The Impact of Heuristic & Prospect Biases on Investment Performance- A Mediating Role of Risk Tolerance

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Abstract

Purpose –The aim of this study is to examine the influence of heuristic and prospect behavioral biases on investment performance along with mediating role of risk tolerance. **Design/methodology/approach** – The study has executed PLS-SEM to test the stated hypotheses, anchoring bias and self-control bias are selected as independent variables, risk tolerance as mediating variable whereas investment performance has been incorporated as the dependent variable. To know the individual variables relative importance and performance the IPMA analysis has been also executed. The sample size comprised 100 individual investors in the context of Karachi, Pakistan. The questionnaire has been a primary data collection tool whereas the convenience sampling method has been adopted.
Findings –The empirical findings reveal the direct and significant impact of anchoring bias on investment performance whereas self-control bias is found to be statistically insignificant on the investment performance of individual investors, lastly the mediating role of risk tolerance is found to be significant in the context of anchoring bias, self-control bias, and investment performance.
Originality/value –This study contributes to the existing literature through its conceptual framework, literature is very scarce regarding the impact of anchoring bias and self-control along with mediating role of risk tolerance on investment performance according to the researcher best knowledge, this study aims to fulfill this gap; the findings will help investors, professionals, regulators to get the practical insights about heuristic and prospect biases impact on investment performance and the way risk tolerance to interact with these biases and shapes the investment performance of individual investors.
Managerial Implications-The empirical evidence has ascertained the existence of irrationality in equity markets this will help the policymakers or managers to recognize the behavior of investors and the risk tolerance mechanism thatled to inefficiencies
Keywords: heuristic theory, prospect theory, anchoring bias, self-control bias, investment performance, risk tolerance

1. Introduction

Over the past years, financial markets have become more competent; the number of players has been drastically increased as well as the investment choices. Investors always look for their wealth maximization howbeit they may not be well equipped to evaluate the available opportunities; therefore, they rely on a certain judgmental process that gets influenced by various cognitive and emotional facets (Sahi, 2017).

Neoclassical theories of finance explain rational behavior of individuals while taking their investment decisions, according to Modern Portfolio Theory investors are risk-averse they prefer low-risk portfolio over riskier ones for the given level of expected return (Markowitz, 1952) similarly, the proponents of Efficient Market Hypothesis state that investors are well informed; all the publicly and privately available information are being held by them, therefore, no one can beat the market (i.e.) abnormal returns are not possible moreover the Expected Utility Theory adds the element of rationality in terms of individual decisions making under uncertainty based on utility and risk (Bernoulli, 1954). In terms of investment risk and return go hand in hand, the risk tolerance level varies from individual to individual, thus it is substantial to figure out the existence of risk tolerance inherited in investors' financial behavior. Generally, individuals rely on their past experiences, intuition, optimism while taking risky investment choices but the ultimate goal remains the maximization of theirwealth(L. Riaz & Hunjra, 2015). However, markets do become inefficient and suffer from various anomalies due to the irrational behavior of investors as explained by Prospect Theory individuals are loss averse under risk & uncertainty; they prefer substantial gain to compensate for the loss(Kahneman, D., & Tversky, 1979). Individuals perceive the value of money subjectively which is the variation between the actual price and their reference price (Thaler, 1985), these theoretical contributions lead to the emergence of behavioral finance as a new discipline.

Behavioral finance explains the irrational behavior of individuals in the context of investment decisions and performance, it combines the behavioral and psychological facets which are involved in investment decision making, it explains different behavioral biases such as cognitive and affective which create different anomalies in the financial market (Sahi, 2017; Toma, 2015). Literature has explained a complex role of behavioral biases as the investors' performance get influenced either positively or negatively (Ogunlusi & Obademi, 2019; Sahi, 2017)

Individuals suffer substantial losses in terms of their financial investment because of misinterpretation of available financial information; this misinterpretation usually occurs due to various behavioral biases(Khilar & Singh, 2020). Various studies have examined the repercussion of behavioral predispositions on investors' decision making and supported the fact that in actual fact markets are disorganized, therefore it is necessary to examine the mechanism that how cognitive and emotional biases impact investment choices, performance and create anomalies so that their impact can be minimized (Aren & Nayman Hamamci, 2020; Ogunlusi &

Obademi, 2019; Shah et al., 2018). Anum & Ameer (2017), identified the positive impact of herding, heuristic, and market biases on investment performance while prospect biases negatively impact investment performance. According toParveen & Siddiqui (2017),disposition and anchoring biases help an investor to achieve positive investment returns whereas overconfidence negatively impacts the investment returns in the context of Pakistan. Bouteska & Regaieg (2020)examined the impact of overconfidence & loss aversion on market efficacy in the context of the United States, the empirical findings suggest a negative impact of loss aversion on the market performance of industrial and service sector firms whereas overconfidence was found to have a positive impact on industrial sector firms market performance but negative impact on service sector firms market performance. Bakar & Yi (2016)investigated the effect of psychological facets on decision making of Malaysian investors, the findings reveal that overconfidence bias, availability bias, and conservatism bias have a substantialeffect on investors' decision making but herding bias was found to be insignificant in terms of investors' decision making. It can be seen that the literature is skeptical about the influential role of behavioral biases in terms of investors' decision-making and performance.

1.1.Problem Statement

The investment decision is considered to be a muddle-headed state where one has to choose the best option keeping in view the risk and return factors; individuals vary in terms of their needs, skills, goals therefore one solution can't be generalized for all, there are no objective rules which can explain its dynamic nature. The economic progress of any country greatly depends on its financial markets particularly the stock market, therefore any disruption in it will ultimately influence the overall economic progress. The well-functioning of the stock market signals investors about better investment opportunities, diversified portfolios, and attractive returns (Shah et al., 2018). Investors' choices play a significant in the development of financial markets; these choices get influenced by various cognitive, emotional facets which may create anomalies and make markets inefficient. Therefore, it is cardinal to study how these behavioral biases influence individual investors' performance particularly in the perspective of developing countries like Pakistan, where economic stability is significantly dependent on stock market performance.

