SURVEY ON COGNITIVE BIAS AND INVESTING

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Abstract
Behavioural finance is the art of understanding investor behaviour which can inform investors about biases and help them improve their decision-making processes in selecting investment services, products, and strategies. The study focuses on four biases that occur in investment decisions – Overconfidence bias, Confirmation bias, Anchoring bias and Self-Serving bias. The main objective is to study the investment decision making process and also to conduct hypothesis testing to confirm correlation of biases with specific demographic attributes. Primary data was collected through a structured questionnaire and Purposive Sampling method was used. Crosstabs and Partial correlation were used to analyze the data. Kruskal-Wallis test was done to identify categories where differences occur.
From the analysis, it was found that investment period, portfolio activity and return expectation differ based on gender. With the help of Kruskal-Wallis test, it was found that there is significant difference in overconfidence and self-serving bias based on age factor and monthly income. After completing this study, we got to know that investors behave more irrationally than rationally. Not many people are aware of how, when and where to invest their money. There is information overload and so investors turn to heuristics for quick decision-making. Investors or Portfolio managers should learn how to manage emotions. They should calmly evaluate the investment decisions and benefit from the opportunities provided by the events.
***Key words**: Investor, Decision, Bias, Study, Investment, portfolio.*

INTRODUCTION

Investing is the act of allocating funds to an asset or committing capital to an endeavour (a business, project, real estate, etc.), with the expectation of generating an income or profit. In colloquial terms, investing can also mean putting in time or effort - not just money - into something with a long-term benefit, such as an education. The expectation of a return in the form of income or price appreciation is the core premise of investing. The spectrum of assets in which one can invest and earn a return is a very wide one.

The field of investor behaviour attempts to understand and explain decisions by combining the topics of psychology and investing on a micro level (i.e., the decision process of individuals and groups) and a macro level (i.e., the role of financial markets). The decision-making process of investors incorporates both a quantitative (objective) and qualitative (subjective) aspect that is based on the features of the investment product or financial service. In practice, individuals make judgments and decisions that are based on past events, personal beliefs, and preferences. They establish short cuts or heuristics that can save time but lead them away from rational, long-term thinking.

Literature Review

Rakesh H M (2014): This study concludes that family members influence the most in investment decisions in case of Gold. In case of Equity, the financial consultants were pronounced more. The influence of friends and others was found to be very less. It was clear that family needs and secured life play a major role in deciding the saving habits. According to the survey, investors are fully aware of the stock market in Mysore city and the respondents feel that majority of investor's investment pattern will affect if there is any change in the market.

Jhansi Rani Boda and Dr. G. Sunitha (2018): The author through this study concludes that cognitive, over-confidence, self-attribution and herd effect are four main psychological biases

which effect the investors more than any other biases. He says these biases cannot be corrected or eliminated by learning or accumulating experiences.

Ambrose Jagongo and Vincent S. Mutswenje (2014): The outcome of factor analysis revealed that firms position and performance, investment returns and economic conditions are the most important factors that influence the investment decision in NSE. With the help of Friedman's ranking the author could find out that reputation of the firm, firm's status in industry, expected corporate earnings, profit and condition of statement, past performance of firm's stock, price per share, feeling on the economy and expected dividend by investors were the factors ranked from most to least that affected the individual investment decisions of investors at NSE.

Dr. Taqadus Bashir, Ms. Scholar AaqibaJaved, Ms. Scholar Arslan Ali Butt, Ms. Scholar Nazish Azam, Ms. Scholar Ayesha Tanveer, Ms. Scholar Irtaza Ansar (2019): This study through calculated mean concludes that all variables are somewhat influencing the decision-making behaviour of individual investors of Pakistan. Out of 33 variables belonging to five main categories, the most influencing items by the order of importance were dividend paid, reputation of firm, feelings for a firm's products and services, get rich quick, firm's involvement in solving community problems, and firm's status in industry related to firm's image/self-image and accounting information. And the least influencing variables with the other classes of selected variables were Friend or co-worker recommendations, Opinions of the firm's majority stockholder, recent price movement in the firm's stock, Religious Reason, Family member opinion and Broker recommendation.

