Evaluation of Behavioral Biases and Investment Decision: An Evidence from Pakistan Stock Exchange (PSX)

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Abstract
Investors act irrationally while making decisions, according to research in the subject of behavioral finance. The main goal of this study is to assess the behavioral biases that influence the choices made by individual equities investors from Punjab. For investors, agents, and other market participants, this study is useful and aids in making better investment decisions. The study takes into account the private investors who buy common stocks in the Pakistani province of Punjab. The Fuzzy Analytical Hierarchy Process (F-AHP) is used to examine the behavioral biases that influence certain common stock investors' choices. The familiarity bias, optimism bias, herding bias, mental accounting bias, loss aversion bias, regret aversion bias, availability bias, anchoring bias, representative bias, and overconfidence bias are the most prevalent behavioral biases taken into account in this study. Mental accounting bias, herding bias, anchoring bias, and representational prejudice were the four factors that had the greatest impact. "I prefer to invest in the well-known companies that have wider media coverage (C101)" was one of the top six sub-criteria. The financial effects of my choices are better than I anticipated (C96). "The financial ramifications of my choices turn out to be immediate" (C95). The company's news (from newspapers, television, and magazines) influences my investment choice (C84). "My investment for purchasing new stock is totally based on information released regarding the stock (C43)." "I have particular skills and experience for decision making (C13)."

Keywords: Behavioral biases, Irrational behavior, Investment decisions, Fuzzy Analytic Hierarchy Process (FAHP)

1. Introduction

Finance is the common denominator of all business functions like Marketing, Human Resource Management, production and operation Management etc. At present, finance is divided into two categories i.e., main category as traditional finance and sub-category as behavioral finance. Various academic/theoretical contributions have been added by the supporters/practitioners in traditional finance over the past few decades. The most important contribution is the Economic Utility Theory in which it is considered that the investors show/exhibit rational behavior while forming their decisions and are well aware of how to obtain maximum pleasure. The traditional finance is mainly focused on the four principles namely CAPM (Baker & Ricciardi, 2015), "Arbitrage Pricing Process (presented by Modigliani and Millar), Option Pricing theory (Sharif Chauhdary et al., 2021) and Principle of Portfolio Management (presented by Markowitz) (Kumar & Goyal, 2016)". "The Efficient Market Hypothesis (EMH) and the Expected Utility Theory (EUT) play a vital role in the decision making. The Efficient Market Hypothesis (EMH) explains that all the relevant information regarding the market is incorporated in the decision-making process while making decisions about investment. The Expected Utility Theory (EUT) is centered on the idea that investors behave in a relational way. Traditional finance proponents believe that since financial markets are entirely efficient, investors behave rationally while making investments. In practice, investors are more likely to adhere to the rule of thumb than to optimize. A number of behaviors are contradictory to the rationality identified by the research in the area of behavioral finance. Usually, these behaviors are categorized under mental biases and bounded rationality. Bounded rationality is the phenomenon in which decision making is grounded on inadequate information. In this way, decision making is based on heuristics and biases due to lack of reliable information. The importance of traditional finance, therefore, decreases and creates doubt about its usefulness as it deviates from the assumptions of the traditional finance. In actuality, traditional finance completely disregards the impact of investor behavior. Since determining the optimum course of action requires considering all viable options, decision making is a complex process that makes use of a variety of models. These flaws in conventional finance emphasis the significance of behavioral finance".

Traditional finance has a behavioral finance subset. "With the aid of certain empirical investigations, the area of behavioral finance was developed in the 1970s. Traditional finance and behavioral finance diverge in two key ways. It is an interdisciplinary area of research, to start. Second, it is a new and expanding area of research within finance. The importance of cognitive psychology and emotions in behavioral finance has an impact on decision-making. Behavioral finance has four themes, namely, Prospect Theory, Framing Effect, Heuristics & Biases, and Affect Theory. (TVERSKY, 2009) presented the Prospect Theory". It is the theory of behavioral finance and behavioral economics which serves as a substitute to the Expected Utility Theory (EUT) and explains how the decision is made under uncertainty. The main purpose of this theory is to describe the actual behavior of the investors. The Framing Effects is the second psychological factor that got prominence after the presentation of the Prospect Theory. According to (TVERSKY, 2009) Framing Effect comes in the existence when different imaginary descriptions of the similar problems highpoint different aspects of the outcomes. The way the problem is constructed and the habits, norms, and personality traits of the staff that the decision maker has chosen to use in making decisions both influence the frame to some extent. "They make it clear that there are two unique phases to every decision-making process: the first frames the acts-related differences and results for the decision choice, and the second assesses the acts-related differences and results for each decision alternative. Irrational biases, according to traditionalists, should normalize at the market level and affect asset prices. On the contrary behaviorists claim that both biases and heuristics are systematic". Therefore, it effects the prices of the assets accordingly. "According to (Finucane et al., 2000), the effect of heuristic is the way in which subjective impersonations of "goodness" and "badness" can function as a heuristic practice of producing quick perceptual judgement and systematic biases.

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The likelihood of making the best decisions is directly increased by the behavioral finance study. The literature study suggests that there are several specific cognitive and emotional biases that influence the decision of investors. In conclusion, the decision-making process is improved by the study of financial behavior.

1.1. Conceptual framework

Nofsinger (2011) says that the fundamental four unconventional finance concepts in his book "Behavioral Finance" are prospect theory, framing effects, heuristics and biases, and affect theory. The four primary behavioral finance topics have been used to select ten psychological biases. These ten psychological biases take into account the primary factors that affect how individual common stock investors make decisions. Below is a quick explanation of the study's chosen psychological biases.

As per the classification of behavioral biases the bias i.e., Overconfidence is fall in cognitive bias. It is the trend of the people for overestimating their own expertise, skills and correctness of information for achieving the targeted goals by ignoring the future uncertainties. The two major features of overconfidence are better than other on average and miscalibration (Ayaa et al., 2022; Marc et al., 2023).

The representative bias is also well known as familiarity bias. When the investors have lack of information, they use the shortcuts for achieving the targeted goal without conducting further research. In this case, the information is executed on the basis past incomplete information (Seth & Kumar, 2020).

"Anchoring bias is occurring when the decision-making pf investors is relied on pre-existing information or the first information they find when making decision". "It is the propensity toward the investment of investors to consider unrelated price of stock as base during the decision making process" (Aydemir et al., 2017).

Availability bias is such type of bias in which the decision making of investor is based on readily available information rather than considering the other available alternatives. Current events which were observed by the investor are more memorable and the investor give preference to the current events, in this way they suffer in availability bias. The investors who are suffering in availability bias commonly invest in local stock and usually invest in those stocks considered by agents (Athur, 2013).

Regret aversion is an emotional bias. It mostly comes into existence due to excessive rely on feeling of regret after knowing that optimal decision has been not taken. Obviously, the outcome can be different than those decisions which have already been taken. The regret aversion bias is initiated when the investors do not admit their mistakes which occur during the investment(Tarika Singh & Monika Gupta, 2015).

Loss aversion is also fall in the category of a cognitive bias that explains the phenomena why for investor the discomfort of losing is psychologically double as compared to the profit. Loss aversion is the tendency of equity investors to give importance avoiding losses to getting equivalent profit (Sulehri & Ali, 2020).

Richard Thaler presented the famous theory of mental accounting (Barrafrem et al., 2020). Mental accounting bias, is commonly known as "two pocket theory", is a cognitive behavioral bias which comes into existence when individual investors consider each component of their portfolio separately. The individual investors divide the portfolio into separate groupings based on different standards according to intent to account or source of the money (Woods et al., 2022).

Herding is the situation in which equity investors response to the information about the behavior of the other equity investors rather than actual behavior of the stock market and the fundamental transection of the market. Frequently, it has been observed in the most cases that the equity investors suffering herding bias do not participate in decision making. Their decision is based on the device of brokers, friends and colleagues (Shaikh et al., 2019).

Optimism is such type of bias in which the individual equity investors overestimate the probability of occurrence of favorable events i.e., profit and underestimate the occurrence of unfavorable events (loss). For example, the individual equity investors are more confident for profit and less confident for loss (Talwar et al., 2021).

Familiarity bias is such type of bias in which an individual equity investor to remain restricted to the familiar stock. The investors indulge this type of bias try to remain within their comfort zone and avoid to take other path never taken (Ranaweera & Kawshala, 2021).