Literature has identified various facets which may influence decision-making procedure of investors named as bounded rationality, intuitions, cognitive and emotional biases, demographic factors, financial knowledge, past experiences, regulatory factors, availably of information so on and so forth among these cognitive and emotional biases are considered to be the most influential ones as these biases shape the investors' goals, strategies, and their performance. The element of risk entails in every decision, no matter how knowledgeable, skilled, and informed the investors are, uncertainties remain as part and parcel with their choices. Kathleen-doyle & Klement (2016) categorized investors according to certain biases and risk tolerance, they concluded 20 types of behavioral biases along with investors risk tolerance level.

Investment decisions leverage with complexity when these behavioral biases intervene with some other variables and bring mediating effect on it. Many studies have examined the direct effect of behavioral biases on individual investors' decision making (Khilar & Singh, 2020; Ogunlusi & Obademi, 2019; Parveen & Siddiqui, 2017; Sitinjak & Ghozali, 2012), other studies have considered mediating effect of different variables such as financial literacy, personality traits some studies have examined moderating effect of age, gender, income, region, experience(Ahmad & Shah, 2020; Bakar & Yi, 2016; Pertiwi et al., 2020; Srivastava et al., 2019)but majority of the researches have been centered on measuring the direct effect of behavioral biases in particular heuristic biases and have been centered on investment decision as dependent variable thus the impact of emotional bias such as self-control, the intervening role of risk tolerance in relation with investment performance has been less explored (Ahmad & Shah, 2020; Amir Rafique et al., 2020; Dubard Barbosa et al., 2019).

This study aims to fill up this literature gap by investigative the direct relationship between Prospect and Heuristic biases and investment performance along with mediating the role of risk tolerance in the context of the Pakistan Stock Exchange Market. This study focuses on two behavioral biases named anchoring and self-control and examines their direct impact on individual investors' performance along with mediating role of risk tolerance. The rationale of selecting investment performance as a dependent variable is to see how behavioral biases influence investors' financial performance and how risk tolerance intervenes between cognitive, emotional biases and investment performance.

1.2. Research Objectives
1. To identify the impact of anchoring bias on individual investors' investment performance.
2. To identify the impact of self-control bias on individual investors' investment performance.
3. To identify the impact of anchoring and self-control bias on risk tolerance.
4. To examinethe mediating role of risk tolerance amid anchoring bias, self-control bias, and individual investors' investment performance.

1.3. Significance of the Study
Stock markets play an important role in a country's economic development, they promote liquidity, help in raising capital, and provide investment options. Investors have to make their decisions under risk and uncertainty, they do face certain behavioral biases which may influence their investment performance and make markets inefficient; this study will help to uncover the possible impact of heuristic bias (anchoring) and prospect bias (self-control) on investment performance, the rationale of using mediating model is to find out how the risk tolerance intervenes between behavioral biases and investment performance as individuals vary in terms of characteristics, risk appetite, investment goals, preferences. Moreover, this study has been conducted during the prevalence of pandemic which has already shaken the economy of many developed and developing countries thus the element of risk in equity markets has been accelerated significantly during recent times. Literature has identified a mixed effect of

behavioral biases both positive and negative in the context of investors' decision making and investors' performance. The findings of the study will help to understand the possible impact of behavioral biases on investment performance in the context of the less developed country. The results will be helpful to understand the mechanism behind over or undervaluation of stocks, risk willingness in the context of investment performance.

This paper is divided into six sections; first section details the introduction, problem statement, research objectives, the significance of the study; the second section includes a literature assessment and conceptual framework; the third section explains the methodology; fourth section details out data analysis and discussion; fifth section depicts conclusion, practical implications & limitations lastly the sixth section includes references which have been used in this study.

2. Literature Review
2.1. Heuristic Theory of Behavioral Finance

The concept of heuristic biases was first introduced in the 1950s by Simon (1952) in his study related to bounded rationality, he suggested that the rational process of decision-making encounters certain cognitive biases, people face time constraints and may not have sufficient information due to which they rely on mental shortcuts to solve the given problem. Heuristic biases further examined by renown psychologists Amos Tversky and Daniel Kahneman during 1970s-1980s they explained how these biases influence individual decision-making process; heuristic approach to problem-solving use mental shortcut to get the solution that is not optimal but satisfy the given situation, people use heuristic approach when there is time limitation and quick decision is required. Investors usually execute heuristic techniques to accelerate their investment performance. Heuristic biases are not necessarily bad as they facilitate timely decisions; financial experts, investors use certain rules of thumbs like trial and error, guesswork, historical data analysis so on and so forth, the heuristic method helps them to make decisions faster through available shortcuts that may give productive results but there is an opportunity cost associated with it as investors may not select the best or optimal solution for the given problem, lack of information and time constraint may lead to inefficient results. Kahneman & Tversky (1979) introduced three significant heuristic biases that influence investors' decision making named as price anchoring, representativeness, and availability. Waweru et al (2008) identified two more heuristic biases such as overconfidence and gambler 's fallacy.

2.1.1. Anchoring Bias

Anchoring bias occurs when individuals rely extensively on the first piece of information or already existing information thus ignoring the intrinsic value. Anchoring bias may result in purchasing an undervalued stock or selling an overvalued stock but this bias also benefits the investors when there is time limitation or lack of information persists in the market. Investors

tend to look for stock price first instead of other pieces of information such as historical growth. They use stock price as their anchor while considering investment choices.

