein, 1980). So self-enhancement triggers overconfidence in investors

## 2.5. Overconfidence and over optimism relationship

The overconfidence and overoptimism quite resemble biases, yet are not the same. People with overconfidence exaggerate their abilities and probability of favorable results, while people with overoptimism might not exaggerate their abilities but they diffidently exaggerate the probability of favorable results (Baumeister et al., 1989).

A person who does not overestimate his/her abilities, but believes in a desired positive result from certain scenario, is overoptimistic. The common thing about overconfidence and overoptimism is that in both bias a person is seeking positive outcomes from his/her decisions. So being overconfident makes a person over optimistic as well, but it is not necessary that an over optimistic person is overconfident. The overestimation of the abilities of one person and outcome of a specific project is overconfidence while the overestimation of only the desired outcome of a specific project it overoptimism (Gervais, et al., 2002).

(Hirshleifer, 2001) outlines the connection between presumptuousness and self-attribution inclination: Overconfidence and predisposition self-attribution are static and alert partners; self attribution causes people to figure out how to be presumptuous as opposed to uniting to a faultless self-evaluation. Notwithstanding its potential significance, there is minimal experimental proof recording those self-attribution matters to managerial choices. There are so many heuristics and biases that have been identified by the researchers that cause for the anomalies occurring in the markets.

(Shiller, 2005), in his research he worked over prospect theory, regret and cognitive dissonance, anchoring, mental compartments, overconfidence, over- and under reaction, representativeness heuristic, the disjunction effect, gambling behavior and speculation, perceived irrelevance of history, magical thinking, quasi magical thinking, attention anomalies, the availability heuristic, culture and social contagion, and global culture.

From above researchers' literature it can be inferred quiet easily that self-attribution, overconfidence and overoptimism leads investors to exaggerate and overestimate their knowledge and then they such decisions that not only are suboptimal but also leads to severe costs and also it shows that how self-attribution becomes root cause for overconfidence bias, and overconfidence becomes seminal cause of overoptimism thus one bias leading to another bias. The literature review also identifies the research gap that the seminal cause is present among the biases and this is the main purpose of the study.

## 2.6. Development of Hypotheses

$H_1$: there is a positive relationship between self-attribution bias and overconfidence.

$H_2$: There is positive relationship between overconfidence and overoptimism.
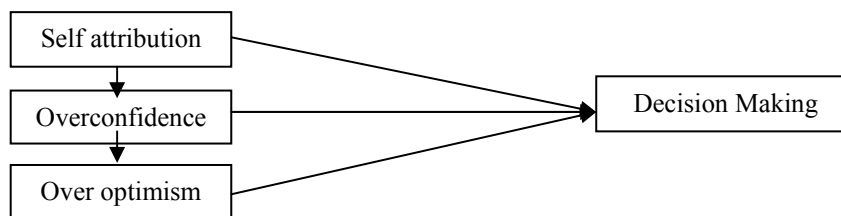
H3: There is negative relationship between self attribution and Rational Decision making.

H4: There is negative relationship between overconfidence and Rational Decision making.

H5: There is negative relationship between overoptimism and Rational Decision making.

## 2.7. Conceptual model of the study

**Figure 2.1**

## 3. Material and Methods

### 3.1. Questionnaire Design

The questionnaire is designed in a way to inspect how individual investors respond to mental problems introduced to them. To determine this we presented the investors with set of questions related to the mental problems, whole questionnaire was joined by picked concepts, and questions were organized in such manner that particular conducts could follow from given responses. The way of inquiries was paired with immediate and circuitous. So some questions were direct, giving regulates replies; meanwhile some questions were solicited from by implication, with sample the scale evaluates. The questions were related to self-attribution bias, overconfidence bias and overoptimism bias and the final portion of the questionnaire was to assess the performance of the investors, that how successful they are in their decision making. This approach was imperative since we are contemplating mental propensities. We can't pose query like this, "Are you impacted from overconfidence?". Questionnaire used for the study are based on the five scale likert. Questionnaires have been taken from existing literature and books (Verheul and Carree, 2007); (Hoffman et al., 2010) and (Seppälä, 2009). The primary purpose of these questionnaires is to detect whether person is suffering from that specific bias or not. Most of the questions are like problems to whom respondent have to give responses. A value will be assign to the responses then these will be used in final statistical technique to prove the model.

### 3.2. Data

The total sum of the member is called population. The sum number of the selected person's of chosen from population is called as population size. In this research the population incorporates investors of Islamabad stock exchange. It is a choice of a component of an aggregate population with the perspective to find data about the entire and chose part which is utilized to figure out the aspects of the entire population as distinguished as sample. For the accumulation of information the testing systems are utilized that have distinctive preferences over statistics. Case in point, this information accumulation strategy is less expensive; give the expedient approach of information gathering and more stupendous exactness. In this research, purposive sampling method has been utilized for the accumulation of information. In this information gathering procedure, a poll involving 24 questions was used than directly went to the Islamabad stock exchange and brokerage houses of twin urban communities Islamabad and Rawalpindi to get the quantitative information on inquiries from investors.

### 3.2.1. Sample size

Sample size of the investors from Islamabad stock exchange was of 220. Since there are 24 questions in the questionnaire so minimum sample size should be 5×24 =120 (Krejcie, 1970). The questionnaire was distributed among the investors through brokers.

