

# Mind Over Markets: Analyzing Behavioral Bias And Its Impact On Investors Decisions.

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## **Abstract:**

Investors are treated as rational decision-makers according to the anticipated utility theory in traditional financial theory. Contrarily, Behavioral Finance strongly disagrees with this rationale point of view, arguing that investors frequently stray from rationality when making investment decisions. Investors today frequently make foolish investment decisions. Frequently, the choice is based on an assumption that is far from rational. When faced with a risky circumstance, investors' decisions are frequently influenced by their objectivity, emotions, and other psychological aspects. Here the primary data is used to collect data through questionnaires and secondary data is used for literature review. The study examines the impact of behavioral bias on investors based on age and education. The study explores various behavioral biases such as herding, endowment, familiarity, overconfidence, recency, loss aversion, and regret aversion. These biases play a significant role in shaping investors' decision-making, often resulting in irrational actions within financial markets. By analyzing these tendencies, we can better understand how emotions and mental shortcuts influence investment decisions, which in turn can affect both returns and risk management strategies. Results show no significant relationship between age and biases, with the null hypothesis accepted and the alternate hypothesis rejected. Overconfidence bias, recency, familiarity, and loss aversion bias are more influenced by investors with science and diploma qualifications, while commerce background investors are less influenced.

**Keywords:** Behavioral Bias, Investment decisions, Biases, age and qualification.

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## **I. Introduction:**

Behavioral bias refers to consistent patterns of judgmental deviations that arise under certain circumstances, often leading to altered perceptions, incorrect judgments, or what may be seen as irrational behavior (Trehan, 2018).

This cognitive phenomenon affects decision-making, a mental process where individuals select a course of action from a set of alternatives. Although traditional finance assumes investors act rationally, many studies indicate that investors frequently behave irrationally due to various biases, such as perceptual distortions and inaccurate assessments (Hayat & Anwar, 2016).

With the growth of digital technology and the accessibility of trading platforms, investing in the stock market has become increasingly straightforward. The surge in promotional and advertising efforts by trading firms has significantly encouraged investors, especially those with limited knowledge or experience, to enter the market. Social media plays a crucial role in amplifying the potential profits of investing while often downplaying or omitting the risk of losses, which appeals particularly to younger demographics. Decision-makers with a background in accounting tend to rely heavily on financial data, while those experienced in technical analysis consider both fundamental and technical factors when making investment choices (Alvia & Sulistiawan, 2010).

## **II. Literature Review:**

Behavioral biases are consistent deviations from rational judgment, often stemming from psychological influences that cause individuals to stray from logical reasoning.

These biases—such as overconfidence, loss aversion, and herd behavior—can lead investors to rely on emotions and heuristics rather than careful analysis, significantly impacting their financial decisions (Kahneman & Tversky, 1979; Barberis & Thaler, 2003). Traditional economic theories, such as Expected Utility Theory by von Neumann and Morgenstern (1944), assumed that individuals are rational, possessing the ability to process information optimally and make decisions that maximize their utility. This “rational man” model, or Homo

economicus, assumes individuals have perfect information and consistently make choices that lead to the best outcomes (von Neumann & Morgenstern, 1944). However, Simon (1955) challenged this view with the concept of bounded rationality, suggesting that cognitive limitations prevent people from making fully rational decisions, and they often “satisfice”—settling for an adequate rather than optimal choice.

In the 1970s and 1980s, Kahneman and Tversky introduced Prospect Theory, which highlighted loss aversion as a crucial element in decision-making, demonstrating that individuals feel losses more acutely than gains of similar size. This work underscored the role of mental shortcuts, or heuristics, such as anchoring, availability, and representativeness, which frequently lead to biased judgments (Kahneman & Tversky, 1979). Thaler’s contributions furthered this understanding by applying behavioral insights to finance, establishing behavioral finance as a field and exploring biases like the endowment effect and mental accounting, which reveal how psychological factors can lead investors away from rational choices (Thaler, 1980). Thaler and Sunstein’s (2008) nudge theory extended the application of behavioral biases to policy, demonstrating how gentle interventions can guide individuals toward beneficial choices, particularly in finance and health, while preserving their autonomy.

