Impact of Cognitive and Behavioral Biases on Trade Performance:
Empirical Evidence from the Emerging Economy

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ABSTRACT

The purpose of this study is to highlight and fully understand the impact of behavioral and cognitive biases on the trade performance of individual investors trading on the Pakistan Stock Exchange. This study contends with the assumption of the rationality of efficient market hypothesis, traditional finance's most prominent theory that has been extensively studied. According to the behavioral finance paradigm, investors are humans and are susceptible to a variety of demographic, emotional, social, and psychological factors such as greed and fear. According to heuristics and prospect theory, investors have a variety of behavioral and psychological biases when making investment decisions and do not adhere strictly to financial theories. The research has a quantitative and deductive approach with an explanatory research design. Individual investors who trade on the Pakistan Stock Exchange constitute the study's population. The sample size for the study was 600 respondents, selected through stratified random sampling techniques and confirmed by Gpower software. The analysis was done with SMART-PLS and SPSS. The results revealed that anchoring, availability bias, stock fundamentals, availability bias, mental accounting, and gambler's fallacy have a significant and positive impact on individual investor performance in terms of trading. Findings support the evidence that Pakistan's investors are not perfectly rational. Instead, behavioral factors are associated with their investment decisions, which makes them bounded rational. Thus, for the purpose of investment analysis, investors must consider not only the fundamental theories and models of traditional finance but also behavioral factors during investment decisions, which may enhance trade performance. The findings provide empirical support for the applicability of heuristics and prospect theory in the particular context of Pakistan.

INTRODUCTION

The finance discipline focuses on two broad aspects: how to obtain and manage money and then allocate it effectively. Effective and optimal decision-making is the critical function of finance. It's phenomenal how decision-making affects so many fields of study, including math and statistics, economics, psychology, and sociology (Singh, Babshetti, & Shivaprasad, 2021).

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In the 18th and early 20th centuries, several prominent economists, including Ivering Fisher, J. M. Keynes, and Adam Smith, integrated psychological concepts into financial analyses. As a result of the rational expectations revolution that began in the 1960s, economic experts have focused exclusively on models with similar characteristics, making an assumption about human psychology that is strictly stated: It is rational for individuals to hold rational beliefs and to make decisions based on their expected utility. A decision maker can decide whether to invest in risky or complex prospects by making comparisons about there utility values, according to expected utility theory. This theory classifies investors into "risk takers," "risk aversers," and "risk neutrals."

For an extended period of time, the Efficient Markets Hypothesis provided theoretical ground for the paradigm of traditional finance, which proclaims that a person's biases and emotions are not affecting his or her decisions (Muhammad & Mehran, 2009; Subramaniam & Velnampy, 2017). According to the EMH theory and other classical economic and neoclassical theories, the Individuals behave rationally in order to maximize profits and avoid risk (Damodaran, 2012). Psychologists, however, have long questioned this assumption of rationality and fairness in people. Barberis and Thaler (2003) describe a rational investor as one who "updates beliefs in a timely and appropriate manner in response to new information and is able to make normatively correct decisions" (VanderPal & Brazie, 2022). In contrast, if individuals behaved rationally, they might not have caused such devastating financial crises and speculative bubbles as the tulip mania, the Black Thursday, the Tequila and Vodka effect, the Ninja Crisis, as well as other financial crises and speculative bubbles in general.   Individual investors consistently make uncertain and prejudiced decisions based on irrational behaviors, a lack of consistency, and ineptitude. (Feldman & Liu, 2022).

However, the reality is quite different, as there have been more than 120 financial crises in the past century and 45 banks have collapsed, especially in emerging countries, which has led to volatility, uncertainty, and instability worldwide in the past decade. One of the most notable, most known, and most documented examples occurred on September 15, 2008, when a "market anomaly" shook the foundations of global economics and triggered the largest economic crisis in human history; the outbreak originated in the United States and rapidly spread to other countries (Jebabli, Kouaissah, & Arouri, 2022).

As an alternative to classical economic theories, at the end of the seventies, a field called "Behavioral finance" emerged, which, from a different perspective of rationality, tried to explain people's behavior in financial decisions. In other words, it tries to explain the events of the financial world through the behavior of the individuals who participate in it from a

psychological perspective (Aurangzeb, 2022). Behavioral finance was born as an alternative to the current paradigm. It argues that without the assumption of "rationality," various financial phenomena would be more simply understandable. By combining traditional finance models with cognitive psychology, this new branch of finance proposes a model of human behavior in rational decision-making (Truc, 2022).

Based on practical considerations, behavioral finance makes it possible to identify certain concepts that drive human beings to behave irrationally, leading them to make suboptimal decisions. The problem is how investors construct their perception of information, which Sha and Ismail (2020) mention as the underlying reason for investors' decisions. In this study, behavioral biases in the investment decisions of Pakistani investors are explicitly evaluated, and their effects on investment decisions are examined.

A fundamental question set forth by the most prominent proponents of behavioral economics is, "Are investors always rational in the real world?" Kahneman and Tversky (1979); De Bondt and Thaler (1985); Shefrin and Statman (1985); Shiller (1987) They argue that the hypothesis of investors being "rational" is harder to fulfil in reality. Because each individual makes his own judgments when faced with alternatives encompassing probability of return, level of risk, and extent of uncertainty, The investor has to select various possibilities, projections (or prospects), and how they measure (sometimes incorrectly or biasedly) the expected possibility of each of these alternatives. It is also imperative that investors take into account not only rational or logical factors but also cognitive and behavioral factors that are based on intuition and emotions. Chandra (2016) identifies self-attributes and inefficient markets, heuristics and biases, frame dependence, and emotions as the three main themes of behavioral finance in the second edition of his famous book "Behavioral Finance." Behavioral and cognitive biases are expedients that individual investors usually adopt to speed up decision-making in complicated, unclear conditions. (Misuraca et al., 2022).