Kanwal et al., (2018) analyzed the impact of herding bias, heuristic, prospect biases, and market factors on individual investors' decision making; sample size comprised of 385 respondents whereas regression analysis was used to analyze the data; the empirical findings reveal the insignificant impact of representativeness, overconfidence, anchoring, gamblers fallacy, availability bias, loss aversion, regret aversion, mental accounting on investors' decision making whereas herding bias and market factors were found to be statistically significant. Madaan & Singh (2019) examined the impact of overconfidence, disposition effect, anchoring, herding behavior on individual investors' decision making; sample size comprised of 243 respondents the study executed regression analysis to test the hypotheses; the empirical findings suggest that overconfidence and herding bias significantly impact investors' decision making whereas anchoring and disposition effect was found to be positive but statistically insignificant. Kartini & Nahda (2021) analyzed the impact of certain psychological factors on investment decision making in the context of the Indonesian stock market; the sample size comprised of 165 respondents moreover one-sample t-test was used to test the hypotheses; the findings revealed a significant impact of representative bias, loss aversion, overconfidence, anchoring, optimism and herding behavior on investment decision. Abraham et al (2014) examined the impact of herding, anchoring &adjustment on property fund managers' investment decision in the context of South Africa; data were collected through a questionnaire due to the limitation of small sample size the study executed non-parametric statistics; the findings suggested that herding, anchoring, and adjustment negatively influence investment decision of property fund managers as they did not like to incorporate new information and follow what others do. Kumar & Nayak (2019) studies the impact of heuristic, prospect, marketing, and herding biases on the investment performance of Indian individual investors; data were collected through a close-ended questionnaire and sample size comprised of 310 respondents, the study executed factor analysis, correlation analysis and ANOVA for hypotheses testing; behavioral biases were found to be statistically significant in relation with investment performance. Amir Rafique et al,. (2020) examined the impact of overconfidence, herding, anchoring, and loss aversion on investment performance in the context of Pakistan; the study executed PLS-SEM to test the hypotheses; the findings suggested positive impact of anchoring on individual investors' performance. Elhussein & Abdelgadir (2020) investigated the impact of market, heuristic, prospect biases on investors' choices in the context of Sudan; the data was collected through structured questionnaire and sample size comprised of 203 individual investors; the study executed correlation and regression analysis and found positive and significant impact of anchoring on investors choices. As per the analysis of available literature the following hypothesis has been formulated:

H1: There is a significant impact of anchoring bias on the investment performance of individual investors.

2.2. Prospect Theory of Behavioral Finance

Prospect theory was developed by Tversky & Kahneman in 1979, the theory explains how individuals behave irrationally under risk and uncertainty; individuals perceive gain and loss differently they look for substantial profit over the loss. People are loss averse thus sadness of losing something is greater as compared to the happiness of gaining something. If people are given two choices with equal results, they will select the one that offers substantial gains. People become risk-averse in terms of certain gains and risk seeker to avoid loss. Investment performance depends on the choices made by the investors under risk; according to Prospect theory individuals are more concerned about relative gain or loss as compared to their total wealth. Risk and return trade-off play an important role in investors' decision-making and influence investors' return on the portfolio. Prospect theory introduced cognitive and emotional biases named loss aversion, self-control, mental accounting & regret aversion.

2.2.1. Self-Control Bias

Self-control bias is an emotional tendency that makes it difficult for people to pursue their long-term goals. This difficulty comes from a lack of self-discipline. It occurs when people change their decision to get it consistent with their culture, value, norms. This emotional tendency makes investors consume more today and save less for tomorrow. Self-control bias may make investors risk seekers to satisfy their needs as they focus on short-term utility instead of long-term returns.

Sahi (2017) studied the impact of different psychological biases on investors' financial satisfaction; the independent variables were overconfidence, reliance on expert, self-control, budgeting tendency, spouse effect, socially responsible investing bias and the dependent variable was financial satisfaction; the study executed mixed-method approach data was gathered through questionnaire &interviews, the total sample size comprised of 377 participants whereas 11 expert interviews were conducted; regression analysis was implemented for data analysis; the findings suggested that self-control has a positive and significant impact on financial satisfaction. Strömbäck et al(2017) also suggested a positive impact of self-control on financial behavior in the context of Sweden; people with good self-control are more inclined to savings, depict better financial behavior, and feel less worried about their present and future financial needs. Anjum et al(2019) examined the impact of overconfidence, loss aversion, self-control, and personality traits on investor trading behavior in the background of the Pakistan commodity market; the sample size comprised of 216 respondents whereas confirmatory factor analysis and structural equation model were used to analyze the data; the findings revealed significant impact of psychological biases and personality traits on investor trading behavior. T. Riaz & Iqbal (2015)

analyzed the effect of behavioral predispositions on investors' decision making in the context of the Karachi stock exchange; data were gathered through questionnaire, the total sample size was 50; the independent variables were overconfidence, self-control, an illusion of control and optimism; the results of regression analysis revealed a significant impact of overconfidence, self-control, an illusion of control and optimism on investors' decision making. Akinkoye & Bankole (2020) examined the influence of behavioral biases on investment decision in the context of Nigeria; independent variables were loss aversion, overconfidence, herding, regret aversion, status quo bias, and self-control while the dependent variable was investment decision, the study executed logistic regression analysis; findings revealed the insignificant impact of self-control and status quo bias whereas the rest of the variables were found to be significant in terms of investment decision. Sadiq et al (2018) analyzed the impact of certain behavioral biases on individual investors' financial satisfaction; the sample size comprised of 207 respondents, regression analysis was used for hypotheses testing, findings revealed the insignificant impact of self-control on investors' financial satisfaction. As per the analysis of the literature the following hypothesis has been formulated:

H2: There is a significantimpact of self-control bias on the investment performance of individual investors.

2.3. Risk Tolerance

Risk refers to the probability of occurring loss or encountering unwanted outcomes. Risk occurs when the future outcome is not known but possible outcomes may be drawn based on past experiences. Risk tolerance reflects an investor's willingness to take up the maximum amount of loss while making an investment choice. Individuals differ in terms of their abilities, goals, experiences hence their risk tolerance also varies. Risk tolerance is an important part of individual investors' choices, it depends upon the emotional and financial capability of investors to endure with loss, accumulation of wealth, retirement plans, portfolio allocation, insurance as well as other investment decisions depends substantially on individuals' risk tolerance(Hanna et al., 1998).