### **Cognitive and Emotional Influences on Investor Behavior**

Behavioral finance research reveals that investors are influenced by cognitive biases, such as overconfidence and availability bias, which often lead to suboptimal financial decisions (Bakar & Yi, 2016). For example, Patil and Bagodi (2021) identified that overconfidence and conservatism bias significantly influence investor decisions, while herd behavior has little effect. Studies have shown that investors tend to rely on financial statements, economic indicators, and technical analysis as primary decision factors, while insider information serves as a secondary consideration (Husin et al., 2022). Furthermore, attitudes shaped by brand familiarity and perceived trustworthiness also impact investment choices, particularly in Islamic stock markets, where attitudes can mediate the influence of brand familiarity on decisions (Wilaiporn et al., 2021).

The overconfidence bias, wherein investors overestimate their abilities or market knowledge, is especially prevalent among retail investors, particularly male investors and those with high trading frequency (Vesterlund & Langer, 2019; Barber & Odean, 2019). This bias frequently leads to excessive trading and under-diversified portfolios, as investors assume they can predict market trends with greater accuracy than they actually can (Cheng & Wu, 2020). Studies have also highlighted that younger and higher-income investors tend to show greater confidence and are more prone to risk-taking behavior than their older counterparts (Kumari & Garg, 2021).

**Loss Aversion and Risk Preferences** Loss aversion, a concept from Prospect Theory, posits that individuals fear losses more than they value equivalent gains, leading them to avoid risks or adopt overly conservative strategies (Kahneman & Tversky, 1979). Research has shown that loss-averse investors often hold on to depreciating stocks longer than is financially prudent, hoping for a recovery (Gerrard & Cunningham, 2021). Kraussl et al. (2020) demonstrated that loss-averse individuals often choose low-risk investments to avoid potential losses, forgoing higher returns that might benefit them in the long run. This tendency is also tied to mental accounting, where people treat money differently based on its origin or intended use, leading to inconsistencies in their investment decisions (Shefrin & Thaler, 1988).

### **Demographic Factors and Behavioral Biases**

Demographic variables such as age, gender, and income significantly impact the behavioral biases that affect investment decisions. Kumari and Garg (2021) found that younger investors are more susceptible to overconfidence and risk-taking, whereas older investors, particularly those over 40, are more influenced by loss aversion and adopt conservative strategies. Additionally, studies indicate that high-income investors tend to diversify their portfolios more effectively and display a higher tolerance for risk, likely due to a larger financial cushion, whereas low-income investors often experience higher susceptibility to loss aversion (Khan & Iqbal, 2019; Thaler & Sunstein, 2020).

### **Financial Literacy and Bias Reduction**

Financial literacy has been identified as a key factor in reducing susceptibility to behavioral biases. Lusardi and Mitchell (2019) found that financially literate individuals make more rational decisions and are less affected by biases such as overconfidence and loss aversion. Nonetheless, Pradhan and Biswas (2021) argue that even financially knowledgeable investors can fall victim to biases, particularly when under emotional stress or during periods of market volatility, highlighting the role of emotional regulation in managing these biases.

**Social Influence and Herd Behavior** Social influence, especially through online platforms and social media, has greatly altered investor behavior, leading to increased herd behavior. Social networks and peer influence often encourage investors to act impulsively, disregarding their risk tolerance or usual investment strategies. This tendency, known as herd behavior, is common during market bubbles, where collective irrationality drives market volatility (Kandemir & Isik, 2021; Zhang & Xu, 2020). Furthermore, endowment bias causes investors to hold underperforming assets due to emotional attachment, even when better opportunities exist (Jain & Padhy, 2020). Familiarity bias also affects investors who prefer well-known stocks or companies, often resulting in under-diversified portfolios (Huberman, 2001; Zhang et al., 2021).

### **Combined Effects of Behavioral Biases**

The interaction between various behavioral biases can amplify their impact on decision-making. For instance, Zhang and Liu (2021) found that loss aversion intensifies regret aversion, leading investors to delay decisions and further entrench loss-averse behavior. Li and Li (2022) demonstrated that recency bias and loss aversion combined can cause investors to hold onto losing investments, as they are reluctant to acknowledge losses, which exacerbates poor decision-making.

## **III. Research Methodology**

### **Objective of the study**

To study the relationship between behavioral biases and qualification of the investor

To study the relationship between behavioral biases and age of the investors

### **Data Collection**

**Survey Instrument and statistical tool** For the purpose of study two types of data were used. Secondary data was collected from the literature review and theory. The study done previously was used to study the analysis done by the research scholars and making questionnaire. It became a great part of the paper. Primary data was collected by making questionnaire from the literature. The data is collected by making google forms, which was filled by giving necessary instructions and guidance.

### **Problem statement**

The fluctuation of the market is mainly dependent on the investment decision of the investors. The investors tend to show the irrational behavior against the belief of traditional theory. The traditional theory projects the investors as ideal and rational in making their investment decision, whereas the reality is different from our traditional theory which emphasized the importance of study of modern behavioral finance. Along with many external and demographic factors the education of the investor plays an important role in his/her investing decision.

1. Is there any significant relationship between education and behavioral biases projected by the investors

2. Is there any significant relationship between age and behavioral biases

H0: Qualification of the investors significantly influences the investment decision of the investors

H1: Qualification of the investors does not significantly influences the investment decision of the investors

H0: Age of the investors significantly influences the investment decision of the investors

H1: Age of the investors does not significantly influences the investment decision of the investors

### **Herding bias**

Herding behavior reflects social learning in economic activity and financial decision-making, but this behavior is dominated by the psychology and emotions of the investor. In economic and financial situations, investor herding behaviour and investor social influence are common occurrences. Herding behaviour is a reflection of social learning in economic activity and financial decision-making, but investor psychology and emotion control this behaviour other investors. Investors frequently rely heavily on other investors who are thought of as skilled in investment analysis when they need to make investment selections. Generally speaking, investors tend to follow the choice of Investors' lack of expertise in investment research and their insufficient information lead them to choose this course of action (Rahayu et al., 2021). In the financial market, herding is a phenomena that is frequently seen. During the unpredictable conditions in the financial markets, it is a natural tendency of human nature to refer to, watch, and copy other people's behaviour. Investors do not make sensible investing decisions when herding is present. They like to base their investment decisions on the beliefs and views of other investors. Investors thus tend to hold back on their choices and follow others when the market is herding. Herding effect is more pronounced when there are market distress factors present, such as market anomalies, price bubbles, and rumours. Herding has been described as a confluence of movements caused by collective imitation (Madaan & Singh, 2019a).

### **Endowment Bias**

The endowment effect, also known as the price gap between buyers and sellers, may be influenced by the expected adverse effects of making poor trading decisions (either purchasing or selling). Buyers and sellers both use extreme thresholds for performing the transactions in order to reduce the likelihood of regret resulting from making poor judgements (Zhang & Fishbach, 2005). The model predicts that settings where there are typically little advantages from trade and conditions where there is significant ambiguity about the fitness value of objects both encourage the endowment effect (Bruner et al., 2020). Investors place more value on something when they mentally "own" it than when someone else owns it, which is known as the psychological endowment effect. The endowment effect is far more noticeable in retail trading than in institutional trading, supporting the claim that it has more of an impact on less experienced investors. There is no proof that as markets have developed, the endowment effect has lost some of its sway. Since the advent of internet "day traders," it has increased in visibility on the ASX rather than decreasing over time (Furche & Johnstone, 2006).

### **Familiarity bias:**

(De Vries et al., 2017) In order to be a successful investor, according to Warren Buffet, one must maintain emotional distance. Recent studies, however, suggest that consumer perceptions of the goods and branding of corporations may have an impact on people's stock market investment choices. This phenomena suggests that individual investors' investment choices may not be only based on company fundamentals, as traditional financial theories would have it, but may also be influenced by their opinions of particular companies' goods and brands. (Cao et al., 2011) People are biased towards sticking with their current consumption/investment positions and choosing default options. They are averse to small bets and are more likely to buy equities with more publicity or news. This suggests psychological biases and economic and financial decisions are influenced by fear and mistrust towards change.

### **Overconfidence bias**

Overconfidence makes someone believe they are more knowledgeable and smarter, thus when they predict something they believe will happen, the truth is frequently different from what they had anticipated. An overestimation of one's skills, performance, and chances of success is referred to as overconfidence. Both extreme assurance about the accuracy of one's beliefs and overconfidence as a perception that one has better judgement than others are examples of overconfidence (Ainia & Lutfi, 2019). Overconfidence is a prevalent psychological bias that, according to behavioural finance, renders financial markets inefficient by leading to mispricing in the form of extremely high volatility and return variability (Madaan & Singh, 2019b). Investors were clearly overconfident in their expertise, their capacity to choose equities, their ability to hold onto stocks, their optimism, their control over their portfolios, and other characteristics. The investors boast about their accomplishments, believe they have complete control over their portfolios, engage in regular trading, and have high expectations for the Indian stock market (Trehan, 2018).

### **Recency bias:**

According to studies on recency bias, consecutive information can lead to either overvaluation or undervaluation. It is terrible news when there is good news followed by negative news because it encourages investors to rely more on the most recent information. Investors will therefore see lower stock levels than they ought to. On the other hand, when a group of investors hears good news after negative news, they often think the stock price is higher than it actually is. We refer to it as overreacting (Sulistiawan & Edie Wijaya, 2015). Uncertainty in the market, encourages the investors to follow the recency bias which has a great impact in their investment decision (Alvia & Sulistiawan, 2010).

### **Loss aversion:**

People who are risk-averse will often take more chances to prevent losses than to realise benefits. In other words, it is discovered that when presented with the possibility of losses, investors are risk takers. However, when they have the chance to profit, they start to fear taking risks. It can be summed up as "the tendency to feel the impact of losses than gains" (Kumar & Babu, 2018). This represents a situation in which there is higher utility lost when cents are lost than utility gained when x dollars are gained (Mbaluka et al., 2012). Losses have a psychological impact that is twice as great as wins. Therefore, when an investor evaluates the expected gain, loss aversion leads to risk aversion. A risk-averse person will choose those options in his judgements having minimal level of risk because most would rather avoid losses than generate gains. People often have a higher tendency to avoid losses than to make profits (Mallik et al., 2017).

### Regret aversion:

Regret bias is when people make judgements with the intention of avoiding making the same mistakes they regret after experiencing losses. The expressions of fear and uncertainty about comparable investment losses, as well as avoiding the same losses, are used to measure the indicators for this variable (Hidayah & Irowati, 2021). An investor who has lost money in the past will adopt a cautious outlook that will influence their future investing choices. Investors frequently act irrationally when making investment decisions. There are other investors whose decisions about investments are unaffected by feelings of regret. The courage to take bigger risks increases with the severity of losses suffered (Sukamulja et al., 2019).

### Data Analysis

#### Research methodology Cluster sampling:

With the cluster sampling technique, the researchers divide the total population into groups that each represent a population. Based on demographic factors like age, sex, geography, etc., clusters are found and included in a sample. This makes it very easy for a survey developer to draw useful conclusions from the responses. Here in this study, the data has been collected from a group of respondents who are investors of share market.

**Table 1 Reliability Statistics**

#### Reliability Statistics

Cronbach's Alpha	N of Items
.914	6

#### Item Statistics

	Mean	Std. Deviation	N
HerdingBias	3.3050	1.01912	94
OverConfidenceBias	3.3161	.91530	94
RecencyBias	3.5505	.87497	94
FamiliarityBias	3.4973	.88255	94
LossAversionBias	3.4894	.88439	94
RegretBias	3.4282	.92648	94

Here the reliability of the data is 0.914, the researchers believe that the more the value of alpha the more the data is considered as reliable. It is in accordance with analysis stated by (Amirrudin et al., 2021; Brown, 2002).

**Table 2 Investors Demographic Profile**

Demographic Components	Frequency	Percentage
<b>Age</b>		
18-27	47	50
28-37	18	19.1
38-47	20	21.3
More than 48	9	9.6
<b>Stream of Education</b>		
Science	22	23.4
Commerce	59	62.8
Diploma	13	13.8
<b>Undergraduate Program</b>		
B.sc	18	19.1
B.E	16	17
B.Com	20	21.3
BBA	24	25.5
B.Voc	16	17
<b>Post Graduate Program</b>		
M.SC	10	10.6
M.E	3	3.2
M.Com	7	7.4
MBA	34	36.2
None	26	27.7
Pursuing Bachelor's Degree	14	14.9
<b>Investing Experience</b>		
Beginner	42	44.7
2-4 years	26	27.7
More than 4 years	26	27.7

**Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.805 <sup>a</sup>	.648	.623	.51143

a. Predictors: (Constant), RegretBias, OverConfidenceBias, RecencyBias, HerdingBias, FamiliarityBias, LossAversionBias

**ANOVA<sup>a</sup>**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	41.839	6	6.973	26.660	.000 <sup>b</sup>
	Residual	22.756	87	.262		
	Total	64.595	93			

a. Dependent Variable: investmentdecision

b. Predictors: (Constant), RegretBias, OverConfidenceBias, RecencyBias, HerdingBias, FamiliarityBias, LossAversionBias

**Coefficients<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.584	.250		2.335	.022
	HerdingBias	.060	.080	.074	.755	.453
	OverConfidenceBias	.301	.088	.330	3.415	.001
	RecencyBias	.296	.092	.310	3.229	.002
	FamiliarityBias	.096	.102	.102	.939	.350
	LossAversionBias	.084	.116	.090	.727	.469
	RegretBias	.043	.090	.048	.477	.635

a. Dependent Variable: investmentdecision

R value represents the correlation between independent variable and dependent variable. It is believed that the value of R more than 0.4 is considered to taken for further analysis. Here the value of R is 0.805, which is considered as good. Value more than 0.5 for R square is considered to be effective, here the value of R square is 0.648. Here the analysis of adjusted R is not far from 0.623 which is not far from the value of R square. The above Anova table shows that the value of significance is less than 0.05, whereas the value F is greater than 1 which states the table is fit model. The above coefficients states that overconfidence bias and recency bias have significant impact on investment decision, whereas the other factors does not have significant impact on investment decision.

**ANOVA**

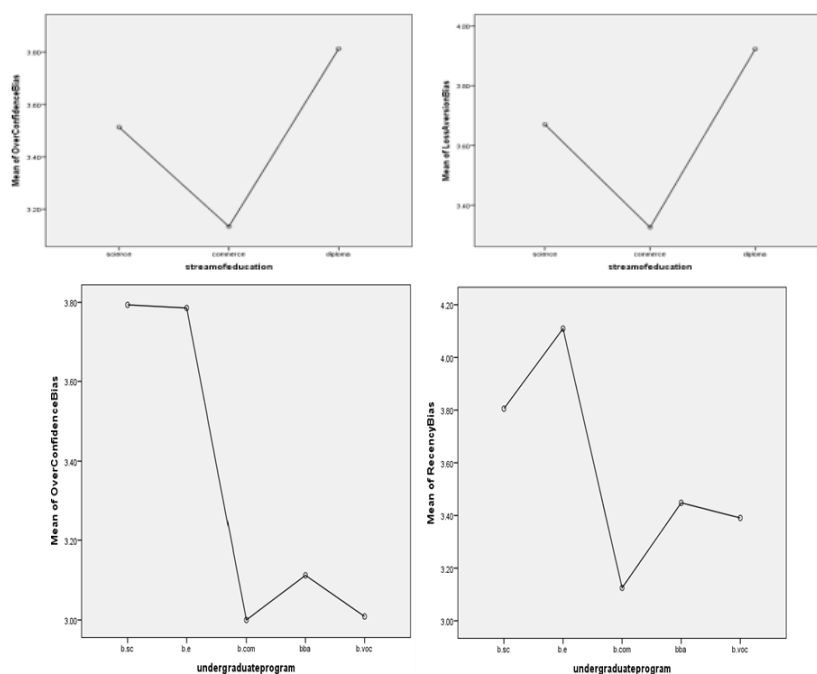
		Sum of Squares	df	Mean Square	F	Sig.
HerdingBias	Between Groups	2.010	3	.670	.638	.593
	Within Groups	94.581	90	1.051		
	Total	96.591	93			
OverConfidenceBias	Between Groups	1.998	3	.666	.789	.503
	Within Groups	75.915	90	.844		
	Total	77.913	93			
RecencyBias	Between Groups	1.069	3	.356	.457	.713
	Within Groups	70.129	90	.779		
	Total	71.197	93			
FamiliarityBias	Between Groups	4.033	3	1.344	1.769	.159
	Within Groups	68.403	90	.760		
	Total	72.437	93			
LossAversionBias	Between Groups	4.313	3	1.438	1.891	.137
	Within Groups	68.426	90	.760		
	Total	72.739	93			
RegretBias	Between Groups	3.839	3	1.280	1.516	.216
	Within Groups	75.989	90	.844		
	Total	79.828	93			

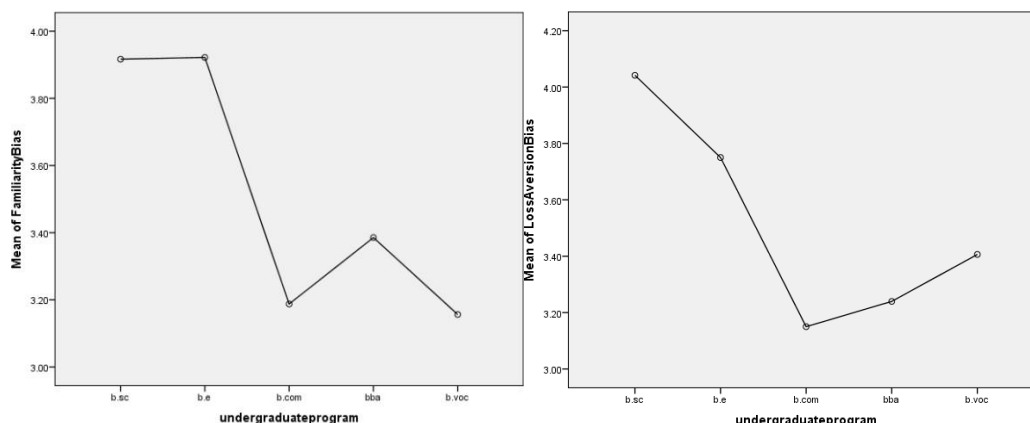
The above data is of one way anova of Biases and Age. All the above data states that all the significance value is above 0.05 and it states that there is no significance between age and biases. Here the null hypothesis is accepted and alternate hypothesis is rejected. There is absence of significant relationship between age and biases. It simply states that the impact of biases is insignificant to age. The biases have influence of investors irrespective to their age.

**ANOVA**

		Sum of Squares	df	Mean Square	F	Sig.
HerdingBias	Between Groups	4.288	2	2.144	2.114	.127
	Within Groups	92.303	91	1.014		
	Total	96.591	93			
OverConfidenceBias	Between Groups	6.039	2	3.020	3.823	.025
	Within Groups	71.874	91	.790		
	Total	77.913	93			
RecencyBias	Between Groups	1.408	2	.704	.918	.403
	Within Groups	69.790	91	.767		
	Total	71.197	93			
FamiliarityBias	Between Groups	3.419	2	1.709	2.254	.111
	Within Groups	69.018	91	.758		
	Total	72.437	93			
LossAversionBias	Between Groups	4.736	2	2.368	3.169	.047
	Within Groups	68.003	91	.747		
	Total	72.739	93			
RegretBias	Between Groups	2.742	2	1.371	1.618	.204
	Within Groups	77.086	91	.847		
	Total	79.828	93			

The above data is of One way Anova of Biases and stream of education. All the above data states that all the significance value is above 0.05 for overconfidence and loss aversion bias. The data states that only over confidence bias and loss aversion bias has significant influence on the basis of stream of education. The means plot of overconfidence bias states that the investor of Diploma and science stream are highly influenced by overconfidence bias and loss aversion bias. Here, the null hypothesis is rejected for overconfidence bias and loss aversion bias and alternate hypothesis is accepted, whereas for herding bias, recency bias, familiarity bias and regret aversion bias null hypothesis is accepted and alternate hypothesis is rejected. It shows that for these factors there is insignificant relationship between bias and stream of education.





