

## **Impact of Socio-Psychological Factors on Investment Decisions: The Mediating Role of Behavioral Biases**

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### **Abstract**

Unlike previous studies that examine the effect of behavioral biases on investor decision-making, this study explores the root causes of behavioral biases and examines the mediating role of behavioral biases in the relationship between different types of emotions and investment decision-making. The cognitive theory of depression, attentional control theory, and prospect theory together provide the foundation and anticipate that stress, depression, anxiety, and social interaction are the major sources of cognitive mistakes that, in turn, affect investment decision-making. Model testing relies upon the data collected from 252 stock investors trading in different stock exchanges of Pakistan; in order to test the hypothesized relationship, structural equation modeling has been used. Depression is a major source of loss aversion bias. Anxiety is a strong source of herding. Stress is a major source of representative bias. Social interaction is a root cause of overconfidence. Loss aversion bias, herding, and overconfidence fully mediate the relationship between depression, anxiety, social interaction, and investor decision; however, anxiety has the strongest impact on investor decision via herding bias, while stress has both insignificant direct and indirect effect on investment decision-making.

**Keywords:** Sources of biases, self-efficacy, behavioral pattern, investment decision.

The conventional finance paradigm analyzes the financial markets with the help of “rationality” models (Baschieri, Carosi, & Mengoli, 2017; Statman, 2019). According to the principle of “rationality,” an individual continuously updates his inclinations and opinions with regard to current information (Bossaerts & Murawski, 2017; Lewis, Howes, & Singh, 2014). In other words, an individual always makes consistent decisions and selects the alternatives that can maximize his satisfaction. On the other hand, according to behavioral finance market agents are neither completely rational nor consistent in their choices because their psychology affect their decisions (Miłaszewicz, 2019; Statman, 2014).

Return volatility (Che, 2018; Kaniel, Saar, & Titman, 2007) and asset prices (Hribar & Yang, 2016) are affected by individual psychology. In reality, stock market disturbances and economic fluctuations leave open to question the adequacy of traditional rationality principle (Gilchrist, Yankov, & Zakrajšek, 2009; L. Wang, Nie, & Wang, 2019). An individual decision is a result of the complex process in which an individual brain system performs different interconnected functions that may not be consistent with the assumptions made by traditional financial theorists (Zaki & Ochsner, 2012). A poor or negative emotional condition can lead an investor towards bad financial decision-making. Research has found that negative emotions affect financial decision-making more than positive emotions do because these emotions create disturbances in the individual's personality (Cheng, 2019; Druckman & McDermott, 2008). Stress is a circumstance, a variable or state, that disturbs an individual's normal functioning; it is also an outcome or the effect (disturbed situation) of the stressor (Sohail & Rehman, 2015). There are mainly two conventional models of psychological stress: response based and stimulus based. The stimulus-based model assumes that different conditions such as workload, heat, time pressure, etc. are stressful for individuals (Ergun, 2015). The response based models, by contrast, define stress with the help of cognitive, behavioral, and affective patterns of response that comes from an individual's

interaction to a given stressor (Ergun, 2015). This model suggests that individuals are not just machines that directly react to environmental stimuli; rather, their personalities, emotions, and other endogenous factors design their psychological conditions and responses. Chronic stressful life situations lead to depression if an individual is not managing stress well (Albert & Newhouse, 2019; Gold, 2015). Owing to its modulatory impact on behavior, stress might contribute to the formation of mood disorders (Nowacki, Duesenberg, Deuter, Otte, & Wingenfeld, 2019; Robinson, Bond, & Roiser, 2015).

Depression is a condition of low mood that is significantly surpassing the temporary feeling of sadness. Depression reduces the sensitivity of reward, influencing those afflicted by depression fail to maximize their monetary benefits (Kunisato et al., 2012; Nowacki et al., 2019). In a depressed state, an individual has the tendency to neglect pleasurable stimuli, and his sad mood diverts attention away from profitable opportunities and toward threatening stimuli (Harlé, Allen, & Sanfey, 2010). Heightened concern about the individual's own current financial condition creates financial anxiety, and, in turn, this anxious state negatively affects the individual's capacity to process available financial information efficiently. Anxious people perceive themselves as having a low level of ability to control their circumstances: They feel that they cannot act constructively (Grahek, Everaert, Krebs, & Koster, 2018; Inzlicht, Bartholow, & Hirsh, 2015). Consequently, they may prefer to follow the actions of the others in order to reinforce their own decision and to reduce the intensity of the feeling of guilt by imitating the actions of others (i.e. herding behavior).

Previous researchers utilized psychological theories e.g. the attentional control theory and processing efficiency theories developed by Eysenck (2007) to explain the cognitive behavior of individuals. Meanwhile, prospect theory was used to explain the effect of behavioral biases on the financial decision-making (Levy & Levy, 2003). Also, many researchers studied the impacts of biases on the investment decisions (Grinblatt & Keloharju, 2001; Rabbani, Yao, Wang, & Grable, 2018). A study by Shiller and Pound (1989) focused on the effect of overconfidence bias on the investment performance; Lucey and Dowling (2005) examined the role of affect in investment decisions; Baddeley, Burke, Schultz, and Tobler (2010) studied the impacts of personality on herding and financial decision-making. Still, the mediation mechanism of behavioral biases between psychological factors and investment decisions is unattended. How will these psychological factors generate behavioral biases and indirectly affect the financial decision making? Particularly, what are the major sources of behavioral biases?

This study contributes to the literature in many ways. First, it explains how biases affect investment decisions. Second, it explores the major sources of behavioral biases. Third, it explains the mediating role of behavioral biases. Finally, it explains the direct and indirect effects of psychological factors (stress, depression, and anxiety) as well as social interaction on investment decisions by applying attentional control and processing efficiency theories in financial decision-making. The researchers will test the hypothesized model in Pakistan. The direct and indirect effects of psychological factors will be tested with the use of structural equation modeling in AMOS. Pakistani stock investors will be the unit of analysis.

### **Research Model and Hypothesis Development**

The present study examines the role of behavioral biases in two ways. It examines the direct effect of biases on the investment performance. Also, it examines the mediating role of these biases on investment performance by investigating the sources of behavioral biases. This study proposes that there are some social and psychological factors responsible for generating behavioral biases.

#### **Anxiety, herding, and investment decisions**

According to attentional control theory, anxiety impairs processing efficiency because it reduces attentional control. As a result, there is a possibility that the processing resources will be diverted from task-relevant stimuli to task-irrelevant stimuli (Eysenck, Derakshan, Santos, & Calvo, 2007; Kraft, Grant, White, Taylor, & Frosio, 2019). Anxiety is a strong desire or concern to do something; thus, in a state of anxiety, an individual is unable to originate a clear behavioral pattern (Zimbardo & Boyd, 2015) and is unable to remove or change the event, object, or interpretation that is threatening the desired goal. Anxiety negatively affects the performance of cognitive tasks; therefore, it has great importance in the field of cognition (Derakshan & Eysenck, 2009). The judgments and the decisions of anxious persons depend upon the characteristics of their feelings; therefore, an anxious individual becomes uncertain and has reduced control over an outcome. At the same time, uncertainty harms general self-efficacy, or the belief that one is capable of attaining

a specific, desirable goal, and thereby erodes self-confidence (Franklin, Smith, & Holmes, 2015; Williams & Krane, 1992). Both low certainty and low control prompt implicit goals of reducing uncertainty and increasing control. As a result, anxious individuals will prefer options that can reduce the uncertainty and improve the control (Brooks & Schweitzer, 2011) by using different approaches. One approach to reducing uncertainty and to improve control is strengthening social relationships (Heaney & Israel, 2008; Newsom, Shaw, August, & Strath, 2018). The other is to follow the actions and opinions of others in order to gain confidence and reduce uncertainty. Depressed people assign greater weight to opinions of others as compared to their own (Galatzer-Levy, Nickerson, Litz, & Marmar, 2013). There is a natural propensity that the people search for evidence which favors their own decision and ignores the evidence that is arrayed against their choice; therefore, they should search for the reasons why their decision is incorrect (Nickerson, 1998). It is evident that the appropriateness of people's confidence in their judgments can be improved as a consequence of such efforts and will be encouraging. According to (Yao, Ma, & He), in order to make a good decision, investors follow the crowd; if a large group of investors is investing in a particular project, the rest of the investors will start investing in that project. Conversely, if some investors stop investing in a project, the rest of the group will stop investing even if they have not suffered from any shock (EMARA, Congcong, & Ya, 2018; Joyce & Nabar, 2009). This is because herding is the replication of the decisions of one's peers (Monne, Louche, & Villa, 2016). Therefore, the researchers hypothesize, anxious investors will herd more than emotionally controlled researchers.

*Hypothesis1: Anxiety generates the herding behavior that consecutively affects the investment decisions negatively*

#### **Depression, loss aversion, and investment decisions**

Prospect theory explains that people are more emotional in the state of loss as compared to the state of gain and explains the S-shaped risk preference of individual investor (Bernheim & Sprenger, 2019; Levy & Levy, 2003). Loss or risk adverse investor behavior depends upon an investor's previous performance (Chen, Chen, & Chi, 2019; Renneboog, Ter Horst, & Zhang, 2008). In a loss-averse condition, "gain" always appears smaller than a loss of equal size because the value (subjective) of money decreases the greater the amount of money one has; on the other hand, the value of money increases the lower amount of money one has this is called the "law of diminishing marginal utility." Loss aversion theory justifies the action of an investor to hold his loser and sell his winner because he feels that in future it is possible that today's loser will do better than today's winner.

The depressed investor will become risk-averse; to understand this relationship, first of all, we should understand what "depression" is. Depression is a condition of low mood and avoidance to an action which can affect an individual's thoughts and sense of well-being (Nettle & Bateson, 2012). Empirical research and clinical observation point out the abnormal responses of depressed individuals toward positive as well as negative stimuli. Biased information processing is also evident among depressed individuals (Beck, Kovacs, & Weissman, 1979; Thomson, 2018). As defined by Haushofer and Fehr (2014), risk taking is a behavior with the potential of reward as well as negative consequences that can be affected by depression. On a self-report measure, depressed individuals appeared to be more risk averse than controlled individuals (Steenbergen, Sellaro, van Hemert, Bosch, & Colzato, 2015). According to Kahneman and Tversky (1979), money flows out less rapidly from underperforming stock as the money flows into overperforming stocks. By mistake a depressed investor may invest in a stock that seeks more attention from market agents. In short, depression leads to risk averse behavior and negatively affects investment decisions.

*Hypothesis2: Depression generates loss aversion bias, which in turn negatively affects the investment decisions*

#### **Stress, representativeness and investment decisions**

Stress is a feeling of pressure and strain. The majority of the research has focused upon the concept that stress reduces an individual's environmental scan, or ability to discern and interpret potential threats from one's surroundings (Barrett, 2017; Bratman, Hamilton, Hahn, Daily, & Gross, 2015). According to LeBlanc, McConnell, and Monteiro (2015) stress reduces the range of attended signals; also, under a stressful condition, one's perceptual field narrows, and the scope of behavior is restricted to the elements that contribute most to the present direction of behavior (Wegbreit, Franconeri, & Beeman, 2015). Thus, from the above discussion, we can say that the stressed individual will be representatively biased. According to Kahneman and Tversky (1979), people tend to have the incorrect perception about the likelihood of the events. Pechtel and Pizzagalli (2011) state that stress impairs the cognitive function by reducing the amount of attention

devoted to the information processing. On the basis of the law of small numbers, people perceive that a random sample selected from the population is a true representative of the whole population and is unbiased (Rabin, 2002a, 2002b). In the case of large, unbiased independent samples, this idea is generally correct. However, when the sample is not representative of the population and is invalid because of its insufficient size, the inference derived from this sample will be biased; this idea can be explained by the representativeness heuristic (Newell, Lagnado, & Shanks, 2015). People assume that the estimates of sample statistics are equal to the population parameters, an assumption that can easily lead to an incorrect prediction (Kahneman & Tversky, 1979).

Barber and Odean (2007) investigated the effects of news and attention on the decision-making of individual and institutional investors. On the basis of recent past stock prices, an investor extrapolates additional purchase of stocks after consecutive bull periods (buyer of rising securities) and additional sale after consecutive bear periods (seller of falling securities). From the above discussion, researcher hypothesizes that stressed individuals take more representatively biased decisions as compared to non-stressed individuals

*Hypothesis 3: Stress originates representative bias and sequentially impairs the investment decision.*

### **Social interaction, overconfidence, and investment decisions**

In the twenty-first century, investment has become an important activity of daily life (Savickas et al., 2009). Investors not only own stocks but also like to talk about them with various individuals in their lives and in a wide array of locations. Investment discussions occur at offices, over lunch, on the radio, and even over the World Wide Web. Investors want to invest on their own, but at the same time, they need the psychological support of like-minded people (Barom, 2019; Dunfee, 2003). The transformations in the ways that human beings communicate with each other since the advent of the Internet and digital communications technology have fundamentally transformed investors' buying and selling activities (Tanner Jr, Fournier, Wise, Hollet, & Poujol, 2008). Therefore, we can say that social interaction affects the investor's decision and investor learns through the interaction of other people.

Online investors have easy access to the information and enjoy a high speed of trade execution (Barber & Odean, 2007; Cartwright, 2018). This information includes historical corporate performance, stock prices and returns, trading volume, analyst's recommendations etc. It leads to believe some investors that they have extensive or insider information which would give them edge on other investors and become overconfident about their investment decisions (Park, Konana, Gu, Kumar, & Raghunathan, 2010). In psychology, overconfidence causes investors to overestimate his knowledge and underestimate risks (Gärling, Fang, & Holmen, 2019; Nosić & Weber, 2010).

Overconfidence increases trading frequency because the overconfident investor is too certain about his opinions (Grinblatt & Keloharju, 2009; Rabbani et al., 2018). Information loading without professional analysis leads to risky decision-making for certain investors. Overconfident investors will lack profit assessment ability and may ignore transaction costs (Barber, Lee, Liu, & Odean, 2008). In fact, overconfident behavior is self-deceptive behavior and may lead to biased investment decisions (Trinugroho & Sembel, 2011). Thus, it can be concluded that social interaction leads to overconfidence and negatively affects the investment decisions.

*Hypothesis 4: Social interactions aggravate overconfidence bias, which sequentially damages the quality of investment decisions.*

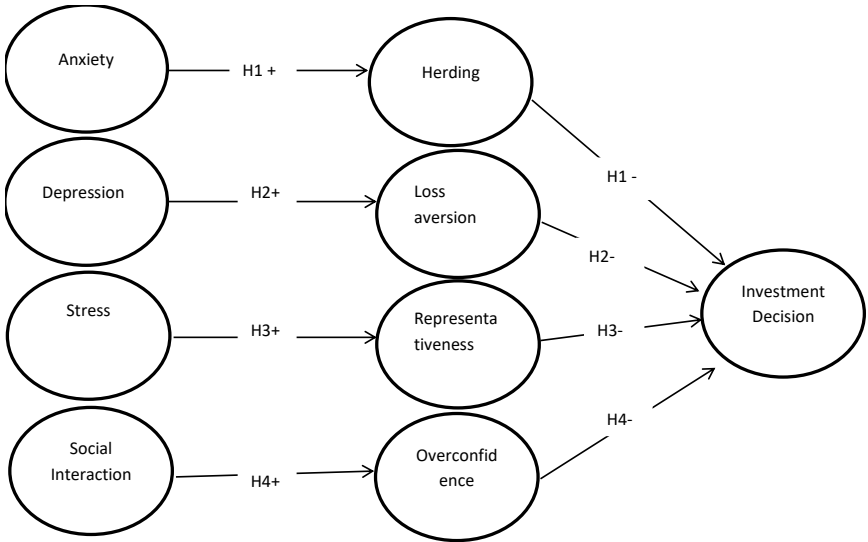


Figure 1: Hypothesized model

## Methodology and data

### Sample and procedure

In this study, the target population comprised of investors in the stock exchanges that operated independently within Pakistan prior to their 2016 merger as the Pakistan Stock Exchange (PSX). Prior to 2016, there were three stock exchanges in Pakistan: the Karachi Stock Exchange, the Lahore Stock Exchange, and the Islamabad Stock Exchange. Investment is mobilized by the stock exchange due to which opportunities for investments are created for investors. These stock exchanges of Pakistan were the main barometers of its economy, and the government utilized this source to raise funds for its development funds.

The Karachi stock exchange (KSE) was situated in a famous building on Stock Exchange Road. The Karachi Stock Exchange building is the hub of Karachi's Business District, "I.I. Chandigarh Road," and is both the oldest stock exchange in South Asia and also the largest stock exchange in Pakistan by market capitalization. It has many local and international corporations listed. The second-largest stock exchange in Pakistan is located in Lahore: Lahore Stock Exchange (LSE). Finally, the youngest stock exchange of Pakistan, Islamabad Stock Exchange (ISE), is located within the city of Islamabad and was formed on 25th of October 1999 as guarantee limited company. The main objective was to set up a trading and settlement infrastructure including the information system, skilled resources, and accessible and orderly marketplace that could be ranked as one of the best around the globe. On January 7, 1992, ISE was licensed as a stock exchange, and it started functioning in July of the same year. On January 11, 2016, Pakistan Stock Exchange was formed through the merger of KSE, LSE, and ISE. PSX (Pakistan Stock Exchange) is amongst the best performing stock exchanges in the world.

We selected 252 stock investors who were trading in these stock exchanges at the time of this study: 80% male and 20% female. Traditionally, being a highly male dominant society, women's participation at workplace is still low in Pakistan. Data was collected following convenient and judgmental, non-probability sampling technique using a self-report questionnaire in face-to-face meetings. We selected 76 stock investors from ISE, 76 from the LSE, and 100 from KSE who invested in the ordinary shares of listed companies. We met the selected investors at the start of 2014 and requested that they fill out the questionnaire containing the investor's biases; at that time the selected investors of ISE had invested in the shares of Pakistan Leather, Gul Ahmed Textile Mills Ltd., Maple Leaf Cement Factory Ltd., and the Fecto Cement Ltd. The selected investors of LSE had invested in the shares of Fatima fertilizer company Ltd., Honda ATLS Cars (Pakistan) Ltd., Farooq Habib Textile Mills Ltd. The selected investors of KSE had invested in the Alhabib Silk, Attock cement, Adam Sugar XD and ADOS Pakistan. At the end of 2014, we met them again and asked the questions about their return on investment, their comparative performance, and their satisfaction from the investment to evaluate their actual performance on investment.

## Measurements

*Stress*: We measured stress with the use of 12 items scale developed by Mitchell, Crane, and Kim (2008)(e.g. 1. You were unable to control the important things in your life; 2. You were upset because something happened unexpectedly).

3.2.2*Anxiety*: For the measurement of anxiety, we relied upon two items scale used by Lim and Sng (2006) which had a good reliability and validity in previous researches (e.g., 1. I worry about my finances most of the time; 2. I often feel anxious about my personal finances).

*Depression*: We measured this with two items scale used by Garst, Frese, and Molenaar (2000)(e.g., A good deal seems senseless to me & I have sad moods).

*Social interaction*: We relied upon the instrument having three items used by Ragins and Cotton (1999)(e.g., 1. I frequently get together with my coworkers informally after work; 2. I frequently have one-on-one, informal social interactions).

*Behavioral Biases*: Representative bias, overconfidence, and loss aversion were measured by five items each, while herding was measured by four items used by Waweru, Munyoki, and Uliana (2008)and indicated as having good reliability (e.g. I use trend analysis of some representative stocks to make investment decisions for all stocks that I invest. I believe that my skills and knowledge of stock market can help me to outperform the market. The fear of losing the amount invested sometimes overwhelms [burdens] me, therefore I sell my security before maturity).

*Investment decision*: To measure investment decision, we used primary data following the research of Oberlechner (2008)and Waweru et al. (2008)in which the return rates were considered most powerful factor for the evaluation of investment performance. We estimated investment rerun subjectively as well as objectively. For our subjective measure, we asked the investors to compare their actual return from the expected return; for our objective measure, we asked them to compare their real return to the average stock market return rate. Finally, we measured the investor's level of satisfaction. Therefore, in this study, each investor evaluated his or her own investment performance. Example items include: The return rate of your recent stock investment meets your expectation. Your rate of return is equal to or higher than the average return rate of the market. You feel satisfied with your investment decisions in the last year (including selling, buying, choosing stocks, and deciding the stock volumes).

To measure response we used a 7-point Likert scale on which 1=strongly disagree and 7=strongly agree. We translated our questionnaire into Urdu, the national language of Pakistan. Before launching the study we conducted a pilot study and interviewed 25 stock investors at ISE with the questionnaire in order to identify of major problems regarding the understanding of questions and the flow of the Urdu version; we encountered no such problems.

## Data Analysis

### Analytical strategy

We analyzed the data in four steps. In the first step, we have checked the measurement, reliability, and validity with the help of confirmatory factor analysis for all measures (Anderson & Gerbing, 1988). After establishing convergent and discriminant validity, we tested the hypothesized structural model using structural equation modeling SEM (Anderson & Gerbing, 1988). Our focus was the direct and indirect effects of stress, depression, anxiety, and social interaction that are the major sources of biases on investor decision.

### Confirmatory Factor Analysis

With the use of well-established instruments, we measured the constructs and checked their reliability and dimensionality in the Pakistani context. We performed confirmatory factor analysis (CFA) in order to check their reliability and dimensionality. We had nine factors in total: stress, depression, anxiety, social interaction, loss aversion, representative bias, herding, overconfidence, and investor decision. We first conducted a single-factor CFA by loading all the items of nine measures onto a single factor (Anderson & Gerbing, 1988). A single-factor CFA did not produce a good fit (Table 1). Then we tested a nine-factor CFA onto which we loaded all the items on their respective measures, This CFA produced a good fit with the data (Table 1).

Table 1. Model Fit Indices

Models		$\chi^2$	Df	$\chi^2/df$	GFI	NFI	TLI	CFI	RMSEA
Model 1	One factor CFA	3036.03	820	3.70	0.58	0.55	0.61	0.62	0.1
Model 2	Nine factor CFA	1368.60	780	1.75	0.79	0.79	0.89	0.90	0.05

With the nine-factor CFA, all items exhibited high-factor loading between .62 to .9 (Kline, 2011). The AVE of all factors is greater than .4, explaining satisfactory convergent validity. Discriminant validity was established for Anxiety, depression, and social interaction (see Table 2).

Table 2. Construct validity and reliability

	1	2	3	4	5	6	7	8	9	$\alpha$
Anxiety	<b>0.79</b>									0.88
Stress	<b>0.25</b>	<b>0.47</b>								0.92
Depression	0.000	<b>0.01</b>	<b>0.55</b>							0.71
Social interaction	0.030	0.020	0.00	<b>0.51</b>						0.83
Herding	0.120	0.560	0.01	0.02	<b>0.59</b>					0.89
Investment decision	0.120	0.310	0.09	0.01	0.300	<b>0.61</b>				0.82
Overconfidence	0.220	0.640	0.02	0.060	0.500	<b>0.31</b>	<b>0.57</b>			0.87
Representativeness	0.190	0.400	0.00	0.020	0.320	0.250	<b>0.41</b>	<b>0.59</b>		0.89
Loss aversion	0.000	0.000	0.12	0.010	0.000	0.140	0.000	0.00	<b>0.48</b>	0.79

On diagonal AVE and below are the values of squared correlations

Eight items showed high internal reliability and consistency with Cronbach's alpha values (see Table 2) of .92 for stress, .89 for representative bias, .87 for overconfidence, .88 for anxiety, .79 for loss aversion, .89 for herding, .83 for social interaction, 0.71 for depression—all greater than the recommended value of .7 (Nunnally, 1978).