### 3.2.2. Data collection

By visiting Islamabad Stock Exchange and meeting with brokers and make request to give access to the actual investors whom have accounts with them. Questionnaires were distributed among the investors and filled questionnaires were received.

### 3.3. Data analysis tool

Structural equation modeling is used to analyze the hypothesis.

$$OC_i = \sum_{i=1}^{n} \beta_i SA_i + \varepsilon$$

$$OO_i = \sum_{i=1}^{n} \beta_i OC_i + \varepsilon$$

$$DM_i = \sum_{i=1}^{n} \beta_i SA_i + \sum_{i=1}^{n} \beta_i OC_i + \sum_{i=1}^{n} \beta_i OO_i + \varepsilon$$

### 3.4. Analysis of data

Editing of survey response for detecting and improving errors and omissions was performed to achieve most favorable standards of data quality. Primarily data was entered in SPSS 18 version. In this research Cornbach's alpha is utilized to calculate the reliability and to calculate validity CFA was utilized on the Questionnaire, and then SEM is used to analyze the final model. Firstly, the reliability test was utilized to check consistency of investor's reactions.

According to (Hair, 1998) Reliability is the level of consistency around the numerous estimations of the variable, while reliability demonstrates compactness in the discoveries of examination study. The best and generally acknowledged register of reliability is inward consistency. And this reliability is obtained by coefficient alpha also known as Cronbach's alpha. For figuring consistency estimations around different variables, reliability test was run to determine it.

## 3.5. Pilot study

Keeping in mind the end goal to assess the different psychometric qualities of the instruments pilot study was performed on the specimen of 60 investors. The purpose of conducting the pilot study was to determine the validity and reliability of the questionnaire, and after that this questionnaire could be used for the final study.

## 3.6. Sample of the study

The following table represents the sample of the pilot study:

**Table 3.1**

| Groups | Subgroups | F | % | Total |
|---|---|---|---|---|
| Gender | Male | 60 | 100% | |
| | Female | 0 | 0% | 60 |
| Qualification | Intermediate | 1 | 1.7% | |
| | Bachelor | 36 | 60% | |
| | Master | 23 | 38.3% | 60 |
| | M.phl | 0 | 0% | |
| | PhD | 0 | 0% | |
| | Total | 60 | 100% | |
| Age | 18-25 | 2 | 3.3% | |
| | 25-32 | 17 | 28.6% | |
| | 32-39 | 22 | 36.6% | |
| | 39-46 | 11 | 18.3% | 60 |
| | 46-52 | 5 | 8.3% | |
| | 52-59 | 3 | 5% | |
| | Above 59 | 0 | 0% | |
| | Total | 60 | 100% | |
| Experience | < 1 year | 3 | 5% | |
| | 1-2 year | 14 | 23.3% | |
| | 2-3 year | 35 | 58.3% | 60 |
| | 3-4 year | 6 | 10% | |
| | >4 year | 2 | 3.3% | |
| | Total | 60 | 100% | |

## 3.7. Confirmatory factor analysis

The Confirmatory factor analysis (CFA) directed in survey to build validity and legitimacy. The validity of the constructs of self attribution bias, overconfidence and overoptimism was determined by using CFA analysis. And following validity properties are obtained $\chi 2$ (chi square), $\chi 2/df$, AGFI (Adjusted goodness of fit), TLI (Tucker-Lewis coefficient)also known as non normed fit index , df (degree of freedom), p-value, GFI (goodness of fit), CFI (comparative fit index) and RMSEA (root mean square error of approximation).

As suggested by (Bentler and Hu, 1991) the root mean square error of approximation must be equal or below 0.80 and comparative fit index, Tucker-Lewis coefficient, goodness of fit should be around 0.90 or above it while $\chi2/df$ should be in between 5 to 3 scale for the model to be fit and accurate. Confirmatory Factor Analysis was applied on the 13 constructs of self-attribution, 5 constructs of overconfidence, 3 constructs of overoptimism and 5 constructs of decision making.
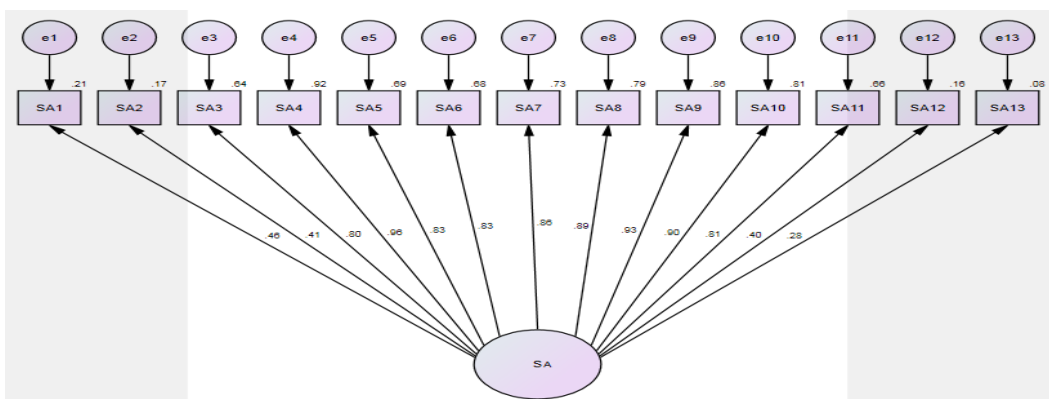
**Figure 3.1**