**ANOVA**

		Sum of Squares	df	Mean Square	F	Sig.
HerdingBias	Between Groups	8.330	4	2.083	2.100	.087
	Within Groups	88.261	89	.992		
	Total	96.591	93			
OverConfidenceBias	Between Groups	12.131	4	3.033	4.103	.004
	Within Groups	65.782	89	.739		
	Total	77.913	93			
RecencyBias	Between Groups	10.451	4	2.613	3.828	.006
	Within Groups	60.747	89	.683		
	Total	71.197	93			
FamiliarityBias	Between Groups	10.131	4	2.533	3.618	.009
	Within Groups	62.306	89	.700		
	Total	72.437	93			
LossAversionBias	Between Groups	10.489	4	2.622	3.749	.007
	Within Groups	62.251	89	.699		
	Total	72.739	93			
RegretBias	Between Groups	7.376	4	1.844	2.265	.068
	Within Groups	72.451	89	.814		
	Total	79.828	93			

The above data is of One way Anova of Biases and stream of education. All the above data states that all the significance value is less than 0.05 for over confidence, recency bias, familiarity bias and loss aversion bias which states that there is significance relationship between over confidence, recency bias, familiarity bias and loss aversion bias and undergraduate program. All the above means plot states that the students who have attended B.Sc and B.E ( basically students of science) have more influence of biases whereas the investors doing B.com and BBA has significantly less impact on their investment decision. For these factors null hypothesis is rejected and alternate hypothesis is accepted. For herding bias and regret aversion bias there is no significance relationship between biases and undergraduate program.

### Correlations

		HerdingBias	OverConfidenceBias	Recency Bias	FamiliarityBiases	LossAversionBias	Regret Bias
HerdingBias	Pearson Correlation	1	.661**	.579**	.696**	.628**	.582**
OverConfidenceBias	Pearson Correlation	.661**	1	.528**	.671**	.666**	.570**
RecencyBias	Pearson Correlation	.579**	.528**	1	.653**	.715**	.573**
FamiliarityBiases	Pearson Correlation	.696**	.671**	.653**	1	.712**	.647**
LossAversionBias	Pearson Correlation	.628**	.666**	.715**	.712**	1	.754**
RegretBias	Pearson Correlation	.582**	.570**	.573**	.647**	.754**	1

\*\*. Correlation is significant at the 0.01 level (2-tailed).



From the above table it shows that there is very strong relationship between biases among themselves. The significance among them is more than 0.5 among all of them. The above results shows that as the one bias increases there is an positive impact of other biases as well. The increase in one bias do increases the another bias as well. The above results states that one bias supports another bias and it goes on.

#### **IV. Limitations:**

It was difficult to find and approach investors and then convince them to fill the questionnaires. The analysis of data was done to the best of our knowledge only. The samples are limited to the state of Gujarat only.

#### **V. Conclusion:**

The study was made to study the impact of behavioural bias in respect to their age and education. The study states that there is no significant relationship between age and biases. The findings state that null hypothesis is accepted and alternate hypothesis is rejected. Whereas the study of behavioural bias and education has significant relationship for overconfidence bias, recency, familiarity and loss aversion bias. The findings state that the investor having science and diploma qualification are more influenced by the biases whereas the investors having commerce background are relatively less influenced by the biases. The comparison helps us to conclude that the investors having the basic knowledge of commerce are more efficient in trading and investing as compared to the investors having science background.

#### **VI. Future Implications:**

The study helps us to understand that lack of knowledge of investment and commerce has great significance in being influenced by the behavioural biases. The knowledge of investment and finance is the key to have investment decision free from biases. The investment behaviour without knowledge should be avoided which only results in capital loss. The schools should include the crucial investment knowledge for the betterment of future investors irrespective of their choice of stream of education. The study need to done with larger sample size to generalise it.

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