Mediating Role of Risk Perception between Cognitive Biases and Risky Investment Decision: Empirical Evidence from Pakistan’s Equity Market
Muhammad Ishfaq*, Zahid Maqbool†, Saira Akram‡, Sanaullah Tariq§ and Muhammad Kashif Khurshid**

Abstract
Investors are the key players in stock exchange. Sometimes the investor’s decisions are rational and sometimes these decisions consist of irrational behavior. This study examined and explored the impact of cognitive biases on risky investment decision and more specifically the mediating role of risk perception is explored. There are various biases which puteffect on investor decisions but this study explored the combined effect of two biases i.e. heuristic and overconfidence on risk perception, which is mediating variable and also examined the effect of these cognitive biases on risky investment decision. This study is conducted on the investors of Pakistan Stock Exchange. Adapted questionnaires are used. Initially 250 questionnaires were distributed out of which 215 questionnaires were returned. The data is run on SPSS 20. Cronbach’s alpha is used to check the reliability of the instrument. Process macro is applied to check the mediating role of risk perception between cognitive biases and risky investment decision. The study finds a significant relationship between cognitive biases (heuristic and overconfidence) and risky investment decisions. Study also explored that risk perception play a mediating effect between cognitive biases and risky investment decision.

Keywords: Heuristic Bias; Overconfidence Bias; Risk Perception

Introduction
Behavioral finance shows how individual investors interpret and judge the information to take risky investment decisions. Behavioral finance defines the mental abilities which are about attention, memory, reasoning, problem solving, decision making and comprehension. In psychology cognition is related to mind, thinking and intelligence. In simple words we can say that cognition is related to the higher mental process such as thinking, feeling, logical ability, analytical ability, problem solving and decision making (Singh & Bhowal, 2010).

* Muhammad Ishfaq, Assistant Professor, Riphah International University, Islamabad.
† Zahid Maqbool, Lecturer, Riphah International University, Faisalabad Campus
‡ Saira Akram, Relationship Manager, Habib Bank Limited
§ Sanaullah Tariq, Lecturer, Riphah International University, Faisalabad Campus
** Muhammad Kashif Khurshid, Lecturer, National University of Modern Languages (NUML) Islamabad. Email: kashif041@gmail.com
Bias is leaning of character to present a viewpoint often accompanied by rejection consider the possible alternative view. Bias can be defined as “one sided not having an open mind”. People are biased toward individual, race and nation (Ferraro, Rogoff, & Rossi, 2015).

Decision making can be explained as the procedure associated with buying a certain choice at an amount of solutions. Stock market changes every day without any change inside the basics of the organization. Decision making is a cognitive process outcome in the selection of any affirmation about many alternative possibilities. Making is a final choice or selection of anything (Bessler & Wolff, 2015). The purpose of this study is to examine those factors and biases which are effecting to investors while they are making risky decisions. Most of the studies explored the portfolio decisions but there is a lack of activity to investigate the biases which are effecting to risky investment decision. This study explores those biases which are effecting to risky investment decision which risk perception playing as a mediator between cognitive biases and risky investment decision.

Theories of behavioral finance
Mental model
A mental model shows how someone’s work in the real world and express his thought process. It belongs to investors or human psychological representations of real, assumption base, or imaginary environment and internally thinking about the external environment. It is a description of investors consciously and unconsciously experiences and thoughts. Everyone has own experiences and thinking level. So they have own mental models, on the basis of these mental thinking and approach investors take decisions. Investors construct their mental model on the basis of their experiences and risk perception. Mental models are based on the generalization and assumptions of individual investors and on the bases of these imaginations investors make investment decisions and actions on it. Cognition is a higher mental process such as person's intuitive perception about his or her own acts and their consequences related to the decision making. Every person has some schemas about anything and according to that particular schema he or she takes decision.

Prospect theory
Expected Utility Theory states that investor who are involve in decision making differentiate between risky and uncertain outcomes and compare with their expected utility value. Expected utility theory is expressive model of decision making under risk. Tversky, Kahneman, and Moser (1990), developed a model which explains the risk in a different way.
Prospect theory explains that potential outcome before reaching the final outcome. It explains that investor’s decisions are not based on final outcome and results. They usually take decisions on the bases of potential losses and gains at the same time theory describe that investor’s preferences are inconsistent when the same choices are available in various forms. In case of prospect theory, the investor usually prefers to earn profit or sell shares even the profit is nominal. Once investor came to know about a profit, what so ever profit. He will immediately sell shares, not hold the securities or shares for a longer period of time.