**Table 3.2.** *CFA of Self-attribution*

| Elements | Estimates | Elements | Estimates |
|---|---|---|---|
| $\chi2$ | 138.418 | Df | 65 |
| $\chi2/df$ | 2.130 | p-value | .000 |
| AGFI | .650 | GFI | .750 |
| TLI | .870 | CFI | .892 |
| RMSEA | .98 | | |

The Confirmatory factor analysis (CFA) of self attribution shows a peripheral fit. The quality of $\chi2/df$ (Chi-square/df) is 2.130 that are less than 3 and according to (Kline, 1998) $\chi2/df$ equal or less than 3 is acceptable while (Ullman, 2001) suggested that $\chi2/df$ equal or less 2 indicates moderate fit but less than 1 is not acceptable fit. The value of AGFI (adjusted goodness of fit index) is 0.650 and GFI (goodness of fit index) is 0.750 which is also indicating a moderate fit, the value of AGFI and GFI close to 0.90 or above is considered good fit. The values of CFI (comparative fit index) and TLI (Tucker-Lewis coefficient) are 0.892 and 0.870 which are just below the benchmark of 0.90. The value of RMSEA (root-mean-square error of approximation) is 0.98 which is too high for the model to be good fit. So all the values are indicating that model for validity of self attribution is a moderate fit.

The estimated values of the constructs of self attribution bias are 0.45, 0.41, 0.80, 0.96, 0.83, 0.83 0.86, 0.89, 0.90, 0.90, 0.81, 0.40, and 0.28. The greater part of the previously stated qualities are above the commendable level of 0.3, from  this henceforth they are recognized exceptional with p-regard < 0.001.

The R² qualities for SA(1,2,3,4,5,6,7,8,9,10,11,12,13) independently, these values show the rate of assortment in each point that is clarified by the components of SA. From the impacts it could be discerned that Sa4 and is the best markers for this fabricate, with the most surprising institutionalized examinations of 0.96 and the most decreased marker is Sa13 with the worth 0.28. So Sa13 could be discarded from final survey. Since all other question's values are to a good

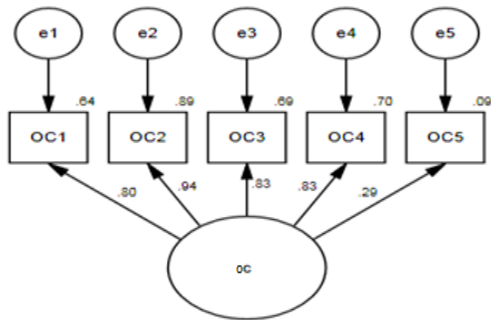degree close to the benchmarked qualities so the model could be appropriated.

**Figure 3.2**



**Table 3.3.** *CFA of overconfidence*

| Elements | Estimates | Elements | Estimates |
|----------|-----------|----------|-----------|
| χ2 | 11.301 | Df | 5 |
| χ2/df | 2.260 | p-value | .046 |
| AGFI | .791 | GFI | .930 |
| TLI | .928 | CFI | .964 |
| RMSEA | .97 | | |

The Confirmatory factor analysis (CFA) of overconfidence shows a peripheral fit. The quality of χ2/df (Chi-square/df) is 2.260, that is less than 3 and according to (Kline, 1998) χ2/df equal or less than 3 is acceptable while (Ullman, 2001) suggested that χ2/df equal or less 2 indicates moderate fit but less than 1 is not acceptable fit. The value of AGFI (adjusted goodness of fit index) is .791 and GFI (goodness of fit index)  is .930 which is also indicating a moderate fit, the value of GFI is above the bench mark of .90 or above so it is considered good fit. The values of CFI (comparative fit index) and TLI (Tucker-Lewis coefficient) are 0.964 and 0.928 which are just above the benchmark of .90. The value of RMSEA (root-mean-square error of approximation) is 0.97 which is too high for the model

to be very good fit. So all the values are indicating that model for validity of overconfidence is moderate fit.

The estimated values of the constructs of overconfidence bias are 0.80, 0.94, 0.83, 0.83 and 0.29. The greater part of the previously stated qualities are above the commendable level of 0.3, from this henceforth they are recognized exceptional with p-regard < 0.001.

The $R^2$ qualities for OC1, OC2, OC3, OC4 and OC5 independently, these values show the rate of assortment in each point that is clarified by the component of OC. From the impacts it could be discerned that OC2 and is the best markers for this fabricate, with the most surprising institutionalized examinations of 0.94 and the most decreased marker is OC5 with the worth 0.29 which is below to the benchmarks of 0.30. So OC5 could be discarded from final survey and was not included in the final questionnaire used for the collection of data for the final study. Since all other question's values are to a good degree close to the benchmarked qualities so the model could be appropriated.
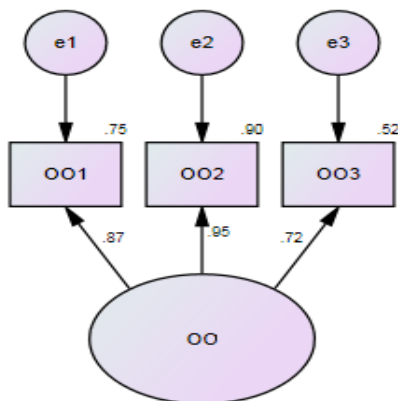
**Figure 3.3**



