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Original Research

Exploring the Sense of Overconfidence Bias on Investment Decisions: Insight from The Retail Investors of Bangladesh

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Abstract

Investment decisions are influenced by several rational and irrational factors. The most common irrational phenomena are behavioral biases, such as overconfidence or herding bias. This paper intends to examine the impact of overconfidence bias on investment decisions from the perspective of Bangladeshi retail investors. The current study is based on primary data collected from general investors through a survey of a self-developed questionnaire. For surveying the questionnaire, investors were selected following the convenience sampling technique. Collected data were analyzed using Correlation, OLS Regression, One-way ANOVA, and One sample t-test in SPPSS software. The study found that the investment decision is significantly influenced by the overconfidence bias. They think they can outperform the market and rely on their capability to analyze an investment opportunity. Such behavior could be very harmful to themselves as well as the market stability. The study also found that male investors tend to be more overconfident in their investment decisions than females. The empirical model concludes that there exists significant overconfidence bias among retail investors. This research could be helpful for stakeholders of the capital market to understand the tendency of Bangladeshi investors towards overconfidence bias.

Keywords: Behavioral Bias, Investment Decision; Investor; Outperform; Overconfidence.

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Introduction

The traditional finance theory focuses only on how the investors should behave and how to make rational decisions. These theories assume that investors or individuals are "Rational Economic Men". But in reality, the individuals or investors don't behave like they should have. Behavioral finance tries to understand why people make irrational decisions and which types of biases are causing this (Grežo, 2021). Many researchers have found that overconfidence bias is one of the most important common biases that can be observed among investors(Costa et al., 2017). There is a lot of research which are conducted in Bangladesh in the field of behavioral fiancé but none of them were done to analyze the effect of overconfidence bias of Bangladeshi investors(Yasmin & Ferdaous, 2023). In this paper, the researcher will try to analyze the effect of overconfidence bias on investment decisions of investors in Bangladesh.

The thought process of investors is essential in determining the market outcome, especially in the stock market (Baker & Wurgler, 2007). Market vulnerability is so frequent that sometimes it is taken for granted as caused by the behavioral cognitive (Detert & Edmondson, 2011). It is perceived that only investor psychology is being considered under behavioral finances but the domain considers the bias of financial analysts too. It is the combination of investors, analysts, traders, and brokers who act directly in the purchase and sale of a stock (Shefrin, 2002). There are several important biases possessed by the investor that influence their buying-selling decision. Overconfidence, an illusion of control, self-attribution, hindsight bias, confirmation, and representative bias are the main areas where investors get trapped in their minds in decision-making (Shah et al., 2018). Among them, overconfidence bias is most simple to understand but irresistible for the investor (Kahneman & Riepe, 1998).

Overconfidence bias is a tendency to perceive a false and misleading assumption about an individual skill set, intellect, and analytical ability (Merkle & Weber, 2011). In behavioral finance, it can be termed as the high belief about their stock analysis and investment decision. They have egoistic confidence in their market understanding as well as their prediction ability about the stock price movement. It is very common for analysts, fund managers, and portfolio managers to pretend that they are better than others in terms of managing investment. To understand the market, it is essential to know the behavior of the market. A market is nothing but a combined output of individual investor behavior (Grinblatt & Keloharju, 2000). So, a rigorous study of the behavior patterns of investors can make it easier to understand a market more effectively. The degree and diversification of the overconfidence bias of each investor is needed to understand to evaluate a market more efficiently. The reason why overconfidence bias needs attention and development.

The primary objective of this paper is to evaluate how investment decisions, such as purchasing stock, holding the investments, or selling the stocks are affected by the overconfidence bias of Bangladeshi investors. The study also intends to measure the extent of the investors' confidence level and find the reasons behind making their irrational decisions.

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Moreover, the paper is designed to understand the irrationality of investor's decisions regarding portfolio construction. There are many reasons and biases which influence the rational behavior of investors. The study aims to find the degree and direction of biases caused only by the overconfidence of individual investors.