Risk influences investment decisions and performance directly or indirectly. L. Riaz & Hunjra (2015) studied the impact of asymmetric information, problem framing and risk propensity with intercedingpart of risk perception on investment decision; data was gathered through structured questionnaire & sample size comprised of 200 participants; structure equation model was used for data analysis purpose, the findings revealed negative impact of problem framing on investment decision whereas risk propensity and asymmetric information were found to have positive and significant impact on investment decision the mediating role of risk perception was also found to be significant. Pak & Mahmood (2015) analyzed the relationship between personality traits, risk attitude and investment decision in the context of Kazakhstan; data was gathered through questionnaire whereas sample size comprised of 127 participants;

multiple regression analysis and generalized method of moments were executed; the results revealed personality characteristics influence individual risk tolerance whereas no significant relationship was established between personality traits and investment decision moreover risk tolerance was found to be statistically significant in relation with investment decision. Aren & Nayman Hamamci (2020) examined the impact of financial literacy, personality traits, and emotions on risk aversion, investment decision and risk investment choices; the data were collected through a structured questionnaire whereas sample size comprised of 105 respondents; the study executed ANOVA, t-test and discriminant analysis; the findings suggested personality traits and emotions influence risk aversion whereas investment choices were found to be influenced by financial literacy, risk aversion and risky investment intentions. Grable et al (2004) studied the relationship between risk tolerance and stock market price with the help of the ordinary least square method the findings revealed a significant and positive relationship between risk tolerance in investment performance in the short run. Kanagasabai & Aggarwal (2020) studies the impact of financial literacy on individual investors' performance with mediating role of risk tolerance, data was collected through a structured questionnaire with a sample size of 203 respondents in the context of Chennai, India; the study executed structural equation modeling and found positive & significant impact of risk tolerance on investment performance furthermore mediation results of risk tolerance were also found statistically significant. Raheja & Dhiman (2018) studied the consanguinityamid behavioral biases and investment decisions with interceding role of risk tolerance, regression analysis was executed; the findings suggested a significant relationship between risk tolerance, overconfidence, and regret biases moreover investment decisions were found to be influenced by overconfidence and regret bias.As per the assessment of the literature the following hypotheses have been formulated:

H3: There is a significant impact of anchoring on risk tolerance.

H4: There is a significant impact of self-control on risk tolerance.

H5: There is a significant impact of risk tolerance on the investment performance of individual investors.

H6: Risk tolerance mediates the relationshipamid anchoring and the investment performance of individual investors.

H7: Risk tolerance mediates the relationship amid self-control and the investment performance of individual investors.

2.4. Investment Performance

Investment performance is defined as a rate of return on a given security or portfolio, several theories have been constructed to elucidate the investors' preferences; Efficient Market

Hypothesis (EMH) states that the price of stock reflect all the available information in contrast to Inefficient Market Theory states that price of the stock does not reflect all the available information some investors can earn the abnormal profit with the use of insider information and may make financial markets inefficient. A framework based on risk and return tradeoff was developed to measure investment performance by Sharpe (1964). The suggested framework was further augmented by the emergence of behavioral finance that explained the importance of certain biases in shaping investment performance. The majority of the studies have used secondary data as a measure of investment performance however, this research is centered on primary data collection, therefore, investment performance has been measured objectively by asking the investors to compare their actual rate of return to the average return rate of the stock market thus reflecting what extent individual investors are satisfied with their financial performance, this criterion of investment measurement is consistent with other previous studies (Kanagasabai & Aggarwal, 2020; Zain-ul-Abdin, 2017).

Amir Rafique et al(2020) examined the repercussion of anchoring, herding, loss aversion and overconfidence biases on individual investors' performance with moderating role of financial literacy; the findings revealed a substantial and positive repercussion of overconfidence and risk tolerance on investment performance. Kanagasabai & Aggarwal (2020) studied the impact of financial literacy on investment performance with mediating role of risk tolerance and found a positive and significant impact of financial literacy as well as the meditating effect of risk tolerance on investment performance. Anderson et al (2005) concluded that a high amount of transactions lead to a higher rate of return and vice versa. Dickason–Koekemoer & Ferreira (2020) found that aggressive investors are more prone to risk and self-control bias that ultimately influence their investment performance in terms of satisfaction.

2.5. Conceptual Framework of the Study

Derived from the literature review, the conceptual model for this study has incorporated anchoring heuristic bias and self-control prospect bias as independent variables and investment performance as a dependent variable moreover risk tolerance has been incorporated as mediating variable, **Figure 1** depicts the conceptual model for this study:
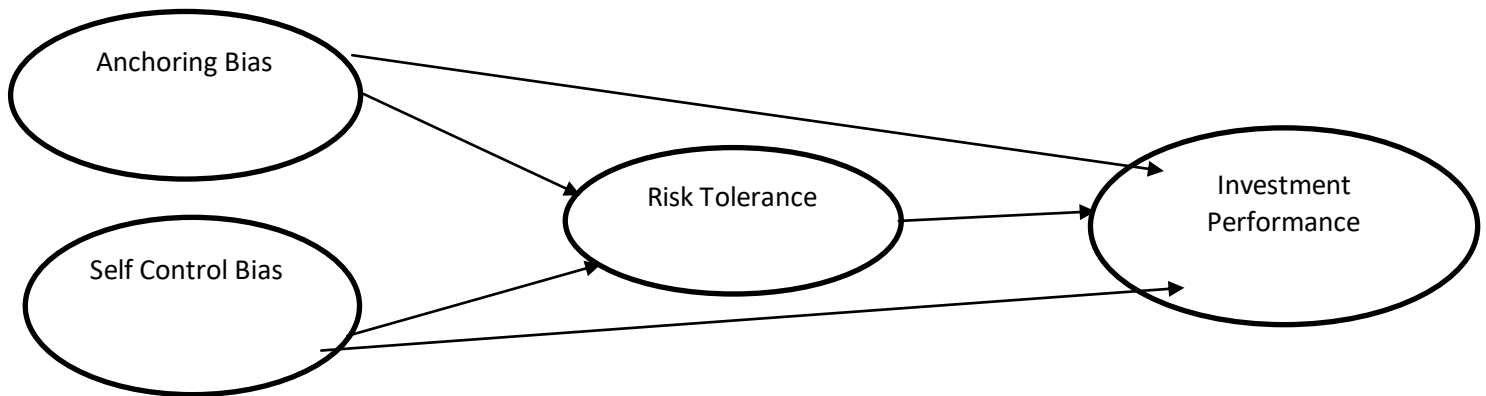
Figure 1: Conceptual Framework

3. Methodology

This section details out the research design, population, sampling, data collection method, data collection instrument, description of constructs, and analytical method.