The paradigm is shifted from traditional finance to behavioral finance after late 1970s.The researchers from the advance countries started working on behavioral finance and found that the behavioral factors including cognitive and emotional biases spontaneously influence the decision making of equity investors. Later on, the traditional financial expert from the developing also realized that the behavioral biases such as cognitive and emotional must be consider during the equity investment. It is need of the time to check up to what extend the behavioral biases effect the decision making of investors in Pakistan.

Behavioral biases impact the client's decisions unknowingly. Investor needs to be more aware of the behavioral biases for more effective investment decisions in equity market. Awareness with the nature of behavioral biases both cognitive and emotional biases spontaneously effect the decision making considered in the study will lead to overcome these biases resulting in avoidance of significant loss. On the other side, this study will also be useful for the advisor to understanding the behavioral biases for the guidance the investors how to develop the optima portfolio according to the investor psychology (Nofsinger et al., 2018; Marc et al., 2022).

Wealth management advisors are pivotal to the investor's successful endeavors. The fundamental aspects of the advisor may include the awareness and understanding of the client's financial goals, adopting an organized approach to guide the client, delivery the results as per expectations of the client and the mutual benefits should be availed and offered from both the client and the advisor. Therefore, this study is helpful for investors and advisors to build strong professional relationship for achieving the mutual goals.

2. Literature review

According to (Jain et al., 2020) The three most prevalent biases that influence an individual investor's decision-making while buying common stock are herding prejudice, overconfidence bias, and loss aversion bias. (Batmunkh et al., 2020) found by applying the

cross sectional absolute deviation model evidence of herding bias was found in the Global financial Crises and economic boom in 2011. "(Metawa et al., 2019) found that the investors sentiments, overconfidence and herd behavior, overreaction and under reaction have significantly affected the decision making of individual equity investors. (Zhou & Anderson, 2013) found that the herding behavior of equity investors in US equity REIT market exists in the 'modern' era as compared to 'pre-modern' era. When the market becomes tumultuous, the herding bias usually occurs. (Javaira & Hassan, 2015) found that herd behavior nor exists in the equity investors of Karachi Stock Exchange for period of 2002-2007 and found no relevant support for the rational asset pricing model. The herd behavior was not found due to asymmetric market volatility, high and low trading and market rate asymmetric. Macroeconomics fundamentals do not play a vital role in decision making process of investors. Therefore, it has no significant impact on herding behavior. However, herd behavior in KSE was found during liquidity crises of March 2005 due to presence of speculator and asymmetric of information among investors. (Caparrelli et al., 2004) found that the herding behavior exists in the extreme market conditions. (Zat & Khan, 2017) considered two cognitive biases i.e. availability bias and loss version bias both have affected the decision making of individual common stock investors in the stock market. (Bouteska, 2020) explained that the loss aversion bias negatively changes the performance of individual common stock investors whereas overconfidence bias affects positively. (Economics et al., 2014) analyzed the common stock investment of men and women from February, 1991 to January, 1997 and found that the trade of men was 45 percent more than the women. The men were more overconfident than the women in the stock market. (Bernoster & Rietveld, 2018) found that the overconfidence is related to the intended market entry not to the market position of the business".(Robert, 1996) found that the financial literacy overconfidence is positively influenced the market participation whereas under confidence is negatively influenced the market participation. Nosi (2010) discovered that at the 5% level of significance, there was a statistically significant influence of overconfidence bias, availability bias, familiarity bias, herding, and representational bias on investment decision. Additionally, the investment decision is significantly impacted by confirmation bias, disposition prejudice, and loss aversion bias at the 10% level. There were no statistically significant differences between male and female responses. According to (Ma et al., 2021), overconfidence has a detrimental impact on the performance of the market for service firms but a good impact on the market for industrial firms. Furthermore, it was found that the overconfidence bias appears to be at work when investors have both increased confidence and increased loss aversion. (Chen et al., 2007) found that the decision making of Chinese investors was poor: the stocks were purchased by the Chinese investors underperform were sold immediately. It also found that the Chinese investors were indulged in three behavioral biases: (i) they encouraged to sell the stocks having increasing trend in price level and discoursed those stocks having decreasing trend in price level; (ii) investors were overconfident and (iii) they believed that the past returns were the indicative of future expected returns (a representative bias).

"(Park et al., 2010) found that when investors process information from the message boards indulges in the confirmation bias. It also found that the investors having stronger confirmation bias tend to greater overconfidence. Finally, the investors have more expectations about their performance trade frequently but get fewer actual returns".

"(Goo et al., 2014) conducted the research on Taiwanese investors and found many interesting results regarding the disposition effect. First, they found that only 26 percent of individual Taiwanese investors report in the bull market. Second, level of education of investors is significantly correlated with the disposition effect. Lower disposition effect was found in the investors having college or advance degrees. Third, the feeling of gains or losses is also significantly correlated to the disposition effect".

Madsen (1994) found by using the non-experimental data of 14 OECD countries that the manufacturing was consistently over optimistic about the expected results. It is also revealed with psychological model the optimism bias exists as an increasing function of uncertainty.

Riaz & Iqbal (2015) found that the four behavioral biases (Self-control, overconfidence, illusion of control and optimism) have positive and significant effect on decision making. The results revealed that the investors of Pakistan were biased while making investment decision.

Marett & Adams (2006) found that the bias does exist and such type of information does helpful for the accuracy of the decision making but sometime there may be limited amount of information observed by the decision makers.

De Vries et al. (2017) found that results indicated that the investors were indulge in familiarity bias selected different companies to invest in.

2.1.   Research hypotheses

The research hypotheses of the study are:

H_1: The relationship is existing between decision making and overconfidence bias
H_2: The relationship is existing between decision making and representative bias
H_3: The relationship is existing between decision making and anchoring bias
H_4: The relationship is existing between decision making and overconfidence
H_5: The relationship is existing between decision making and availability bias
H_6: The relationship is existing between decision making and regret eversion bias
H_7: The relationship is existing between decision making and loss aversion bias
H_8: The relationship is existing between decision making and mental accounting bias
H_9: The relationship is existing between decision making and optimism bias
H_{10}: The relationship is existing between decision making and familiarity bias
H_{11} The relationship is existing between decision making and confirmation bias
H_{12} The relationship is existing between decision making and disposition bias

3. Research Methodology

3.1. Universe

The universe of this study was the total population of the Punjab

3.2. Target Population

The target population of this study was the individual common stock investors from Punjab who invested in the stock market.

3.3. Data

The core information was acquired utilizing a structured questionnaire from Pakistani residents who own common stocks and invest in the Pakistan Stock Exchange. 950 questionnaires were distributed to equity investors and only received 850 responses from the respondents. The questionnaires were adopted for this study (Barrafrem et al., 2020; Jain et al., 2020; الربضي et al., 2018)

3.4. Sample size

A sample of size 850 was used for this study.

3.5. Sampling technique

The snow ball and convenience sampling techniques were used to collecting the primary data from the equity investors. These two methods were applied for collecting the data due to its benefits to easily access of the respondents.

3.6. Analysis Tool

Microsoft Excel applied for analysis the data. Fuzzy Analytical Hierarchical Process is the step-by-step technique and only Microsoft Excel support to apply F-AHP.