Regret theory

Regret theory also postulate the risk perception and decision making behavior of the investor according to this theory sometimes investor wants to take risk and sometimes they avoid making investment. Both investment and risk are related to each other. There are two types of investors i.e. risk taker and risk averse. Regret theory relates to both types of investors. Some investors think that if they make investment and if particular value of portfolios or investment value drops then they will regret their decision. Other individuals or investors make investment because they will regret on their decision if particular investment value increases (Loomes et al., 1982).

The study analyzed those factors/biases which are effecting more to investor decision. Previous studies have been executed on the effect of authority on decision-making, but there has been inadequate research on this subject and more specifically in business settings.

Cognitive biases

The developed or urban market practices is positively related to rising and diversified market. Firms' entrance and survival in developed markets are features that are same in every market. However, cognitive biases are the biases that directly linked with the roles that are being played by other types of experiences and knowledge (Sultan, Bungener, & Andronikof, 2002).

Overconfidence

People are usually inclined to overestimation that are related to one’s own personality (Sahi, Arora, & Dhameja, 2013). They overestimate their abilities and evade consulting others in decision making practice. Overconfidence is defined as the determined overvaluation and over expectations of own risky investment decision. The recent studies indicated and stated that overconfidence increases with the absolute nonconformity and extra market knowledge from finest choices, with task and destination complexity that is making task difficult to understand like risky assets and decreases with individual observed ambiguity. According to (Bodnaruk & Simonov, 2015).
“Overconfidence is the sensation of knowing more than you actually do or of owning abilities that you do not own actually. It results investors in overestimating their knowledge and underestimating risks connected with decision”. Boonvorachote and Lakmas (2016) defined “Overconfidence is the extent to which people apprehend their own abilities and the bounds their knowledge”.

Heuristic

According to Chng (2009), heuristic judgment constitutes the only practical way to estimate uncertain element. Thus it is considered as the realistic method to evaluate uncertain elements. In fact, unlike what calculus, heuristic evaluation of estimations is based generally on abrupt solutions, all the factors of interests yet are not considered. But only the unusual features of the object being determined while taking the decisions. The way of the problem been formulated and the clarity which describes the problem and its solution, the extent of control to which the problem is evaluated, significance of the results, all the knowledge and information and relevant experience and so on are the part of it.

Risk Perception

The subjective judgment and thinking of customer and market situation is not only affected to investor but it also affects to the company. Risk perception has a vital position in equity market and the behavior of an investor that is focus of our research. Risk perception determines investor’s opinion when they evaluate past or how risk is associated with investment (Daskalaki & Skiadopoulos, 2016). Thus investor’s opinion is totally linked with the risk perception they possess. The concepts of uncertainty and risk were first defined by an economist Knight (1921) who differentiated the uncertainties which are either measurable or non-measurable. The concept of uncertainty and risk are associated and having a correlation with each other and determine the intensity of risk, how it is perceived by the investor. The risk cannot exist without uncertainty present in it (Daskalaki, Kostakis, & Skiadopoulos, 2014).

Uncertainty must be radically differentiated from the familiar conception of Risk, though it has never been properly separated. Thus risk is given more importance in the literature as compared to the uncertainty (De Bondt, Mayoral, & Vallet, 2013).

Investor’s perception can be measured by the portfolios results, where investors are like to invest to save their investment and due to fear of loss. In other words, we can say that when the possible outcome is different as compared to the present target then it means risk is not properly evaluated.
Objectives of the study
1. To discover the effect of heuristic and overconfidence on risky investment decision.
2. Effect of risk perception as a mediating variable between cognitive biases and risky investment decision.

Behavioral finance emphasizes and stress on the fact that our decisions are effected by human psychology, perception and thinking. When investors are going to make decision then various biases affecting their behavior. This study considering two biases, overconfidence and heuristic, which put effect on investor’s risky investment decisions while using risk perception as a mediator.

