

Behavioural Biases and Investment Process

(A special reference to Self-attribution bias and Over-Confidence Bias)

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Abstract—This paper examines whether the investors suffer from two behavioral biases, namely overconfidence and self attribution while making investment decisions. Also, is the presence of these biases related to investor’s age, market involvement and gender? We conduct survey and employ non-parametric test such as Mann-Whitney U test and probability model Logit to find the same. Our results suggest that investors are overconfident but most of them do not suffer from self-attribution bias. Overconfidence bias tends to get reduced with age. And self attribution bias is more dominant among the non-brokers.

Keywords—Behavioural finance, overconfidence bias, self-attribution bias

I. INTRODUCTION

From the mid-1950s, the field of finance has been dominated by the traditional finance model (also referred to as the standard finance model). The central assumption in standard finance is that people behave rationally while making investment decisions. And because people behave rationally, markets tend to be efficient. Fama (1997) [1] says that any observed anomalies in the capital markets should disappear over a period of time because once the market recognizes these anomalies, market participants act on them and soon, the profits from these anomalies vanish. But, there are certain exceptions like momentum which are still generating profits even though it has been documented in the financial literature long back. And these persistent anomalies have their roots in a new dimension of finance called ‘behavioural finance’. Behavioural finance helps in explaining how psychology affects the behaviour of participants in financial markets and the subsequent effect on the market itself. Various research studies support the fact that those who have day to day knowledge of capital markets suffer from biases.

Menkhoff and Nikiforow (2008) [2] examined the biases suffered by endorsers and non-endorsers of behavioural finance. They found that although endorsers view market differently and are able to regard strong market influences to behavioural biases, but when it comes to recognition of the biases in their own behaviour, they fail. This view is shared by Nikiforow (2009) [3] who studies the difference in behavioural biases of trained and untrained German fund managers. He extrapolates that training improves recognition of biases in others’ behaviour but it is insufficient to improve fund

managers’ investment behaviour. There are several other researchers who document that these behavioural patterns are so deeply rooted in human beings that they cannot be overcome by even learning about them. Bodnaruk and Simonov (2013) [4] empirically show that mutual fund managers do not outperform the novices in the financial markets and neither do they exhibit lower behavioural biases. Hence, the so-called experts of the financial market do not make superior investment decisions. So, to those for whom the role of psychology in finance is self-evident, both as an influence on securities markets fluctuations and as a force guiding individuals’ investment decision making process, it is very difficult to believe that there is actually a debate about the relevance of behavioural finance. Advocates of behavioural finance, however, are 100 percent convinced that an awareness of pertinent psychological biases is crucial to finding success in the investment arena and that such biases warrant rigorous study.

And as Dr. Meir Statman, Santa Clara University, has rightly put it, “*People in standard finance are rational. People in behavioural finance are normal.*”

Yet many academics and practitioners, residing in the “standard finance” camp, are still not convinced that the effects of human emotions and cognitive errors on financial decisions merit a unique category of study.

In this paper, we try to investigate whether investors behave rationally as presumed under efficient market hypothesis or they suffer from the overconfidence and self-attribution bias? Can these biases inherent in investors be attributed to their age, involvement in the market (i.e. Broker or non brokers) and gender?

These two biases can be explained as follows:

- An **overconfidence bias** is seen when somebody relies too much on his own judgment, foresight and abilities. Overestimate the chances of success of its own moves (complacency). It reflects an illusion of control / of competence / of knowledge / of experience. Overconfidence can lead to either rushing into not well thought and poorly informed wild moves, for example, or on the contrary, delaying decisions about needed changes of practices.

- **Self-attribution bias** is the tendency of humans to attribute successful outcomes to their own skills and to attribute unsuccessful outcomes to bad luck. Investors who experience a run of successful results start to develop an inflated opinion of their own skill, thus possibly resulting in both complacency and exaggerated risk taking.

In a way, these two biases are related to a certain extent as self-attribution bias leads to more overconfidence.

Empirical findings support the proposition that biases can be related to personal attributes. Glaser, Langer and Weber (2005) [5] report that the judgement of professionals is biased and they suffer from a higher degree of overconfidence than the student group in their study. Barber and Odean (2001) [6] empirically investigate whether men are more overconfident than women. For this, they hypothesize that overconfidence bias can lead to more trading activity by men than that of women and this excessive trading hurt their performance. As a result, they earn lower returns than that earned by their female counterparts.

The empirical studies suggest that overconfidence leads investors to strongly believe their own valuation than that of others. Rational investors trade on the basis of available information leading to an increase in their expected utility while the overconfident investors lower their expected utility by trading excessively on the basis of their irrational beliefs (see Barber and Odean (2001) [6]). Menkhoff, Schmidt and Brozynski (2005) [7] document that with experience, as the learning grows investors understand volatility in asset prices better and experienced fund managers become less overconfident and hence, start taking lower risks.

Another important bias that is detrimental to the learning process is the “self attribution bias” whereby investors commit the fallacy of irrationally attributing success to themselves and failures to the external factors. This hinders the investors to learn from their own mistakes (see Pompian (2006) [8], Gervais and Odean (2001) [9])

II. RESEARCH OBJECTIVES

The study is undertaken to serve a dual objective.

- To see whether the subjects are suffering from the above mentioned two biases or not.*
- To analyze whether different personal characteristics of subjects make them more prone to certain kinds of biases or not.*

III. RESEARCH DESIGN

In order to achieve the research objectives, a structured questionnaire was formed and responses were elicited.

The research was conducted in June-July 2013. The participants were recruited from the subject pool of brokers trading on BSE and NSE and other retail investors. Following several socio- demographic questions (concerning gender, age, educational qualifications etc.), the subjects had to fill in a

questionnaire consisting of 6 questions related to the behavioural biases mentioned in the introduction. Convenience sampling was adopted giving adequate representation to different participants. