

Exploring the influence of behavioral aspects on stock investment decision-making: a study on Bangladeshi individual investors

Stock
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making

467

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Abstract

Purpose – Determining the impact of behavioral influences on the stock market has significant implications for investment analysis and portfolio management. Behavioral biases are parameters that need to be considered in investment decision-making. The purpose of this study is to inform Bangladeshi investors about behavioral biases that they may encounter when making investment decisions in the prevailing frontier environment.

Design/methodology/approach – Through the chi-square test, one-way ANOVA, paired-samples *t*-test and descriptive analysis based on the facts collected from 281 respondents of the Dhaka Stock Exchange (DSE), the study has found that individual investors of Bangladesh often make investment decisions emotionally rather than based on theories.

Findings – The result shows that risk aversion and risk perception are the two most influential emotional dimensions that impact investors' decisions. The findings are consistent with the other researchers and highlight the fact that investors hardly act according to the norms recommended in the financial theories.

Research limitations/implications – The findings are grounded on a small portion of investors at DSE on some particular days, which is not sufficient to study individual investors' entire complex decision-making behavior from various angles. Many respondents were reluctant and even confused to disclose their behavioral aspects. These, along with biased and careless answers, may impede the identification of the actual scenario of the behavioral responses in decision-making that demand further study.

Originality/value – The novelty of this study is unique in that it examined investors of the DSE, who are considered to be a representative in a frontier market like Bangladesh. Since this market is not very resilient, small investors need to be aware of the biases of behavioral factors to survive.

Keywords Behavioral finance, Loss aversion, Overconfidence, Herding, Dhaka Stock Exchange (DSE)

Paper type Research paper

1. Introduction

Over the past several decades, finance scholars and researchers have conducted several studies and research for establishing different theories to explain the financial markets

JEL Classification — G40, G41, G44

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environment considering investors as rational. One such hypothesis is the efficient market hypothesis (EMH), which claims that capital markets are informationally efficient and that investors may make the best investment decisions assuming information symmetry. By examining a number of share prices in the market, Fama (1991) discovered that the market is efficient when all of the necessary information is held by market participants for investment decision-making. However, Raiffa and Raiffa (1968), Kahneman and Tversky (1979) observed that an individual investor's behavior, in theory, diverges from that in practice. They found traditional financial models are unable to clarify and predict all financial decisions and fail to explain some phenomena that impact an investor's stock-picking choice. Some emotional issues move investors in making investment decisions which is the evidence of irrational market behavior or inefficient markets. Here, the importance of behavioral finance is apparent. Individuals may not always be coherent, according to behavioral finance; instead, they are human beings who discover the irrationality of investors in general, leading them to make irrational investing decisions.

Numerous empirical studies carried over many financial markets to prove that investment choices are not constantly built on the traditional finance theories; they also depend on behavioral financial factors (Baker and Wurgler, 2007; Banerjee, 1992; Caparrelli *et al.*, 2004; Chaudhary, 2013; Fama, 1965; Fogel and Berry, 2006; Jokar and Daneshi, 2018; Olsen, 1998; Shleifer, 2000; Waweru *et al.*, 2008; De Bondt and Thaler, 1985). However, resourceful and effective data and testable estimates are necessary to determine the success and occurrence of behavioral finance (Sent, 2004).

With few developments in the Bangladeshi stock market, the investors' irrational behavior is visible. This irrational behavior will have an enduring, extensive upshot on the whole Bangladeshi financial market. This study's key driver is to understand how the investors' psychological actions can elucidate Bangladeshi capital markets' deficiencies. Though several studies (Bakar and Yi, 2016; Bashar *et al.*, 2017; Caparrelli *et al.*, 2004; Chaudhary, 2013; Mouna and Anis, 2014; Trehan and Sinha, 2018) have been conducted on stock market, this study examines the consequences of four well-known behavioral biases (loss aversion, overconfidence, herding, and risk perception) on investment choices for 281 Bangladeshi individual investors in Dhaka Stock Exchange (DSE).

It is expected that this study will assist the existing and potential investors by providing a way to make investment decisions by combining the fundamental and the technical aspect with the psychological factors to improve their risk-adjusted performance. The study will also assist Bangladesh Securities and Exchange Commission (BSEC), DSE, Chittagong Stock Exchange (CSE) to formulate policy and regulation considering the distortions caused by investors' psychological factors while making investment decisions. The findings will form a foundation for more learning in this area as very little research has been published on frontier markets like Bangladesh. However, the sample is too low compared to the total population. Conducting this study on this sample is supposed to give investors a technique to identify behavioral elements that can be used to hand-pick a healthy stock investment decision-making strategy.

The objectives of this research are to (1) determine if behavioral factors influence individual investors' stock investment decisions at the DSE and (2) determine the relative significance of behavioral factors in influencing individual investors' stock investment decision-making at the DSE. The factor of investment behavior was examined by applying the thought of behavioral finance among the individual investors of the DSE, Bangladesh.

2. Literature review and hypotheses development

2.1 Literature review

Behavioral analysis of investors in the stock market is very central in any developing country because most investors are behaviorally biased. Behavioral influences on human behavior in

stock markets sometimes compel them to make irrational decisions. So, it is essential to address those influences. Many anomalies in the financial market cannot explain market inefficiency and irrationality. Extensive studies and research by behavioral psychologists and finance theorists have been conducted to address this irrationality. Recurrent forms of irrationality, inconsistency and incompetence in people's decision-making are found when faced with uncertainty in these studies. By merging behavioral and cognitive-emotional concepts with conventional economics and finance, behavioral finance aids in describing why financial markets might be inefficient due to this irrationality.

Daniel Kahneman and Amos Tversky are considered the fathers of behavioral finance. They have published a considerable number of papers related to behavioral finance concepts since the 1960s where the foundations of behavioral finance were established with the concept of "Prospect Theory." The prospect theory asserts that people make decisions based not just on utility decision-making processes but also on the probable value of gains and losses. The work of [Tversky and Kahneman \(1974\)](#) revealed that people do not use statistical approaches in their decision-making; instead, they rely on an insufficient number of investigative philosophies. According to them, people, contrary to expected utility theory, place different weights on gains and losses, as well as a different series of probabilities. They found that individual investors are affected much more by potential losses than equivalent gains. Richard Thaler, a renowned finance theorist, emphasizes applying the prospect theory to financial markets.

According to [Shleifer \(2000\)](#), market information has a significant impact on the stock market and, hence, on individual investors' investment behavior. [Waweru et al. \(2008\)](#) showed that, to some extent, investors' investment behavior is affected by the changes in the price of stocks. Stocks that have had a significant price movement for two years in row attract investors who choose to purchase rather than sell ([Odean, 1999](#)).

Motivated by them, researchers nowadays are trying to explore how investors' biases affect the efficiency of capital markets. Studies conducted by [Hilbert \(2012\)](#) and [Chaudhary \(2013\)](#) supported the effect of behavioral factors on investing outcomes such as greed, fear, cognitive dissonance, mental accounting, heuristics and anchoring of investors' thinking. [Hilbert \(2012\)](#) showed how behavioral bias such as herding, overconfidence and reinforcement bias influence individual investors more as compared to their institutional counterparts, whereas [Chaudhary \(2013\)](#) discovered that behavioral finance explains investors' irrational financial decisions and anchoring, overconfidence, herd behavior, over and underreaction, and loss aversions lead to irrational financial decisions. Different financial traits and biases such as loss aversion, hindsight bias, anchoring, endowment effect, disposition effect and mental accounting help individual investors in making sound financial decisions. Furthermore, according to [Caparelli et al. \(2004\)](#), the herding effect impacts stockholders, causing them to move in unison with the rest of the herd if there are changes.

Investors, according to [Barber and Odean \(2000\)](#), sometimes place too much confidence in their previous gains and investment skills, leading them to overestimate their knowledge while underestimating risks. Overconfidence in predicting stock prices along with unnecessary transactions can ultimately lead to poor investment choices ([Barber and Odean, 2000](#)). However, some studies did not find any significant impact of overconfidence bias on the investment decision. This suggests that overconfidence is not common among individual investors around the world.

Loss aversion is not an unusual behavior of investors. A number of studies on loss aversion have been conducted and found that people are more distressed at the view of losses than they are happy by equivalent gains ([Barberis, 2001](#)). The possibility of losing money is, on an average, twice as motivating as the possibility of making the same amount of money ([Barberis, 2001](#)). Loss aversion, according to [Barberis \(2001\)](#), has a crucial impact in

determining how people evaluate risky gambles. To them, loss aversion is the tendency of an individual to be more affected by losses than corresponding gains.

2.2 Theoretical framework and hypotheses development

The influence of behavioral aspects on stock investment decision-making can be related with the cognitive dissonance theory which says that the reactions of humans shoot from the view of themselves as “smart, nice people” and people tend to ignore or reject the information that conflicts with this smartness (Aronson, 1979). The conceptual framework for our analysis can be based on cognitive dissonance as labeled by psychologists rather than rational behavior under Bayesian decision theory. Interestingly we found that most of the investors take their investment decision based on their estimate of the state of the world as influenced by their preferences over their state of belief as suggested in “The Economic Consequences of Cognitive Dissonance” (Akerlof and Dickens, 1982). The theoretical framework is depicted in Figure 1.

Though several kinds of research have been conducted on behavioral finance variables, most of them have been carried out in developed markets (Odean, 1999; Caparrelli et al., 2004; Fogel and Berry, 2006) with relatively little in emerging and frontier economies (Sochi, 2018; Akhter and Ahmed, 2013). Akhter and Ahmed (2013) in their study found different factors such as advice of brokers, friends and family, past performance, news of media, etc. influence investment decision. Sochi (2018) has found the significant presence of representativeness, overconfidence, anchoring, gambler’s fallacy, loss aversion, regret aversion and mental accounting in investment decision. However, the statistical significance of such findings is absent in her study. Given the paucity of behavioral finance research in Bangladesh’s emerging market, this study proposes testing the following hypothesis to evaluate the behavioral influences on investors’ stock investment decisions.

(H0)1. There is no effect of behavioral financial issues on stock investment choice-making at DSE.

To determine which of the factors (loss aversion, overconfidence, herding and risk perception) most contributes to stock investment choice-making, the main hypothesis is subdivided into subsequent sub-hypotheses:

(H0)1–1. There is no effect of loss aversion on stock investment decision-making at DSE.

(H0)1–2. There is no effect of overconfidence on stock investment decision-making at DSE.

(H0)1–3. There is no effect of herding on stock investment decision-making at DSE.

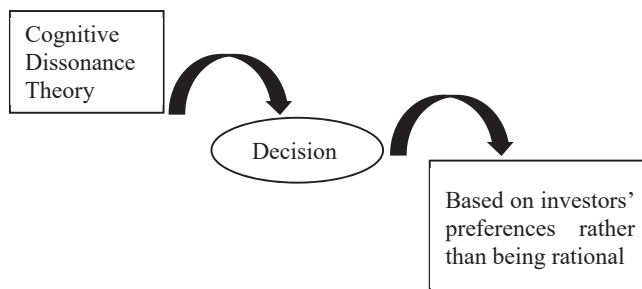


Figure 1.
Theoretical framework

(H0)1–4. There is no effect of risk perception on stock investment decision-making at DSE.

(H0)1–5. There is no significant difference in the effect among the four behavioral traits on stock investment decision-making at DSE.

The proposed conceptual framework based on the hypothesis has been depicted in [Figure 2](#).

3. Data and methodology

3.1 Research method

The main goal of this study is to explore the presence of behavioral characters impacting individual Bangladeshi individual investors while taking any investment conclusion. For building the knowledge, several studies have been reviewed ([Andrade, 2005](#); [Bouwman, 2014](#); [Choi and Skiba, 2015](#); [De Bondt and Thaler, 1985, 1995](#); [Dickinson and Muragu, 1994](#); [Durham, 2002](#); [Fama, 1965, 1991](#); [Grinblatt and Keloharju, 2001](#); [Ritter, 2003](#); [Statman, 1999](#)). Using the deduction approach of exploratory factor analysis (EFA), four psychological traits are found to be more effective in influencing the investment decisions of investors of the DSE. A well-structured closed-end questionnaire was designed and around 320 questionnaires were distributed. Only 281 useable forms were used in the subsequent statistical investigation, resulting in a participation rate of 88%.

The survey used a five-point Likert scale ranging from 1 (strongly disagree) to five (strongly agree) which contains 16 statements under four dimensions after the exclusion, inclusion and rephrasing. [Table 1](#) illustrates the statements for each factor in the questionnaire. To evaluate individual investor’s loss aversion, four items adapted from [Chun and Ming \(2009\)](#) have been used in this study. Four items adapted from [Areiqat et al. \(2019\)](#) are employed to assess the risk perception. Overconfidence is examined using four items in a study by [Ngoc \(2014\)](#). Based on [Tan et al. \(2008\)](#), four items measuring herding are adapted. The survey consists of two segments. The first segment is used to collect information about the demographic context of individual investors. The second segment focuses on psychological factors that influence investors’ decision-making, wherein investors

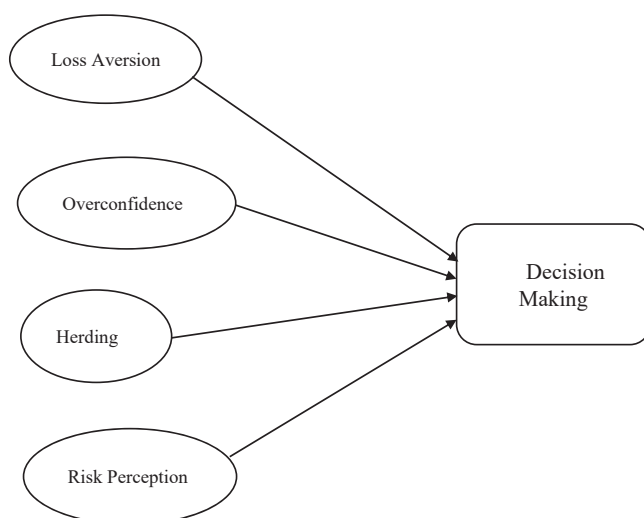


Figure 2.
Conceptual framework

were asked to evaluate each statement based on their perceptions and thoughts. The score of the answers to the questionnaire has been used to capture the investment decisions. The mean values of these choices are used to examine the influences of the behavioral dimension of the investment decision according to the measurement scale mentioned in [Table 2](#).

To test the internal reliability of multi-element scales, Cronbach's alpha is used. Descriptive statistics, chi-square test, one-way ANOVA are used to test the four null sub-hypotheses ((H0)1-1, (H0)1-2, (H0)1-3, (H0)1-4) under the main null hypothesis ((H0)1) for assessing the impact and the relative importance of behavioral traits on investment decision-making. In addition to these, paired-samples *t*-test has been conducted to test the fifth sub-hypothesis ((H0)1-5) for testing the significance of statistical differences among the behavioral factors. Different tables and graphs are used to precisely calculate data percentages and frequencies.

Variables	Author(s)
<i>Loss aversion</i> A large loss in my investment is more important to me than missing a substantial gain (profits) Large price drops in my invested stocks make me nervous I will avoid increasing my investment when the market performs poorly I will not sell shares that have observed a decline in value whereas sell shares that have a rise in value	Chun and Ming (2009)
<i>Risk perception</i> I generally do not have a fear of capitalizing on stocks with a certain gain I am careful about stocks that show unexpected fluctuations in price or transaction I generally have concerns about investing in stocks with a historical adverse performance in trading I don't consider the idea of trading in the stock market attractive	Areiqat et al. (2019)
<i>Overconfidence</i> I sense more assurance in my own investment views over others I don't look up to others in case of making investment decisions I am certain of my expertise and experience in outpacing the stock market I am successful in an environment where others fail	Ngoc (2014)
<i>Herding</i> My investment choices are affected by the choices of choosing stocks of other investors My investment choices are affected by the choices of the stock volume of other investors My investment decisions are affected by the decisions of buying and selling stocks of other investors I generally respond fast to the fluctuations of other investors' choices and track their responses to the stock market	Tan et al. (2008)

Table 1.
Statements for each factor in the questionnaire

Mean values	Impacts
<2.00	Very low
2.00–2.80	Low
2.81–3.60	Moderate
3.61–4.40	High
>4.41	Very high

Table 2.
Measurement scale

Source(s): Authors' assumption

3.2 Reliability test

Cronbach's alpha is typically used in societal and behavioral studies to gauge consistency (Liu *et al.*, 2010). Hence, Cronbach's alpha is used in this study to test the reliability of items included as the factors where the questionnaire consists of five-point Likert measurements. Nunnally (1978) asserted that measurements with at least Cronbach's alpha 0.7 are reliable. However, according to others, to be acceptable, Cronbach's alpha should be over 0.6, and the corrected item-total correlations should be 0.3 or higher (Shelby, 2011). The survey yielded a Cronbach's alpha of 0.732, indicating that the scale has a good level of internal reliability. Cronbach's alpha of all factors is more than 0.7, where the corrected item-total correlation of all items is greater than 0.30. Besides, Cronbach's alpha of each factor, if deleted, is less than the factor's Cronbach's alpha.

3.3 Demographic background

Due to various demographic factors such as age, education level, gender, race, social and economic context, every individual is different. The condition is the same with the individual investors while making any investment decision. They are usually affected by their emotional biases, which may vary according to their demographic traits. Table 3 shows the demographic background of the respondents of this study.

Considering gender biases, we have collected and analyzed information on gender. The figure shows that the number of female investors is very low compared to that of male investors in the sample, which further supports the study by Barber and Odean (2001) in the US. Men are more active in investment and have overconfidence in terms of excessive trading and higher-risk trading than women. Only 4.6% of the participants were female, indicating that women are not very interested in participating in share business. However, data obtained to a limited extent cannot accurately represent the genuine situation. Also, there is a possibility that women may be share trading online.

The study discovered that 54.4% of the total sample are investors less than 40 years, while 25.3% of the respondents are in the age group of 40–50, and only 20.3% of sample investors are more than 50 years. It is exposed from the study that most of the individual investors at the DSE are young, and this research may vastly replicate the investment behaviors of these young individual investors.

Area	Grouping	Occurrence	Percentage
Gender	Male	268	95.4
	Female	13	4.6
Age	Less than 40 years	153	54.4
	40–50 years	71	25.3
	Above 50 years	57	20.3
Academic qualification	SSC or equivalent	17	6.0
	HSC or equivalent	37	13.2
	Diploma or equivalent	24	8.5
	Honors or equivalent	56	19.9
	Masters or equivalent	136	48.4
Stock investment training	Others	11	3.9
	Yes	80	28.5
Experience in the stock market	No	201	71.5
	Less than 1 year	15	5.3
	1–3 years	47	16.7
	3–5 years	76	27.0
	5–10 years	62	22.1
	Over 10 years	81	28.8

Table 3.
Demographic data

According to the data, 48.4% of the investors were post-graduates, indicating that the majority of DSE investors are well-educated. Of the total, 19.9% of those surveyed were graduates, with 6% having completed primary school, 13.2% have completed secondary school, 8.5% having completed a diploma and 3.9% having completed other courses.

The survey further found that the majority of investors (71.5%) of the sample did not attend any specialized training for stock trading. Only 28.5% of those surveyed have taken a course in this field. As a result, the majority of investors may be influenced by their behavior.

According to the survey, 71.2% of the sample has less than 10 years of experience, implying that most individual investors have just recently begun to pay attention to the stock market. This higher percentage of individual investors with low experience in the surveyed sample makes investors behaviorally biased. Only 28.5% of investors have spent more than ten years in the stock market.

4. Results of hypothesis testing

4.1 Descriptive statistics

Prospect theory is also known as the loss-aversion theory. The prospect theory says that investors value gains and losses differently, placing more weight on perceived gains versus perceived losses. The prospect theory is a behavioral model that shows how people decide between alternatives that involve risk and uncertainty (e.g. % likelihood of gains or losses). It demonstrates that people think in terms of expected utility relative to a reference point (e.g. current wealth) rather than absolute outcomes (Hirshleifer, 2001). Investors' loss aversion tendency can result in excess fluctuation in stock prices (Barberis, 2001). Moreover, this loss aversion psychology of investors is sometimes responsible for creating momentum effects on stock market trading (Grinblatt and Bing, 2005). In our study, we also tried to determine whether there is any contribution of loss aversion trait on Bangladeshi investors' investment decision-making. Table 4 shows the result of loss aversion which establishes that to some level, after a gain, investors at DSE turn out to be more risk lovers, whereas, after a loss, they lean towards more risk-averse. This behavior is not surprising as any failure on the investment surely slows down the investors a lot though gain motivates them so much.

Furthermore, the concept of risk perception can be used to explain investor behavior in the securities market. Researchers have used several indicators in their studies to measure the individual investors' risk perception while trading at a stock exchange. Four questions were used in our research to describe individual investors' risk perception, which was found to be negative at the DSE (Table 5).

SL.	Loss aversion	Mean	SD	Meaning
1	A large loss in my investment is more important to me than missing a substantial gain (profits)	4.36	0.97	High impact
2	Large price drops in my invested stocks make me nervous	4.40	0.86	High impact
3	I will avoid increasing my investment when the market performs poorly	4.32	0.84	High impact
4	I will not sell shares that have observed a decline in value whereas sell shares that have a rise in value	4.17	0.94	High impact
	Average	4.31	0.91	High impact

Table 4.
Loss aversion

Considering the principle of finance, “higher the risk–higher the return,” loss aversion and negative risk perception are not good investment strategies. Loss aversion can lead to poor decisions, which can have a negative influence on an investor’s wealth (Odean, 1999).

Overconfidence bias is the tendency for a person to overestimate their abilities. Overconfidence bias can be defined as an unwarranted and often illogical faith that an investor has in their ability to predict the market. Some investors believe that they are somehow gifted and have special intuition and reasoning skills that help them predict the outcome of the market. This could be because they believe that they have some special skills. Alternatively, they might also falsely think that they have access to superior information, which is why their decisions will always be better. In simpler words, overconfidence bias is a belief amongst investors that they are smarter than everyone else (Nevins, 2004). According to Odean (1999), overconfidence bias often leads people to overestimate their understanding of financial markets or specific investments and disregard data and expert advice. This often results in ill-advised attempts to time the market or build concentrations in risky investments they may consider a sure thing.

Four questions were posed to investors in this study to assess their overconfidence bias. The result is shown in Table 6. The table shows that individual stockholders at DSE have a moderate level of confidence. The reason behind this moderate level of confidence might be the status of the security market. Bangladeshi security market is a frontier market with many fluctuations in its security prices irrespective of the acts of the listed stock issuing firms. Therefore, investors are unable to predict market trends and, hence, have less confidence in their decisions.

People generally trust their friends, colleagues, family members and relatives, and they take opinions from them while making a decision. This reflects the herding behavior of human beings. In stock markets, this herding behavior is apparent as individual investors usually follow a mass without understanding the company fundamentals. Sometimes, they

SL.	Risk perception	Mean	S.D.	Meaning
1	I generally do not have a fear of capitalizing on stocks with a certain gain	4.20	0.82	High impact
2	I am careful about stocks that show unexpected fluctuations in price or transaction	4.20	0.86	High impact
3	I generally have concerns about investing in stocks with a historical adverse performance in trading	4.05	0.88	High impact
4	I do not consider the idea of trading in the stock market attractive	4.10	0.74	High impact
Average		4.14	0.828	High impact

Table 5.
Risk perception

SL.	Overconfidence	Mean	S.D.	Meaning
1	I sense more assurance in my own investment views over others	3.70	1.37	High impact
2	I do not look up to others in case of making investment decisions	3.35	1.22	Moderate impact
3	I am certain of my expertise and experience in outpacing the stock market	3.55	1.23	Moderate impact
4	I am successful in an environment where others fail	3.34	1.20	Moderate impact
Average		3.48	1.265	Moderate impact

Table 6.
Overconfidence

might follow the recommendations provided by famous security analysts. Several studies have found that investors trading in the stock market have a herding behavior (Hilbert, 2012). However, in our analysis, we have found a low level of herding behavior among the individual investors at DSE, which is evident in Table 7. This low effect of herding variables can be clarified by the fact the DSE has been operating for many years while being significantly impacted by share market gambling. Thus, individual investors at the DSE might have grown a tendency to depend on their skills and knowledge of the stock market and anticipation of market returns. Investors with more experience, maturity and expertise may now make proper use of different information from diverse sources when making investing decisions. Hence, from the survey, we found a low effect of herding behavior.

4.2 Chi-square test

The Pearson chi-square test was used to see if there was a relationship between investor behavioral traits and stock investment decisions at the DSE. The results of the Pearson chi-square test have shown at 5% significance level, $p < 0.05$, which indicates that there is a significant relationship between the four behavioral traits of investors and the stock investment decision-making at DSE (Tables 8–11). So, the four null sub-hypotheses ((H0)1-1, (H0)1-2, (H0)1-3, (H0)1-4) under the main null hypothesis ((H0)1) are rejected. Tables 12 and 13 show that the main hypothesis is rejected at 5% significance level where $p < 0.05$.

4.3 ANOVA test

A one-way ANOVA was conducted to test whether the stock investment decision that individual investors at DSE make is significantly impacted by their behavioral traits like loss aversion (LA), overconfidence (OC), herding (HR) and risk perception (RP). Table 14 shows the results which indicate that behavioral traits of investors have a statistically significant impact on the investment decision-making at DSE at the $p < 0.05$ level for the three conditions

Table 7.
Herding

SL	Herding	Mean	S.D.	Meaning
1	My investment choices are affected by the choices of choosing stocks of other investors	2.82	1.32	Moderate impact
2	My investment choices are affected by the choices of the stock volume of other investors	2.74	1.26	Low impact
3	My investment decisions are affected by the decisions of buying and selling stocks of other investors	2.080	1.27	Low impact
4	I generally respond fast to the fluctuations of other investors' choices and track their responses to the stock market	2.77	1.31	Low impact
	Average	2.78	1.289	Low impact

Table 8.
Chi-square test of loss aversion

	Value	df	Asymptotic significance (2-sided)
Pearson chi-square	4496.000 ^a	16	0.000
Likelihood ratio	2442.195	16	0.000
Linear-by-linear association	1056.541	1	0.000
N of valid cases	1124		

Note(s): ^a9 cells (36.0%) have expected count less than five. The minimum expected count is 0.23
Source(s): Calculation by authors based on survey

[$F(3, 4,492) = 456.042, p = 0.000$]. So, again four null sub-hypotheses ((H0)1-1, (H0)1-2, (H0)1-3, (H0)1-4) under the main null hypothesis ((H0)1) are rejected.

4.4 Paired-samples *t*-test

A paired-samples *t*-test was conducted to test the significance of the mean differences among the four behavioral factors on stock investment decision-making at DSE. Table 15 shows the results of paired-samples *t*-test which indicate that there is significant difference among the four behavioral traits on stock investment decision-making at DSE at the $p < 0.05$ level for all six pairs. So, it is clear from the test that the fifth sub-hypothesis ((H0)1-5) is rejected.

	Value	df	Asymptotic significance (2-sided)
Pearson chi-square	4496.000 ^a	16	0.000
Likelihood ratio	3341.978	16	0.000
Linear-by-linear association	392.090	1	0.000
<i>N</i> of valid cases	1124		

Note(s): ^a0 cells (0.0%) have expected count less than five. The minimum expected count is 9.08

Source(s): Calculation by authors based on survey

Table 9.
Chi-square test of overconfidence

	Value	df	Asymptotic significance (2-sided)
Pearson chi-square	4496.000 ^a	16	0.000
Likelihood ratio	3419.563	16	0.000
Linear-by-linear association	125.672	1	0.000
<i>N</i> of valid cases	1124		

Note(s): ^a0 cells (0.0%) have expected count less than five. The minimum expected count is 13.24

Source(s): Calculation by authors based on survey

Table 10.
Chi-square test of herding

	Value	df	Asymptotic significance (2-sided)
Pearson chi-square	4496.000 ^a	16	0.000
Likelihood ratio	2571.372	16	0.000
Linear-by-linear association	353.034	1	0.000
<i>N</i> of valid cases	1124		

Note(s): ^a10 cells (40.0%) have expected count less than five. The minimum expected count is 0.04

Source(s): Calculation by authors based on survey

Table 11.
Chi-square test of risk perception

	Value	DF	Asymp. Sig. (2-Sided)
Pearson chi-square	1.172E3 ^a	12	0.000
Likelihood ratio	1.214E3	12	0.000
Linear-by-linear association	54.956	1	0.000
<i>N</i> of valid cases	4,496		

Source(s): Calculation by authors based on survey

Table 12.
Chi-square test

Table 16 summarizes the descriptive statistics about behavioral factors. The table shows that investor behavioral traits have a significant impact on investment decision-making where both loss aversion and risk perception have a high impact on investment decision-making with overconfidence having a moderate impact and herding having a low impact on investment decision-making.

478

5. Discussion

The objective of this study was to see if behavioral factors influence individual DSE investors' stock investment decisions, as well as to determine the relative importance of behavioral factors in influencing individual investors' stock investment decisions. The factors that influence investment behavior were investigated using behavioral finance theory among 281 individual investors on the DSE in Bangladesh.

Table 13.
Symmetric measures

		Value	Approx. Sig
Nominal by nominal	Phi	0.511	0.000
	Cramer's V	0.295	0.000
	Contingency coefficient	0.455	0.000
	N of valid cases	4,496	

Source(s): Calculation by authors based on survey

Table 14.
ANOVA test decision-making

	Sum of squares	DF	Mean square	F	Sig
Between groups	1631.794	3	543.931	456.042	0.000
Within groups	5357.714	4,492	1.193		
Total	6989.508	4,495			

Source(s): Calculation by authors based on survey

Table 15.
Summary of paired-samples t-test

		95% confidence interval of the difference		t	DF	Sig. (2-Tailed)
		Lower	Upper			
Pair 1	LA - OC	0.56624	1.08876	10.080	3	0.002
Pair 2	LA - HR	1.36060	1.69940	28.744	3	0.000
Pair 3	LA - RP	0.04219	0.30781	4.193	3	0.025
Pair 4	OC - HR	0.47770	0.92730	9.945	3	0.002
Pair 5	OC - RP	-0.93874	-0.36626	-7.255	3	0.005
Pair 6	HR - RP	-1.49523	-1.21477	-30.750	3	0.000

Table 16.
Summary of factors impacting decision-making

Factors	Mean	Standard deviation	Meaning	Ranking
Loss aversion	4.31	0.907	High impact	1
Overconfidence	3.48	1.265	Moderate impact	2
Herding	2.78	1.289	Low impact	3
Risk perception	4.14	0.828	High impact	1
Average	3.68	1.247	High impact	

By applying the chi-square test, one-way ANOVA and descriptive analysis, loss aversion, overconfidence, herding and risk perception are identified as psychological biases that influence investors to make irrational decisions. With scores of 4.31 and 4.14, loss aversion and risk perception are found to have the highest impact on individual investor decision-making. The other two biases (overconfidence and herding) have a smaller impact. With the result of paired-samples *t*-test, it was found that there is significant difference among the four behavioral traits on stock investment decision-making at DSE.

From the above analysis, it can be concluded that Bangladeshi security investors' investment decisions at the DSE are not always rational as traditional finance theory, rather affected by their behavioral biases, resulting in irrational decisions. Therefore, it could be asserted that most investors are risk-averse and prefer to invest in well-known companies that generate consistent profits. The findings are consistent with other researchers and highlight the fact that investors hardly act according to the norms recommended in the financial theories. Gächter *et al.* (2010) focused on behavioral finance to better understand how human, social, cognitive and emotional biases affect investment decisions and market prices.

The study has found that:

- (1) Individual investors of Bangladesh often make investment decisions emotionally.
- (2) Risk aversion and risk perception are the two most influential emotional dimensions that impact investors' investment decisions.

6. Conclusion and limitations

Behavioral finance helps to study the psychological variables that can affect financial decision-making. Gächter *et al.* (2010) focused on behavioral finance to better understand how human, social, cognitive and emotional biases affect investment decisions and market prices. So, before making any investment decision to maximize wealth, it is always a good idea to understand the features of securities markets using a combination of psychology and finance. The evidence of behavioral persuasions suggests that individual investors need to control their behavioral emotions in making investment decisions. Identifying the relative importance of biases in influencing a decision may help them gain a better understanding of behavioral psychology, which will help investors develop a better investment strategy. This study will be closer to reality in terms of behavioral finance theory, and it is expected to provide additional important perceptions in terms of selecting investment strategy and psychological factors to explain market irregularities.

The findings are grounded on a small portion of investors at DSE on some particular days, which is not sufficient to study individual investors' entire complex decision-making behavior from various angles. Many respondents were reluctant and even confused to disclose their behavioral aspects. These, along with biased and careless answers, may impede the identification of the actual scenario of the behavioral responses in decision-making that demand further study.

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Appendix
Questionnaire for survey

Section A: General information: (Please tick the correct answer)

- (1) Gender: Male Female
- (2) Age: Less than 40 years 40–50 years Above 50 years
- (3) What level of education have you completed?

SSC or equivalent HSC or equivalent Diploma or equivalent Honors or equivalent
Masters or equivalent Others

- (4) Have you attended any course of stock exchange? Yes No
- (5) How long have you been participating in the stock market?

Less than 1 year 1–3 years 3–5 years 5–10 years Over 10 years

Section B: Behavioral factors influencing investment decisions

Please evaluate the degree of your agreement with the impacts of behavioral factors on your investment decision-making:

	Strongly agree(5)	Agree	Neutral	Disagree	Strongly disagree
<i>Loss aversion</i>					
1	A large loss in my investment is more important to me than missing a substantial gain (profits)				
2	Large price drops in my invested stocks make me nervous				
3	I will avoid increasing my investment when the market performs poorly				

(continued)

		Strongly agree(5)	Agree	Neutral	Disagree	Strongly disagree
4	I will not sell shares that have observed a decline in value whereas sell shares that have a rise in value					
<i>Risk perception</i>						
5	I generally do not have a fear of capitalizing on stocks with a certain gain					
6	I am careful about stocks that show unexpected fluctuations in price or transaction					
7	I generally have concerns about investing in stocks with a historical adverse performance in trading					
8	I do not consider the idea of trading in the stock market attractive					
<i>Overconfidence</i>						
9	I sense more assurance in my own investment views over others					
10	I don't look up to others in case of making investment decisions					
11	I am certain of my expertise and experience in outpacing the stock market					
12	I am successful in an environment where others fail					
<i>Herding</i>						
13	My investment choices are affected by the choices of choosing stocks of other investors					
14	My investment choices are affected by the choices of the stock volume of other investors					
15	My investment decisions are affected by the decisions of buying and selling stocks of other investors					
16	I generally respond fast to the fluctuations of other investors' choices and track their responses to the stock market					

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