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Examining Behavioral Biases among Investors in the Saudi Arabian Stock Market: A Behavioral Finance Approach

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Abstract

This paper presents an explanatory study of the prevalence and influence of behavioral heuristics and prospect biases among investors in the Saudi stock market with the specific goal of determining the extent to which these biases impact investment decisions. Data were collected through an online questionnaire completed by 598 investors, and a statistical analysis was performed to determine the prevalence and impact of identified biases. The data were analyzed using descriptive statistics, and the mean values were tested using a one-sample t-test. In addition, one-way analysis of variance (ANOVA) was conducted to determine significant differences based on demographic and trading variables. The results indicate that investors in Saudi Arabia show moderate behavioral biases, with variations in how these influence investment decisions. Representativeness and regret aversion emerged as the most prominent bias, with a high level of each observed. Age, income, education, trading experience, and trading frequency were significant factors influencing. the degree of bias The findings of this study, therefore, have important implications for investors, and policymakers in the KSA context, highlighting a need for initiatives that promote rational decision-making and reduce the impact of behavioral biases on investors.

Keywords: behavioral finance biases, behavioral heuristics, prospect biases, investment decision.

I. INTRODUCTION

In recent years, research interest in explaining investor behavior in terms of behavioral biases has grown significantly (Mathur & Rastogi, 2018; Sharma & Kumar, 2019; Argan et al., 2023; Mittal, 2022; and Parveen et al, 2023). Conventional financial theories and models, such as portfolio theory (introduced by Markowitz, 1952), the capital asset pricing model (Sharpe, 1964), and the efficient market hypothesis, all begin from the assumption that investors act logically and make sound decisions (as stated by Fama, 1965a, 1965b, and 1970). Or, put another way, investors are held to be capable of both processing all available information as in efficient market theory (Shiller, 1999) and acting rationally such that they consistently make reasonable decisions and revise their beliefs based on incoming information (Thaler, 2005). However, referencing the limited resources of the human mind, several behavioral economists have challenged this assumption of rationality. Far from positing rational investors, they argue instead that investors' irrationality is reflected as random patterns in stock prices, which leads to extreme mispricing due to the influence of sentiments on stock price movements (Fahkry, 2016; Mathur & Rastogi, 2018).

To understand how investment decisions are made, it is essential to examine the behavioral aspects that drive individual stock markets. In relation to behavioral finance, researchers have identified three psychological biases that can lead to inefficient

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investment choices for individual investors: overconfidence, herding, and loss aversion (Shiller, 2000). Addressing these biases can lead to better investment outcomes (Thaler, 2015). For instance, it has been shown that individual investors in the US equity market tend to buy high and sell low, leading to lower investment returns than accrue from a passive strategy (Barber & Odean, 2000). In the same way, research into the Chinese stock market has demonstrated that herd behavior and overconfidence on the part of investors result in increased market volatility and lower investment returns (Tan et al., 2008). Thus, if individual investors are to make informed investment decisions, they need to identify and understand the influence of their own behavioral biases. Further, governments can play a critical role in reducing the negative impact of behavioral biases on the stability and efficacy of financial institutions.

A prominent topic of discussion in recent times, behavioral finance underscores the impact of psychological biases on financial decision-making. Over the last two decades, the Tadawul, Saudi Arabia's stock market, has experienced swift expansion, attracting both domestic and foreign investors thanks to its considerable size, transparency, and liquidity. Of all the stock markets in the Gulf Cooperation Council (GCC), the Tadawul is the largest and most advanced, with an unmatched market capitalization of approximately $2 trillion. In comparison, the Dubai Financial Market has a substantially lower market capitalization of about $75 billion. With an average daily trading volume of about $2.5 billion, the Tadawul enjoys a high level of liquidity, which promotes stock price transparency and simplifies the buying and selling of stocks. In summary, Tadawul's market size, liquidity, and transparency make it the most prominent and well-developed stock market in the GCC region. However, little is known about either the prevalence among or the influence of behavioral biases on investors in this context. The purpose of the present study, therefore, is to investigate the extent of behavioral heuristics and prospect biases among investors in the KSA stock exchange.

According to the middle east investor relations association (MEIR) report for 2021, as of 2020, retail investors accounted for around 67% of trading volume on the Tadawul. According to the Saudi Arabian monetary agency (SAMA) financial stability report (2015), this figure represents a decrease from 2014, at which time individual investors accounted for 86.9% of the trades that took place in the Saudi stock market as compared with institutional investors at 11.8% and foreign investors at 1.2%. Against this background of overall growth, the present study focuses on recent developments in the Saudi stock market, such as the increased number of initial public offerings and new regulations introduced by the Tadawul and the Saudi capital market authority (CMA). The chairman of the Saudi CMA announced that at least 23 companies are planning to launch an initial public offering (IPO) on Saudi Arabia's stock exchange in 2023, in line with the KSA's Vision 2030 objective of becoming a recognized global financial center on the international stage. Further, with the exception of 2019 when Saudi Aramco was listed on the Saudi capital market, 2022 was the market's most successful year ever based on 49 listings with SR40 billion ($10.66 billion) raised in equity capital (Arab News, 2023).

There is a dearth of research on investor sentiment in Saudi Arabia. Further, the valuations of some of the listed stocks before the 2006 crash have yet to be fully accounted for. Given that this is the case, this study focuses on identifying and comprehending the attitudes and behaviors of investors in Saudi Arabia as a foundation for developing an investor relations and communication strategy that resonates with key stakeholders.

An examination of the behavioral biases present in the Saudi stock market can yield valuable insights into investors' decision-making processes in the context of an

emerging market. As part of the vision 2030 initiative, the Saudi stock market is undergoing a transformation, which presents opportunities for investors and challenges for policy makers. By examining how behavioral biases operate in this context, researchers can better understand how investors and policy makers are adapting to these changes. Additionally, it is reasonable to expect that the distinct cultural context of Saudi Arabia influences decision-making such that a study of behavioral biases in this specific market can shed light on how cultural factors shape these biases and their influence. In addition, the scarcity of studies on the prevalence and functioning of behavioral biases in the Saudi stock market means that there is a need to investigate this subject in order to advance the field's knowledge of the financial system. Overall, through a focus on the Saudi stock market, it becomes possible to account for investment choices and revisit policy choices as a way to support greater knowledge of and more informed decision-making within the financial system.

To achieve this objective, a validated questionnaire was designed and used to collect data online from 598 investors. The questionnaire consisted of two sections: demographic and trading-related information and multiple item blocks measuring specific biases. A panel of professors and trading experts validated the questionnaire for face validity. The data were analyzed using SPSS v.27, and the questionnaire's validity and reliability were assessed using Cronbach's alpha coefficients and internal consistency validity.