A. Charles and R. Kasilingam (2016): This research concludes – results of SEM Model show that relationship between heuristics and personality is stronger than other relationship factors and with the help of statistical tools the results show that investor's frames, personality and mood bias factors influence their general investment decisions. This study has taken into consideration major behavioural factors to understand the investor market behaviour and investment decisions of equity investors on stock market investments.

Objectives of the study

- To study the investment decision making process.
- To understand four different types of cognitive biases (overconfidence, confirmation, anchoring, and self-serving) affecting investor decisions.
- To conduct hypothesis testing to confirm correlation of biases with specific demographic attributes.

Need of the study

Understanding investor behaviour can inform investors about biases and help them improve their decision-making processes in selecting investment services, products, and strategies. Post financial crisis of 2007-2008, there is renewed interest by the social sciences and business disciplines has spurred new research on investor behaviour. This survey has been conducted purely to understand biased behaviour of individual investors. The study will help fund managers or brokers to know what factors lead an investor in the market to behave in a biased manner.

Research Methodology

A. Data Sources:

PRIMARY DATA: The primary data was collected through a structured questionnaire. The questionnaire contained 29 questions divided into 6 sections. The options given for the questions were multiple choice and Likert scale. The data was collected online using Google Forms. The questionnaire was open for the period: 24th June 2019 to 10th July 2019 (2 weeks). Of the 180 people contacted, 104 filled the questionnaire. Thus, the response rate was 58%.

B. Sample:

Purposive Sampling was used. The sample for the study were investors who either invest in Stock Market or Mutual Funds. The size of the sample was 104.

C.Data Analysis:

The data was analysed using IBM SPSS version 20

HYPOTHESES:

Hypothesis testing is an act in statistics whereby an analyst tests an assumption regarding a population parameter.

The null hypotheses of the study are:

• There is no significant difference between investment period based on gender.
• There is no significant difference between portfolio activity based on gender.
• There is no significant difference between average return expected by an individual based on gender.
• There is no significant difference between biases based on gender
• There is no significant difference between biases based on age of a person.
• There is no significant difference between biases based on level of education.
• There is no significant difference between biases based on employment status.
• There is no significant difference between biases based on monthly income of a person.

D. Statistical Tests:

Chi-square test, cross tabs were used to create categorial data and assess the correlation between variables. Chi-square test was used to test the significance of the relationship.

A chi square ($\chi 2$) statistic is a test that measures how expectations compare to actual observed data (or model results).

Kruskal Wallis test was used as the study has used non random sampling method (Purposive sampling). Kruskal Wallis Test is used for analysing the data, where covariance is found related to age, gender, income and investment products. Kruskal Wallis test was used to test the significance difference in the categories. It is a non-parametric test which is an alternative to ONE WAY ANOVA, which have one independent variable with two or more levels and one dependent variable which are measured in continuous level.

Limitations of the study

1. Time constraint.
2. Investors were confined to only Hyderabad.
3. All the investors who responded to the survey were literate people only.
4. The survey was conducted online.
5. The focus of the survey was on only four biases.

Data analysis and Interpretation

1. INVESTMENT PERIOD AND GENDER

H0: There is no significant difference between investment periods based on gender

H1: There is significant difference between investment periods based on gender

		What is your gender?		Total
		Male	Female	
How long have you been investing in the	Not Invested	5	3	8
	Under 3 Years	20	17	37
	3-5 Years	17	3	20
	More than 5			

Years	16	23	39
Total	58	46	104

	Value	**Df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	10.556[a]	3	.014

Interpretation: As P value is less than 0.05, it is significant. The null hypothesis is rejected and alternate hypothesis is accepted. ***There is significant difference between investment period based on gender.***

2. PORTFOLIO ACTIVITY AND GENDER

H0: There is no significant difference between portfolio activities based on gender

H1: There is significant difference between portfolio activities based on gender

	What is your gender?		**Total**
	Male	**Female**	
Every 2-3 months	12	8	20
n major changes happen in the k market	18	2	20
ny Broker/Investment Advisor tells			
Annually I review my portfolio and ges if required	10	10	20
	18	26	44
Total	58	46	104

How do you often buy and sell stocks in your portfolio?

	Value	**df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	13.854[a]	3	.003

Interpretation: As P value is less than 0.05, the null hypothesis is rejected and alternate hypothesis is accepted. ***There is significant difference between portfolio activity based on gender.***

3. RETURN EXPECTATION AND GENDER

H0: There is no significant difference between average return expected by an individual based on gender

H1: There is significant difference between average return expected by an individual based on gender

		What is your gender?		Total
		Male	Female	
On an average how much do you wish to earn through your investment?	Less than 5%	10	4	14
	5 to 15%	30	24	54
	16 to 30%	16	6	22
	More than 30%	2	12	14
Total		58	46	104

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	13.725[a]	3	.003

Interpretation: As P value is less than 0.05, null hypothesis is rejected and alternate hypothesis is accepted. ***There is significant difference in average returns expected by an individual based on gender.***

HYPOTHESIS TESTING

The sample data set has scores on four biases- Overconfidence, Confirmation, Anchoring and Self-Serving biases. These biases were analysed based on gender, age, level of education, employment status and monthly income using Kruskal Wallis Test.

EFFECT OF GENDER ON EACH BIAS

HO: There is no significant difference between biases based on gender

H1: There is significant difference between biases based on gender

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of Overconfidence Bias Score is the same across categories of What is your gender?	Independent-Samples Kruskal-Wallis Test	.915	Retain the null hypothesis.
2	The distribution of Confirmation Bias Score is the same across categories of What is your gender?	Independent-Samples Kruskal-Wallis Test	.329	Retain the null hypothesis.
3	The distribution of Anchoring Bias Score is the same across categories of What is your gender?	Independent-Samples Kruskal-Wallis Test	.067	Retain the null hypothesis.
4	The distribution of Selfserving Bias Score is the same across categories of What is your gender?	Independent-Samples Kruskal-Wallis Test	.791	Retain the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

From the above hypothesis test summary, it can be interpreted that there is no significant difference between biases and gender of a person as p value is greater than 0.05. Hence, null hypothesis cannot be rejected.

- The overconfidence bias p value is 0.915 which indicates that there is no difference based on gender. Therefore, null hypothesis is retained.
- The confirmation bias p value is 0.329 which indicates that there is no difference in this biased behaviour based on gender. Therefore, null hypothesis is retained.

- The anchoring bias p value was found to be 0.067 which indicates that there is no significant difference between anchoring bias and gender. Therefore, null hypothesis is retained.
- The Self-Serving bias p value was found to be 0.791 which indicates that there is no significant difference in the self-serving bias behaviour based on gender. Therefore, null hypothesis is again retained. Hence, the biased behaviour is similar in both genders.

EFFECT OF AGE ON EACH BIAS

HO: There is no significant difference between biases based on age of a person

H1: There is significant difference between biases based on age of a person

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of Overconfidence Bias Score is the same across categories of What is your age?.	Independent-Samples Kruskal-Wallis Test	.035	Reject the null hypothesis.
2	The distribution of Confirmation Bias Score is the same across categories of What is your age?.	Independent-Samples Kruskal-Wallis Test	.847	Retain the null hypothesis.
3	The distribution of Anchoring Bias Score is the same across categories of What is your age?.	Independent-Samples Kruskal-Wallis Test	.219	Retain the null hypothesis.
4	The distribution of Selfserving Bias Score is the same across categories of What is your age?.	Independent-Samples Kruskal-Wallis Test	.019	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

From the above hypothesis summary, it can be interpreted that Overconfidence bias and Self-Serving bias have a significant difference whereas Confirmation bias and Anchoring bias have no significant differences based on age of persons.

- The overconfidence bias p value was found to be 0.035 which is less than the 0.05 which indicates that there is highly significant difference in overconfidence bias based on age. Therefore, null hypothesis is rejected.
- The confirmation bias p value was 0.847 which indicates that there is no significant difference in confirmation bias behaviour based on age. Therefore, null hypothesis is retained.
- The anchoring bias p value was 0.219 which indicates that there is no significant difference in this particular bias based on age factor.
- The self-serving bias p value was found to be 0.019 which is less than 0.05 significance level, which indicates that there is significant difference based on age of a person. Therefore, null hypothesis is rejected. Hence, based on age factor there can be differences in biased behaviour of a person in case of overconfidence and self-serving bias.

EFFECT OF EDUCATION ON EACH BIAS

HO: There is no significant difference between biases based on level of education

H1: There is significant difference between biases based on level of education

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of Overconfidence Bias Score is the same across categories of What is your highest level of education?.	Independent-Samples Kruskal-Wallis Test	.146	Retain the null hypothesis.
2	The distribution of Confirmation Bias Score is the same across categories of What is your highest level of education?.	Independent-Samples Kruskal-Wallis Test	.293	Retain the null hypothesis.
3	The distribution of Anchoring Bias Score is the same across categories of What is your highest level of education?.	Independent-Samples Kruskal-Wallis Test	.268	Retain the null hypothesis.
4	The distribution of Selfserving Bias Score is the same across categories of What is your highest level of education?.	Independent-Samples Kruskal-Wallis Test	.175	Retain the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

From the above hypothesis summary, it can be interpreted that there is no significant difference between biases and level of education.

- The overconfidence bias p value was found to be 0.145 which is more than 0.05 significance level and which indicates that there is no significant difference in overconfidence bias behaviour based on level of education. Therefore, null hypothesis is not rejected.
- The confirmation bias p value was 0.293 which indicates that there is no difference in confirmation bias and level of education. Therefore, null hypothesis is not rejected.
- The anchoring bias p value was 0.268 which again indicates that there is no significant difference in anchoring bias and level of education. Therefore, null hypothesis is retained.
- The self-serving bias p value was found to be 0.175 which indicates that there is no significant difference between self-serving bias behaviour and level of education. Therefore, null hypothesis is not rejected. Hence, it can be said that there is no effect of level of education on the biased behaviour of persons in investments they make. All of them have same biased behaviour irrespective of level of education.

EFFECT OF EMPLOYMENT STATUS ON EACH BIAS

H0: There is no significant difference between biases based on employment status

H1: There is significant difference between biases based on employment status

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of Overconfidence Bias Score is the same across categories of What is your employment status?.	Independent-Samples Kruskal-Wallis Test	.287	Retain the null hypothesis.
2	The distribution of Confirmation Bias Score is the same across categories of What is your employment status?.	Independent-Samples Kruskal-Wallis Test	.776	Retain the null hypothesis.
3	The distribution of Anchoring Bias Score is the same across categories of What is your employment status?.	Independent-Samples Kruskal-Wallis Test	.332	Retain the null hypothesis.
4	The distribution of Selfserving Bias Score is the same across categories of What is your employment status?.	Independent-Samples Kruskal-Wallis Test	.575	Retain the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

From the above hypothesis summary, it can be interpreted that there is no significant difference between biases and employment status. Therefore, null hypothesis cannot be rejected and is retained.

- The overconfidence bias p value was found to be 0.287 which is greater than 0.05 significance level , which clearly indicates that there is no significant difference in overconfidence bias and employment status. Therefore, null hypothesis is retained.
- The confirmation bias p value was 0.776 which indicates that there is no significant difference between confirmation bias and employment status. Therefore, null hypothesis cannot be rejected.
- The anchoring bias p value was 0.332 which indicates that there is no difference in this particular bias based on employment status. Therefore, null hypothesis is retained.
- The self-serving bias p value was found to be 0.575 which indicates that there are no differences in this bias based on employment status. Therefore, null hypothesis is retained.

Hence, it can be said that there is no effect of employment status on the biased behaviour of persons during investments. The employment status does not play a role in the behaviour of a person while making investments.

EFFECT OF MONTHLY INCOME ON EACH BIAS

H0: There is no significant difference between biases based on monthly income of a person
H1: There is significant difference between biases based on monthly income of a person

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of Overconfidence Bias Score is the same across categories of What is your monthly income?.	Independent-Samples Kruskal-Wallis Test	.012	Reject the null hypothesis.
2	The distribution of Confirmation Bias Score is the same across categories of What is your monthly income?.	Independent-Samples Kruskal-Wallis Test	.172	Retain the null hypothesis.
3	The distribution of Anchoring Bias Score is the same across categories of What is your monthly income?.	Independent-Samples Kruskal-Wallis Test	.075	Retain the null hypothesis.
4	The distribution of Selfserving Bias Score is the same across categories of What is your monthly income?.	Independent-Samples Kruskal-Wallis Test	.045	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

From the above hypothesis summary, it can be interpreted that there is significant difference in overconfidence bias, self-serving bias and monthly income of a person and there is no significant difference between confirmation bias, anchoring bias and monthly income of a person.

- The overconfidence p value was found to be 0.012 which indicates that there is highly significant difference in overconfidence bias and monthly incomes of persons. Depending on the type of income, there is more or less overconfidence biased behaviour. Therefore, null hypothesis is rejected.
- The confirmation bias p value was found to be 0.172 which indicates there is no significant difference between confirmation bias and monthly income of a person. Therefore, null hypothesis cannot be rejected.
- The anchoring bias p value was found to be 0.075 which indicates that it is significant at the 0.01 level of significance yet not at 0.05 significance level. Thus, there is no significant difference in anchoring bias and monthly income of a person. Therefore, null hypothesis cannot be rejected.
- The self-serving bias p value was found to be 0.045 which indicates that there is significant difference between self-serving bias and monthly income of a person. Thus, null hypothesis cannot be rejected.

Hence, it can be said that the effect of monthly income is seen only in case of overconfidence bias and self-serving bias whereas there is no significant difference in anchoring bias and confirmation bias. Different categories of income possess different levels of overconfidence

and self-serving bias. Confirmation and anchoring biased behaviour are same in all categories of monthly income.

Findings

➢How long investors stay invested, how often they buy and sell stocks and how much return they expect – all these differ based on gender.

➢With the help of Kruskal-Wallis test, it was found that there is significant difference in overconfidence and self-serving bias based on age factor and monthly income.

Conclusion

In this study, we have concentrated on four cognitive biases i.e. Overconfidence bias, Confirmation bias, Anchoring bias and Self-Serving bias and how each of them affects investment decision making process of investors. After completing this study, we got to know that investors behave more irrationally than rationally.

Not many people are aware of how, when and where to invest their money. It is observed that 50% of females more likely make long term investments. Only 6% of females opt for not investing at all and 36% invest for about 3-5 years. The reasons can be marriage, child education etc. Males invest in both short-term and long-term investment periods and only 8% males opt for not investing. About 56% of females choose to annually review their portfolios and make changes if required. 30% of males often buy and sell stocks when major changes happen in the market and if their adviser tells them to do so. Approximately 50% of males and females expect return on investments up to 5 to 15%. There is information overload and so investors turn to heuristics for quick decision-making. If the same quick heuristic method is used repeatedly it becomes a bias.

- Overconfidence Bias: The investor has an egoistic belief that they're better than they actually are. Therefore, he needs to test himself cautiously and take time to look at their failures when they could not achieve their personal goals.
- Confirmation Bias: The investor favors information that confirms his existing beliefs. They ignore the information that presents different ideas. Therefore, an investor should seek alternative ideas or opinions that challenge their point of view. He should not rely only on the information or ideas that supports his beliefs.
- Anchoring Bias: The investor relies on initial piece of information. He does not update. Therefore, to overcome this bias the investor should stay connected to new developments and adjust his view about the stock or company.
- Self-Serving Bias: The investor believes that the good outcome is because of his skill and bad outcome is because of sheer luck or fund manager/broker's decision. The investor should start recording and documenting his decisions and the outcomes that followed.

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