Significance of the study
Biases are our personal judgment about particular thing, what we like and dislike investor’s thoughts vary individual to individual. Traditionally researches investigated that investor’s acts and make decisions on rational basis. These traditional researches are not based on biases which are totally relevant to behavior of investors. The purpose of this study is to check the behavior of an investor and on which grounds their investment decisions are based so this study relates to behavioral finance. In this study, biases are explored and checked that which biases plays significantly role in risky investment decisions. Investors behave and make decisions on the basis of market information. Market information reflects investors’ behavior. Investors work like rational agents who want to increase their wealth and minimize risk by taking the accurate decisions at an accurate time. This study is an attempt to give view about the behavior of individual investors and also discuss different biases which may affect their behavior while taking risky investment decisions. Past studies only focused on different biases but this study combined these two variables and checks the effect of these two biases on risky investment decisions. In a growing and fast economy or due to globalization investors put their money in that area where returns are more than their competitors so at the same time where an investor want to take risky decisions due to gain higher profits, so investors have to take the decisions as soon as possible because market rapidly changes day by day. There is a need to take decision within short time, for this purpose investor use mental shortcuts or rule of thumb. This concept is called heuristic bias. Investors own experience and market information plays vital role in decision making. Market experience and too much returns and destiny gives and put impact on human psychology. Overconfidence is a concept that is came from psychology. Many studies analyzed the role played by overconfidence in the behavior of investors.
Basically investors are overconfident and make such risky decisions on the basis of their own thinking and psychology. Researchers also concluded that when an investor having a lot of money than they are overconfident to make investment and they take risky investment decisions.

**Literature Review**

Stock market fluctuations also affect to investors decisions. Sometimes investor decisions consist of actions and behaviors and sometimes decisions are based on investors thinking. Thinking relates to our personal perception and mental ability. Different kinds of biases are associated with investors thinking while making investment decisions. Heuristic is a bias which effects to investor liking and disliking behavior. If investors have to make quick risky decisions then on the bases of available information, actions and decisions are performed. Heuristic not only affect in risky investment decisions but it also effect to perception of investor.

Perception is process of higher mental functioning that provides awareness about the surroundings. Biased perception generates an imperfect awareness of reality. Due to this wrong perception the same informative impetus, different people perceive differently (Kumar, 2009). Study analysis whether effective or ineffective feelings for decision-making are mostly dependent on how people's experience those feelings and think about the investment decision during the taking decision (Mallik, K. A., Munir, M. A., & Sarwar, S. 2017). The investor's behavior depends on how the information available is offered and how much investors taking risk while making decisions; thus a investor's style Plays an important role in investment (Riaz, L., Hunjra, A. I., & Azam, R. I. 2012).

Investors personally act as a judge while making investment decisions (Narayan, Narayan, & Sharma, 2013). When they have enough knowledge they are not relying on experts and analyst reports. They are overconfident about their decisions, just because of their ability, experiences and knowledge towards particular market. May be the overconfidence is due to past huge returns on shares or having excessive amount to invest in any securities. So it put effect on their risk perception and risky investment decisions. Risk is factors which is reflecting or react on every investor. Some investors take risk lightly and some investors take it seriously. It fluctuates because of every investor has different mind of thinking and perception about investment. Investors past experiences indicate or reflect good or bad decisions. Risk perception effects to our thinking and negotiate with our mind. These biases heuristic, and overconfidence effecting to risk perception and risk
perception itself effecting to risky investment decisions. Risk perception is a mediator between cognitive biases and risky investment decision. So objective of our study is to find and locate these biases and also predict that at what level and extend these biases are effecting to risky investment decisions and risk perception.

It is common practice that investors make decisions on the bases of market information. They have no intention about their behavior and biases. Even most of the investors take decisions regarding securities without the intention and concept of biases. So it is important to discuss the theory of biases and how it affects to investor’s decision. Behavioral finance theory deals with investor feelings and emotions that how investor feels about particular company and price of their shares. Asadullah and Kundi (2013), explored the fact that investors decisions are based on their mental process and thinking and there are number of biases which are affecting investors decision either in positive way or in negative sense. Sometime the outcomes of the decision, which are based on different biases, are favorable and sometimes it put adverse effect on your investment. So there is a need to understand and create awareness among investors that market fluctuations not only affecting on their decision but also their own mental capabilities and thinking process reflect on them. Further some studies also explored that intuitive judgment, which deals with the biases; such developments demonstrated the effect of cognitive heuristics and biases on risk perceptions and behaviors (Boonvorachote & Lakmas, 2016).

Risk refers to the uncertainty about the investor’s decision whether portfolios or investment give significant or disappointing outcomes. Dittrich, Güth, and Maciejovsky (2005), stated that firstly investors have to calculate the risk and return combinations to make risky decisions. Risk perception also effected by time horizon it is effected deeply to risk perception. Maldonato and Dell’Orco (2011), investigated the effect of time constraints and duration on risk perception.

Another study done by Martin, Martin, and Kent (2009) take two time horizon of one year and five year and check the behavior of investor and concluded that risk perception is effected by time horizon. They also concluded that long term investment leads to long term returns and it effects higher risk perception. So time factor plays vital role on risky assets and results indicated that there is significant relation between long term and short term investment.