3.1. Quantitative Research Design

The focus of this research is to find out the influence of heuristic and prospect biases on the investment performance along with the intervening role of risk tolerance therefore quantitative research design has been implemented. Quantitative research has the advantage of being scientific this increases the generalizability of the findings; moreover, this research design entails out the aspect of replication, researchers can select already existing research instrument, re-test the conceptual frameworks in different settings, with different respondents thus this research design gives concrete and empirically validated findings (Daniel, 2016).

3.2. Population & Sampling

Pakistan Stock Exchange is the central equity market comprised of 546 listed companies with a market capitalization of Rs. 8,398,456.068. The total number of investors comprised of 1,886 foreign institutional investors, 883 domestic institutional investors, and 258,210 individual investors moreover 400 brokerage houses are working as its recognized members(Haq, 2020). Thesampling frame includes individual stock holders in the context of Pakistan. Individual investors invest their own money in different financial securities in smaller quantities; the stocks purchased by them represent their portfolio instead of any other organization. For this study data was gathered from individual stock investors in the context of Karachi; a total of 180 questionnaires were circulated to the potential participants whereas only 100 responded to it thus the response has been 55.6%. The initial scrutiny of data revealed no missing value case hence 100 observations were processed for the analysis purpose.

3.3. Sampling Technique

This study has employed a non-probabilistic convenience sampling technique. Convenience sampling is considered to be cost and time effective and is widely used in various disciplines; respondents who were found to be readily available and accessible were approached for data collection purpose.

3.4. Data Collection Method

In this study survey method has been employed for data collection purpose as it is considered useful for determining true values and strength of variables. Moreover, it helps to explain the validity of the proposed model and measures the variables over multiplescales (Newsted et al,. 1988).

3.5. Research Instrument

Quantitative research design favors the use of questionnaires for primary data collection as it ensures that data have been collected in a standardized form and considered to be cost and time effective. It helps to gather data from a larger sample size, coversthe different essential aspects of research topics, helps to visualize the responses, and ensures the anonymity of participants (Zikmund, 1984). This study has employed a closed-ended questionnaire which comprised of 02sections; the first section depicted the demographic information of participants whereas the second section centered on the proposed conceptual framework.

The designated constructs were estimated on a five-point Likert scale where (1 specifies Strongly Disagree), (2 specifies Disagree),(3 specifies Neutral), (4 specifies Agree), (5 specifies Strongly Agree), the definitions of selected constructs are as follow:

Anchoring Heuristic Bias (ANC) is defined as a cognitive bias when investors depend greatly on the initial piece of information; it reflects the subconscious use of irrelevant information. Investors use an arbitrary anchor or reference point such as the price of stocks while making their financial investments.

Self-Control Prospect Bias (SC)is defined as an emotional bias that makes individuals fail to pursue their long-term financial goals due to a lack of self-discipline. This bias makes investors spend more today rather than save for the future. Investors who encounter self-control bias tend to be more risk seekers this may lead to inappropriate asset allocation.

Risk Tolerance (RT)is defined as an individual's attitude towards risk; investors encounter risk and return tradeoff; they prefer to get maximum return with low risk but in reality, higher returns are associated with a higher degree of risk. Investors with a high-risk tolerance level tend to be more risk seekers and vice versa.

Investment Performance (INVP) is defined as a return-on-investmentportfolio. A portfolio may consist of a single security or multiple securities. Return on investment is being measured in monetary gain or loss.

3.6. PLS-SEM as an Analytical Method:

The study has executed Partial Least Squares Structural Equation Modeling to empirically validate the suggested framework. It has gained substantial importance over the past years among research scholars; it is considered to be highly effective in terms of measuring complex relationships among variables; PLS-SEM is capable to analyze the dual role of variables where one facet is dependent and independent simultaneously. It measures multiple relationships among variables simultaneously. It also overcomes the limitation of small sample size and is considered to be robust for handling the non-normality of data. It is highly capable to control the problem of endogeneity(Hair et al., 2014). The conceptual framework for this study depicts both direct and indirect impact regarding the selected variables, for this purpose PLS-SEM will be an effective statistical tool to validate the empirical findings.

4. Results & Discussion

This section entails out empirical validation of the conceptual framework; it includes demographic details of respondents, reliability and validity measures, and hypotheses testing of the research model.

4.1. Demographic Information of the Respondents

The study has implemented convenience sampling technique; a total of 180 questionnaires were circulated to the potential participants whereas only 100 responded to it thus the response has been 55.6%. The initial scrutiny of data revealed no missing value case hence 100 observations were processed for the analysis purpose. **Table 1**, indicates the demographic details; the sample size comprised of 62% males and 38% females; 10% of the respondents were undergraduates, 61% of the respondents were graduates, postgraduate 27% and others 02%. 32% of the respondents belong to the age group 18-26 years followed by 30% belong to the age group of 27-35 years. In terms of experience 55% of the respondents fall under 1-5 years lastly 53% of the respondents fall in the income bracket of Rs. 41,000 or more.