The results indicate that investors in Saudi Arabia are moderately influenced by various behavioral biases when making investment decisions. Overconfidence bias and anchoring bias were found to be prevalent in the sample, with differences between investors in terms of the extent of each bias's influence. The most influential overconfidence bias item pertained to holding stocks in more than one company in the Saudi stock exchange. For anchoring bias, investors were most influenced by their recent trading experiences and by comparisons of current stock prices with recent year high and low prices as a way to justify a stock purchase and by stock purchase price as a reference point for trade. Further, representativeness bias, regret aversion bias, and self-control bias were each found to have a moderate influence on investment decisions, with specific items representing these biases found to be the most influential. This study also highlights the significant role of investors' demographic characteristics and trading-related information in determining the level of given biases. The results indicate that a large income, a high level of education, and many years of investment experience combined with frequent trading tend to be associated with a low level of bias.

Overall, the study provides important insights into the prevalence of behavioral biases among and their influence on investors in the KSA stock exchange. The findings indicate a need for awareness and management of behavioral biases in investment decision-making and point to the significant role of investors' demographics and trading-related information in determining the level of those biases.

The rest of the paper is organized as follows: section 2 presents a literature review and an account of how behavioral finance biases are defined and identified. The methodology used in the study is detailed in section 3 together with a description of the sample selection data analysis and the empirical results. The key findings and general discussion are presented in section 4, while study limitations and concluding remarks are addressed in section 5.

II. LITERATURE REVIEW

2.1. Behavioral Finance and Investor Biases

2.1.1. Context and relevance to the Saudi market

The focus of this paper is advancing understanding of behavioral biases in the context of the Saudi stock market as a critical consideration in shaping financial policy in the Kingdom but also with implications for stock markets and investor behavior more broadly. This research direction is of great importance because if we are to accurately identify and better understand the mechanisms governing investment decisions, it becomes imperative to explore the behavioral dimensions steering individual stock markets. In particular, an exploration of the prevalent behavioral biases pertinent to the Saudi stock market provides a foundation for a comprehensive picture of how investors make decisions within the framework of an emerging market. Notably, in 2020, retail Saudi investors constituted approximately 67% of the trading volume on the Tadawul.

2.1.2. Review of empirical literature on behavioral biases

Behavioral finance delves into the emotional aspects that investors grapple with when making investment choices (Mittal, 2022). Research in this area suggests that individuals do not consistently make rational decisions in their investments, but are, instead, often swayed by irrational factors, which can result in emotional and, consequently, irrational investment preferences (Dickason et al., 2017; Sharma & Kumar, 2019; and Argan et al., 2023). In fact, emotions play a defining role in equity investment decisions, especially when information is abundant and uncertainty is high. Due to the irrational behavior of investors, market anomalies arise, which has led to investigations focused on psychology to explain investor behavior (Phung, 2010). In fact, in the sphere of behavioral finance, Chaudhary (2013) showed that emotional and cognitive factors exert an extensive influence over investors' decision-making processes. Further, Chaudhary (2013) identified loss aversion, overconfidence, anchoring, herd behavior, and over- and under-reaction as the principal factors impacting investor decision-making. Similarly, Parveen et al. (2023) observed that behavioral heuristics and biases, such as the representative heuristic, anchoring heuristic, overconfidence bias, and disposition effect, have adverse impacts on the decision-making processes of investors in the Pakistani stock market. Pennings and Gracia (2010) examined the role of psychological and behavioral elements on investors' decision-making processes. Based on secondary data, they suggested that rather than making investment decisions based on a rational analysis of sound information, retail investors frequently rely on behavioral factors such as mental accounting, cognitive dissonance, anchoring, greed, fear, and heuristics. Additionally, research indicates that investors' personality traits have a marked impact on their investment choices, with a stronger correlation found between the factor of relative emotional stability and equity investments than between this factor and other investment options (Chitra & Sreedevi, 2011). However, investors' biases hinder their ability to make sound decisions in the stock market context, leading to suboptimal investment performance (Chandra, 2008; Mittal, 2022; and Aljifri, 2023).

In a number of studies, researchers have shown that it is crucial to take behavioral biases into account when making investment decisions and that policymakers can promote a more effective financial system by implementing regulations that address the impact of these biases on investment choices (Ritter, 2003; Pennings & Gracia, 2010; Chaudhary, 2013; Chaffai & Medhioub, 2014; and Parveen et al., 2023).

2.1.3. Cognitive biases in investment decisions

Extensively studied in psychology, behavioral biases have been found to lead to predictable errors in people's beliefs (Kahneman & Tversky, 1979; Shefrin & Thaler, 1988). Of these various kinds of biases, those classified as cognitive result from how people think and have been modeled as heuristic rules of thumb that generally perform well but sometimes lead to systematic errors (Tversky & Kahneman, 1992). The following definitions of multiple kinds of cognitive biases are drawn principally from a study by Pompian (2012):

1) Overconfidence bias refers to excessive faith in one's cognitive abilities and intuitive reasoning. It involves overestimating one's predictive skills and the accuracy of the information available. In relation to investment behavior specifically, behavioral theories suggest that "overconfident investors overestimate the quality of their information and underestimate risk" (Aljifri, 2023, p. 93).
2) Anchoring bias refers to an over-reliance on just one piece of information in making a decision, which, therefore, has a negative effect on how people estimate probability. Over-reliance on arbitrary price levels or indexes when making decisions about buying or selling securities is an example of this kind of bias relative to investing. Another example is an investor considering only the price at which he/she bought a security with insufficient adjustment for subsequent information (De Bondt, 1993; Muradoğlu & Önkal, 1994).
3) Availability bias refers to the tendency to give too much weight to information that is easily accessible or recently observed. It can lead to overestimating the likelihood of certain events due to their salience.
4) Representativeness bias refers to the tendency to make judgments based on how well an opportunity or instance fits into a familiar classification scheme. Another way of putting this is that representativeness refers to an overreliance on stereotypes. Base-rate neglect and sample-size neglect are both examples of this kind of bias relative to investing.
5) Gambler's fallacy refers to the erroneous belief that a random event is less likely to occur following a given kind of event/series of events that is/are independent of it such that none of these have any relationship with or influence on the others.

2.1.4. Prospect theory and preference-based biases

Referring to another category of biases related to investor preferences, prospect theory offers a behavior-based framework to explain how individuals deviate from the expected utility theory axioms (Kahneman & Tversky, 1979). The main biases incorporated in prospect theory (Kahneman & Tversky, 1979) are described briefly next based on definitions from Pompian (2012):

1) Self-control bias refers specifically to the tendency to prioritize immediate consumption over saving for the future. It stems from a conflict between a person's overarching desires and a lack of self-discipline in pursuing those desires.
2) Loss aversion bias refers to the tendency to avoid losses rather than to acquire gains. This kind of bias suggests that people experience more pain from losing than pleasure from winning. According to Tversky and Kahneman (1992), loss aversion bias describes investors' reluctance to incur losses and constitutes a phenomenon in which people attach double the significance to losses as to gains of a similar magnitude.
3) Regret aversion bias refers to the tendency to avoid making decisions that could lead to regret. This bias is driven by a desire to avoid the emotional pain associated with poor decision-making.

4) Mental accounting refers to the tendency to categorize and evaluate economic outcomes by grouping assets into non-interchangeable mental accounts. This can lead individuals to allocate wealth to separate compartments and ignore the effects of fungibility and correlation.