#### Common Method Variance

We had collected data with the help of the same questionnaire within the same time period and research design was cross-sectional; thus the chances of common method bias (CMB; (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003) existed. We used Harman's one-factor method to test for the presence of CMB. The first factor accounted for a percentage of variance that was less than 50% thus denying the presence of CMB in the data.

#### Multicollinearity

Multicollinearity increases the variance of the regression coefficients. The results of the predicted equation will be less stable if the variances are high. To test the existence of multicollinearity of the data, we checked the VIF (variance inflation factor). A high VIF value will indicate a multicollinearity problem Normal standard to check the multicollinearity is the rule of thumb which states that VIF  $\geq 10$  for definite multicollinearity. In our data, however, all the independent variables had VIF less than 4. It shows that our data is protected from the threat of multicollinearity.

#### Descriptive statistics and correlation analysis

Table 3 represents the descriptive statistics (i.e., mean and standard deviation) and the correlations among nine variables. This correlation table provides initial understanding about the proposed and non-proposed relationships among variables.

Table 3. Descriptive Statistics and correlations

	Mean	SD	1	2	3	4	5	6	7	8	9
Anxiety	3.93	1.86	1								
Stress	4.13	1.29	.50	1							
Depression	3.63	1.77	-.01	.11	1						
Social interaction	4.38	1.38	.17	.15	.01	1					
Herding	4.23	1.47	.35	.75	.14	.14	1				
Investment decision	3.89	1.60	-.34	-.56	-.31	-.10	-.54	1			
Overconfidence	4.20	1.48	.47	.81	.13	.24	.70	-.55	1		
Representativeness	4.07	1.55	.44	.64	.09	.16	.56	-.50	.63	1	
Loss aversion	4.10	1.40	-.07	-.07	.34	-.10	-.02	-.37	-.07	.01	1

Correlations among variables are significant 5%

## Results

### Model fit

In the present study, we formed nine constructs in order to measure the model fit indices (Anderson & Gerbing, 1988). In our model, we included behavioral biases (i.e. herding, representativeness, loss aversion, and overconfidence) as mediators between socio-psychological factors (i.e. anxiety, stress, depression, and social interaction) and investment decision. The results of the proposed model were good (see Table 4).

Table 4. Model fit indices

Model	Description of model	$\chi^2$	Df	$\chi^2/df$	Model fit				
					GFI	NFI	TLI	CFI	RMSEA
Model 2	Multi mediation	1943.58	805	2.41	0.85	0.83	0.79	0.81	0.07

**Model Testing**

With the help of structural equation modeling, we tested the direct and indirect effects of independent and mediating variables on investment decision. Furthermore, we compared the effects of stress, depression, anxiety, and social interaction on investor decision-making before and after mediation.

A mediation model (see Table 4) produced a good fit with the data ( $\chi^2=545.48$  df= 226  $\chi^2/df=2.4$  GFI=0.85 CFI=0.89 TLI=0.88 NFI=0.83 RMSEA=0.075), suggesting that biases will significantly have a negative effect upon the investment decision.

Table 5. Direct Effects on Investment Decisions

Independent variable	Dependent variable				
	Loss aversion	Representative Bias	Herding	Overconfidence	Investor decision
Depression	0.45**	....	....	....	-0.09
Stress	....	0.71**	....	....	-0.08
Anxiety	....	....	0.43**	....	-0.02
Social interaction	....	....	....	0.30**	-0.01
Loss aversion	....	....	....	....	-0.59**
Representative	....	....	....	....	-0.14**
Herding	....	....	....	....	-0.27*
Overconfidence	....	....	....	....	-0.46**