Table 1: Demographic Details of Respondents

	Demographic Details	Percentage (%)
Gender	Males	62
	Females	38
Age	18-26	32

	27-35	30
	36-44	25
	45 or more	13
Education	Undergraduate Degree	10
	Graduate Degree	61
	Postgraduate	27
	Others	02
Experience	Under 01 year	14
	1-5 years	55
	5-10 years	21
	More than 10 years	10
Income	Rs. 10,000-20,000	11
	Rs. 21,000-30,000	13
	Rs. 31,000- 40,000	23
	Rs. 41,000 or more	53

4.2. Measurement Model- Reliability & Validity

The study has executed PLS-SEM in two steps; firstly, the reliability and validity were established as per the criterion provided by Hair et al (2019). According to the criterion to establish the reliability, the values of CB alpha and Composite reliability must be greater than 0.70 moreover the values of indicator factor (outer) loadingshall be greater than 0.70. The results in **Table 2** reflect that all the constructs have the CB alpha and Composite reliability values greater than the recommended threshold value of 0.70 furthermore the indicator factor (outer) loading values of all the constructs are as per the prescribed threshold (i.e.) greater than 0.70, therefore, the internal consistency and indicator reliability of all the constructs have been ascertained.

The validity of the constructs has been established through implementing the two-fold procedure suggested by Hair et al (2019)it involves the assessment of Convergent validity and Discriminant Validity; firstly, convergent validity was examined through the estimation of AVE as per the suggested criterion the value of AVE shall be greater than 0.50. As per the results depicted in **Table 3**all, the constructs have AVE values greater than 0.50 thus ascertaining the Convergent validity. Furthermore, for the Discriminant validity, firstly the cross-loadings values have been analyzed as the indicators factor (outer) loading values are greater than all its cross-loading values with other constructs moreover Fornel-Larcker has also been adopted in which the square rooted values of AVE have been compared with the inter-construct correlations moreover, the HTMT ratio criterion has also been implemented to ensure discriminant validity.

Table 2: Reliability and Validity

Construct	Type	Items	Loadings	Cronbach's Alpha	rho_A	CR	(AVE)
Anchoring Bias	Reflective	ANC1	0.859	0.786	0.786	0.875	0.701
		ANC2	0.825				
		ANC3	0.827				
Self-Control Bias	Reflective	SC1	0.791	0.754	0.757	0.859	0.669
		SC2	0.841				
		SC3	0.821				
Risk Tolerance	Reflective	RT1	0.727	0.731	0.795	0.845	0.646
		RT2	0.785				
		RT3	0.891				
Investment Performance	Reflective	INVP1	0.908	0.894	0.896	0.934	0.826
		INVP2	0.888				
		INVP3	0.929				

The results of FL criteria & HTMT ratios are exhibited in **Tables 3& 4**, showing that square root values of the AVE of each construct are greater than their highest correlations with any other construct whereas HTMT ratios for the stated constructs are greater than 0.50 whereas less than the threshold of 0.90. **Table 5** indicates that indicators' outer (factor loading) values are greater than their cross-loadings values with other constructs; therefore,the Convergent and Discriminant Validity of the constructs have been established.

Table 3: Fornel-LarckerCriteria

	Anchoring	Investment Performance	Risk Tolerance	Self-Control
Anchoring	0.837			
Investment Performance	0.740	0.909		
Risk Tolerance	0.697	0.676	0.804	
Self-Control	0.557	0.510	0.635	0.818

Note: The diagonal values represent the square root of AVE.

Table 4: Heterotrait-Monotrait Ratio (HTMT)

	Anchoring	Investment Performance	Risk Tolerance	Self-Control
Anchoring				
Investment Performance	0.881			
Risk Tolerance	0.875	0.807		
Self-Control	0.717	0.618	0.817	

Table 5: Cross Loadings

	Anchoring	Investment Performance	Risk Tolerance	Self-Control
ANC1	0.859	0.635	0.534	0.492
ANC2	0.825	0.618	0.619	0.389
ANC3	0.827	0.605	0.595	0.519
INVP1	0.659	0.908	0.629	0.456
INVP2	0.642	0.888	0.605	0.511
INVP3	0.714	0.929	0.611	0.428
RT1	0.433	0.367	0.727	0.358
RT2	0.410	0.549	0.785	0.510
RT3	0.763	0.660	0.891	0.617
SC1	0.382	0.416	0.534	0.791
SC2	0.425	0.380	0.435	0.841
SC3	0.545	0.448	0.572	0.821

4.3.   PLS Algorithm:

Figure 2 shows the PLS-Algorithm values of the conceptual framework, PLS algorithm is also referred to as measurement model as it depicts the measures which are essential to ascertain the reliability and validity of constructs; it shows a sequence of regression expressed in terms of weight vectors (Henseler et al., 2009).
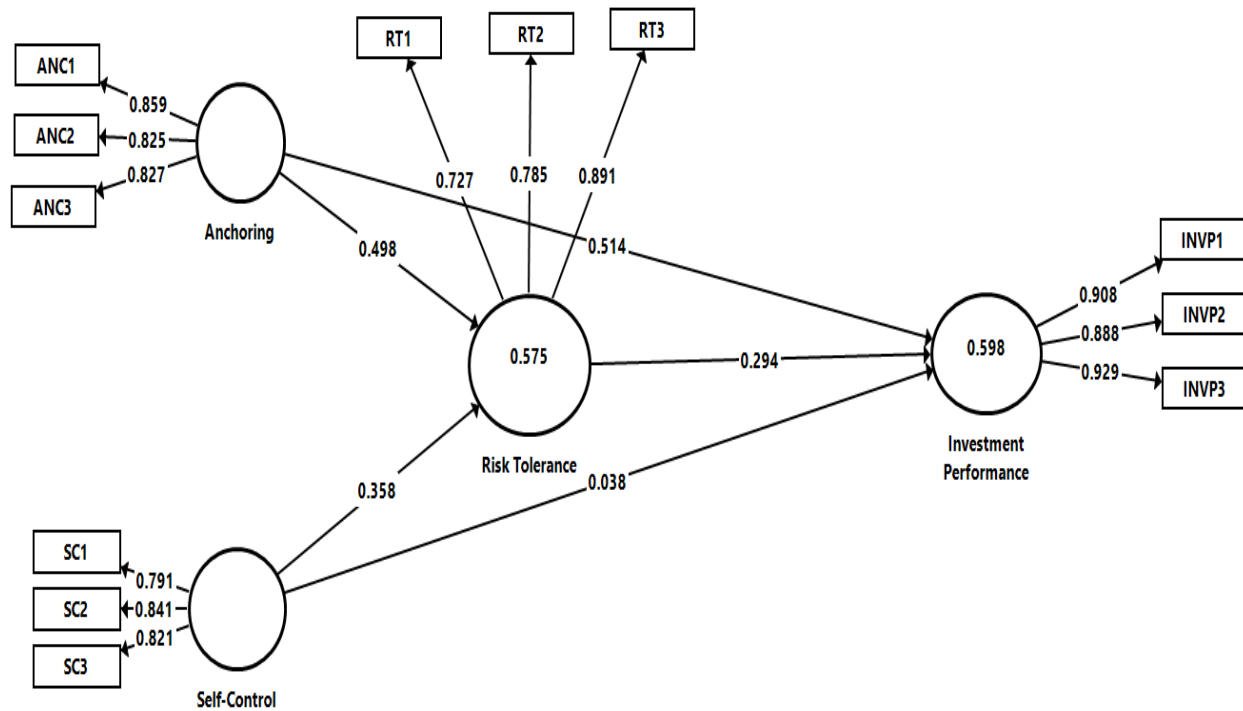
Figure 2: PLS-SEM Algorithm of Conceptual Model