III. RESEARCH METHODOLOGY

3.1. Overall Methodology and Statistical Method

With a descriptive approach and quantitative data collected through a survey questionnaire, this exploratory study draws on Kahneman and Tversky's (1979) biases and a deductive analytical approach to present a broad account of how cognitive biases determine investor behavior. The data were obtained through a self-administered online questionnaire and evaluated using a quantitative descriptive technique, i.e., mean and standard deviation with IBM SPSS v.27. To establish their significance, the mean values were tested based on a one-sample t-test. In addition, one-way analysis of variance (ANOVA) was operationalized to determine significant differences in relation to demographic and trading information variables.

3.2. Questionnaire Design

In this study, the paper investigates the behavioral heuristics and prospect biases prevalent among investors in the KSA stock exchange. Data were collected via a questionnaire instrument developed by drawing on key studies in the literature and incorporating scales designed to assess the magnitude of each kind of bias to be measured. The questionnaire was divided into two sections, of which the first comprised items designed to capture demographic and trading-related information and the second multiple-item blocks, each measuring a specific bias. Responses were given according to a 5-point Likert scale to rate level of agreement with each item. The scales used to measure respondent bias are presented in Table 1.

Table 1
Bias Measures

	Bias	Number of Items	Source
Behavioral Heuristics	Overconfidence	7	Odean, 1999; Lin, 2011; and Parveen et al., 2023
	Anchoring	7	Khan et al., 2017
	Availability	8	Waweru et al., 2008; Luong & Thu Ha, 2011; Kudryavtsev et al., 2013; Khan et al., 2017; and Rasheed et al., 2018
	Representative-ness	5	Waweru et al., 2008; Luong & Thu Ha, 2011; Sarwar et al., 2014; and Rasheed et al., 2018
	Gambler's Fallacy	1	Shefrin, 2000; Barberis & Thaler, 2003; Szyszka, 2007; Evans et al., 2011; and Singh, 2012
Prospect Biases	Self-control	5	Pompian, 2012, 2016
	Loss Aversion	6	Waweru et al., 2008
	Regret Aversion	5	Waweru et al., 2008; Luong & Thu Ha, 2011
	Mental Accounting	3	Waweru et al., 2008

The face validity of the scales was established by a panel of professors and trading experts. Based on their feedback and amendments, the questionnaire underwent several iterations, leading to the final version that was subsequently employed to collect the study data in online settings created using Google forms.

3.3. Sampling, Data Screening, and Preparation

The data collection phase involved sharing an online survey over a period of three months in 2022 with investors in the KSA stock exchange. Significant effort was made to obtain the largest possible sample, which resulted in a total of 626 questionnaires being gathered. However, as 28 were considered invalid, only 598 questionnaires were included in the analysis. Given that the skewness and kurtosis coefficients were within the range recommended by Sposito et al. (1983) for a dataset free of normality concerns (2.2 ±), the data met the normality assumption required for parametric tests such as ANOVA and the t-test. The skewness coefficients were as follows: overconfidence [-.253], anchoring [-.610], availability [-.390], representativeness [-.702], gambler's fallacy [-.227], self-control [-.501], loss aversion [-.418], regret aversion [-.642], and mental accounting [-.464]. The kurtosis coefficients were as follows: overconfidence [.165], anchoring [1.330], availability [1.729], representativeness [1.769], Gambler's fallacy [-.622], self-control [1.603], loss aversion [.422], regret aversion [1.786], and mental accounting [.666].

Common method bias is often found with self-reporting. Consequently, a standard one-factor test was conducted to assess its significance in the results profile. The impact of common method bias was found to be minimal (26.383% of the variance), which does not come near the 50% cutoff threshold generally accepted in the field (Podsakoff et al., 2012). Additionally, the issue of high collinearity among the biases was not observed, as evidenced by the Pearson correlations (Table 2), which were all below the threshold of r= 0.90 proposed by Pallant (2020). These findings confirm the suitability of the data collected for further analysis.

Table 2
Correlation Matrix (n= 598)

Bias	1	2	3	4	5	6	7	8	9
Overconfidence	1								
Anchoring	.346**	1							
Availability	.327**	.634**	1						
Representativeness	.356**	.629**	.562**	1					
Gambler's fallacy	.408**	.393**	.399**	.315**	1				
Self-control	.353**	.599**	.665**	.530**	.454**	1			
Loss aversion	.299**	.550**	.474**	.493**	.262**	.408**	1		
Regret aversion	.279**	.578**	.612**	.542**	.325**	.626**	.469**	1	
Mental accounting	.269**	.552**	.542**	.445**	.322**	.485**	.381**	.493**	1

Note: ** correlation is significant at the 0.01 level.

Table 2 presents a detailed correlation matrix for the nine biases measured in this study (n= 598). The correlations between each of the biases are in the overall range from -1 (perfect negative correlation) to 1 (perfect positive correlation). In this range, the value of 0 means that no correlation was found.

Further, positive correlations are evident between all the biases, with significant correlations observed at 0.01. As an example, the overall picture of correlation values for Anchoring is as follows: positive correlations were found between anchoring and overconfidence (r= 0.346), gambler's fallacy (r= 0.393), loss aversion (r= 0.550), mental accounting (r= 0.552), regret aversion (r= 0.578), self-control (r= 0.599), representativeness (r= 0.629), and availability (r= 0.634). It is also the case that the results show numerous positive correlations between various biases. Of these, the representativeness and self-control biases are clearly the most strongly correlated (r= 0.665) followed by the anchoring and availability biases (r= 0.634). However, given that all the Pearson correlations reached the threshold of 0.90, the correlation values are not

considered particularly high. For this reason, collinearity is not a matter for concern in the analysis.

3.4. Questionnaire Validity and Reliability

A questionnaire that relied on valid and reliable measures constituted the primary data source for this study, as the findings presented in Table 3 indicate. The questionnaire's reliability was confirmed using Cronbach's alpha coefficients, the values of which exceeded both the 0.6 threshold and the 0.7 threshold recommended by Sekaran and Bougie (2019). Additionally, internal consistency validity was assessed using Pearson correlations between each statement and its total score. The results in Table 3 indicate that all these correlations were positive and significant, exceeding the established minimum acceptable level of 0.20 for Pearson correlations to ensure internal consistency (Pallant, 2020). The correlations, therefore, indicate a satisfactory level of internal consistency.

Table 3
Questionnaire Validity and Reliability (n= 598)

Bias	Item	r
Overconfidence Cronbach's alpha [0.808]	O1	.788**
	O2	.708**
	O3	.419**
	O4	.781**
	O5	.657**
	O6	.644**
	O7	.782**
Anchoring Cronbach's alpha [0.837]	PA1	.687**
	PA2	.660**
	PA3	.712**
	PA4	.774**
	PA5	.755**
	PA6	.703**
	PA7	.688**
Availability Cronbach's alpha [0.794]	A1	.692**
	A2	.648**
	A3	.629**
	A4	.614**
	A5	.634**
	A6	.566**
	A7	.626**
	A8	.726**
Representativeness Cronbach's alpha [0.751]	R1	.711**
	R2	.751**
	R3	.748**
	R4	.713**
	R5	.630**
Gambler's Fallacy Cronbach's alpha [n/a]	GF1	1.00**
Self-control Cronbach's alpha [0.658]	SC1	.705**
	SC2	.674**
	SC3	.735**
	SC4	.557**
	SC5	.620**

To be continued Table 3.

Bias	Item	r
Loss Aversion Cronbach's alpha [0.755]	LA1	.713**
	LA2	.741**
	LA3	.685**
	LA4	.640**
	LA5	.691**
	LA6	.562**
Regret Aversion Cronbach's alpha [0.700]	RA1	.664**
	RA2	.680**
	RA3	.692**
	RA4	.627**
	RA5	.711**
Mental Accounting Cronbach's alpha [0.633]	MA1	.746**
	MA2	.721**
	MA3	.812**

Note: ** correlation is significant at the 0.01 level.

IV. RESULTS AND DISCUSSIONS

4.1. Demographics and Characteristics of the Surveyed Sample

Several characteristics of investors in the KSA market can be identified based on the data presented in Table 4. At 84.9%, the vast majority of investors included in the sample were male. In addition, most of the investors were young in age with more than two thirds (67.4%) aged between 26 and 45. Just over half the respondents reported being married (52.8%). In regard to income, it is important to note that most of the investors were far from affluent: 38.5% reported earning no more than SR 19,999, 17.1% reported earned income in the range of SR 20,000-99,999, and 12.4% in the range of SR 100,000-149,999. Moreover, the majority of surveyed investors (78.1%) reported that they are currently invested with no more than SR 100,000.

In regard to formal education, most of the investors included in the sample had earned a degree, with 56.0% reporting a bachelor's degree and 14.2% reporting a postgraduate degree as their highest level of formal education. In terms of their employment status, just over a third (34.5%) reported that they were working in the public sector with a similar proportion (32.3%) in the private sector. Relative to overall work experience, a large majority (44.0%) reported less than 5 years, with almost a third (30.3%) reporting more than 10 years, and just over a quarter (25.8%) 5-10 years. In terms of experience trading in the stock market, more than half (55.5%) were inexperienced, reporting that they had been engaged in this activity for less than a year and almost a quarter (22.6%) reporting their trading experience as spanning 1 to less than 3 years.

In terms of how often the respondents traded on the stock market, more than half (51.7%) did so on a frequent and apparently routine basis: daily (17.9%), monthly (17.4%), and weekly (16.4%). The proportions for annual (30.8%), quarterly (11.2%), and biannual trading (6.4%) comprise the rest of the sample.

Table 4
Investors' Information (n= 598)

	Sub-Group	n	%
Gender	Male	[508]	84.9%
	Female	[90]	15.1%
Age	18–25 years	[142]	23.7%
	26–35 years	[266]	44.5%
	36–45 years	[137]	22.9%
	46–55 years	[44]	7.4%
	More than 55 years	[9]	1.5%
Marital Status	Single	[267]	44.6%
	Married	[316]	52.8%
	Divorced	[11]	1.8%
	Widowed	[3]	0.5%
	Other	[1]	0.2%
Yearly Income in Saudi Riyal	Less than 20,000	[230]	38.5%
	20,000–99,999	[102]	17.1%
	100,000–149,999	[74]	12.4%
	150,000–199,999	[51]	8.5%
	200,000–499,999	[58]	9.7%
	500,000–999،999	[8]	1.3%
	1,000,000–4,999,999	[2]	0.3%
	More than 5 million	[2]	0.3%
	Prefer not to say	[71]	11.9%
Investment Capital in Saudi Riyal	100.000 or below	[467]	78.1%
	101.000–300.000	[74]	12.4%
	301.000–500.000	[27]	4.5%
	501.000–700.000	[15]	2.5%
	701.000–1.000.000	[4]	0.7%
	More than 1 million	[11]	1.8%
Educational Level	Diploma or less	[177]	29.6%
	Bachelor	[335]	56.0%
	Postgraduate	[85]	14.2%
	Other	[1]	0.2%
Employment Status*(632)	Public sector	[204]	32.3%
	Private sector	[218]	34.5%
	Freelance	[81]	12.8%
	Student	[129]	20.4%
	Other	--	
Working Years	Less than 5 years	[263]	44.0%
	5–10 years	[154]	25.8%
	More than 10 years	[181]	30.3%
Trading Experience in the Stock Market	< 1 year	[332]	55.5%
	1–< 3 years	[135]	22.6%
	3–< 5 years	[57]	9.5%
	5–< 10 years	[41]	6.9%
	> 10 years	[33]	5.5%

To be continued Table 4.

	Sub-Group	n	%
Trading Frequency in the Stock Market	Dayly	[107]	17.9%
	Weekly	[98]	16.4%
	Monthly	[104]	17.4%
	Quartely	[67]	11.2%
	Six-monthly	[38]	6.4%
	Yearly	[184]	30.8%
Attendance at Stock Trading	Not yet	[447]	74.7%
Workshops/training	Yes	[151]	25.3%

Note: * multiple select was allowed.

4.2. Findings of the Descriptive Analysis

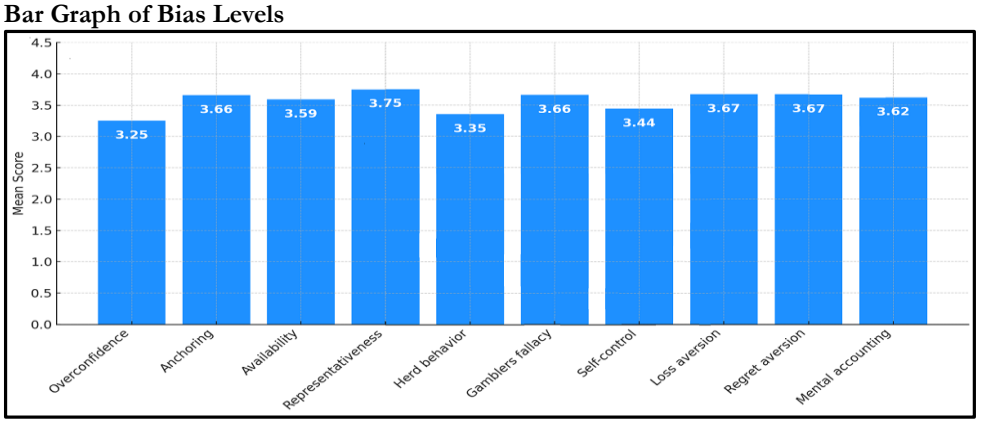
The extent of the bias present among the surveyed investors was evaluated using the mean and standard deviation coefficients in addition to one-sample t-tests. The mean values were classified using the three-level scale suggested by Sekaran and Bougie (2019), which consists of low (1-2.339), moderate (2.34-3.669), and high (3.67-5.00).

According to the results presented in Table 5, the surveyed investors demonstrated moderate levels of agreement with all the biases with two exceptions, i.e., representativeness [3.75] and regret aversion [3.67], each of which had a high mean value. This result suggests that overconfidence [3.25], anchoring [3.66], availability [3.59], Gambler's fallacy [3.35], self-control [3.66], loss aversion [3.44], and mental accounting [3.62] each exerts a moderate influence over the respondents' investment decisions. Additionally, in making investment decisions, the respondents were influenced to a great extent by the representativeness and regret aversion biases.