Risky investment decision is the main power behind investment in the financial market. The relationship is more elaborated with the independent variables i.e. heuristic, over Confidence that are most
common biases being found. ‘Over Confidence’ stated by De Bondt et al. (2013) as “Over Confidence is the behavioral phenomenon where investor tends to overestimate their own capabilities and perceive themselves as skillful”. Over Confidence often leads to losses. It is one of the serious biases that restrict the people to make proper investment decision.

Jensen and Meckling (1976), evaluated in a field experiment at South Korea to evaluate that how stock prices influence investors trading decisions and investment performance. They argued that investors who have stronger confirmation bias having greater overconfidence. Such kind of investors has higher expectations about stock prices and they trade frequently but get lower realized returns. They argued and concluded that rate and degree of overconfidence and perceived competences of investors, subsequently effects investors trading patterns, frequency and performance. Another study conducted by Mellios, Six, and Lai (2016)indicates that when an investor comes into the market they are overconfident if they have professional knowledge and at the same time risk perception is low. Elmassri, Harris, and Carter (2016), investigates the impact of behavioral biases on investor’s risky decision making. In this study, overconfidence, confirmation, and illusion of control, loss aversion, mental accounting, status quo and excessive optimism includes as behavioral biases.

Mental shortcuts are used when investor making judgments and analyzing the decision about the possibility and outcome of an event under uncertainty. It has long been recognized that a source of judgment and investor decision biases, such as time, thinking, memory, and attention are restricted, human information processing capability is limited. Therefore, there is a need to study and investigate the imperfect decision-making procedures, or heuristics. Heuristics play important roles in both scenarios problem solving and investment decision making. It is a short cut method which is used while making quick decisions (Nimalendran & Ray, 2014). Investors use heuristics in decision making because they are not willing to adopt long computational strategies to calculate the estimated risk and return because it take long hours and energy.

The investors are more inclined towards psychological prejudices. As humans in all cases are not able to cope with these optimization problems so people rely more on heuristics which is considered at rule of thumb and is highly dependable on beliefs and biases of people. It tells us how they deal with excessive information which they are not able to evaluate analytically. Therefore investment decision making behavior is usually biased (Okuyama & Francis, 2006).
Heuristics are basically studied to know the intuition of the people that they consider while taking investment. As the research studies explain that investors place their investments into randomly selected shares and evaluate their investment by adopting different ways.

**Research Methodology**

Decisions play a vital role in every business context. Right decision at right time leads to the organizational success. Different biases effect the risky investment decisions while risk perception plays as a mediating role between cognitive biases and risky investment decisions. Various biases affecting to investors’ decision, but this study explores only these two cognitive biases i.e. heuristic and overconfidence.

**Conceptual Framework**

Mental model described that how thought process affected from real, assumption, or imaginary environment and internally thinking about the external environment and in turn these effect on decision making. In the current study different biases were taken as independent variable that described its impact on risky investment decision. Expected Utility Theory states that investor who are involve in decision making showed expressive decision making under risk differentiate between risky and uncertain outcomes and compare with their expected utility value. Tversky, Kahneman, and Moser (1990), Developed a model which explains the risk in a different way. Prospect theory explains that potential outcome before reaching the final outcome. According to this decisions are effected by final results. As well as another theory postulated that investor wants to take risk and sometimes they avoid making investment. According to this theoretical information present study is an attempt to give view about the behavior of individual investors and also discuss different biases which may affect their behavior while taking risky investment decisions. Heuristic and confidence bias is an independent variable and risky investment decision is dependent variable which risk perception is a mediating variable. Both overconfidence and heuristic bias is a cognitive bias. Past studies only
focused on different biases but this study combined these variables as well as checks the effect of risk perception as mediator on risky investment decisions.

Hypotheses of the Study

H1: There is a significant relationship between overconfidence and risky investment decision

H2: There is a significant relationship between heuristic and risky investment decision.

H3: There is a significant relationship between risk perception and risky investment decision.

H4: There is a significant relationship between cognitive biases and risk perception.

H5: Risk perception is a mediator between cognitive biases and risky decision making.

Research Design and Methodology

This study is based on behavioral finance so data is based on questionnaires. Process Macro (Hayes, 2017) is used to check the mediation effect.

Population and Sample

The population consists of investors of Pakistan Stock Exchange. 250 questionnaires were distributed out of which 215 were returned and were properly filled.