The variance inflation factor is used to examine the co-linearity of the constructs. The VIF values shall be closed to 3 or lesser in some cases it can be up to 10(Hair et al., 2019). In this case, the values of VIF seem within the defined threshold. **Table 6** indicates the VIF values of the constructs.

Table 6: Co-linearity Statistics (VIF)

Outer VIF Values	VIF
ANC1	1.852
ANC2	1.565
ANC3	1.623
INVP1	2.792
INVP2	2.376
INVP3	3.238
RT1	1.392
RT2	1.417
RT3	1.623

SC1	1.439
SC2	1.802
SC3	1.516

4.4.   Structural Model Testing:

After the establishmentof measurement model the next step in analyzing PLS-SEM results is the evaluation of the structural model; this comprised of the evaluation of coefficient of determination (R-square), the process of blindfolding to explain the predictive relevance of the model measured by (Q-square) and the statistical significance of path coefficients; to examine the indicators weight and relevance statistically significance bootstrapping will be executed(Hair et al., 2019). In bootstrapping sub-samples are being created from randomly drawn observations from the original data sets with replacement these subsamples will be used for the estimation of the path model. The coefficients of the structural model explain the associations amid the constructs that are resulted from assessing a sequence of regression equations but prior examining the structural model it is necessary to inspect the collinearity to ensure that the obtained results are free from any bias. R-square measures the variance which has been brought by independent variables independent variable thus it shows explanatory power of the model, the values of R-square ranges from 0 to 1, another important measure of PLS path model predictive relevance is Q-square, the value of Q-square is being obtained through blindfolding and should be higher than 0 (Hair et al., 2019).

Table 7: Hypotheses Testing

	Path			Beta	p-value	Decision
Hypothesis 1	ANC ➡		INVP	0.514	0.00	Supported
Hypothesis 2	ANC ➡		RT	0.498	0.00	Supported
Hypothesis 3	SC ➡		INVP	0.038	0.64	Not Supported
Hypothesis 4	SC ➡		RT	0.358	0.00	Supported
Hypothesis 5	RT ➡		INVP	0.294	0.01	Supported

Hypothesis 6	ANC ➡ ➡ INVP		RT	0.146	0.02	Supported
Hypothesis 7	SC ➡ ➡ INVP		RT	0.105	0.04	Supported
R square (INVP)				0.598		
Q square (INVP)				0.481		
R square (RT)				0.575		
Q square (RT)				0.338		

$p \leq 0.05$ Null Hypothesis reject.

R^2 values of 0.75, 0.50, and 0.25 indicate substantial, moderate andweak model respectively.

Q^2, predictive relevance of predictor exogenous variables as according toHenseler et al. (2009), q2 values 0.35 (large), 0.15 (medium), and 0.02 (small).

The results of the hypotheses testing are depicted in **Table 7.** The structural model results show that anchoring bias (ANC) (β=0.514, p = 0.000) and self-control bias (β=0.358, p = 0.000) has a significant positive impact on risk tolerance (RT)(Dickason & Ferreira, 2018; Ishfaq & Anjum, 2015). Nearly, 57.5% variation in risk tolerance (RT) is being explained by anchoring bias (ANC) and self-control bias (SC). Moreover, 59.8% variation in investment performance (INVP) is being explained by risk tolerance (RT). The empirical findings reveal that anchoring (ANC) (β=0.146, p = 0.02) and self-control bias (SC) (β=0.105, p = 0.04) have a substantial indirect impact on investment performance (INVP), anchoring bias makes investors conservative in terms of risk-taking they tend to believe on the first available information thus hold moderate risk tolerance to bring a positive return on investment whereas self-control bias makes investors aggressive in terms of risk tolerance accompanied with high spending, this bias makes investors risk seeker get the high returns in short-run hence high risk comes with high return. It indicates a significant mediating role of risk tolerance among anchoring bias, self-control bias, and investment performance of individual investors, the results regarding the interceding role of risk tolerance and behavioral biases are found to be significant with the previous studies (Raheja & Dhiman, 2018, 2019) however this study has explained the mediation impact of risk tolerance in the context of anchoring, self-control and investment performance that has not been addressed

comprehensively in previous literature according to the researcher best knowledge. The direct impact of anchoring (ANC) (β=0.514, p = 0.00) on investment performance (INVP) is found to be statistically significant hence the results are consistent with previous researches(Amir Rafique et al., 2020; Kumar & Nayak, 2019; Parveen & Siddiqui, 2017)whereas the direct impact of self-control (β=0.038, p = 0.64) (SC) on investment performance (INVP) is found to be insignificant; one possible reason would be people with self-control bias have shorter financial insight, therefore, they are not concerned with long term growth of their portfolio. Whereas the impact of risk tolerance (RT) (β=0.294, p = 0.01) is statistically significant on investment performance (INVP) hence the results are consistent with previous researches(Grable et al., 2004; Kanagasabai & Aggarwal, 2020). The value of R-square explains the variance, which is brought in each of the endogenous constructs; the value of R square in the case of dependent variable investment performance (INVP) is0.598which means that the robustness of the model is moderate. Finally, the results of Q square explain the predictive relevance of the model in terms of investment performance (INVP)the value of Q square is 0.481whereas in the context of risk tolerance (RT) the value of Q-square is 0.338which shows the predictive relevance of the given model is large.