Table 5
Descriptive Analysis (n= 598)

Bias	Mean	Level	Std.	Min	Max
Overconfidence	3.25	Moderate	0.78	1.00	5.00
Anchoring	3.66	Moderate	0.72	1.00	5.00
Availability	3.59	Moderate	0.65	1.00	5.00
Representativeness	3.75	High	0.70	1.00	5.00
Gambler's Fallacy	3.35	Moderate	1.11	1.00	5.00
Self-control	3.66	Moderate	0.64	1.00	5.00
Loss Aversion	3.44	Moderate	0.76	1.00	5.00
Regret Aversion	3.67	High	0.67	1.00	5.00
Mental Accounting	3.62	Moderate	0.79	1.00	5.00

Figure 1
Bar Graph of Bias Levels



After the mean value of each of the nine biases was determined, the next step was to develop a thorough descriptive analysis of each bias. The goal was to provide detailed information about every item related to each bias, including the mean value, proportional mean (%), level scale, standard deviation (Std.), t-value, and p-value.

4.3. Results of the Descriptive Analysis of Heuristic Biases

In this section, the paper presents an extensive descriptive analysis of each of the heuristic biases, i.e., overconfidence, anchoring, availability, representativeness, and gambler's fallacy. The objective is to provide comprehensive information about each bias, i.e., mean score, proportional mean percentage, level scale, standard deviation, t-value, and p-value. This detailed investigation was undertaken to enable a more profound and complete understanding of each bias and its impact on investors' decision-making.

The results for the overconfidence bias, as presented in Table 6, indicate that the respondents showed moderate overconfidence in their investment skills, with an average score of 3.25. Additionally, the proportional mean score for this bias was 65%, indicating that the respondents agreed with approximately 65% of the questionnaire statements pertaining to overconfidence. The results of the one-sample t-test were significant, confirming that the mean value differed significantly from the hypothesized standard level of 3 (i.e., 3 = the neutral point on a Likert-type scale). On this basis, it can be concluded that in making investment decisions investors are moderately influenced by overconfidence bias.

Most of the items had a mean value above the proposed standard level of 3 with significant t-test results. There were, however, two exceptions: "I consider myself to be an experienced investor" and "I tend to engage in excessive stock trading." Each of these items had a mean value below 3 and t-test results with a negative value, indicating that they had the least influence on investors' decision-making. The most influential item in the overconfidence bias block was found to be "I hold stocks in more than one company in the Saudi stock market."

It is worth noting that there were variations in the assessments, with std. values above the cutoff of 1, indicating that the investors differed from each other regarding the extent to which the overconfidence bias items influenced their investment decisions. Overall, this detailed descriptive analysis provides a comprehensive view of the influence of each bias item on the investors surveyed.

Table 6
Descriptive Analysis of Overconfidence (n= 598)

No.	Order	Item	Mean	Proport. Mean (%)	Level	Std.	t-value	p-value
1	6	I consider myself to be an experienced investor.	2.88	57.59%	Moderate	1.21	-2.325	.020*
2	5	I tend to place more confidence in my own investment opinions over the opinions of my colleagues or friends.	3.36	67.19%	Moderate	1.07	8.155	.000*

To be continued Table 6.

No.	Order	Item	Mean	Proport. Mean (%)	Level	Std.	t-value	p-value
3	2	Before making a stock purchase, I consult with others, such as family, friends, or colleagues.	3.56	71.2%	Moderate	1.15	11.987	.000*
4	4	I try to use my predictive skills to time the market and improve my portfolio performance so that it is better than the market performance.	3.38	67.6%	Moderate	1.10	8.412	.000*
5	7	I tend to engage in excessive stock trading.	2.60	52%	Moderate	1.18	-8.315	.000*
6	1	I hold stocks in more than one company in the Saudi stock market.	3.61	72.2%	Moderate	1.19	12.457	.000*
7	3	I believe that I have the ability to choose stocks that will perform better than the market.	3.39	67.80%	Moderate	1.11	8.675	.000*
		Overall mean	**3.25**	**65%**	**Moderate**		**7.979**	**.000***

Note: * significant at $\alpha \leq 0.05$.

In regard to the anchoring bias, the findings presented in Table 7 suggest that Saudi investors have a moderate level of anchoring bias, with an overall mean value of 3.66, which represents a proportional mean of 73.2%. The t-test results further support this finding, as they point to positive differences in favor of the anchoring mean value. It can be concluded, therefore, that the surveyed investors are moderately influenced by the anchoring bias when making investment decisions.

Each anchoring item had a mean value above 3, and the t-test results for each showed a significantly positive difference. In terms of the anchoring bias, the most influential items were "I tend to compare current stock prices with their recent year high and low prices to justify my stock purchases," "I tend to use the stock purchase price as a reference point for my trades," and "My trading decisions regarding buying and selling shares are influenced by my recent experiences." The rest of the items included in the anchoring block showed only moderate agreement: The lowest mean value was found for "I am less likely to buy a stock if its current price is higher than it was in the previous year," making it the item with the most limited effect on the surveyed investors' decision-making. Additionally, most of the standard deviation (std.) values were above the cutoff of 1, indicating non-homogeneity in the assessments.

Table 7
Descriptive Analysis of Anchoring (n= 598)

No.	Order	Item	Mean	Proport. Mean (%)	Level	Std.	t-value	p-value
1	1	I tend to compare current stock prices with their recent year high and low prices to justify my stock purchases.	3.91	78.2%	High	1.00	22.356	.000*
2	5	I am more likely to sell my stocks after their prices have hit the recent year high.	3.61	72.2%	Moderate	1.04	14.349	.000*
3	7	I am less likely to buy a stock if its current price is higher than it was in the previous year.	3.44	68.8%	Moderate	1.07	10.150	.000*
4	4	I perceive a stock's price as high if it has increased to the current year's high.	3.61	72.2%	Moderate	1.04	14.344	.000*
5	6	I believe that the year's high and low prices determine the current stock price movement range.	3.57	71.39%	Moderate	1.01	13.708	.000*
6	3	My trading decisions regarding buying and selling shares are influenced by my recent experiences.	3.73	74.6%	High	0.98	18.228	.000*
7	2	I tend to use the stock purchase price as a reference point for my trades.	3.76	75.2%	High	0.95	19.764	.000*
		Overall mean	**3.66**	**73.2%**	**Moderate**		**22.487**	**.000***

Note: * significant at $\alpha \leq 0.05$.