Results and Findings

Y = RID
X = Biases
M = RP

Risky investment decision is dependent variable while cognitive biases i.e. heuristic and overconfidence are dependent variables while risk perception is mediating variable.

Effect of Biases on Risk Perception

Model Summary

<table>
<thead>
<tr>
<th>R</th>
<th>R-Square</th>
<th>MSE</th>
<th>F</th>
<th>df1</th>
<th>df2</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>.8290</td>
<td>.6873</td>
<td>.1271</td>
<td>468.1649</td>
<td>1.0000</td>
<td>213.0000</td>
<td>.0000</td>
</tr>
</tbody>
</table>

Model

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>SE</th>
<th>t</th>
<th>p</th>
<th>LLCI</th>
<th>ULCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>.4211</td>
<td>.1577</td>
<td>2.6697</td>
<td>.0082</td>
<td>.1102</td>
</tr>
<tr>
<td>Biases</td>
<td>.8938</td>
<td>.0413</td>
<td>21.6371</td>
<td>.0000</td>
<td>.8124</td>
</tr>
</tbody>
</table>

R value (0.8290) shows the relationship between Biases and Risk perception. Value of R-square (0.6873) shows that 68.73% risk perception is effected by biases. P value is less than 5% so there is a significant relationship between biases and risk perception. These finding
Advances in Managing Operations and Sustainability (AMOS 2017)

also supported by another researcher Odean, (1999) emphasize the role of risk perception in the risk-taking behavior of finance professionals. It showed that there is significant relationship between risk perception and risky investment decision.

**Effect of Biases and Risk perception on Risky Investment Decision**

<table>
<thead>
<tr>
<th>Model Summary</th>
<th>R</th>
<th>R-Square</th>
<th>MSE</th>
<th>F</th>
<th>df1</th>
<th>df2</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>.9087</td>
<td>.8257</td>
<td>.0756</td>
<td>502.0087</td>
<td>2.0000</td>
<td>212.0000</td>
<td>.0000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>SE</th>
<th>t</th>
<th>p</th>
<th>LLCI</th>
<th>ULCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>.5296</td>
<td>.1237</td>
<td>4.2826</td>
<td>.0000</td>
<td>.2858</td>
</tr>
<tr>
<td>RP</td>
<td>1.0757</td>
<td>.0528</td>
<td>20.3602</td>
<td>.0000</td>
<td>.9716</td>
</tr>
<tr>
<td>Biases</td>
<td>-.1881</td>
<td>.0570</td>
<td>-3.3025</td>
<td>.0011</td>
<td>-.3004</td>
</tr>
</tbody>
</table>

If risk perception is a mediating variable, then the relationship between biases and risk perception with risky investment decision is 90.87%. R Square value (0.8257) shows the effect of Biases and risk perception on risky investment decision which is 82.57%. So it is concluded from results that mediation exists. A study which is conducted by Barney (1998) supported the results it stated that if the environment is uncertain and complex, heuristics can be an effective and efficient aim to decision making because in that scenario mental short cuts are used.

**Conclusion**

This study measures investor’s attitudes towards risk with a new perspective and in a better way thus leading to better investment decision making. The present study is also helpful for investors to aware about the consequences of their behaviors regarding risky investments that how business tenure effecting to their investment decisions. Understanding of the cognitive biases play vital role, especially when there is prevailing uncertainty in the market. Emotional and personality factors need to be incorporated in the investment strategies formulated for individual investors. Overconfidence bias has significant effect on risky investment decision while risk perception mediates the relationship. While partial mediation shows that no doubt risk perception mediates the relationship but partially. On the other hand, there is full mediation affect between heuristic and risky investment decision while risk perception is a mediating variable.

This study only checks the effect of two cognitive biases heuristic and overconfidence on risky investment decision and mediating role of risk perception in risky investment decision. There are several other biases which are affecting to investment. Some biases relate to own mental capabilities and some relate to thinking level of an investor. It is
difficult to access and know the each and every investor’s behavior because behavioral finance is based on the personal observations, thinking and decisions made by the investors depending on the biases.

**Practical Implications**

The study suggests that the investor who wants to increase or decrease the risk-taking attitude can effectively get his target by analyzing the other factors of the problem Framing and risk perception. This study also understands the relationship between investors' asymmetric information and investor risk perception while taking investment decision. Investors need basic information about investment in the asymmetric information, thus making them confidential information immediately and fair and accurate evaluation of the stock market, to make decisions based on. The current study will increase the confidence of individual investors to understand mental models and how to prefer risky investments by providing them guidance that how to control the constraint factors to achieve higher returns and secure their capital.
References