**Table 3.4.** *CFA of overoptimism*

| Elements | Estimates | Elements | Estimates |
|----------|-----------|----------|-----------|
| χ2 | 1.496 | Df | 1 |
| χ2/df | 1.496 | p-value | .221 |
| AGFI | .901 | GFI | .984 |
| TLI | .983 | CFI | .994 |
| RMSEA | .092 | | |

The Confirmatory factor analysis (CFA) of overoptimism shows a peripheral fit. The quality of χ2/df (Chi-square/df) is 1.496, that is less than 2 and according to (Kline, 1998) χ2/df equal or less than 3 is acceptable while (Ullman, 2001) suggested that χ2/df equal or less 2 indicates moderate fit but less than 1 is not

acceptable fit. The value of AGFI (adjusted goodness of fit index) is 0.901 and GFI (goodness of fit index) is 0.984 which is also indicating a good fit, the value of GFI and AGFI is above the bench mark of 0.90 or above so it is considered good fit. The values of CFI (comparative fit index) and TLI (Tucker-Lewis coefficient) are 0.983 and 0.994 which are just above the benchmark of .90.

The value of RMSEA (root-mean-square error of approximation) is 0.92, which is too high for the model to be very good fit; the value of RMSEA should be below 0.80 to be acceptable the more closely it gets to 0.01 the more suitable the model is. So all the values are indicating that model for validity of overconfidence is moderate fit. The estimated values of the constructs of overoptimism bias are 0.87, 0.95 and 0.72. The greater part of the previously stated qualities are above the commendable level of 0.3, from this henceforth they are recognized exceptional with p-regard < 0.001.

The R² values for OO1, OO2 and OO3 independently, these values show the rate of assortment in each point that is clarified by the component OO. From the impacts it could be discerned that OO2 and is the best markers for this fabricate, with the most surprising institutionalized examinations of 0.95 which is a very good value of the validity for an instrument and the most decreased marker is OO3 with the worth 0.72.

Since all the values are very close to the benchmarked values so the model can be accepted and no question will be removed from final study and all the questions of overoptimism bias will remain in the final questioner used for the collection of data for the final study. So all question's values are to a good degree close to the benchmarked qualities so the model is appropriate.
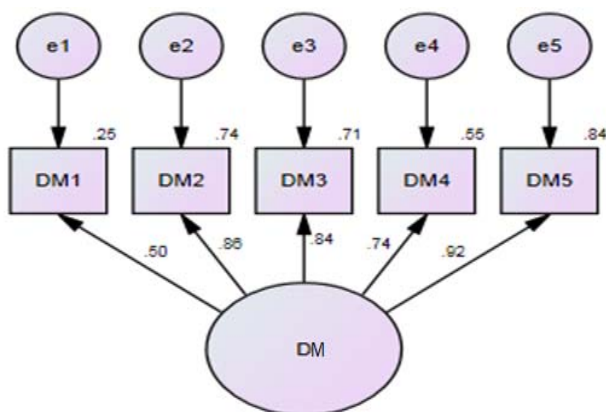
**Figure 3.4**

**Table 3.5.** *CFA of Decision Making*

| Elements | Estimates | Elements | Estimates |
|----------|-----------|----------|-----------|
| $\chi^2$ | 27.271 | Df | 5 |
| $\chi^2/df$ | 2.454 | p-value | .000 |
| AGFI | .543 | GFI | .848 |
| TLI | .766 | CFI | .883 |
| RMSEA | .275 | | |

The Confirmatory factor analysis (CFA) of Decision Making shows a peripheral fit. The value of $\chi^2/df$ (Chi-square/df) is 2.454, that is more than 2 and according to (Kline, 1998) $\chi^2/df$ equal or less than 3 is acceptable while (Ullman, 2001) suggested that $\chi^2/df$ equal or less 2 indicates moderate fit but less than 1 is not acceptable fit. The value of AGFI (adjusted goodness of fit index)  is 0.543 and GFI (goodness of fit index)  is 0.848 which is also indicating a moderate fit, the value of GFI and AGFI is below the bench mark of 0.90 or above so it is moderate good fit. The values of CFI (comparative fit index) and TLI (Tucker-Lewis coefficient) are 0.883 and 0.766 which are below the benchmark of 0.90.

The value of RMSEA is (root-mean-square error of approximation) 0.275, which is very good for the model fit. So all the values are indicating that model for validity of Decision making is moderate fit. The estimated values of the constructs of Decision making are 0.50, 0.86, 0.84, 0.74 and 0.92. The greater part of the previously stated qualities are above the commendable level of 0.3, from  this henceforth they are recognized exceptional with p-regard < 0.001.

The $R^2$ qualities for DM1, DM2, DM3, DM4 and DM5 independently, these values show the rate of assortment in each point that is clarified by the component of DM. From the impacts it could be discerned that DM5 and is the best markers for this fabricate, with the most surprising institutionalized examinations of 0.92 and the most decreased marker is DM with the worth 0.72. Since all the values are very close to the benchmarked values so the model can be accepted and no question will be removed from final study.