Many studies have confirmed that these critical cognitive and behavioral biases, such as availability, anchoring, overconfidence, availability bias, mental accounting, and loss aversion, affect investment decisions, including Chandra (2008), Ajmal et al. (2022), Bakar and Ye (2016), Shahid et al. (2018), and Quaicoe and Eleke-Aboagye (2021).

The purpose of this study is to examine how cognitive and behavioral biases affect the trade performance of individual Pakistan Stock Exchange investors. Cognitive biases lead to deviations from rationality, financial market inefficiencies, and anomalies among investors. Investors' systematic deviations from rationality are revealed by behavioral economics (Al-Mansour, 2020). The efficient markets hypothesis (EMH) theory dominated the finance

discipline for a long time. The mentioned theory proposes three primary forms of the market based on efficiency. In efficient markets, share prices remain on a random walk, dependent on the market's general information regarding macroeconomic variables, stock market drivers, specific firms, and the economy as a whole. The share price increases upon the release of any good news and decreases upon the release of any bad news. According to Nanayakkara et al. (2019) and Metawa et al. (2019), this is a case that is not covered under EMH. There are countless cases in the literature where the deficiency of traditional financial theories can be seen easily. These tendencies reveal that there are some other factors, i.e., behavioral and psychological, which differentiate investment decisions and hence the return of every individual (Yüksel & Temizel, 2020).

Investing decisions in developing countries can be influenced by the information available to investors, and the dilemma is in interpreting that information (Sha and Ismail, 2020). Investors shall be familiar with the prominent cognitive and behavioral factor that could contribute to well-being of individuals or even worse position in this frame of reference. The original gap was pointed out by Debondt and Thaler (1985), the first proponents of behavioral finance, who studied how the equity market reacts and revealed substantiation that individuals react emotionally to information that deviates significantly from the norm and also ignore long-term forecasting patterns. Other scholars, including Tversky and Kahneman (1974), Barber and Odean (2002), and many others, confirmed this finding by reporting other behavioral biases impacting investment decisions.

Problem Statement

This study aims to examine how cognitive and behavioral biases affect investors' trade performance on the Pakistan Stock Exchange. The concept of "rationality" in traditional finance is contradicted by behavioral finance. Empirical evidence from previous studies reveals that individual investors are not "perfectly rational" in the context of Pakistan. Individuals' behavioral and cognitive biases affect their investment decisions, making them "bounded rational." Consequently, for investment analysis and optimal investment decisions, investors should also consider behavioral factors in investment decisions in addition to the fundamental theories and models of traditional finance. Several factors and biases that affect investors' decision-making, including behavioral, cognitive, emotional, contextual, market, and demographic factors, were pointed out in previous studies. The cognitive biases of investors influence their decisions, which result in deviations from rationality, financial market inefficiencies, and anomalies. Investors' systematic deviations from rationality are revealed by behavioral economics (Al-Mansour, 2020). Sha and Ismail (2020) found that various cognitive

factors significantly influenced investors depending on their gender. Further, several studies, including Chandra (2008), Shukla et al. (2020), Bakar and Yi (2016), Shahid et al. (2018), Quaicoe and Eleke-Aboagye (2021), Ahmad & Wu (2022), Misuraca et al. (2022), Ghaffar et al. (2022), Hussain et al. (2022), Tauseef (2022), and many others, have confirmed the presence of these critical cognitive and behavioral biases that impact investment decisions, such as availability, anchoring, overconfidence, availability bias, mental accounting, and loss aversion. Through an extensive review of the literature, studies conducted in developed countries were numerous while fewer were conducted in developing countries like Pakistan (Khan et al., 2021; Ghaffar et al., 2022; Hussain et al., 2022; Tauseef, 2022; Aurangzeb, 2022; Rehan et al., 2021; and Sattar et al., 2021) to determine how behavioral biases affect investment decisions in behavioral finance. The majority of the studies focused primarily on behavioral factors of individuals in decision-making, and very few of them (Dąbrosz-Drewnowska, 2021; Cao, Nguyen, & Tran, 2021; Khan, Afeef, & Ihsan, 2021) examined cognitive biases. However, other factors, as mentioned above, were ignored. These studies have investigated the effect of cognitive and behavioral biases on investment decisions. However, there is still a question.

Research Gap

In developed countries, there have been a number of research studies conducted to determine the effect of behavioral biases on investment decisions in the field of behavioral finance like (Naseem, Mohsin, Hui, Liyan, & Penglai, 2021), Vaidya (2021), Quaicoe and Eleke-Aboagye (2021)and fewer studies in developing countries like Nazir, & Afzal, (2013) Shahid et al. (2018), Parveen, Satti, Subhan, & Jamil, (2020), Sattar, Toseef, and Sattar, (2020) All of these studies have examined the impact of behavior and cognitive biases on investment or decision-making. However, there is still a question and a literature gap as to whether investor biases significantly influence or do not influence trade performance. As per the best knowledge from literature and searches by the study's author, no study has empirically examined the impact of six prominent cognitive and behavioral biases identified by Chandra (2016) on the trade performance and stock volatility of the Pakistan stock exchange. Therefore, aimed at answering the above assertions and filling a gap in the literature, this study was conducted.

Further, these studies have investigated only one behavioral bias, and some have considered only two or three biases. Awais et al., (2016) focused solely on financial literacy and investment experience. Zat & Khan (2015) evaluated the inclusion of availability and loss aversion biases in financial decision-making. This study examines six prominent cognitive and behavioral biases identified by Chandra (2008). Further, the study will test the applicability of heuristic theory, prospect theory as underpinning theories, and EMH as contrasting theory.

LITERATURE REVIEW

Investors' systematic deviations from rationality are revealed by behavioral economics (Al-Mansour, 2020). Behavioral economics is defined as a field that investigates an individual's cognitive and emotional tendencies for a better understanding of economic decision-making. To understand why some individual investors make irrational decisions, behavioral finance combines traditional finance with concepts from cognitive psychology and limitations arbitrage theory. According to Bikas and Jureviciene (2018), an emerging field in economics called behavioral finance studies examines how individuals use their minds and behavioral patterns to make decisions about market transactions involving stock purchases and sales. Behavioral finance contradicts the assumption of "rationality" in traditional finance. Behavioral models integrate the views of both psychology and neoclassical economic theory. The combination of the two disciplines, economics and psychology, helps explain why individuals make apparently irrational or arbitrary choices when they spend, invest, save, and offer loans. (Belsky & Gilovich, 2010). In real life, some investors earn a high profit, while others lose a significant amount on the same day. According to Nanayakkara et al. (2019) and Metawa et al. (2018), this is a case that is not covered under EMH. There are countless cases in the literature where the deficiency of traditional financial theories can be seen easily. These tendencies reveal that there are some other factors, i.e., behavioral and psychological, which differentiate investment decisions and hence the return of every individual (Yüksel & Temizel, 2020).

According to Sha and Ismail (2020), individual investors in developing countries take decisions based on the information available, and the dilemma is just in how that information is interpreted. Investors should be familiar with the various cognitive biases contributing to their well-being or even worse position in this frame of reference. They found that various cognitive biases influence investors depending on their gender.

Bias is defined in behavioural finance as the natural tendency to make investment choices when a prudent investor has been convinced by some underpinning view, conviction, or idea. Behavioral finance also investigates the reasons for various market anomalies, irregularities, and human errors contributing to such irregulated anomalies (Singh, 2021). Behavioral and cognitive bias variables that can influence investment decisions and trade performance are often divided into two groups: factors of prospective theory and heuristic-based factors (Kannadhasan, 2015; Waweru, Mwangi, and Parkinson, 2014). Ma & Birrell (2022) state that the prospect theory explores how individuals frame and evaluate a decision when faced with ambiguity.

Underpinning Theories

Efficient Market Hypothesis (EMH)

In traditional finance and capital market studies, the efficient market hypothesis (EMH) has been a leading theory for many years. EMH assumes that a market's share prices reflect all information about the stock market. EMH also makes the assumption that equities are often purchased and sold on stock exchanges at their fair market value, attempting to prevent stakeholders from buying undervalued securities or trying to sell overpriced securities. Further, it assumes that stock markets become more efficient as the number of market participants increases since investors have access to a broader range of information.

EMH proponents argue that cognitive and behavioral biases have little effect on the markets (Sharma and Kumar, 2019). Stocks will always be adjusted automatically to their base price when anomalies occur (Filbeck et al., 2017; Obalade, 2019).

Heuristic Theory

The Heuristic theory was proposed by Herbert A. Simon in 1947. His famous book, "Administrative Behavior" explores how Behavioral and cognitive processes influence individuals' rational decision-making. According to him, instead of being perfectly rational, individuals operate on the assumption of bounded rationality.

The concept of heuristics refers to guidelines, basic and approximate rules, shortcuts, or techniques used to solve problems in complicated, uncertain, or complex circumstances, as well as to make decisions and solve issues. (McMahon, 2005; Ritter, 2003). The most common way to learn something is to do it by trial and error, which is often the process by which individuals develop rules of thumb that can be applied to their problems in the future. (Kannadhasan, 2015; Shefrin, 2000). Heuristics, in other words, are expedients or cognitive shortcuts that aid individuals in making judgments and decisions quickly and effortlessly in complex situations (Prosad, Kapoor, & Sengupta, 2015). These expedients can be helpful in the short term but can also lead to unsatisfactory and erroneous decisions (Kannadhasan, 2015; Shefrin, 2000). There is a tendency for individuals to utilize heuristics in developing judgments and making decisions that involve concentrating on one element and neglecting that there are other aspects of a complex problem. It is evident that these guidelines work in most situations, even though they deviate from traditional logic, probability, or the assumption of rationality (Virigineni and Rao, 2017). Heuristics enhance decision-making efficiency by providing rules to decision-makers, particularly in complicated and uncertain environments (Ritter, 2003). In addition to its limitations and biases, it also has some strengths (Kahneman & Tversky, 1979;

Ritter, 2003; Waweru et al., 2008). Shah, Ahmad, and Mahmood (2018) claim that heuristic bias adversely affects investment decisions.

Prospect Theory

The prospect theory was proposed by Kahneman and Tversky in 1979. TIn this theory, investors evaluate their loss and gain perspectives asymmetrically under specific risk conditions. Therefore, in contrast to theory of expected utility (based on classical assumption of a perfectly rational economic agent), prospect theory seeks to reflect actual human behavior in the decision. Unlike the expected utility theory, the prospect theory assists investors in making subjective decisions. (Filbeck, Hatfield & Horvath, 2005). They revealed that losing hurts almost twice as much as profits do. According to Waweru et al. (2008), investment decisions are influenced by mental accounting, loss aversion, and risk aversion.

Variables and Hypothesis

Anchoring

Anchoring is a commonly used psychological heuristic in behavioral finance. The anchoring process involves evaluating or estimating unknown values using irrelevant information as a reference, or, in other words, some unknown information (Shefrin, 2000). Asziz and Khan (2016) explored how behavioral factors affect investment decisions and trade performance and found that anchoring bias is positively related to trade performance. In their study, Ishfaq and Anjum (2015), Menike et al. (2015), Obara (2015), and Ranjbar et al. (2014) found that anchoring significantly impacts investor decisions and trade performance. Contrary to findings in other studies, Shah et al. (2018) reveal that anchoring negatively impacts investment decisions and individual investors' trading performance.

H_1: Anchoring bias has a significant impact on the trade performance of individual investors trading on the Pakistan Stock Exchange.

Availability Bias

The availability bias occurs when a decision maker depends heavily on information available rather than examining and evaluating alternative options and procedures. (Jahanzeb, 2012; Moradi et al., 2013). According to Alrabadi et al. (2018), availability bias has a significant impact on individual investors' trading performance. Khan (2017), based on the findings of his study, argues that availability bias has an adverse effect on trade performance. According to Javed et al. (2017), availability bias has a significant positive influence on trade performance.

H_2: The availability bias of individual investors has a significant impact on trade performance.

The Gambler's Fallacy

As well as the gambler fallacy, the Monte Carlo fallacy is also called the maturity of chance fallacy. As the name implies, it is associated with the delusional notion that something appears to occur more often in a typical day's routine, so there is a chance that it will happen less in the future; in other words, if something occurs less in daily routine life in the near future, there is a possibility that such an event will occur on a more frequent basis. (Sewell, 2017). Mahmood et al. (2016) investigated how cognitive and behavioral biases affect investors' trading performance. Individual investors' trading performance is significantly correlated with gamblers' fallacy bias, according to empirical findings.

H₃: Gamblers gambler's fallacy has significant influence on the trading performance of individual investors.

Loss aversion

The theoretical notion of loss aversion was first proposed in 1979 by two prominent psychologists, Daniel Kahneman and Amos Tversky. Loss aversion, the tendency to perceive losses as greater than equally sized benefits at a given point, may occur in both riskless and risky positions (Kahneman & Tversky, 1979; Tversky & Kahneman, 1991). Typically, an individual rejects an accessive loss in order to gain profit and avoid the loss (Pompian, 2012). A loss-averse investor will invest with the expectation of definite losses, take precautions against losses, and make investments with a good track record of success. Women in Pakistan are more loss-averse than men in terms of cultural values (Tahira Hassan, Wajiha, Khalid, & Habib, 2014).

H₄: Loss aversion bias has a significant influence on the trade performance of an individual investor.

Mental accounting

In 1985, Thaler developed and presented his mental accounting theory. In the theory of mental accounting, "framing" means how a person or individual subjectively sets and imagines a transaction in their minds and determines what benefit or utility they will derive from it. Individuals tend to store some events in their brains as images, and these mental images might occasionally influence our behavior more than the actual occurrences (Dadashi, Pakmaram, Rezaei, & Abdi, 2022). According to Bonner et al. (2014) and Choi et al. (2009), each investor keeps a separate and unique mental accounting for every asset and has a personal and unknowingly intimate relationship with each of them. As a result, it is more difficult to convince anyone to buy from them.

H₅: The mental accounting of investors has a significant influence on trade performance.

Stock Fundamentals

Fundamental stock analysis is a way of assessing the health of a company. It examines various aspects of the company's management and financial position, as well as the conditions in its industry that may impact its performance. (Myers & Majluf, 1984).

H₆: Stock fundamentals have a significant impact on the trade performance of an individual investor.

Trade Performance

Trade performance is the dependent variable and is measured with the satisfaction level of the investors, i.e., is the investor satisfied with his returns, or do the investors consider their returns to be higher than those of their peers or not? The trade performance will be measured with questionnaires and not with traditional performance measurement, i.e., ROA, ROE, ROE,
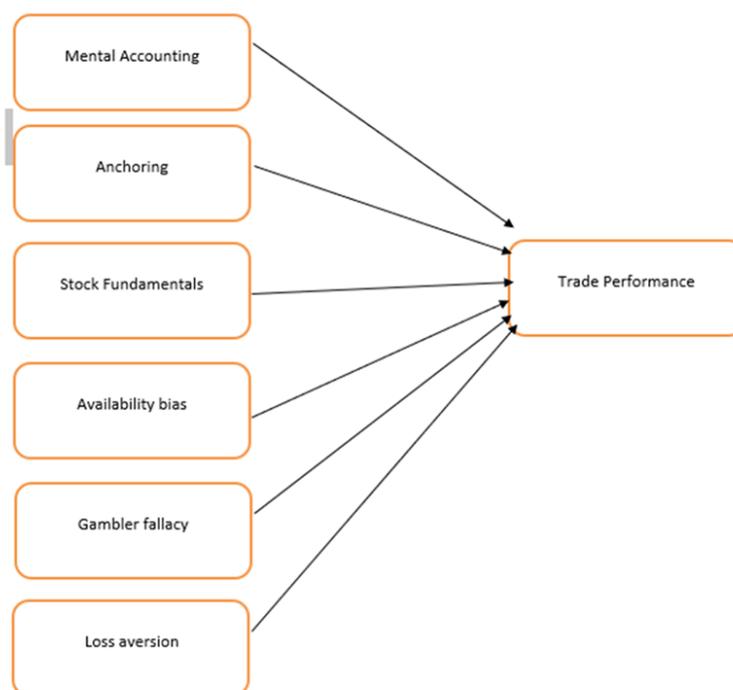
CONCEPTUAL FRAMEWORK

Figure 2.1 Conceptual frame work

METHODOLOGY

Based on a positivist approach, this study applies the deductive method of research, in which actual stock market events are analyzed experimentally and explained with logical analysis. The criterion for determining the validity of each assertion was whether our knowledge claims or hypotheses (i.e., behavioral theory predictions) aligned with the data collected from respondents to the study through a survey. All individual investors trading on the Pakistan stock exchange make up the population of the study. The study's sample size was 600 respondents

selected through stratified random sampling. With the purpose of making the sample a true reflection of the population, data were collected from 20 respondents in each of the top 30 sectors of the Pakistan stock exchange. The sample size of the study was confirmed by Gpower software, which is the best sample calculation in the statistics field. The analysis was done with SMART-PLS and SPSS.

Operationalization and Measurement Scales of Variables

The study has used seven constructs, including three from heuristic theory, two from prospect theory, and one from market factors and investment theory. Primary data was collected from individual investors using an adapted questionnaire. The questionnaires include two sections. Section 1 relates to investors' demographic information, while Section 2 relates to the measurement of behavioral biases. There are five Likert categories, where 1 indicates strongly disagree and 5 indicates strongly agree. (Fisher, Buglear, Lowry, Mutch, & Tansley, 2010)

Table 1: *Operationalization and Measurement scales of variables*

S, No	Theory	Variable	No of items	Reference
1.	Heuristic Theory	Anchoring Bias	06	Pompian (2012).
2.		Availability bias	02	Massa and Simonov, 2005
3.		Gambler Fallacy	05	Shefrin, 2002
4.	Prospect theory	Loss Aversion	06	(Kengatharan and Kengatharan, 2014
5.		Mental accounting	05	Grinblatt and Han, 2005
6.	Market factor	Stock Fundamental	06	Grinblatt and Keloharju, 2000
7.	Investment theory	Trade Performance	03	Le Luong & Thi Thu Ha, 2011

Response Rate

A total of 600 research questionnaires were distributed to Pakistan Stock Exchange investors. 470 questionnaires out of 600 were filled and returned by respondents. A response rate of 76.5% was obtained based on questionnaires that were properly filled and completed; 11 questionnaires were excluded from the sample, leaving 459 completed questionnaires for final analysis. According to Babbie (2004) a response rate of 70% or higher is considered excellent, 60% is considered good, and 50% is considered acceptable .

ANALYSIS AND DISCUSSION

Table 2*: Respondents Profile*

Demographic variables	Frequency (N=459)	Valid (%)
Gender		
Male	316	69%
Female	143	31%
Age		
30-40 years	184	40%
41-50 years	172	38%
51- 60 years	103	22%
Family member		
Less than 2 members	84	18%

3 to 6 members	220	48%
More than 6 members	155	34%
Marital status		
Single	110	24%
Married	349	76%
Educational Qualification		
SSC or less	54	12%
Under Graduate	116	25%
Graduate	211	46%
Masters	48	11%
MS and PhD	30	7%
Monthly income		
Less than 20000	90	20%
21000-40000	138	30%
41000-60000	192	42%
61000-80000	31	7%
More than 80000	8	2%
Employment status		
Employed for wages	142	31%
Self employed	148	32%
Looking for work	73	16%
Retired	41	9%
Other	55	12%
Trading experience		
Less than one year	183	40%
01 to 03 years	142	31%
04 to 05 years	63	14%
06 to 10 year	43	9%
More than 10 years	28	6%
Investment		
Less than 100000	147	32%
100000 to 300000	129	28%
300001 to 500000	73	16%
500001 to 1000000	58	13%
More than 1000000	52	11%

Assessment Of Measurement Model

Purwanto and Sudargini (2021) define a measurement model as "the part of a model that describes how the observed variables relate to unobserved, composite, or latent variables." According to Hair, Ringle, and Sarstedt (2011), the two-step model provides more robust results than the one-step model in the study at hand. First, the measurement model, or outer model, is assessed for its convergent validity, internal consistency, reliability, indicator loading, and discriminant validity (Henseler, Ringle, & Sarstedt, 2015).

Measurement Reliability and validity of modal

Model reliability and validity of measurement Model constructs are described in Table 3. All cases have a Cronbach's alpha greater than 0.7, which is considered good internal consistency,

as suggested by Nunnally (1978), Chin (1998) b, and Henseler et al. (2014). In composite reliability (CR), all the constructs measured reflectively must be greater than 0.7 (Chin, 1998; Peterson & Kim, 2013; Lebdaoui & Chetioui, 2020) and greater than the Cronbach alpha values for each of the proposed constructs (Fornell & Lacker, 1981). The values of the constructs in this case are satisfactory.

Table 3: *Measurement of Reliability And Validity*

Latent variable	Rho_A	Composite Reliability	Cronbach Alpha	Average Variance Explained (AVE)
Anchoring Bias	0.95	0.94	0.91	0.71
Availability Bias	0.87	0.94	0.87	0.88
Gamblers Fallacy	0.87	0.90	0.86	0.64
Loss aversion Bias	0.85	0.88	0.84	0.56
Mental Accounting	0.92	0.93	0.90	0.72
Stock Fundamental	0.91	0.90	0.86	0.60
Trade Performance	0.74	0.84	0.72	0.64

Using an average variance explained, convergence validity can be determined (Fornell and Larcker, 1981). The AVE coefficient measures the variance between a construct and its indicators. An average variance extract (AVE) of 0.5 or more is considered sufficient (Hair et al., 2010). According to Table 4.2, each latent variable of the study has convergent validity since the average variance extracted (AVE) is >0.5.

Discriminant Validity of Modal

The discriminant validity of a construct is an assessment of the extent to which it differs from other constructs (Chetioui et al., 2020b). The heterotrait-monotrait ratio (HTMR) and Fornell & Larcker (1981) criteria were used to assess discriminant validity.

The Fornell-Larcker criterion for discriminant validity,

Fornell and Larcker (1981) suggested that the root square of the extracted average variance of every latent construct should be higher than the correlation with every other latent variable. Therefore, the square root of the AVE of each latent variable in table 4 is greater than its correlation with the rest of the variables, and thus the construct has discriminant validdy

Table 4: *Discriminate Validity (Fornell and Larcker Criteria)*

	ANCH	AVBLT	GF	LSAVG	MACC	SF	TF
Anchoring	**0.843**						
Availability Bias	0.211	**0.940**					
Gamblers Fallacy	0.096	0.701	**0.801**				
Loss Aversion bias	0.221	0.592	0.574	**0.746**			
Mental Accounting	0.228	0.673	0.709	0.552	**0.850**		
Stock Fundamental	0.137	0.671	0.738	0.552	0.706	**0.774**	
Trade Performance	0.327	0.663	0.669	0.627	0.679	0.678	**0.803**

Note: SF Means Stock Fundamentals, MACC means Mental Accounting, LSAVG, means loss aversion, TF means Trade performance , GF stand for Gambler fallacy, AVBL for Availability bias and ANCH for Anchoring.

HTMT matrix.

The heterotrait-monotrait ratio requires that all values be less than 0.9. (Hair et al., 2010). According to (Henseler, Ringle, and Sartedt (2016), when performing simulations, they showed that the HTMT ratio was more effective at detecting a lack of validity. A discriminant validity will occur if the correlation between Monotrait-Heteromethod indicators are greater than the correlation between the indicators measuring different constructs. This means that the HTMT ratio must be lower than 1. A value of 0.90 is considered by Ferraresi et al. (1999). In table 5, each of the HTMT values is less than 1, which means that on the basis of the HTMT criterion, the scale is eligible for next step analysis.

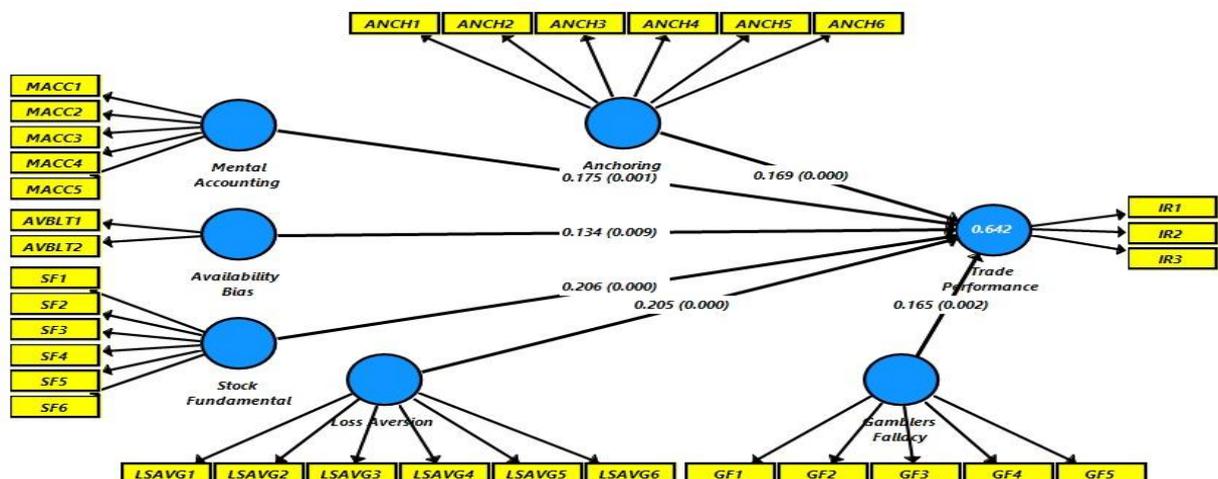**Table 5:** *Discriminate Validity (Heterotrait-Monotrait Criteria)*

	ANCH	AVBLT	GF	LSAVG	MACC	SF	TF
Anchoring							
Availability Bias	0.226						
Gamblers Fallacy	0.107	0.806					
Loss Aversion Bias	0.255	0.696	0.664				
Mental Accounting bias	0.250	0.753	0.787	0.628			
Stock Fundamental	0.140	0.759	0.832	0.623	0.772		
Trade Performance	0.405	0.827	0.828	0.794	0.826	0.820	

Note*: SF Means Stock Fundamentals, MACC means Mental Accounting, LSAVG, means loss aversion, TF means Trade performance , GF stand for Gambler fallacy, AVBL for Availability bias and ANCH for Anchoring*

Structural Model

To test the hypothesis in PLS-based modeling, the next step is to assess the measurement model. A structural model was run with 1000 bootstrapping iterations, and the obtained results were used to accept or reject hypotheses. Redundancy measure Q2, relevance of path coefficients, and coefficient of determination (R2) are standard assessment criteria that were evaluated.

Structural Modal with R^2-values, loadings and Beta

Variance Inflation factor for checking multicollinearity

In order to measure multicollinearity, the variance inflation factor (VIF) was used. The value of VIF should ideally be less than five. Tolerance is another statistic that illustrates the variance of a formative indicator that is not explained by the other indicator in the same block. There is no difference between the two statistics. For the PLS-SEM, tolerance values below 0.20 and VIFs above five of the predictor constructs indicate critical levels of collinearity.

Table: 6 *Collinearity Statistics (Inner VIF Values)*

	Trade Performance
Anchoring	1.102
Availability Bias	2.513
Gamblers Fallacy	2.984
Loss Aversion	1.755
Mental Accounting	2.625
Stock Fundamental	2.731

The VIF value should preferably be closer to 3 or below, according to Mason and Perreault (1991); Becker et al. (2015). The above table 6 shows that all VIF values are close to or lower than 3. In light of this, it can be concluded that the data do not exhibit multicollinearity.

R-Square (Co-efficient of Determination)

This is a measure of the degree of predictability of a model based on the variation in exogenous dependent variables caused by endogenous independent variables.

Table 7 *R-Square*

	R^2	Adjusted R^2
Trade-Performance	0.642	.637

According to table 7, the R-Square value is 0.642, while the adjusted R-Square value is 0.637. it means that gambler fallacy, stock fundamental, availability bias, mental accounting, anchoring, and loss aversion together explains 64.2 percent variation in trade performance .

Assessment of Structural Modal: Hypothesis testing

Table 8: *Assessment of Structural Modal*

Hypo-thesis	Relationship	Beta	Std Error	T-value	p-value	f-Sq	2.5% CI LL	97.5% CI UL	Decision
H₁	Anchoring->Trade Performance	0.169	0.033	5.159	0.000	0.073	0.102	0.230	Supported
H₂	Availability Bias-> Trade Performance	0.134	0.052	2.598	0.009	0.020	0.037	0.241	Supported
H₃	Gamblers Fallacy-> Trade Performance	0.165	0.054	3.031	0.002	0.025	0.055	0.266	Supported
H₄	Loss Aversion-> Trade Performance	0.205	0.044	4.629	0.000	0.067	0.119	0.293	Supported
H₅	Mental Accounting -> Trade Performance	0.175	0.053	3.276	0.001	0.033	0.073	0.280	Supported
H₆	Stock Fundamental -> Trade Performance	0.206	0.051	4.064	0.000	0.044	0.111	0.313	Supported

Anchoring Bias and Trade Performance

According to the study's first hypothesis, anchoring bias significantly influences investors' trading performance. There is a positive and significant relationship between anchoring bias and trade performance, as shown in the figure and table 4.5. (β = .169, se = .033, t-value =1.96 < 5.159, p-value   0.05> 0.000, ci =. 0.102 , 0.230). This leads to the acceptance of the first hypothesis of the study. It means that investors, when deciding about an investment, rely on anchoring. The results show that, on average, investors' perception is positive towards anchoring, believing that anchoring contributes positively to maximizing investment returns. The study's findings can be justified because most of the individual investors in the stock market are not financially illiterate but are less knowledgeable about the various aspects of stock trading and investing in the stock market. They make irrational investment decisions based on irrelevant information, specific anchors of past experiences, and old perceptions. The findings of this study are in line with the results of previous research studies, i.e. (Kahneman, 2011; Ngoc, 2014; Kengatharan & Kengatharan, 2014; Chen et al., 2011; Duxburry, 2015; Baker et al., 2019; Shahid et al., 2018; Naseem et al., 2021; Vaidya, 2021; Sattar et al.2020; Kartini & Nahda, 2021; Selim, 2021; Parveen et al., 2021; Rehet et al., 2021; Dirir, 2022; and Malik et al., 2022). They also found similar results, with a minor variation.

Availability bias and trade performance

The second hypothesis proposed in the study is that investors' trading performance is significantly influenced by availability bias. The availability bias and trade performance are associated with positive and significant results, as shown in Table 4.5. (β = .134, S.E = .052, t-value = 2.598 , p-value < .0.000, ci = 0.037, 0.241). This supports the second hypothesis of the study. It means that investors rely on easily available information when deciding about an investment. The results show that, on average, investors' perceptions are positive towards availability bias, believing that availability bias contributes positively to maximizing investment returns. It is possible to justify the empirical finding of the study regarding availability bias. The stock market in Pakistan is semi-efficient, and all information is not easily available to the investor. Investors use readily available information excessively instead of collecting reliable and relevant information for financial analysis and stock evaluation to make an optimal decision. When making decisions, individuals tend to utilize the information that comes to mind immediately and spontaneously, which results in irrationality. Investors, on average, perceive that investing in local firms is better than investing in foreign firms because information about local firms is more easily available than that about foreign firms. Investors believe local firms are more profitable than foreign companies based on the limited information

available. Individual Investors in the stock market manifest this bias by favouring stocks about which In their familiarity with or ease of access to information, they ignore the fundamentals of financial planning or stock analysis and invest in an optimal portfolio. Qureshi et al. (2012), Nofsinger and Varma (2013), Bakar and Yi (2016), Sattar et al. (2020), Kartini and Nahda (2021), Rehen et al. (2021), Imran et al. (2021), and Malik et al. (2022) also found that availability bias had a significant impact on individual investors' investment decisions and trades.

Gambler Fallacy and Trade Performance

In the third hypothesis, it was suggested that the gambling fallacy affects investors' trading performance in a significant way. The empirical results presented in the table 4.5 confirm that the gambler fallacy has a positive and significant relationship with trade performance (β =. 0.205, S.E = 0.054, t-value = 3.031, p-value < .0.000, CI = 0.055, 0.266). This supports the study's third hypothesis. This means that investors, when deciding about an investment, do not rely on the misperception of the gambler's fallacy. The findings portray that, on average, the perception of sample investors is positive and significant towards gambler's fallacy, with the belief that gambler's fallacy contributes positively to maximizing investment returns. The empirical findings of the study can be justified. Pakistani investors tend to make more conservative investment decisions because of their financial illiteracy, lack of stock market trading expertise, lower income, and degree of saving. Due to the gambler's fallacy bias, people can postpone buying or selling stocks in hopes that the trend will reverse, which could affect the return on their investment.

On the stock exchange, it can be found that when investors notice a specific stock whose price keeps increasing for a few days, they think it will decline. This tendency is consistent with the notion that rational and sophisticated investors also firmly believe that stock prices will correct and, thus, are expected to decline. Another fact is that stock brokers and stock analysts strongly recommend buying shares that are trading at 52-week lows. Generally, analysts and brokers recommend stocks they believe will increase in price in the near future. However, there is no justification for these expectations and misbeliefs. This study confirms the findings of previous studies by Waweru et al. (2008), Kim & Nofsinger (2008), Darwis, Suwito, and Jhay (2021), and Sattar et al. (2020). Malik et al., 2021; Rehen et al., 2021; Malik et al., 2022). Phung (2015) found a negative relationship between gamblers' fallacy and investment performance, contrary to our findings.

Loss aversion and trade performance

According to the study's fourth hypothesis, loss aversion significantly impacts investors' trading performance. Loss aversion is positively correlated with trade performance, as shown in Table 4.5. (β = .134, se = 0.044, t-value = 4.629, p-value < .0.000, ci = 0.119, 0.293). Accordingly, the fourth hypothesis of the study is accepted. In other words, investors consider loss aversion a significant factor when deciding about an investment. These findings indicate that, on average, the perception of sample investors is positive towards loss aversion, with the belief that this behavior contributes positively to maximizing investment returns. The findings of the research can be justified. Individual investors can be classified as moderators, risk-takers, or risk-averse, depending on their tendency to take risks. It is more common for individuals to be risk averse and less risk tolerant in developing countries like Pakistan. Investors are unwilling to take on high risks because of stock market volatility, lack of trading experience, low income, and low savings, and prefer to avoid losses over making abnormal profits. Due to this irrational behavior, they are usually not earning an optimal profit. The current study confirms the findings of Lehenkari and Perttunen (2004), Razek (2011), Pompian (2012), Jan, Adil, and Sapna (2021), Khan et al. (2021), Rashata (2022), and Kleine, Peschke, and Wuschick (2022), who found that investors have more loss aversion and are very reluctant to take any risk corresponding to any rate higher than the risk-free rate. Shah and Malik (2021) and Aziz and Khan (2016) found a negative relationship between loss aversion and trading performance, contrary to our findings

Mental accounting and trade performance

The fifth hypothesis of the study proposed that mental accounting significantly impacts investors' trading performance. Empirical results in Table 4.5 have confirmed a significant and positive association between mental accounting and trade performance. (β =. 0.175, se = 0.053, t-value = 3.276, p-value < .0.001, ci = 0.073, 0.280). The fifth hypothesis of the study is therefore accepted. This means that when deciding about investments, investors keep separate accounts of their money in mind but do not treat all of their money as money having the same purchasing power and equally during consumption. Thus, the results of this study are consistent with previous studies of Langer & Weber (2001), Seiler et al. (2010), Bonner, Clor-Proell, and Koonce (2014), Gazel (2015), Vaidya (2021), Khan et al. (2021), Sattar et al. (2021), Rehan et al. (2021), Rashata, H. (2022), Ahmad et al. (2022), and Dadashi et al. (2022).