In relation to the availability bias, the results presented in Table 8 demonstrate that the surveyed investors are moderately impacted by this bias. The overall mean value of availability bias was 3.59, indicating a proportional mean of 71.8%. The t-test results also

support the significance of the overall mean value given that it exceeds the proposed standard level of 3 and that all the items had a mean value above this level. The results indicate that all aspects of availability bias exist among investors to a level exceeding the proposed standard level of 3. A high level of agreement was associated with the following availability bias items, indicating that they exert a strong influence on the surveyed investors' investment decisions: "If I want to invest in the stocks of a particular company, I will rely on information provided by financial experts," "In order to make an informed decision about investing in a company's shares, I typically review the company's historical financial performance," and "if I want to invest in the stocks of a particular company, I will rely on information provided by that company." The remaining items in the availability bias block were found to exert a moderate level of influence on the respondents' investment decision-making. The least influential item pertained to the respondents' interest in possible input from work colleagues, which was generally discounted: "if I want to invest in the stocks of a particular company, I will rely on my co-workers' opinions." Furthermore, a standard deviation value above the cutoff of 1 was found for some aspects of availability bias, indicating that the surveyed investors differed in regard to the extent of their agreement with those items.

Table 8
Descriptive Analysis of Availability (n= 598)

No.	Order	Item	Mean	Proport. Mean (%)	Level	Std.	t-value	p-value
1	5	If I hear from a friend about a stock that has achieved high returns, I may be more likely to buy it	3.58	71.6%	Moderate	1.04	13.562	.000*
2	8	If I want to invest in the stocks of a particular company, I may rely on my co-workers' opinions	3.29	65.8%	Moderate	1.09	6.429	.000*
3	7	If I want to invest in the stocks of a particular company, I will rely on information I find on the internet	3.34	66.8%	Moderate	1.07	7.696	.000*
4	3	If I want to invest in the stocks of a particular company, I will rely on information provided by that company	3.75	75%	High	0.99	18.598	.000*

To be continued Table 8.

No.	Order	Item	Mean	Proport. Mean (%)	Level	Std.	t-value	p-value
5	1	If I want to invest in the stocks of a particular company, I will rely on information provided by financial experts.	3.86	77.2%	High	0.95	22.237	
6	6	When considering an investment in a company's shares, my personal analysis is often a key factor in my decision-making process.	3.53	70.6%	Moderate	1.05	12.339	
7	2	In order to make an informed decision about investing in a company's shares, I typically review the company's historical financial performance.	3.78	75.6%	High	0.95	20.186	
8	4	If a friend advises me to purchase a stock in a particular company and then news arrives about the probability of that stock's price rising, I will be more likely to invest in those stocks.	3.63	72.6%	Moderate	0.96	16.148	.000*
		Overall mean	**3.59**	**71.8%**	**Moderate**		**22.409**	**.000***

Note: * significant at $\alpha \leq 0.05$.

In regard to representativeness bias, the results show an overall mean value of 3.75 and a proportional mean of 75%, suggesting that it has a strong influence on investors. The results of the t-test presented in Table 9 support this finding, confirming that representativeness bias is a significant factor in investors' investment decisions. The mean value of each of the items related to representativeness bias exceeded the proposed standard level of 3. However, two items showed only a moderate level of agreement: "I tend to buy 'hot' stocks and avoid stocks that have performed poorly in the recent past" and "My approach to making buy or sell decisions involves utilizing both trend analysis and technical analysis." In comparison, the other items showed a higher level of agreement and, therefore, a greater influence on investment decision-making: "I believe that good stocks are firms with a history of consistent earnings growth," "I rely on past

performance when selecting stocks, believing that good performance will continue," and "I try to avoid investing in companies that have a history of poor earnings."

Table 9
Descriptive Analysis of Representativeness (n= 598)

No.	Order	Item	Mean	Proport. Mean (%)	Level	Std.	t-value	p-value
1	3	I try to avoid investing in companies that have a history of poor earnings	3.84	76.8%	High	0.98	21.107	.000*
2	2	I rely on past performance when selecting stocks, believing that good performance will continue	3.85	77%	High	0.97	21.326	.000*
3	1	I believe that good stocks are firms with a history of consistent earnings growth	3.89	77.8%	High	0.92	23.629	.000*
4	4	I tend to buy "hot" stocks and avoid stocks that have performed poorly in the recent past	3.62	72.39%	Moderate	1.03	14.759	.000*
5	5	My approach to making buy or sell decisions involves utilizing both trend analysis and technical analysis	3.57	71.39%	Moderate	1.06	13.098	.000*
		Overall mean	**3.75**	**75%**	**High**		**26.224**	**.000***

Note: * significant at $\alpha \leq 0.05$.

In the case of the Gambler's fallacy, the results presented in Table 10 show that the surveyed investors exhibited a moderate level of bias, with an average score of 3.35, equivalent to a proportional mean of 67%. The significant t-value suggests that this bias has a moderate influence on investment decisions, given that the mean value exceeds the proposed standard level of 3. The bias is reflected in the statement "I can predict the expected market returns, whether they are positive or negative, in a normal manner for the stock exchange."

Table 10
Descriptive Analysis of Gambler's Fallacy (n= 598)

No.	Order	Item	Mean	Proport. Mean (%)	Level	Std.	t-value	p-value
1	1	I can predict the expected market returns, whether they are positive or negative, in a normal manner for the stock exchange	3.35	67%	Moderate	7.708	.000*

Note: * significant at $\alpha \leq 0.05$.

4.4. Results of the Descriptive Analysis of Prospect Biases

This section offers a detailed descriptive analysis of several prospect biases, i.e., self-control, loss aversion, regret aversion, and mental accounting. The analysis encompasses a consideration of the mean, proportional mean (%), level scale, standard deviation (Std.), t-value, and p-value with the aim of furthering understanding of the impact of each bias on investment decision-making.

To begin the discussion on self-control, the findings in Table 11 indicate that investment decisions were moderately influenced by the self-control bias, with an overall mean value of 3.66 and a proportional mean of 73.2%. Additionally, the results of the t-tests presented in Table 11 show that the mean value of all the items used to measure the self-control bias exceeded the proposed standard level of 3. Of the five self-control bias items, three exerted a strong influence on investment decisions: "I only purchase shares of a particular company if I have access to detailed information about those shares," "I allocate my funds between investment capital and daily expenses," and "Consulting with experts regularly can help me generate profits from my stock investments." The two remaining items were found to be moderately influential: "regardless of my stock market investment goals, I believe that I can attain them" and "my current focus is on meeting my daily financial obligations, rather than prioritizing savings for the future."

Table 11
Descriptive Analysis of Self-Control (n= 598)

No.	Order	Item	Mean	Proport. Mean (%)	Level	Std.	t-value	p-value
1	3	Consulting with experts regularly can help me generate profits from my stock investments	3.75	75%	High	0.97	18.825	.000*
2	1	I only purchase shares of a particular company if I have access to detailed information about those shares	3.92	78.4%	High	0.83	27.212	.000*

To be continued Table 11.

No.	Order	Item	Mean	Proport. Mean (%)	Level	Std.	t-value	p-value
3	4	Regardless of my stock market investment goals, I believe that I can attain them	3.53	70.6%	Moderate	0.93	13.975	.000*
4	5	My current focus is on meeting my daily financial obligations, rather than prioritizing savings for the future	3.29	65.8%	Moderate	1.14	6.185	.000*
5	2	I allocate my funds between investment capital and daily expenses	3.79	75.8%	High	1.02	18.900	.000*
		Overall mean	**3.66**	**73.2%**	**Moderate**		**25.079**	**.000***

Note: * significant at $\alpha \leq 0.05$.