So all other the qualities are to a good degree close to the benchmarked qualities so the model is appropriate for conducting the final study. The confirmatory factor analysis of all the variables is showing that the questionnaire is valid and can be used for the data collection of the final study. Only two questions are removed from the final study and remaining is included in questionnaire.

## 3.8. Reliability analysis (N = 60)

Table 3.6 depicts reliability of instruments of the study indicates the scale of all the items are within the satisfactory parameters. Estimates of Cronbach's alpha for each item are above the 0.80 which indicates good reliability of the questionnaire.

The Cronbach's alpha of Self attribution is 0.926, overconfidence is 0.856, overoptimism is 0.852 and Decision making is 0.879. For the 13 items of self-attribution, 5 items of overconfidence, 3 items of overoptimism and 5 items of decision making.

**Table 3.6**

| Scale | No. of Items | Value of Cronbach's alpha |
|---|---|---|
| Self attribution | 13 | .926 |
| Overconfidence | 05 | .856 |
| Overoptimism | 03 | .852 |
| Decision making | 05 | .879 |

The results obtained from The Confirmatory factor analysis (CFA) and Cronbach's alpha implemented on the pilot study suggest that the model is appropriate and fit for the conduction of final study. So final study is conducted using sample size of 220 investors from Islamabad stock exchange, next chapter includes the SEM test and its results on final study.

## 4. Results and discussion

### 4.1. Results

The following table represents the sample of the study:

**Table 4.1**

| Groups | Subgroups | F | % | Sum |
|---|---|---|---|---|
| Gender | Male | 217 | 98.6% | |
| | Female | 3 | 1.4% | 220 |
| Qualification | Intermediate | 7 | 3.18% | |
| | Bachelor | 84 | 38.19% | |
| | Master | 105 | 47.71% | 220 |
| | M.phl | 19 | 8.64% | |
| | PhD | 5 | 2.28% | |
| | Total | 220 | 100% | |
| Age | 18-25 | 12 | 5.5% | |
| | 25-32 | 69 | 31.3% | |
| | 32-39 | 76 | 34.5% | |
| | 39-46 | 24 | 10.9% | 220 |
| | 46-52 | 18 | 8.2% | |
| | 52-59 | 16 | 7.21% | |
| | Above 59 | 5 | 2.3% | |
| | Total | 220 | 100% | |
| Experience | < 1 year | 38 | 17.3% | |
| | 1-2 year | 59 | 26.8% | |
| | 2-3 year | 57 | 25.9% | 220 |
| | 3-4 year | 46 | 20.9% | |
| | >4 year | 20 | 9.1% | |
| | Sum | 220 | 100% | |

**Table 4.2.** *Descriptive statistics*

|         | N   | Minimum | Maximum | Mean   | Std. Deviation |
|---------|-----|---------|---------|--------|----------------|
| SA      | 220 | 1.50    | 4.83    | 3.3781 | .99680         |
| OC      | 220 | 1.25    | 4.75    | 3.4955 | 1.20192        |
| OO      | 220 | 1.33    | 4.67    | 3.4016 | 1.11338        |
| DM      | 220 | 1.40    | 4.60    | 2.5964 | .97811         |
| Valid N | 220 |         |         |        |                |

Table 4.2 depict reliability of instruments of the study indicates the scale of all the items are within the satisfactory parameters. Estimate Cronbach's alpha is above the .80 which indicates good reliability.

## 4.1.1. Reliability of final model (N = 220)

**Table 4.3**

| Scale          | No. of Items | Value of Cronbach's alpha |
|----------------|--------------|---------------------------|
| Self attribution | 12         | .929                      |
| Overconfidence | 04           | .942                      |
| Overoptimism   | 03           | .878                      |
| Decision making | 05          | .884                      |

**Figure 4.1.** *Structural model*          **Figure 4.2.** *Unstandardized estimates*
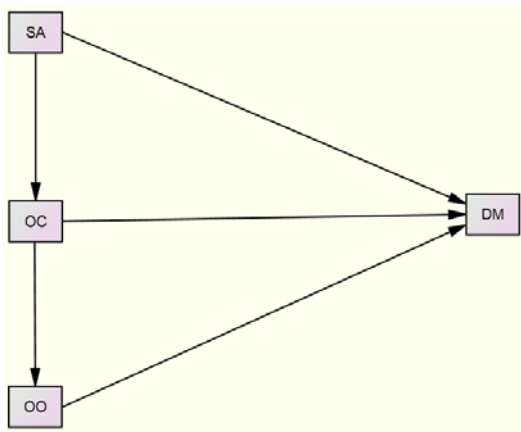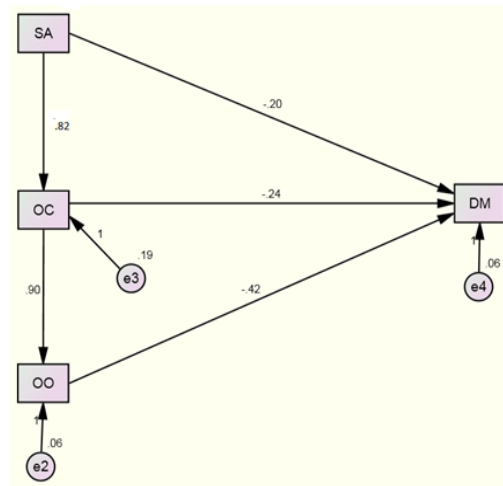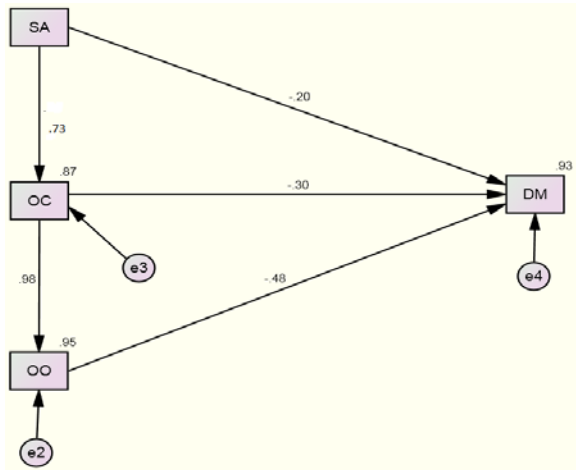
**Figure 4.3.** *Standardized estimates*