Stock fundamentals and trade performance

The sixth hypothesis proposed that stock fundamentals significantly impact investors' trading performance. In table 4.5, empirical results show that stock fundamentals are positively

correlated with trade performance. (β =. 0.206, S.E = 0.051, t-value = 4.064, p-value < .0.000, C.I = 0.111, 0.313). This confirms the sixth hypothesis of the study. This means that investors' decision-making relies on the fundamental analysis of stocks, which can be viewed as an in-depth analysis of the company's health. It examines various aspects of the company's performance, including its management, economy, industry conditions, and overall performance (Myers and Majluf 1982). The findings of the study indicate that, on average, the perception of sample investors is positive towards stock fundamental analysis, with investors believing that stock fundamentals contribute positively to maximizing investment return.

CONCLUSIONS AND RECOMMENDATIONS

The last two decades have seen a change from traditional finance to behavioral finance. Behavioral finance contends with the classical assumption of efficient market hypotheses regarding the "rationality" of an investor as an economic agent. Behavioral finance refers to the concept of "bounded rationality" and believes that investors are influenced by psychological, emotional, social, and demographic factors when making investment decisions. In other words, behavioral finance emphasises the fact that investors aren't always rational and don't always follow traditional finance's principles and methods. This study aims to analyze and understand how six cognitive and behavioral biases influence individual investors' trading performance. The underpinning theories providing theoretical grounds to study are Prospect theory, Heuristic theory, and efficient market hypothesis as contrast theory. Six cognitive and behavioral biases were extracted from underpinning theories and were included as an independent variable study Through stratified random sampling, 600 respondents were selected. The SMART PLS 3 has been used to analyze the data. PLS path-based SEM modelling as a data analysis method is extensively applied in social sciences and management (Purwanto & Sudargini, 2021). A two-step model approach was used in this study since Hair, Ringle, and Sarstedt (2011) indicate that a two-step model is more robust than a one-step model. Data analysis begins with assessing the measurement or outer model, which determines whether the scale used for data analysis is convergent and discriminant. A convergent validity test was carried out by calculating average variance, composite reliability, factor loadings, Cronbach's alpha, and Rho-A. To determine the discriminant validity of the assessment model, Fornell-Lacker and HTMT criteria were used. In PLS-based modeling, the next step was to run the structural model to test the hypothesis based on the measurement model. For testing the hypothesis of the study, the structural model has been run with 1000 bootstrapping iterations based on the obtained data. According to the structure modal, anchoring, availability bias, gambler's fallacy, loss aversion, mental accounting, and stock fundamentals, these factors

significantly affect individual investors' trade performance on the Pakistan stock exchange. Accordingly, the findings of the study support all six hypotheses. The findings of the study were in line with those of similar studies in the past.

On the basis of these empirical findings, it can be concluded that individual investors are not entirely rational when making investments. Consequently, their financial decisions are influenced by behavioral and cognitive biases, which restrict their ability to make rational financial decisions. Therefore, investors must examine fundamental theories and models of traditional finance and behavioral elements while making investment decisions, which may lead to optimum investment choices.

Limitations of the Study

There are numerous implications of the study for stakeholders, and it adds to the body of knowledge in the field but also has some limitations like other similar studies, which are as follows:

1. Choosing a sample representative of the target population has always been challenging for researchers. Despite selecting a larger sample, respondents cannot be guaranteed to provide honest, factual, and biased responses. It is called "Response Bias" (Curtis, 2009) and is a limitation of all primary data studies. Data from 459 respondents may not be sufficient to support hypotheses and generalise the study's findings.

2. The primary data was collected from individual investors. Thus, the results apply to individual investors only and cannot apply to institutional or corporate investors.

3. Some investors remain very reluctant to fill out the questionnaires, and the scholar assumes that they did not give an appropriate response. As their response is suspicious, the results might not be 100% accurate.

4. The study investigated only behavioural and cognitive factors' impacts on investment decisions. Other factors, like sociological and cultural factors, as well as different demographic variables, should be looked at in more research to confirm and add to the results of the current study.

5. The ratio of males is higher than females in the sample size, which restricts the resulting applicability equally to males and females.

Implications of the Study

Findings from the study will have significant implications for individual investors, financial consultants, brokerage firms, corporations, and governments. It is critical for individual investors to understand how behavioural and cognitive biases might affect their investment decisions in the future. It is important for institutional investors, regulatory authorities, and

investment managers to study the behavioral biases that cause them to make poor investment decisions. It will help them make an informed investment decision by analyzing all pertinent data. In addition, they may conduct awareness training seminars about behavioral biases, which can enhance stakeholders' decision-making. The results of this study may be used by financial consultants to recommend the most appropriate investment alternatives to their clients. The study is also helpful for policymakers since it allows them to understand the behavior of individual investors on the stock market and facilitates efficient market functioning. Thus, the study findings have significant implications for individual investors, brokerage houses, and other parties.

Recommendations for Further Research

The study investigates the effects of behavioral and cognitive bias on the trading performance of Pakistani stock exchange investors. We did not include institutional investors and asset managers in our study. The study can be further extended by including other cognitive and behavioral biases that could significantly impact trading performance. In addition to primary data, other studies can also use secondary data to support their findings.

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