In regard to the loss aversion bias, the overall mean value was 3.44 with a proportional mean of 68.8%, which suggests that this bias has a moderate influence on investment decisions. All the items in Table 12 have a mean value above the proposed standard level of 3, as supported by the level of significance of the t-test results. With just one exception, all the items in the loss aversion bias block were found to be at a moderate level: Only "my primary worry is experiencing a significant decrease in my stock's value rather than missing out on substantial gains" was found to have a significant influence on the respondents' investment decisions. The least influential item for loss aversion was "when assessing my investments, I prioritize profits over the amount of capital invested." Variations in agreement levels were evident, as the majority of standard coefficients were above the cutoff value of 1.

Table 12
Descriptive Analysis of Loss Aversion (n= 598)

No.	Order	Item	Mean	Proport. Mean (%)	Level	Std.	t-value	p-value
1	1	My primary worry is experiencing a significant decrease in my stock's value rather than missing out on substantial gains	3.69	73.8%	High	1.12	15.010	.000*
2	4	I experience apprehension when my invested stocks incur substantial paper losses or price drops	3.40	68%	Moderate	1.09	8.964	.000*

To be continued Table 12.

No.	Order	Item	Mean	Proport. Mean (%)	Level	Std.	t-value	p-value
3	5	I decrease my investment when the market is not performing well	3.38	67.6%	Moderate	1.16	8.043	.000*
4	6	When assessing my investments, I prioritize profits over the amount of capital invested	3.21	64.2%	Moderate	1.14	4.430	.000*
5	2	I dispose of stocks that have rapidly increased in value	3.51	70.19%	Moderate	1.11	11.327	.000*
6	3	I retain stocks that have experienced a prolonged decline in value	3.42	68.39%	Moderate	1.17	8.839	.000*
		Overall mean	**3.44**	**68.8%**	**Moderate**		**14.020**	**.000***

Note: * significant at $\alpha \leq 0.05$.

Regret aversion bias was found to be moderately present, with an overall mean value of 3.67 and a proportional mean of approximately 73.4% (Table 13). These results suggest that regret aversion bias has a strong influence on investment decisions. The t-test results were significant for each item in the regret aversion block, indicating that all the items exceeded the proposed standard level of 3 (the midpoint of the 5-point Likert-type scale). Two items were found to be strongly influential: "I invest in companies that have low risk" and "despite their low value, I may still purchase the stocks." The remaining three items were found to exert a moderate influence: "I retain stocks that have decreased in value and do not sell them," "I dispose of stocks that have rapidly increased in value," and "I purchase stocks that are being bought by a group of investors in the market."

Table 13
Descriptive Analysis of Regret Aversion (n = 598)

No.	Order	Item	Mean	Proport. Mean (%)	Level	Std.	t-value	p-value
1	3	I retain stocks that have decreased in value and do not sell them	3.65	73%	Moderate	1.08	14.815	.000*
2	4	I dispose of stocks that have rapidly increased in value.	3.62	72.39%	Moderate	1.00	15.042	.000*
3	1	I invest in companies that have low risk.	3.78	75.6%	High	0.95	20.219	.000*

To be continued Table 13.

No.	Order	Item	Mean	Proport. Mean (%)	Level	Std.	t-value	p-value
4	2	Despite their low value, I may still purchase stocks.	3.74	74.8%	High	0.94	19.321	.000*
5	5	I purchase stocks that are being bought by a group of investors in the market.	3.57	71.39%	Moderate	0.98	14.122	.000*
		Overall mean	**3.67**	**73.4%**	**High**		**24.617**	**.000***

Note: * significant at α≤0.05.

In regard to mental accounting bias, the results show a moderate level for the items in this block, with an overall mean value of 3.62 and a proportional mean of 72.39% (Table 14). A moderate level of influence was also observed for the individual items, with all the mean values exceeding the proposed standard level of 3, as indicated by the significant t-test results. "I tend to view each component of my investment portfolio as a distinct entity" was found to have a high level of influence and to be the most influential item in the mental accounting bias block. In contrast, two items were at a moderate level: "Even though their prices are decreasing at present, I am hesitant to sell stocks that had high returns in the past" and "I place greater emphasis on the individual returns of each account, rather than the overall performance of my investment portfolio." Variations in assessments were observed, as all the standard deviation values were greater than one.

Table 14

Descriptive Analysis of Mental Accounting (n= 598)

No.	Order	Item	Mean	Proport. Mean (%)	Level	Std.	t-value	p-value
1	1	I tend to view each component of my investment portfolio as a distinct entity	3.79	75.8%	High	1.00	19.460	.000*
2	2	Even though their prices are decreasing at present, I am hesitant to sell stocks that had high returns in the past	3.55	71%	Moderate	1.05	12.676	.000*
3	3	I place greater emphasis on the individual returns of each account, rather than the overall performance of my investment portfolio	3.52	70.39%	Moderate	1.06	11.994	.000*
		Overall mean	**3.62**	**72.39%**	**Moderate**		**19.240**	**.000***

Note: * significant at α≤0.05.

4.5. Differences in Bias Levels According to Investors' Demographics and Trading-Related Information

To gain a better understanding of the extent of the biases among specific groups of investors within the overall sample, differences according to demographics and trading-related information were examined using an ANOVA test. Gender and workshops related to trading in the stock exchange were excluded due to gaps between groups. The results of the ANOVA test (Table 15) indicate that significant differences exist in behavioral heuristics levels based on certain demographic factors. Age was found to be a significant factor (F= 3.910, p= 0.004), with investors aged 18-25, 46-55, and above 55 years showing higher levels of behavioral heuristics for overconfidence, anchoring, and mental accounting as compared with investors aged 26–45. Moreover, there were significant differences in the levels of behavioral heuristics based on yearly income (F= 2.718, p= 0.006), with investors who preferred not to disclose their income showing the highest level.

Additionally, experience in trading was also found to be significant (F= 3.719, p= 0.005), with investors reporting 1<3 and 5-<10 years of experience showing higher levels of behavioral heuristics, mainly for the overconfidence bias. However, no significant differences were observed based on marital status, investment capital, or working years.

In regard to the prospect biases, the analysis indicates significant differences between demographic groups based on educational level (F= 3.219, p= 0.022). Specifically, the surveyed investors with a diploma or a bachelor's degree showed the highest levels of prospect biases.

Additionally, based on post hoc testing, significant differences for both behavioral heuristics (F= 7.348, p= 0.000) and prospect biases (F= 3.085, p= 0.009) were indicated for trading frequency. Specifically, compared with those who traded less frequently, the respondents who reported engaging in trading activity daily, weekly, or monthly showed higher levels of behavioral heuristics, primarily in relation to the overconfidence bias. Further, both daily and monthly trading on the stock exchange were associated with higher levels of prospect biases for self-control, regret aversion, and also mental accounting.