3.7. Hierarchical structure

The hierarchical structure is given below:
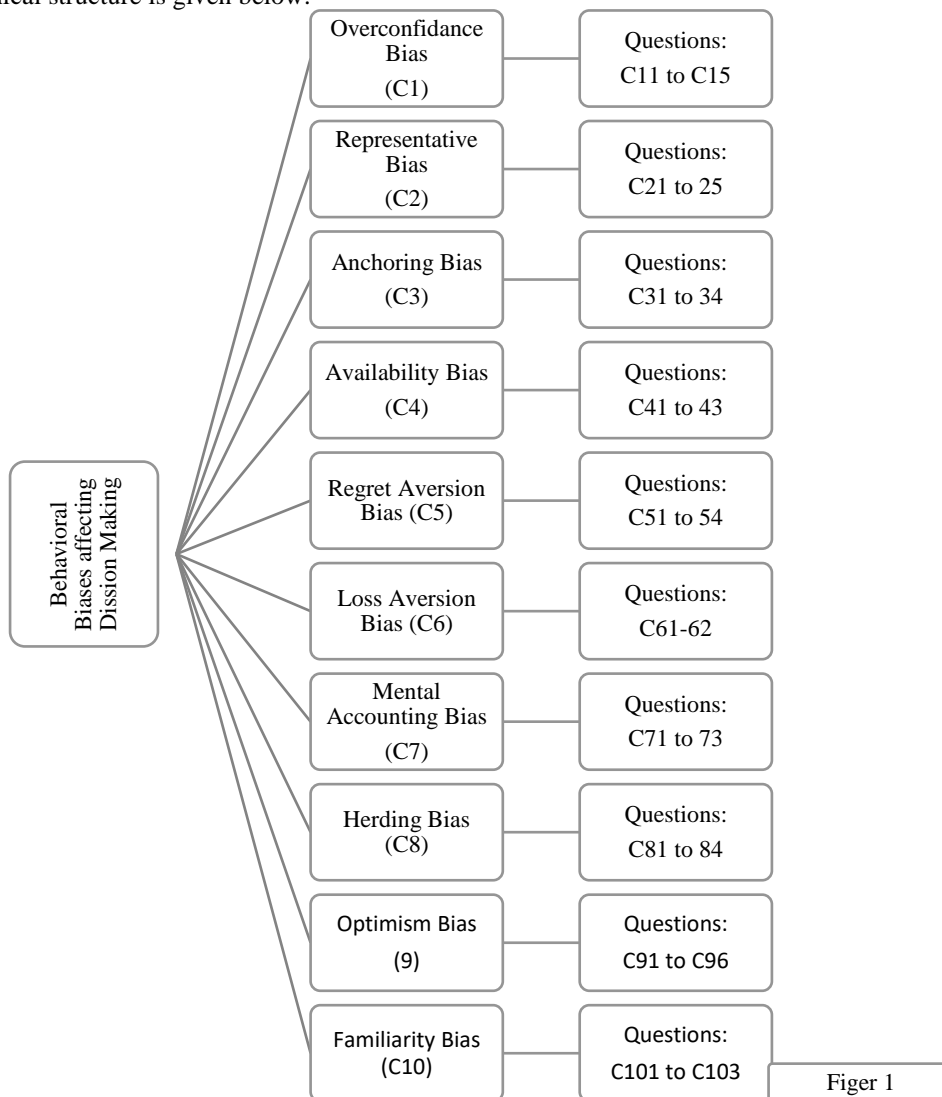
Figer 1

The hierarchical structure of the study is showed in the above-mentioned figure 01. There are three levels, first is the weight of criteria i.e., behavioral biases that affects the decision making process and the second is the weight of sub-criteria and third is he relevant questions of sub-criteria of this study.
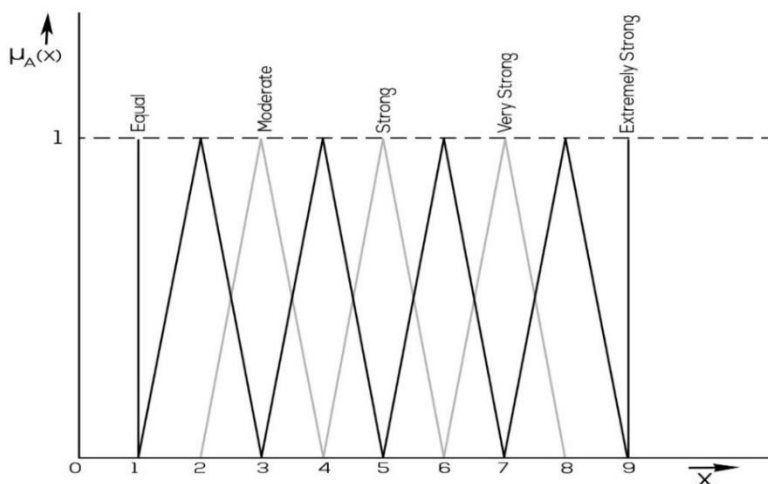
3.8. Fuzzy analytical hierarchy process (FAHP)

Zadeh introduced the concept of Fuzzy set theory in 1965. Fuzzy Analytical Hierarchical Process (FAHP) is a logical framework that combines set theory and hierarchical structures. The fundamental objective of Fuzzy set theory is to enable a concurrent approach to dealing with specific sequences and information handling. According to Wu et al. (2008), the dependable environment aligns well with the Fuzzy framework. Fuzzy AHP's expansion addresses previously intractable problems and mitigates the limitations of traditional AHP. Essentially, Fuzzy set theory is most applicable to triangular fuzzy numbers, denoted by a set of three real numbers (l, m, u) representing the minimum, maximum, and maximum feasible values, respectively. These numbers serve to elucidate the degree of fuzziness in the evaluated data and should not be confused with fuzzy numbers. For further insights into these numbers, Table 1 offers detailed information, highlighting that these numbers are not considered fuzzy when $l = m = u$ (Chan & Kumar, 2007).

Table 1: Fuzzy Scale of Relative Importance, numbers and inverse

Relative importance		Fuzzy numbers	Inverse numbers
Equal	1	(1,1,1)	(1,1,1)
Moderate	3	(2,3,4)	(1/4 ,1/3, 1/2)
Strong	5	(4,5,6)	(1/6, 1/5, 1/4)
Very strong	7	(6,7,8)	(1/8, 1/7, 1/6)
Extremely strong	9	(9,9,9)	(1/9, 1/9, 1/9)
	2	(1,2,3)	(1/3, 1/2, 1)
	4	(3,4,5)	(1/5, 1/4, 1/3)
Intermediate values	6	(5,6,7)	(1/7, 6/7, 1/5)
	8	(7,8,9)	(1/9, 1/8, 1/7)

Figure 2 explain the concept of fuzzy numbers by graphically. The numbers like 1, 3, 5, 7 and 9 assigning the value like Equal, moderate, strong, very strong and extremely strong respectively. The numbers such as 2,4, 6 and 8 falls among these numbers assigning as intermediate values

The fuzzy triangular numbers are explained by the following equation:

$$\mu a^{\sim}(x) = \begin{cases} \frac{(x-l)}{(m-l)} & l \leq x \leq m \\ \frac{(u-x)}{(u-m)} & m \leq x \leq u \\ 0 & otherwise \end{cases} \tag{1}$$

Fuzzy Analytical Hierarchical Process (F.AHP) integrates fuzzy aspects into the conventional Analytical Hierarchy Process (AHP), initially introduced by Saaty in 1980. AHP serves as a multi-criteria decision-making tool that aids decision-makers in selecting the most suitable option from among various alternatives. It is a methodology employed to determine the relative importance of criteria (Badshah et al., 2016). FAHP, on the other hand, serves as an alternative to AHP, specifically designed to address the limitations of AHP in dealing with linguistic variables and reducing the reliance on compensatory decision-making approaches. The algorithm for applying the FAHP for behavioral biases effecting investment decision are given:

Step 1: The cognitive and emotional behavioral biases that affect individual equities investors' decision-making are described, along with the corresponding criteria and sub-criteria.

Step 2: After explaining the evaluative behavioral biases criteria and sub-criteria, the individual equity investors are requested to assign relative weights to each criterion and sub- criteria according to their choice apply during the decision making.

Step 3: According to (Vargas, 1990), first develop normal pair-wise comparison matrix (NPCM) by simply applying the AHP for evaluating the weights of each criteria as well as sub-criteria. It is explained in equation (2)

$$\begin{bmatrix} a11 & \cdots & a1n \\ \vdots & \ddots & \vdots \\ a31 & \cdots & a3n \end{bmatrix} \tag{2}$$

Step 4: By considering the order, normal pair- wise comparison matrices of all the selected criteria, by using the Fuzzy AHP the values of all the criterion are found.

$$\begin{bmatrix} a11la11ma11u & ... & a1nla1nma1nu \\ \vdots & \ddots & \vdots \\ a31la31ma31u & \cdots & a3nla3nma3nu \end{bmatrix} \tag{3}$$

Step 5: By using the equation no 4 the preferences of each equity investors are consolidated due to multi decision maker's existence.

$$a_{ij} = \text{Min}_k \left\{ a_{ij}^k \right\}, b_{ij} = \frac{1}{k} \sum_{k=1}^{k} b_{ij}^k, c_{ij} = \text{Max}_k \left\{ c_{ij}^k \right\} \tag{4}$$