\*\*significant at 1%level of significance

\*significant at 5% level of significance

All the biases have a significant and direct effect on investor decision. Table 5 shows that the loss aversion will significantly have a negative effect upon investor decision (i.e. -0.59 at 5% and 1%). Representative bias will also significantly have a negative effect upon the investor decision (i.e. -0.14 at 5% and 1%). In the above table 5, we can observe that herding will significantly and negatively affect the investor decision (i.e. -0.27 at 5% and 1%). Our data supports the hypothesis that overconfidence will significantly impair the investor’s decision, and the resulting biased decisions will lead to low performance. On the other hand, our data demonstrates the sources of the different biases that we have proposed. Table 5 demonstrates our proposition that depression is a significant source of loss aversion bias (i.e. 0.45 at 5% and 1%), stress is a significant source of representative bias (i.e. 0.71 at 5% and 1%), anxiety is basic source of herding bias (i.e. 0.43 at 5% and 1%), and social interaction is a major source of overconfidence bias (i.e. 0.30 at 5% and 1%).Table 6 shows that direct effects of stress, depression, anxiety, and social interaction are insignificant in investment decision-making, while the indirect effects of depression, anxiety, and social interaction on investor decision-making are significant. The direct effect of depression on investor decision is insignificant (i.e. -0.09 at 5% and 1%), while the indirect effect of depression on investor decision via loss aversion bias is significant (i.e. -0.24 at 5%). This shows that loss aversion bias will fully mediate the relationship between depression and investor decision. The direct effect of anxiety on investor decision in the presence of herding bias is insignificant (i.e. -0.08 at 5% and 1%). Our final model tested the direct and indirect effects of stress, depression, anxiety, and social interaction on investor decision through the mediation of biases; this model also produces a good fit with the data ( $\chi^2 =1943.58$  df=805  $\chi^2/df=2.41$  CFI=0.81 TLI= 0.79 NFI =0.71 RMSEA=0.07).

Table 6. Indirect Effects on Investment Decisions

Independent Variable	Dependent variable Investor decision			
	Via loss aversion	Via Representative	Via Herding	Via overconfidence
Depression	-0.24*	....	....	....



Stress	.....	-0.10	....	.....
Anxiety	.....	.....	-0.10**	....
Social interaction	....	.....	.....	-0.08*

\*significant at 5%level of significance

\*\*significant at 1%level of significance

On the other hand, the indirect effect of anxiety on investor decision in the presence of mediator herding is significant (i.e. -0.10 at 5% and 1%). This shows full mediation of herding between the incidence of investor anxiety and the investor's ultimate decision. Table (6) shows that stress will not affect the investment decision because stress is a temporary change in the mood or a temporary state of low mood; therefore, an investor under stress experiences momentary fluctuations in his mood, yet ultimately his financial decisions remain unaffected. Social interaction has an insignificant direct effect on investor decision in presence of mediator overconfidence (i.e. -0.01 at 5% and 1%), while the indirect effect of social interaction on the investor decision via overconfidence is significant (i.e.-0.08 at 5%). This latter finding shows full mediation of overconfidence between the relationship of social interaction and investor decision. The results provided above support our hypothesis that loss aversion, herding, and overconfidence are the mediators between depression, anxiety, social interaction, and investor decision, whereas stress does not affect investment decision.

## Discussion

### Academic Contribution

The objectives of this study are not only to examine the effects of behavioral biases on the investor's decision but also to explore the basic sources of these biases. Using structural equation modeling we have determined that stress, depression, and anxiety are strong predictors of an investor's decision through loss aversion and representative bias. We had hypothesized that depression would affect the investor decision via loss aversion and representative bias would mediate the path between stress and investor decision. We also had hypothesized, on the other hand, that anxiety would impair the investor's decision via herding and social interaction will create the overconfidence bias which in turn will affect investor decision. After carrying research we have found that in Pakistani stock exchanges the bias of loss aversion significantly affects the investor decision.

Our results are consistent with those of Inesi (2010), who found that loss-averse investors can't make decisions rationally. Fellner and Sutter (2009) found that investment decisions are significantly and negatively affected by the loss-averse behavior of investors. In this study, we have demonstrated that the representative bias will significantly affect the investment decision, a result consistent with the findings of (Boussaidi, 2013) that an association exists between past earnings and future returns and that future returns are not the function of past earnings. In the current study, we determined that overconfidence will significantly affect investors' decisions, a result consistent with the finding of Kim and Nofsinger (2007) that the overconfident investor will misprice a stock because they will overestimate the quality of information available to them. Herding behavior is also significant in Pakistani stock exchanges, a result supporting the examination by Tan, Chiang, Mason, and Nelling (2008) of the herding behavior in dual-listed Chinese A-share and B-share stocks. We also observed the herding behavior of investors during 2008 financial crisis. Here the question arises that if biases such as loss aversion, representativeness, and overconfidence will impair investor decision-making and may lead to irrational decisions, then what are the root causes or originators of these biases? Psychologists explained that the stress, depression, and anxiety will damage the cognitive performance of the people (Beck et al., 1979). Depression is a source of loss aversion bias, a result supported by the cognitive theory of depression (Beck et al., 1979). Stress is a source of representative bias that decreases the amount of attention devoted to information processing: By using heuristic simplifications, an investor will become representatively biased (Dohmen, Falk, Huffman, Marklein, & Sunde, 2009). In this study, we have tested these theories about financial decision-making and shown that stress, depression, and anxiety will create cognitive biases such as loss aversion, representative bias, and herding. Our results further showed that social interaction will create overconfidence. This result is consistent with the findings of (Hall, Ariss, & Todorov, 2007), which show that social interaction leads to biased investor decision-making, because when social interaction increases owing to the perception of having greater knowledge and control, an investor can become overconfident.