Table 15

Differences in Bias Levels According to Investors' Demographics and Trading-Related Information (n= 598)

Bias	F-value	Sig.	Significance Group
Age			
Behavioral heuristics	3.910	.004*	18–25 years; 46–55 years; more than 55 years
Prospect biases	2.069	.083	--
Marital status			
Behavioral heuristics	.221	.927	--
Prospect biases	.229	.922	--
Yearly income in Saudi Riyal			
Behavioral heuristics	2.718	.006*	Prefer not to say
Prospect biases	.939	.483	--
Investment capital in Saudi Riyal			
Behavioral heuristics	1.762	.119	--
Prospect biases	0.783	.562	--

To be continued Table 15.

Bias	F-value	Sig.	Significance Group
Educational level			
Behavioral heuristics	2.516	.057	--
Prospect biases	3.219	.022*	Diploma or less; Bachelor
Working years			
Behavioral heuristics	1.110	.330	--
Prospect biases	0.537	.585	--
Trading experience in the stock market			
Behavioral heuristics	3.719	.005*	1–< 3 years ; 5–< 10 years
Prospect biases	0.237	.918	--
Trading frequency in the stock market			
Behavioral heuristics	7.348	.000*	Daily; Weekly; Monthly
Prospect biases	3.085	.009*	Daily; Monthly

Note: * difference is significant at $\alpha \leq 0.05$.

4.6. Discussion

Through an investigation of the prevalence of behavioral heuristics and prospect biases and their influence on the investment decisions of investors in the Saudi stock market, it was found that multiple biases influence investment decisions: specifically, the overconfidence, anchoring, availability, gambler's fallacy, self-control, loss aversion, and mental accounting biases were all found to have a moderate influence on investment decisions with representativeness bias and regret aversion bias found to be highly influential. The results of this study align with research conducted in major economies, where these biases have been observed to impact decision-making in investment contexts (Khan et al., 2017; Rasheed et al., 2018; Sharma & Kumar, 2019; Mittal, 2022; Aljifri, 2023; and Parveen et al., 2023).

In more detail, Saudi investors show a moderate level of both overconfidence and self-control biases in their investment decisions, with variations observed among individual investors. Of the five self-control bias items, "I only purchase shares of a particular company if I have access to detailed information about those shares" was found to be the most influential.

It was also found that anchoring and availability biases have a moderate influence on investment decisions. The respondents showed a high level of agreement on one item used to measure availability bias, which concerned relative reliance on information from financial experts when investing in a particular company's stocks. In terms of the anchoring bias, three critical factors were identified as having the most influence on investors. These concerned comparing current stock prices with their recent year's high and low prices to justify stock purchases, using the stock purchase price as a reference point for trades, and drawing on recent trading experiences.

A moderate level of gambler's fallacy bias and mental accounting bias were found to be associated with the respondents' investment decisions. The gambler's fallacy bias was found to moderately influence investment decisions, with the belief that one can predict market returns regardless of whether they are positive or negative identified as a key representation of this bias. It was also found that mental accounting has a moderate level of influence on investment decisions, with investors' tendency to view each

component of their investment portfolios as a distinct entity identified as the most influential of the gambler's fallacy items.

Representativeness bias and regret aversion bias were found to have a high level of influence on investment decisions. Representativeness bias, in particular, was found to be highly influential, with the mean values for all the items exceeding the proposed standard level of 3. The highest level of agreement was found for "I believe that good stocks are firms with a history of consistent earnings growth." Similarly, regret aversion bias was also found to be highly influential, with the highest level of agreement found for "I invest in companies that have low risk" and "Despite their low value, I may still purchase the stocks." However, the loss aversion bias was found to have a moderate level of influence, with "My primary worry is experiencing a significant decrease in my stock's value rather than missing out on substantial gains" having the most significant influence.

Significant differences in the levels of behavioral heuristics and prospect biases were identified based on certain demographic factors and trading-related information. Age, yearly income, and trading experience were the most significant factors for the behavioral heuristics, whereas educational level was the most significant factor for the prospect biases. Investors aged 18–25, 46–55, and above 55 years, those who preferred not to disclose their income, and those with 1–<3 years or 5–<10 years of investing experience showed the highest levels of behavioral heuristics. Those with a diploma or a bachelor's degree as their highest level of education showed the highest levels of prospect bias.

Trading frequency was found to have a significant relationship with both the behavioral heuristics and the prospect biases. The behavioral heuristics, particularly overconfidence bias, were highest for investors who engaged in trading activity daily or weekly. Additionally, those who engaged in daily or monthly trading tended to show higher levels of prospect biases, specifically related to self-control, regret aversion, and mental accounting.

V. CONCLUSION

The study found that multiple behavioral heuristics and prospect biases influence the investment decisions of investors in the KSA stock exchange. The most influential biases were representativeness bias and regret aversion bias, each of which had a high level of influence on investment decisions. Of the numerous kinds of biases included in the investigation, some showed a moderate influence, i.e., overconfidence, anchoring, availability, gambler's fallacy, self-control, and mental accounting. The study also found certain demographic factors—principally age, income, education, and years of trading experience—to be important in determining the level of the biases considered. The findings are relevant to the concerns of policymakers and financial advisors and other professionals in finance and associated fields, as well as to investors, as these groups have an interest in furthering their understanding of how behavioral biases come into play in investment decisions and in finding effective ways to overcome them to improve investment outcomes.

In the face of the very strong influence of representativeness bias and regret aversion bias on investment decisions, it would surely serve Saudi investors well if they were to become cognizant of these biases in a formal way as a basis for considering their possible influence on past investment decisions and control for them in undertaking future trading. It is also the case that policymakers and financial professionals have a part to play in raising awareness of these biases among investors in general. These groups can also foster investment choices based on methods developed in accordance with sound

investment principles representing a range of practices from helping investors diversify their portfolios to engaging them in strategic investment planning in order to build long-term security.

This study also points to the need to take demographic factors and trading behavior into account when examining the influence of behavioral biases on investment decisions. Through achieving a stronger understanding of how these factors influence investment decisions, financial advisors can become more adept at working with investors on a more customized basis.

In conclusion, the study provides valuable insights into the impact of behavioral biases on investment decisions among investors in the Saudi stock market. The findings can inform efforts to promote rational investment decisions and mitigate the negative effects of biases.

This study offers a valuable and extensive exploration of behavioral biases in the context of the Kingdom of Saudi Arabia, thereby advancing the goals of the Kingdom's Vision 2030; yet, it is essential to acknowledge its limitations. The study provides a comprehensive analysis of prominent heuristic biases, encompassing overconfidence, anchoring, availability, representativeness, and the gambler's fallacy, alongside the prospect biases of self-control, loss aversion, regret aversion, and mental accounting among investors in the Saudi stock market. Its primary aim was to provide a broad picture of the various facets associated with each of these biases. This inquiry provides a well-supported account of which specific biases have the most impact on investment decision-making and indicates that their collective influence molds the investment choices of Saudi investors. In addition, the study points to the need for research investigating the interconnections between these biases and how they operate concurrently to shape the decision-making processes driving the actions of investors in the Saudi stock market. Further, the author of this study is presently engaged in further research in this area with a specific focus on providing initial quantitative evidence for the relationships among heuristic biases and their effects on investor actions for Saudi citizens.

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