Step 6: As per (Buckley, 1985) the geometric mean of each criterion and sub-criterion is got by using the equation no 6

$$\tilde{A}1 \otimes \tilde{A}2 \otimes \tilde{A}3 = (l1 \times m1 \times n1) \otimes (l2 \times m2 \times n2) \otimes (\ln \times mn \times un)$$
$$= (l1 \times l2 \times \ln), (m1 \times m2 \times mn), (u1 \times u2 \times un) \tag{5}$$

$$\tilde{r}i = (l1 \times l2 \times \ln)^{1/n}, (m1 \times m2 \times mn)^{1/n}, (u1 \times u2 \times un)^{1/n} \tag{6}$$

Step 7: To find weight and of each criterion as well as sub criteria $(\tilde{w}i)$ multiply by each $(\tilde{r}i)$ with the inverse factor (shown in equation 7).

$$\tilde{w}i = \tilde{r}i \otimes (\tilde{r}1 \oplus \tilde{r}2 \oplus \cdots \oplus \tilde{r}n)^{-1} \tag{7}$$

Step 8: A technique called center of area (COA) is applied for converting the fuzzy triangular numbers $(\tilde{w}i)$ in to de-fuzzified numbers.

$$(Wi) = \frac{l\tilde{w}i + m\tilde{w}i + u\tilde{w}i}{3} \tag{8}$$

Step 9: A non-fuzzy (*Wi*) is obtained from the equation no 8 and it is normalized by the formula shown in the equation no 9

$$(Nwi) = \frac{(Wi)}{\sum(wi)} \tag{9}$$

The above mentioned 9 steps are executed for finding out the weight of each criterion and sub criteria. After executed nine steps multiplying, each sub-criteria weight with relevant criteria for weight of each criterion are calculated.

4. Research findings

After analyzing the pairwise comparison matrix by considering the criteria and sub-criteria of the study, the Fuzzy Analytical Hierarchy Process (FAHP) was applied. First, the crisp numbers are transformed to the Fuzzy numbers and then prepare pairwise comparison matrix as explained in the calculation steps of AHP. After applying the seventh steps as explained in the Fuzzy calculation and get aggregate results for each alternative according to each criterion (Table 2)

The findings of this study are important when compared to the body of literature already in existence that supports various behavioral biases influencing common stock investors' decision-making. Fuzzy AHP is used in this study to determine the relative importance of factors influencing cognitive and emotional biases. The importance of the weights assigned to each level of the behavioral bias criteria influencing investment decisions, as shown in Table 3.

The highest value was for "Mental Accounting" (having a weight of 0.238), and the remaining nine behavioral biases are "Herding" (having a weight of 0.201), "Anchoring Bias" (having a weight of 0.165), "Representative Bias" (having a weight of 0.145), "Regret Aversion Bias" (having a weight of 0.091), "Availability Bias" Figure 2 is a radar chart illustrating how the distribution of the weights of each criterion influences the choices made by individual equity investors.

Table 2: Fuzzy Analytical Hierarchy Process

Behavioral Biases	Weights	Q1	Q2	Q3	Q4	Q5
Over Confidence Bias	0.3950	0.0337	0.2862	0.3043	0.0710	0.3048
Representative Bias	0.4037	0.0746	0.3105	0.3105	0.1522	0.1522
Anchoring Bias	0.0642	0.2500	0.2500	0.2500	0.2500	0.0000
Availability Bias	0.0618	0.0593	0.1946	0.7461	0.0000	0.0000
Regret Aversion Bias	0.0752	0.0601	0.3235	0.2929	0.3235	0.0000
Loss aversion Bias	0.3950	0.1440	0.8560	0.0000	0.0000	0.0000
Mental Accounting Bias	0.4037	0.0665	0.2181	0.7155	0.0000	0.0000
Herding Bias	0.0642	0.0485	0.3095	0.3095	0.3325	0.0000
Optimism Bias	0.0618	0.0207	0.2499	0.5728	0.0475	0.1090
Familiarity Bias	0.0752	0.0479	0.1910	0.7611	0.0000	0.0000

After applying all the steps of Fuzzy AHP, find the weightage of all the criteria that affect the decision making of individual common stock investors (Table 3)

Table 3: Fuzzy AHP

Behavioral Biases	WEIGHT
MENTAL ACCOUNTING	0.2379
HERDING BIAS	0.2007
ANCHORING BIAS	0.1649
REPRESENTATIVE BIAS	0.1454
REGRET AVERSION	0.0909
AVAILABILITY BIAS	0.0649
LOSS AVERSION	0.0459
OVER CONFIDANCE BIAS	0.0338
OPTIMISM BIAS	0.0121
FAMILIARITY BIAS	0.0034

Behavioral Biases Weights
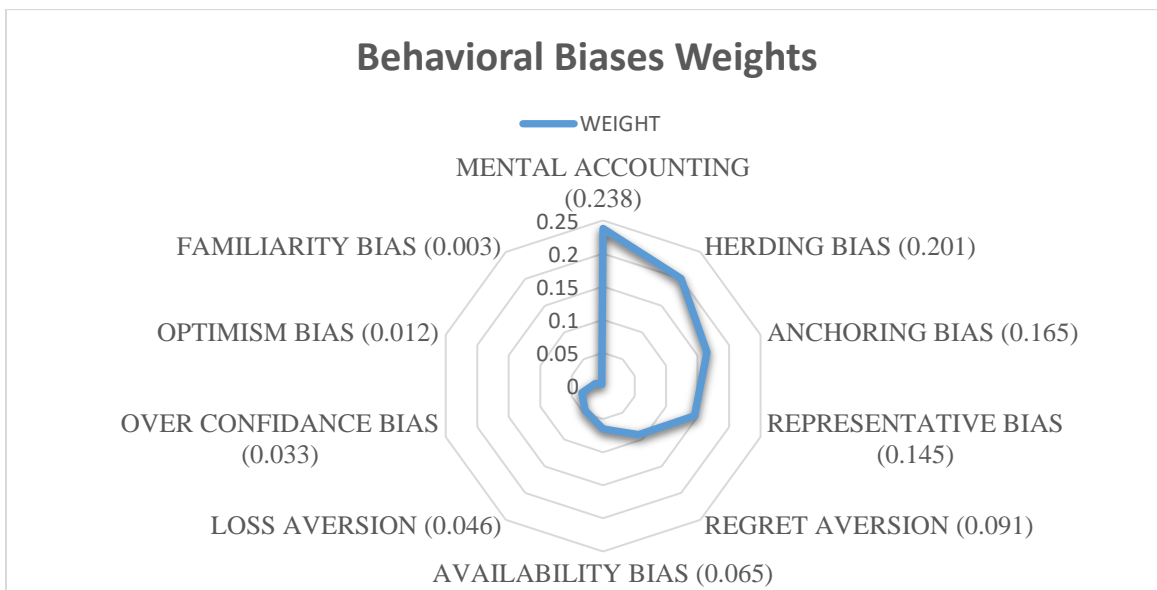
5. Conclusion

An interdisciplinary approach has been employed to assess cognitive and emotional biases. This research has adopted a multi-criteria decision-making methodology to evaluate the behavioral biases that impact the decision-making process of individual investors in the stock market. The primary technique utilized for analyzing the influence of emotional and cognitive biases on investor decision-making is the Fuzzy Analytical Hierarchy Process (Fuzzy AHP).

Following an exhaustive review of relevant literature, 23 behavioral biases were identified, and from these, the study selected the ten most significant ones. These key behavioral biases include Mental Accounting, Herding, Anchoring Bias, Representative Bias, Regret Aversion Bias, Availability Bias, Loss Aversion Bias, Overconfidence Bias, Optimism Bias, and Familiarity Bias.

The findings from the application of Fuzzy AHP indicate that Mental Accounting, Herding, Anchoring Bias, and Representative Bias are the most critical behavioral biases that influence the decision-making process of common stock investors. These research results offer valuable insights for investors when making investment decisions and contribute to better communication and understanding between investors and financial advisors.

5.1. Limitations and scope for future research

The study is conducted in the province of Punjab where most of the people are business minded. The results of the study may be varying if the study is conducted in different geographical area. The data collection by using the snow ball sampling is also another limitation of the study.

This study has analyzed only 10 cognitive and emotional biases affect the decision making of investors and data has been collected form investor who reside in Punjab. Further, research can be conducted by increasing the behavioral biases and data may be collected from all the investors who reside in Pakistan.

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