## **Managerial Implications**

The results presented above have many managerial implications, particularly as investors are affected by the emotions of greed and fear that damage decision quality. Our results suggest that it is wise to make the decision when these emotions are not present: An investment decision that is taken under stress or while depressed or anxious will neither be rational nor will facilitate the maximization of the investor's wealth. Moreover, investors must control their investment environment as well as their emotions. A depressed investor may be overtaken by the desire to avoid loss, or even the fear of loss, and may hold onto a losing stock too long or sell a winner too early e.g. depressed investor tend to be more indecisive and have more trouble making any decision at all. Depressive thinking is pessimism, as depressed investors are more likely to believe that a situation will turn out badly. A stressed investor may generate predictions based on present circumstances and conditions rather than heeding the past e.g. An investor making investment, has no idea what is about to happen when gets stressed and often make very bad decisions. This is why so few investors were able to see "dot com" stock market crash in 2000 or the housing crash in 2008/2009. Anxious investors will follow others to get quick success e.g. Anxiety has many ways to inject itself resulting in wrong decisions. It tends to disengage the part of brain that is essential for making good decisions and direct behavior towards the safest option. Thus, by controlling their emotions, investors can take rational decisions. Anything that gives us new knowledge gives us an opportunity to be more rational (Simon, Augier, & March, 2004); it is, however, difficult to make an ideal decision due to the limitations of one's capacity to gather information and a limited amount of time in which to process and come to an adequate understanding of information.

According to Ben Graham (father of value investing), the investor's main problem and the worst enemy is likely to be "himself" (as qtd in Montier, 2010, P, 1). A successful investor must have the ability to keep his emotions under control and not uncritically, even if not blindly, follow the judgments of other investors. It is important for an investor to think independently, gather facts, and test these facts and also to evaluate them empirically in order to gain knowledge and experience. An individual can evaluate the evidence and logically test his ideas and can enjoy the opportunity to place his knowledge into broader perspective with the help of unbiased discussions. Consequently, such unbiased discussions will be helpful in strategic decision-making (Garbuio, Lovallo, & Sibony, 2015). Decision-makers do not have complete access to the information about firms (P. Wang, 2017). Therefore, an investor must have the ability to work with incomplete information, to become a rational investor by manifesting the necessary patience while buying or selling stock. Sometimes the market takes a long time to recognize the intrinsic value of a particular stock; if the investor holds on, then he can enjoy the benefits of greater earnings.

While investing, an investor should be neither anxious nor depressed; nor should he drop his standards in the face of the possibility of immediate return or loss, but should think optimistically that market will be favorable for him if not presently but obviously in future. Market pessimism is the friend of investor, but it needs a strong will if it is to help the investor to stand against the tide of opinion. An investor should not change his investment style frequently. In down periods, he should resist the stress to give up and try the latest fashionable market wisdom. An investor is bound to make mistakes, and it is not possible for him to be right all the time. But excellent decision-making requires not only time but also patience. An investor should learn not only from his own mistakes but also from the mistakes of others. A successful investor does not immediately put failure behind him but rather faces up to and learns from it.

### **Limitations of Study and Future Research Direction**

The scope of this study is limited, as it investigates only stock investors. A convenient and judgmental non-probability sampling technique was used in this study. Although this technique is not as strong as the probability sampling, it still served the goal of our study.

Our findings open a new horizon for future researchers to arrange further inquiries to discover more sources of biases. Furthermore, our findings broaden the road toward a future larger-scale study of the individual investor. The list of sources and the biases of investor decisions concluded from this study are not exhaustive due to time constraints and other limited sources, and merely make one humble offering among many other potential explorations. Moreover, the selected context of the inquiry is a single country, i.e., Pakistan; future researchers can apply this model in their respective context or can arrange a comparative study among different countries to provide assessments of the behavioral biases and their respective sources. Well-arranged fact-finding in further research can provide an insight into the financial decision-making, and every individual investor can take guidelines for rational decision-making.

## Conclusion

This study examines that behavioral biases play a mediational role in determining the investment performance. There are some socio-psychological factors which are responsible for these biases. If it is possible to control psychological factors then it is possible for investors to make a rational decision. In short, this is an in-depth study of the underlying mechanisms of behavioral biases by investigating their mediational role in the investment decision-making process.

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