Literature Review

Behavioral finance began based on prospect theory which was developed by Daniel Kahneman and Amos Tversky where both scholars proved that people generally make decisions as opposed to simply relying on the utility decision-making strategies (Lawa, 2017). In the field of the financial market, the application of behavioral finance should ensure the explanation of inefficiencies and mispricing of assets (Qashim et al., 2019). According to Antti Seppälä (2009), overconfidence bias is one of the most important psychological characteristics of investors which are observed among them and he categorized the appearance into three basic forms which are 'better than average', 'optimism biases, and 'setting narrow confidence limits. Different types of studies examined overconfidence and these prove that people are suffering from overconfidence during decision-making (Haliassos, 2015). Overconfidence can lead to serious financial problems and increase the risk of financial wellbeing (Seppälä, 2009). According to Lewellen et al (1977), overconfident investors trade a lot and believe that their capabilities to predict the returns are highly accurate which will lead them to earn more than anyone else in the market. They will get higher returns than the less confident investors (Lewellen, 1977). Another researcher Odean (1998) found that the investors suffering from overconfidence overestimate the value of their private information and they ignore the information that is gathered by others, causing them to trade actively. However, it is not true that only active trading will lead to better performance. Indeed, according to Barber and Odean (2000), household trading frequently has earned much lower net annualized returns than traders who trade infrequently. So, the overconfidence bias can be disastrous to the individual's wealth.

Hoffman has shown in his research that overconfident investors tend to show few characteristics in general like thinking of themselves as superior to others, capable of predicting the market movement, and able to earn higher returns than others (Hoffmann, 2014). On the other hand, Lawa stated that overconfident investors tend to underestimate the downside risks of their chosen investments. However, these characteristics can be compiled to get a clearer view of overconfident investors. Some major characteristics of overconfident investors are-

- Prediction of market movement: Hoffman found that overconfident investors think they can predict the market movement more appropriately than others (Hoffmann, 2014). They think their analytical power and capability are much higher than other people. They think they are superiors.

- Underestimating the market and downside risk: Lawa found in his paper that overconfident investors tend to underestimate the market risks and stock risks. They don't consider all the available information and when they have made up their mind regarding an investment opportunity, they underestimate other risk factors.

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- Earning higher return: According to Daniel and Hirshleifer, (2015) Overconfident people think of themselves as better than others and they can earn more return than others. They act more confidently based on their analysis and they are very confident to earn higher returns in any situation.

- Outperforming the market: Oehler has stated that, overconfident investors think that can outperform the market because they have the superior capability to analyze the market and other things (Oehler, 2000). They tend to have more confidence in choosing stocks, and investment opportunities and make investment decisions.

In reality, investors don't behave rationally because their actions, thinking, and strategies are affected by different types of biases. Behavioral finance mixes psychological theories with finance theories to analyze the actions of investors. Professor (Brad Barber, 2001) studied 35000 households who are holding accounts in large brokerage firms and their study showed the relationship between the overconfidence of both men and women and the effect of overconfidence on portfolio performance. They have found that overconfident investors overestimate the precision of their information (Brad Barber, 2001). Besides that, Brad Barber found that overconfident people may even trade when the true expected gains are negative. At the end of their studies, Barber and Odean concluded overconfidence is a factor that is hazardous to the wealth of investors. According to these researches, overconfident investors have a few characteristics identified which are the ability to predict the future, higher confidence of their own to earn more than any other investors in the market, the ability to outperform the market, and underestimating the downside risks. The behavioral analysis of the investors of Bangladesh has not been yet done by many researchers. In Bangladesh, plenty of retail investors are investing in the stock market. Though they hold a smaller portion of the volume of stock than institutional investors, they still are an important part of the financial market. The psychology of the investors in Bangladesh is quite different from that of other countries and most of the retail investors here are less rational than other countries (Khan et al., 2015). So, it is important to apply behavioral financial theories here to analyze the impact of it on investment decisions. In this paper, only the impact of overconfidence bias will be evaluated and it is the most common psychology which has been found among the investors by Barber and Odean in their research. But other biases like representative bias, cognitive dissonance bias, availability bias, self-attribution bias, the illusion of control bias, etc. also need to be focused too.

There are several research analyses conducted to analyze the effect of overconfidence bias and how they are changing the thinking patterns of human beings. However, how it will specifically influence the investment decision is not analyzed in those research papers. The impact of overconfidence bias on investors is very general in Bangladesh as most investors are financially illiterate and do not have enough understanding of market parameters (Sochi, 2018). They act based on rumors, emotion, suggestion, and their self-estimation (Gupta & Banik, 2013). Generally, the retail investors of Bangladesh are more emotional and unrealistic than any other investors of developed countries and this was shown in many events. Their actions were ridiculed in past years when the stock market crashed (Van Agtmael, 2007). So, how behavioral finance is working, needs to be measured. In this paper, the impact of overconfidence bias will be evaluated which will

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help us to understand how it is affecting their investment decisions. This could help the investors themselves, market analysts, financial advisors, and other parties.

Material and Methods

In this research, the null hypothesis is that overconfidence bias has no impact on investment decisions. On the other hand, there are a few alternative hypotheses which are:

H_0: The overconfidence bias has no impact on the investment decisions of retail investors in Bangladesh

H_1: Future prediction capabilities of overconfident investors influence investment decisions.

H_2: Higher confidence level of earning more return on average than the market of overconfident investors influences investment decisions.

H_3: Ability to outperform the market of overconfident investors influences investment decisions.

H_4: Underestimating the downside risks of overconfident investors influences investment decisions.

This paper will use the primary data collected by surveys using a questionnaire. Here the null hypothesis is that the overconfidence bias has no impact on the investment decisions of retail investors in Bangladesh. To test the hypothesis, one sample t-test will be used here. A regression model will also established to present how much the independent variables will have explained the dependent variables. A correlation matrix will be also presented to show the linearity between different variables used in this paper (Zou et al., 2003). In this paper, the dependent variable is the investment decisions of investors and the independent variable is overconfidence bias. To test the overconfidence bias, here different types of questions will be prepared, and based on the answers of respondents the effects of overconfidence on investment decisions will be evaluated. The conceptual framework is given below:

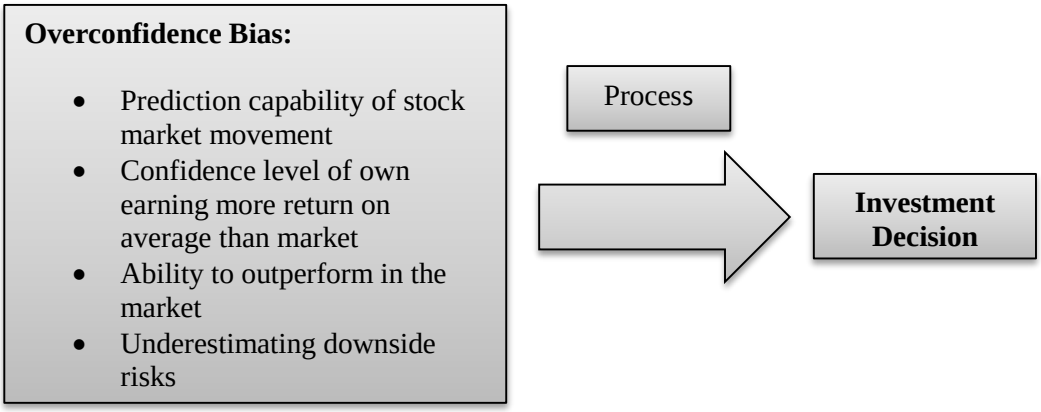

Figure 1: Research Model

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Here, the overconfidence bias is considered the independent variable that affects investment decisions. Several researchers have found that overconfidence bias has a significant impact on investment decisions and it increases the number of trading of investors in the market who are overconfident (Bodied, Kane, and Marcus, 2014). They are thinking that they are making the right decisions and they can predict the market movement. So, they believe that they earn more returns than any other investors in the market. But probably they are not right; their returns may be higher because of excessive trades or simply just luck (Czaja and Röder, 2020). When an investor is overconfident, he may make three types of decisions regarding a stock or portfolio. He may sell it, buy more, or hold it for the future to increase the price (Dittrich et al., 2005). Overconfidence bias can be harmful to investors because it can make them underestimate the downside risks associated with their investments (Pikulina et al., 2017).

The data have been collected from the investors of Bangladesh who are holding portfolios in DSE or CSE with a brokerage firm. They were selected by convenience sample technique and a questionnaire was provided to them to answer the questions. The different professional was also tested in this research to know how their investment decisions could be affected by overconfidence. Based on their answers the analysis was done. Here the Ordinary Least Square (OLS) Regression was used to measure how the independent variables were expressing the dependent variable. One sample t-test was also used in this paper to test the hypothesis.

The data collection method has great importance in any research where primary data is used. Due to the nature of the research, this paper will use the primary data collected from respondents. Here primary data will be collected by questionnaire. To ensure the data quality and prevent biases, the researcher explained the necessity of this research analysis to the respondents properly.

The researcher has made a questionnaire where some questions were asked to get the responses of respondents. Besides the research-related questions, a few demographic questions were also asked. The questionnaire was sent to the respondents through e-mail and hard copy. The respondents were requested to complete the questionnaire and submit it to the researcher. Here the researcher used Google Forms to collect and store their responses.

The sampling method is very important for data analysis. In this paper, the t-test was used which takes the sample for the population in a convenient way. The data collection was produced using a convenient sampling method. The convenient sampling technique is used as investors are difficult to reach and communicate. Moreover, it is also required that investors have minimum financial knowledge and understanding about biases. However, it is ensured by the researcher that the data is collected from a well-diversified sampling group who are of different ages, professions, genders, income levels, and educational backgrounds. As a result, it is assumed that the samples are well representative of the population.

The data which are collected from the primary sources are analyzed by using different types of statistical tools here. To test the hypothesis t-test was used in this research paper. The data was collected by using a Likert chart and the values were distributed from 1 to

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5. Then the responses were analyzed through statistical tools. In this research paper, SPSS and MS Excel were used for the analysis purpose. The one-sample t-test, Pearson correlation, and OLS regression were run by the SPSS, and the descriptive statistics were produced.

Analysis

The data was collected from the primary sources by using the Likert scale. Then the responses were coded into numerical data. Here, the responses were collected from 45 respondents.

Descriptive statistics

Descriptive statistics presents the mean, median, mode, range, standard deviation, and other statistical results of different variables. It shows the overall picture of all the variables and responses which are collected from the respondents. In this part, the descriptive statistics of all the independent variables and dependent variables are given below:

Table 1. Descriptive Analysis

Particular	Gender	Prediction of market	Earning Higher return	Underestimating downside risk	Ability to outperform the market	Investment decision
Mean	1.5778	3.3556	3.1333	2.8666	3.3777	2.2888
Standard Error	0.0744	0.1716	0.1758	0.1639	0.1566	0.1173
Median	2	3	3	3	3	2
Mode	2	4	4	3	3	3
Standard Deviation	0.4994	1.1511	1.1793	1.0995	1.0507	0.78688
Sample Variance	0.2494	1.3252	1.3909	1.2091	1.104	0.6191
Kurtosis	-1.9841	-0.8957	-0.8923	-0.6123	-0.6901	-1.1395
Skewness	-0.3259	-0.1905	0.07849	0.06059	0.03114	-0.5709
Range	1	4	4	4	4	2
Minimum	1	1	1	1	1	1
Maximum	2	5	5	5	5	3
Sum	71	151	141	129	152	103
Count	45	45	45	45	45	45

In this survey, both male and female respondents were given the questionnaire. A total of 60 questionnaires were distributed and 45 respondents filled up the form properly. A few questionnaires were not fulfilled properly. The data of the independent variable was coded based on a Likert chart. There were three options in the dependent variable which are coded from 1 to 3.

Most of the respondents were male which can be found from the mode, median, and mean. According to data coding, 1 is for females and 2 is for males. The responses of independent variables were collected by using a Likert chart which is coded 1 to 5. The prediction capability of the market is an independent variable of this paper. Here, the

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mean is 3.35 which represents that the average responses were more than 3. Most of them think they have good prediction capability of market movement. The mode is 4 which shows the highest number of responses were 4 which agrees with the given statement.

In the case of "earning more return than the average market return", the mean, median, and mode also indicate the same thing. Most of the responses agreed with the statements but the mean value is less than the previous. That means there is more variation of answers than in previous questions. The standard deviation is also higher here.

In "underestimating the downside risks", the responses of respondents are slightly different from the previous two. Because the mean and mode both are decreased here. Most of the responses were 3 which means most of them are neutral to that statement and they take the downside risks into their consideration sometimes.

The "ability to outperform the market" is one of the important characteristics of overconfident investors which were found by Barber and Oden in their research. It has the highest mean value among all four independent variables which is 3.37. The mode and medium are also here 3 but the standard deviation is 1.05 which is relatively lower than other variables. Though numerous responses were neutral, a lot of responses also came from other sections like agreeing or strongly agreeing with the statement.

The dependent variable is the responses of investors on how frequently overestimation is influencing their investment decisions. Here 3 options were given which are never, rarely, and most of the time. The mean is 2.28 which represents their investment decision is influenced a lot by their overconfidence bias. Here mode is 3 which means most of the respondents think overconfidence is affecting their investment decisions most of the time.

Correlation

The correlation matrix is a table where the relationships between different variables are provided to understand the relationship between them. In this part, the correlation between all independent variables and dependent variables of this paper will be shown. Several studies exhibit a correlation matrix of variables to present the relationship because they declare that the correlation will help to understand the strengths of the relationship between variables (Muhammad Qasim, 2018). The Pearson correlation matrix of this research is presented below with the significance level.

From the table 2, it can be understood that all the variables have a positive correlation with each other and all the relationships are statistically significant. The highest correlation is 0.737 which is between the Prediction of the market and Investment decision. On the other hand, the lowest correlation is 0.438 which is between Underestimating downside risks and Ability to outperform the market. As a result, it can be said that these variables don't have a very strong or weak correlation between them but rather a moderate correlation which is near 0.5.

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Table 2. Correlations

Correlations		Investment Decision	Ability to outperform the market	Underestimating Downside risk	Earning Higher return than average	Prediction of market movement
Investment Decision	Pearson Correlation	1	.662**	.650**	.692**	.737**
	Sig. (2-tailed)		0	0	0	0
Ability to outperform the market	Pearson Correlation	.662**	1	.438**	.509**	.600**
	Sig. (2-tailed)	0		0.003	0	0
Underestimating Downside risk	Pearson Correlation	.650**	.438**	1	.505**	.505**
	Sig. (2-tailed)	0	0.003		0	0
	N	45	45	45	45	45
Earning Higher return than average	Pearson Correlation	.692**	.509**	.505**	1	.617**
	Sig. (2-tailed)	0	0	0		0
Prediction of market movement	Pearson Correlation	.737**	.600**	.505**	.617**	1
	Sig. (2-tailed)	0	0	0	0	

OLS Regression

To test the hypothesis, OLS regression will be used in this paper because it can analyze and present the relationship between dependent and independent variables. In their research on measuring the impact of herding behavior and overconfident bias on investors' decisions, several researchers used regression and correlation (Muhammad Qasim, 2018). The regression analysis will present the adjusted R square value and level of significance of the intercept of independent variables which will help to understand the impact of independent variables on dependent variables according to Table 3.

Table 3. OLS Regression

Regression Statistics	
Multiple R	0.852800981
R Square	0.727269513
Adjusted R Square	0.699996464
Standard Error	0.430998568
Observations	45

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Here, the regression statistics table represents the R square value of the analysis. The adjusted R square is 0.699 which means that; the independent variables were able to explain 69.9% of the dependent variable. As a result, the dependent variable which is investors' decisions is explained 69% by the overconfidence bias characteristics

In this table of regression analysis, the coefficient of every independent variable and their significance level are provided. The coefficients of every independent variable present how much the dependent variable will change if one unit of change occurs in the independent variable. As the range of the dependent variable was 1 to 3, a little fractional coefficient will have a great impact on the dependent variable.

According to Table 4. the prediction capability of the market has a coefficient of 0.211 which is positive and has a p-value of 0.01 which is less than the significance level of 0.05. So, it has a positive and significant impact on the investment decisions. The coefficient of earning a higher return is 0.165 and the p-value<0.05. So, this variable also has a positive and significant impact on the dependent variable. Underestimating the downside risks of the market has a higher coefficient than the previous variable which is 0.19 and the p-value is also significant as 0.011<0.05. So, it also has a positive and statistically significant impact on the dependent variable. The coefficient of ability to outperform the market is 0.175 and the p-value indicates that this is also statistically significant. It is also positive in value and statistically significant for the dependent variable.

Table 4. Coeeficients

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-0.0761	0.24312	-0.3127	0.756	-0.5675	0.4154	-0.5675	0.4154
Prediction of market	0.21133	0.08091	2.6118	0.0126	0.0478	0.3748	0.0478	0.3748
Earning Higher return	0.16574	0.07416	2.2348	0.0311	0.0158	0.3156	0.0158	0.3156
Underestimating downside risk	0.19014	0.07214	2.6357	0.0118	0.0443	0.3359	0.0443	0.3359
Ability to outperform the market	0.17507	0.08007	2.1865	0.0346	0.0132	0.3369	0.0132	0.3369

So, all the independent variables have a positive coefficient and a statistically significant p-value. That represents the integration of independent variables with dependent variables. It can be understood from here that, the investment decisions of the investors are influenced by the overconfidence bias.

One sample t-test

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One sample t-test is a statistical tool that is widely used to test the hypothesis where the sample mean is compared with a given or population mean (Mishra et al.,2019). In the test, the sample mean is calculated and a given mean is compared with it to find out whether there is a significant difference between them or not. The sample mean is compared in the t-test and is run against the known value to find out the significant difference between them which leads the researcher to prove the hypothesis (Mishra et al.,2019). In the case of testing the behavior patterns of human beings, the test is used by Aspara in their research (Aspara, 2011). They used population mean to find out the behavioral decisions their sample made. Besides that, to evaluate the impact of behavioral bias on households Chiang used one sample t-test (Chiang, 2013). For this reason, the researcher has decided to use the test for this comparison.

The objective of this t-test is to know whether the investment decision is influenced by the overconfidence of investors. By using the data collected from the sample will be used to conduct the test here. The respondents were asked how frequently their investment decision would be affected by their overestimation of a stock. Three options were used here which were never, rarely, and most of the time which are categorized 1 to 3. If their investment decision is not influenced by overconfidence, their average or mean response would be "1" or "Never". So, in this t-test, the sample mean will be compared with the given mean "1" to see if there is any difference. The hypothesis of this test is-

H_0: There is no mean difference between the sample mean and the given mean

H_1: There is a significant difference between the sample mean and the given mean

So, here the test value of this two-tailed t-test is 1 and the confidence level is 95%. As a result, the significance level is 0.05 which will be used to prove the hypothesis. The level of significance of the t-test will be compared with the p-value to accept or reject the null hypothesis. If the significance level of the test is less than 0.05, the null hypothesis will be rejected or it will be proved that there is a significant difference between the sample and the given mean. Otherwise, the null hypothesis will fail to be rejected.

In Table 5., the mean of the Investment decision can be seen along with the standard deviation. Here, the mean value is 2.29 which is higher than the given mean of 1.

Table 5. One-sample t-test of Investment Decision

One-Sample Statistics				
	N	Mean	Std. Deviation	Std. Error Mean
Investment decision	45	2.29	.787	.117

One-Sample Test						
	Test Value = 1					
	t	f	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Investment decision	0.988	4	.000	1.289	1.05	1.53

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Here, the mean difference and significance level are presented along with the t value of the statistics. The mean difference is quite higher which is 1.289 and it can be said that the difference is much higher. The significance level is 0.000 which is less than 0.05 and it indicates that there is a significant difference between the sample mean and given mean. So, the null hypothesis would be rejected and the alternative hypothesis would be accepted.

One sample t-test to measure the overconfidence bias

One sample t-test can be used to measure whether the respondents have an overconfidence bias or not. In the questionnaire, there were four major questions to measure their overconfidence which can be used here to identify their overconfidence (Park, 2010). Those questions had five options which were prepared by using a Likert scale from 1 to 5 representing strongly disagree, disagree, neutral, agree, and strongly agree consequently. If the respondents are suffering from overconfidence, they will disagree with the statement which will be the basement of this t-test. Those variables or sample means will be tested against the given mean of 2. If there is a mean difference and the significance level is less than 0.05, it would be proved that there is a significant difference between the sample mean and the given mean. As shown in Table 6., this will prove that the respondents are overconfident.

Table 6. One sample t-test of independent variables

One-Sample Test						
	Test Value = 2					
	t	f	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Prediction of market movement	7.899	4	.000	1.35556	1.0097	1.7014
Earning Higher return than average	6.446	4	.000	1.13333	.7790	1.4877
Underestimating Downside risk	5.287	4	.000	.86667	.5363	1.1970
Control over outperforming the market	8.796	4	.000	1.37778	1.0621	1.6935

Here, all the t-values, mean differences, and significance levels of these variables are given. From the table of the t-test, the mean differences of all variables are positive and greater than zero. On the other hand, all the significance level is also less than 0.05 which indicates that there is a significant difference between the sample mean and the given mean. It indicates that the average respondents were overconfident as there is less or little evidence of disagreeing with the statement which is asked of them through the questionnaire.

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ANOVA test

Barber and Odean analyzed 35000 households for testing the overconfident bias and they have shown that gender has an impact on the overconfidence bias (Brad Barber, 2001). According to their research, male respondents had more overconfidence than the female. Through the ANOVA test, the tendency of male and female respondents to the overconfident will be measured here. In the ANOVA test, the mean between groups is compared with each other to find out if there is any difference (Oehler, 2000). Here the hypothesis is, that the male and female have no different mean. That means gender has no impact on making the investment decision. If there is a mean difference between these two groups, it will be proved that gender also has an impact on investment decision-making by overestimating it. Here the hypotheses are-

- H0: There is no significant mean difference between males and females in investment decision

- H1: There is a significant mean difference between males and females in investment decision

Table 7. ANOVA

Desciptive								
Investment Decision								
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Female	17	1.8824	0.85749	0.20797	1.4415	2.3232	1	3
Male	28	2.5357	0.63725	0.12043	2.2886	2.7828	1	3
Total	45	2.2889	0.78689	0.1173	2.0525	2.5253	1	3

From the Table 7., the number of observations of each group can be seen. Here 17 female and 28 male respondents have participated and there is no missing dependent variable as the total is 45. The mean of the female group is 1.88 which is close to the value of 2 and 2 indicates that the female respondents were rarely overconfident with their investment decisions. On the other hand, the mean value of the male group is 2.535 which is more than 2 and close to 3 and 3 indicating that most of the time the investors are overconfident with their investment decisions. So, here it can be seen that the means of both groups are not the same or close. It is important to find out more evidence from the Table 8.

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Table 8. Significance level

ANOVA					
Investment Decision					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4.515	1	4.515	8.543	0.006
Within Groups	22.729	43	0.529		
Total	27.244	44			

From the table 8, the significance level can be found which 0.006 is and it is less than 0.05. As the p-value is less than 0.05, it is proved that there is a significant mean difference between those two groups. From the ANOVA analysis, it can be concluded that gender has an impact on investment decision-making and male people are more overconfident than females as Barber and Odean found in their article.

Conclusion and Findings

The aims and objectives of this paper were to evaluate the retail investors of Bangladesh and identify their overconfidence bias. This research was designed to evaluate the impact of overconfidence bias on investment decisions of overconfident investors. The data was collected from primary sources and analyzed by using statistical tools to test the hypothesis. Throughout this paper the attained aims and objectives are presented below:

Four types of common characteristics of overconfident investors were identified by other researchers, psychologists, scholars, and articles. Those traits have a vital impact on the investors' behaviors and characteristics (Demirer, 2006). Although there are few traits identified by other researchers, these are the most common and major impacts that were found among overconfident investors.

How the investment decisions are biased by overconfidence and overestimation is also measured by this paper. The impact of demography like gender on the investment decision is also evaluated here.

The four traits of overconfident investors are also analyzed here to understand how much these traits influence an investor. From the t-test of these characteristics, it can be understood that all of these have a great impact on the investors' decision-making.

The regression analysis showed the relationship between dependent and independent variables. The R square value was 0.69 which represents that independent variables explained 69% of dependent variables (Hoffmann, 2014). Besides that, the coefficient of all of these independent variables is positive. So, they have a positive and strong relationship. It proved that the overconfidence bias influences the investment decisions of retail investors.

This paper was done based on primary data. The data was collected through convenient sampling. A total of 60 questionnaires were distributed and 45 respondents completed it

properly. Based on the data of 45 respondents, those are approached based on a convenient sampling method to ensure the data validity and reliability on the subject matter. From the analysis, it is found that the overconfidence bias has a significant influence on the investment decisions of retail investors in Bangladesh. From the regression analysis and correlation matrix, this is proved. The R square value is .69 and the regression table has shown the coefficient of independent variables along with their p-value. The independent variables that are used in this analysis are the ability to outperform the market, prediction capability of market movement, underestimating the downside risks of investment, and earning a higher return than the average market return. All the variables have a significant p-value which is less than 0.05 and a positive coefficient. So, these variables have a positive relationship with the dependent variable which is an investment decision. On the other hand, the correlation matrix has shown a strong relationship between different variables which was ranging from 0.43 to 0.73 and there is no negative or inverse relationship. It proves that all the variables are correlated with each other and the investors' investment decision-making has a strong relationship with the overconfidence bias.

This paper also evaluated the extent of the overconfidence bias of investors. The descriptive analysis and one sample t-test have shown that most of the investors are suffering from the overconfidence bias. The mean value of the ability to outperform the market is 3.37 which is the highest. It indicates that there is the highest number of respondents who have this particular characteristic of overconfidence. Besides the mean value, the mode also indicates that most of the investors have the traits of overconfidence bias. But all of them are not suffering from this and few investors are free from overconfident bias and their investment decision is not affected by it.

Another important finding is the influence of demographic factors on investment decisions. From the analysis of variance (ANOVA) it is found that male investors are likely more overconfident than female investors. Barber and Odean found this in their research in 2000 and it is also found in the case of the investors of Bangladesh.

Behavioral finance has a wide range of implications in the financial market. This type of research will be helpful for the convenient sampling consultants, financial professionals, fund managers, and investors themselves. This paper will help to understand how investors are making their decisions and what factors are influencing their decision-making. The overconfidence bias has a great influence on overall decision-making as well as the actions of investors. It could be a good thing for investors a few times but it will bring plenty of problems at the end of the day. The investors will not be able to focus on the market or available information properly and they will make mistakes that will bring them financial losses. This will be bad for the financial market also. If most investors are biased, the market won't work efficiently or the market will be more bullish (Baker & Nofsinger, 2002). So, it is important to understand the behavioral patterns of investors and take action to reduce this bias for the greater good.

Limitations

The study only focuses on the investors who have portfolios on the Dhaka Stock Exchange. The research area may limit the generalizability of the findings only to the

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investors of Bangladesh, more specifically to the investors of DSE. It may not prevail a conclusive finding to other populations. Moreover, the sample size is very limited which also may not outline the impact of overconfidence bias very precisely. All the respondents are in the age group of 35 to 50 and all of them are graduates who have minimum financial literacy. The respondent group has an average income of 500 USD. So, the demography of the respondent also confined the generalizability of the result as different results may come when there is a change in respondent demography. The researcher uses common statistical measures to draw conclusions and findings. The use of sophisticated statistical tools may portray a shred of better evidence in case of overconfidence bias among investors.

Recommendation to Address Overconfidence Bias

It is difficult to overcome the overconfidence bias which is cognitive in nature. The investor needs to adjust room for the opinion from their close one. Diverse opinion is a key to minimizing the overconfidence of investors to outperform the market (Asaad, 2020). Another key strategy will be to set realistic investment goals that will eradicate the tendency to underestimate the downside risk (Kahneman & Riepe, 1998). As part of self-awareness, investors may keep a record book about each investment decision, the reason behind the decision, and the outcome of the decision which will help to be realistic in making investment decisions. It is also necessary to raise questions about self-instinct and belief, assumptions about the market, and evaluate past performance will be required to prevent overconfidence bias in decision-making. Proper risk management asks to assess the potential possibility of loss and gains, prepare a worst-case scenario, create a diversified investment portfolio, proper risk-return analysis as well, and measure certainty. So, Proper risk management and self-education on the market movement need to be emphasized by the investor as they keep the investor aware of the market trend and updated about the relevant market information.

Another strategy to address the overconfidence bias can be “premortem”, suggested by Daniel Kahneman, a Nobel Prize winner in economics and psychology(Port, 2019). It is suggested to imagine the success of the investment decision and list the potential reasons for this success. Also, imagine the failure of an investment decision and list the potential reasons for failing an investment decision. This process reduces the degree and nature of overconfidence bias for investors as well as financial professionals.

Future Research

There are several overconfidence biases exist among investors. The illusion of control, timing optimism, and over-ranking can be studied as those biases are not addressed in this paper. Moreover, there are biases such as confirmation bias, hindsight bias, familiarity bias as well as loss aversion can also be tested to understand the behavioral pattern more accurately in the context of Bangladesh. The behavior patterns of Bangladeshi investors are different from other countries which is the reason for doing a specific study on them Also, a comparative study on the overconfidence bias will be more effective in understanding the investment dynamics among the different countries and stock markets. Lastly, by changing the demographic dynamics, used in this paper, numerous studies can

be designed to illustrate the behavioral psychology of investors of certain groups or populations.

Author Contributions

The corresponding author designs and collects the data, produces the analysis, and writ the methodology. The second author wrote the introduction and literature review and accumulated all the sources used in this article.

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