## 4.1.2. Statistical results and interpretation:

**Table 4.4**

|   |   |   | Estimate | S.E. | C.R. | P | Result |
|---|---|---|---|---|---|---|---|
| OC | <--- | SA | .822 | .030 | 27.436 | *** | accepted |
| OO | <--- | OC | .904 | .014 | 66.891 | *** | accepted |
| DM | <--- | SA | -.196 | .047 | -4.206 | *** | accepted |
| DM | <--- | OC | -.243 | .075 | -3.250 | .001 | accepted |
| DM | <--- | OO | -.422 | .071 | -5.964 | *** | accepted |

All the probability values are less than 0.05 so all the hypothesis are accepted. The negative values indicate the negative effect as indicated in hypothesis. The (***) indicate that the p-value is less than .001 which shows that all the estimates are significant.

These regression weights are indicating that when self-attribution (SA) bias increases by 1 unit the overconfidence (OC) bias increases by 0.822 units. The positive sign indicates that the increase in self-attribution bias increases the overconfidence bias. Similarly when overconfidence (OC) bias increases by 1 unit the overoptimism (OO) bias increases by .904 units. The positive sign indicates that the increase in overconfidence bias increases the overoptimism bias. The results are in line with the studies of (Gervais and Odean, 2001), (Seppälä, 2009), (Choi and Dong, 2008), (Wolosin and Till, 1973). The third regression estimate shows that when self-attribution (SA) bias increases by 1 unit the possibility of making a rational decision (DM) decreases by -0.196 units. The negative sign indicates the inverse relationship among self-attribution bias and rational decision making. The fourth regression estimate shows that when overconfidence (OC) bias increases by 1 unit the possibility of making a rational decision (DM)

decreases by -0.243 units. The negative sign indicates the inverse relationship among overconfidence bias and rational decision making. The fifth regression estimate shows that when overoptimism (OO) bias increases by 1 unit the possibility of making a rational decision (DM) decreases by -0.422 units. The negative sign indicates the inverse relationship among overoptimism bias and rational decision making. Thus all the results support the hypothesis of the study. The results are in line with the findings of (Gervais and Odean, 2001) and (Shefrin, 2007).

### 4.1.3. Correlation Matrix

**Table 4.5**

|       | 1       | 2       | 3       | 4 |
|-------|---------|---------|---------|---|
| 1 SA  | 1       |         |         |   |
| 2 OC  | .931**  | 1       |         |   |
| 3 OO  | .948**  | .976**  | 1       |   |
| 4 DM  | -.933** | -.954** | -.962** | 1 |

The table represents the correlation of all the variables. The correlation is noteworthy at the 0.01 level (2-tailed) ranging from .931 to -.962. It is concluded that SA, OC and OO are found positively correlated and significant while the effects of SA, OC and OO are found negatively correlated with DM. The findings are similar to what (Hastorf et al., 1970), (Seppälä, 2009) and (Choi and Dong, 2008) studied.

### Conclusions

The empirical evidences shows that the proposed hypothesis are correct thus it is proved that the Pakistani Investors of Islamabad Stock exchange who suffer from either of these Biases i.e. self attribution, overconfidence and overoptimism make suboptimal decisions and their outcome is less then what they expect. The findings on self attribution bias show that it negatively affects the rational decision making of investors. The findings are similar to what (Gervais and Odean, 2001), (Seppälä, 2009) and (Choi and Dong, 2008) and found in their study of self attribution bias, that self-attribution bias affects the impression of people regarding their abilities and diverts them from learning from past successes. Self-attribution bias is s significant channel that hinder people to link their successes with their internal forces e.g. personal capabilities, and their nonsuccesses with external forces (e.g. bad luck). Furthermore the evidence shows that the investors who are not exposed or aware of the biases make rational decisions and thus they enjoy more favorable outcome. This evidence also supports the second object of the study, which was to study the interrelationship among these biases. It is examined that the biases are related and if an investor suffer from one bias there is a higher possibility that he/she would eventually

exposed to another bias. This study shows that self attribution will lead to overconfidence. The finding of this research are also in line with the results of (Miller and Ross, 1975), (Shiller, 2005), (Malmendier and Tate, 2005) and (Gervais and Odean, 2001) who measured that self attribution bias induces overconfidence and overconfident investors make suboptimal decisions thus they fail to generate the desired outcomes. While on the other hand the rational investors will make optimal decisions and generate the desired results. So it is established that self attribution motivates overconfidence and overconfidence causes overoptimism in investor behavior, hindering the investor from rational decision making. The findings on overconfidence bias show that it negatively affects the rational decision making of investors. The findings are similar to what (Barber and Odean, 2001) and (Seppälä, 2009).