4.5. IPMA Analysis:

The IPMA analysis identifies the relative importance and performance of individual independent antecedents as per their contribution in the dependent antecedent. **Table 8,** represents the relative importance and performance of anchoring, self-control and risk tolerance in relation with investment performance; it can be seen that anchoring has the highest score in terms of importance 0.739 as well as in terms of performance 69.810 whereas the other bias self-control shows the lowest numbers in terms of importance and performance 0.161 and 57.327 respectively, lastly the mediating variable risk tolerance has second highest number in terms of relative importance and performance (i.e.) 0.318 and 67.337 respectively.

Table 8: IPMA Analysis

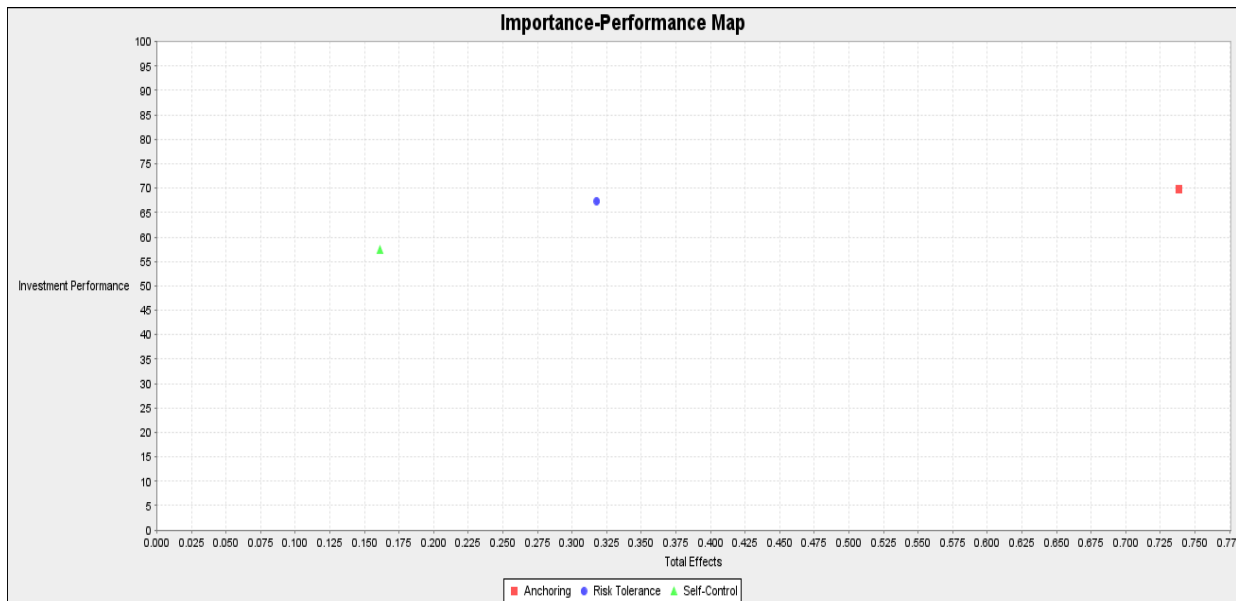| Variables	Importance	Performance
Anchoring	0.739	69.810
Self-Control	0.161	57.327
Risk Tolerance	0.318	67.337

Figure 3: IPMA Analysis

5. Conclusion

Behavioral biases depicta significant role in the context of investment performance; cognitive and emotional facets make investors behave irrationally in the given situations. Investors encounter different situations where risk and return trade-off persist, particularly in the context of a developing country. The risk appetite intervenes between investors' behavioral facets and investment performance. This research studyfocuses to uncover the influence of heuristic and prospect biases on investment performance of individual investors accompanied withinterceding role of risk tolerance. The study has executed Partial Least Square-Structural Equation Modeling to test the stated hypotheses. The independent facets were anchoring and self-control, mediating facet was risk tolerance and the dependent facet was investment performance. The empirical findings revealed a positive and significant impact of anchoring bias on investment performance as well as on risk tolerance whereas self-control is statistically insignificant in terms of investment performance but significant in the context of risk tolerance. Furthermore, the direct and indirect impact of meditating variable risk tolerance has been found statistically significant thus risk tolerance intervenes between behavioral biases and individual investors' performance which means heuristic (cognitive) and prospect (self-control) biases increase the risk tolerance of individual investors that ultimately increases their investment performance. This research seems to contribute to the existing body of literature through its conceptual framework as there are very few studies that have been conducted on the suggested framework according to the researcher's best knowledge. Investors' behavioral biases get influenced by the level of risk tolerance as the results suggest the presence of heuristic biases and prospect biases increase the level of risk tolerance in the case of individual investors which ultimately increases the investment performance this higher the risk higher will be the return.

5.1.   Limitations & Practical Implications:

There are certain limitations associated with this research study, firstly the study has been centered on individual investors in the context of Karachi future researches may incorporate the samples selected from other cities also and may perform comparative analysis using the same conceptual framework, institutional and entrepreneurial investors can also be considered, the framework can be extended by adding other heuristic, prospect biases, personality traits, demographics variables, moderating effect of gender can also be examined by using the same conceptual model on larger sample size, the qualitative approach can also be implemented to get more deep insights.

The empirical results of this study will be proven beneficial for the investors, professionals to comprehend the repercussion of behavioral biases & risk tolerance on investment performance moreover they will also get insights about the significant role of behavioral biases in shaping investors' risk tolerance level. The empirical evidence has ascertained the existence of irrationality in equity markets this will help the policymakers or regulators to recognize the behavior of investors and the mechanism that leads to inefficiencies.

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