Overconfidence will also lead to overoptimism, as previously proved by (Weinstein, 1980). Investors, who are overconfident about their success, show inclination towards overoptimism. The findings on overoptimism bias show that it negatively affects the rational decision making of investors. The findings are similar to what (Weinstein, 1980) proved in the studies. These biases individually affect the decision making. But theses biases are dependent to each other. When an investor suffers from self attribution bias it is higher possibility that investor will be exposed to overconfidence and overoptimism. Firstly, self attribution generates overconfident behavior in investors and secondly overconfidence leads to overoptimism. So it is found that investors will become overconfident and overoptimistic when they credit themselves of their success and blame other factors for failures.

## Limitations and recommendations

The limitations include that in this study we took response from the investors and it is known that investors themselves often are unaware of the modern world financial terminologies, although it is tried to minimize the effect of their lack of knowledge on their responses but it may have some effect. The data is collected from Islamabad stock exchange and brokerage house of Islamabad and Rawalpindi, so this data might not be applicable for whole Pakistan as there could be regional influence on other geographical areas. And also the data is dependent on the motives, willingness and consent of each individual and the data might not represent the true feelings of individuals who responded. Another limitation is that all most all of the respondents were male investors and very few female investors were available. So it is recommended that in future researches more female investors are included so the effect of gender could be explored as well.

Behavioral Finance is an exceptionally intriguing area of finance, so it is suggested that have a full in-depth analysis of behavior finance theories before

conducting the research, by keeping in mind that it is not a simple area for research and study. Prescription to future research is that to lead comparable research however attempt in escalation size of the sample. From the study 1 situation is to verify, at how much extent these results might sum up the exploration information on greater citizenry. For managing this situation it is recommend to use 2 conceivable exploration methods, 1: expand size of sample 2: limit exploration in precise setting. Behavioral finance is a vast field; there are hundreds of biases still to be search upon. Since this research concludes that these biases are interrelated with each other so further biases could be added with these biases for research purposes. One thing which could be possible in future that I might be possible to study the effect of biases on female investors, because the majority investors participated in this research are male investors. It would be very interesting aspect because mental psychology in gender also differs. So it will be a unique dimension for further research for Pakistani researchers.

## Implementations

A very few researches have been done on the physiological aspect of financial trouble in Pakistan. Individual can utilized findings of this research help rationalize their decision making. The other financial corporation's can also use it can additionally utilize it for yearly appraisal of fiscal position of the organization and on this premise further choice identified with continuation, end, or recharging of the strategies could be defined. It is found that researchers provided most of the evidence on the individual relationships among the biases, heuristics and irrational behavior and decision making, market anomalies. It was found that there is relationship exists among these biases and heuristics but few scholarly work over it found. We develop the model depicting the relationships among these behavioral aspects and finally proving it through empirical evidence.

So financial advisor, brokers, consultant, and investors themselves can identify the seminal causes of irrationality and can significantly improve or enhance their cognitive activities. As a result they can improve their financial decision making because they are now more aware of biases that they suffer. This study can be an important participation by studding affiliation among biases and how one bias generates another bias. So by the help of this study individuals can identify the biases and how to counter them for example if a broker knows that his investor is suffering from overconfidence bias, the broker could easily conclude that it is self attribution bias which is generating overconfidence in investor, so the broker can take steps to eradicate the self attribution bias and overconfidence bias will automatically be controlled then.

## References

Barber, B. and Odean, T. (2001). "Boys will be boys: Gender, overconfidence, and common stock investment", Quarterly Journal of Economics, vol. 116, pp. 261-292

Baumeister, R.F., Tice, D.M. and Hutton, D. (1989). "Self-Presentational Motivations and Personality Differences in Self-Esteem". DOI: 10.1111/j.1467-6494.1989

Bentler, P.M. and Hu, L. (1991). "Fit indices in covariance structure modeling: Sensitivity to underparameterized model misspecification", *Psychological Methods,* 3(4), December, pp. 424-453

Bernstein, P.L. (2009). *Against the Gods: The Remarkable Story of Risk,* John Wiley & Sons Inc.

Brown, G., Cliff, M. (2005). "Investor Sentiment and Asset Valuation", *The Journal of Business.* vol. 78, issue 2, Chicago, pp. 405-36

Choi, D. and Dong, L. (2008). *A test of the self-serving attribution bias: evidence from mutual funds*, Hong Kong University of Science and Technology

Coval, J., Hirshleifer, D., Teoh, S.H. (2001). "Self-Deception and Deception in Capital Markets". Austrian Ministry of Science Workshop, Paris, December 7-8

Epstein, S. (1991). "Cognitive-experiential self-theory: An integrative theory of personality", in R. Curtis, the relational self: *Convergences in psychoanalysis and social psychology*, pp. 111-137, New York: Guilford Press

Fama, E. (1970). "Efficient capital markets: A review of theory and empirical work", *Journal of Finance*, 25(2), pp. 383-417

Gervais, S. and Odean, T. (2001). "Learning to Be Overconfident", *The Review of Financial Studies,* vol. 14, no. 1, pp. 1-27

Gervais, S., Heaton, J., Odean, T. (2002). "The Positive Role of Overconfidence and Optimism in Investment Policy", pp. 1-36, The Rodney L. White Center for Financial Research

Golden, J., Milewicz, J., Herbig, P. (1994). "Forecasting: Trials and Tribulations", *Management Decision,* no. 32, issue 1, pp. 33-4

Hair, J. (1998). *Multivariate Data Analysis,* 5th edition, Upper Saddle River, NJ: Prentice Hall

Hastorf, A., Schneider, D., Polefka, J. (1970). *Person Perception,* Addison-Wesley, Reading, Mass

Hirshleifer, D. (2001). "Investor Psychology and Asset Pricing", *Journal of Finance*, no. 56, pp. 1533-1597

Hoffman, A., Shefrin, H., Pennings, J. (2010). "Behavioral Portfolio Analysis of Individual Investors", *European Journal of Finance*, no. 9, pp. 437-81

Kahneman, D., Tversky, A. (1979). "Prospect theory: an analysis of decision under risk", *Econometrica*, 47(2), pp. 63-91

Kline, R. (1998). *Principles and Practice of Structural Equation Modeling,* New York: The Guilford Press

Krejcie, R.V. (1970). *Determining sample size for research activities,* University of Minnesota, Duluth, 30, pp. 607-610

Malmendier, U., Tate, G. (2005). "Does Overconfidence Affect Corporate Investment? CEO Overconfidence Measures Revisited", *European Financial Management*, 11(5), pp. 649-659

Meinert, J. (1991). "Financial Advice from a Business Veteran", *Journal of Accountancy*, no. 171, issue 6, pp. 134-4

Miller, D.T. and Ross, M. (1975). "Self-serving Biases in Attribution of Causality: Fact or Fiction?", *Psychological Bulletin,* no. 82, pp. 213-225

Odean, T. (1998). "Volume, volatility, price and profit when all traders are above aver-age", *Journal of Finance*, 53, pp. 1887-1934

Olsen, R. (1998). *Behavioural finance and its implications for stock Price volatility*, Association for Investment Management and Research, Financial Analysis Journal, vol. 54, no. 2, pp. 10-18

Russo, E., Schoemaker, P. (1992). "Managing Overconfidence", *Sloan Management Review*, no. 33, pp. 7-17

Schneider, D., Hastorf, A., Ellsworth, P. (1979). *Person Perception,* Addison-Wesley, Pub. Co.

Seppälä, A. (2009). "Behavioral Biases of Investment Advisors: The Effect of Overconfidence bias, self-attribution bias and Hindsight", Thesis retrieved from http://hsepubl.lib.hse.fi/FI/ethesis/pdf/12150/hse_ethesis_12150.pdf

Shefrin, H. (2007). *Behavioral Corporate Finance. Decisions that Create Value,* McGraw-Hill/Irwin: New York

Shiller, R. (2005). *Irrational Exuberance,* Princeton: Princeton University Press

Svenson, O. (1981). "Are we all Less Risky and More Skillful than our Fellow Drivers?", *Acta Psychologica*, no. 47, pp. 143-148

Taylor, S. and Brown, J. (1988). "Illusion and well-being: A Social Psychology Perspective on Mental Health", *Psychological Bulletin,* no. 103, pp.193-210

Tversky, K. (1995). "The Psychology of Risk", in Behavio*ral Finance and Decision Theory in Investment Management*, CharlottesvillE, VA: AIMR

Ullman, M.T. (2001). *Declarative/Procedural Model,* Cambridge, MA: MIT Press

Verheul, I., Carree, M. (2007). "Overoptimism among entrepreneurs in new ventures: the role of information and motivation", Scales Research Reports H200723.

Weinstein, D. (1980). "Unrealistic Optimism about Future Life Events", *Journal of Personality and Social Psychology*, no. 39, pp. 806-820

Weinstein, D., Kline, R. (2002). "Resistance of Personal Risk Perceptions to Debiasing Interventions", in Th. Gilovich, D. Griffin and D. Kahneman, *Heuristics and Biases: The Psychology of Intuitive Judgment*, Cambridge, UK: Cambridge University Press

Wolosin, R., Till, J. (1973). "Effects of Cooperation and Competition on Responsibility Attribution After Success and Failure", *Journal of Experimental Social Psychology*, no. 9, pp. 220-235

Yosef, B., Kumar, A. (2012). "Political Climate, Optimism, and Investment Decisions", AFA 2012 Chicago Meetings Paper

**Appendix. List of abbreviations**

| | |
|---|---|
| BF | Behavioral Finance |
| SA | Self-attribution |
| OC | Overconfidence |
| OO | Overoptimism |
| DM | Decision Making |
| SEM | Structural Equation Modeling |
| RMSEA | Root mean square error of approximation |
| GFI | Goodness-of-fit index |
| AGFI | Adjusted goodness-of-fit index |
| CFI | Comparative fit index |
| TLI | Tucker-Lewis coefficient |
| CFA | Confirmatory Factor Analysis |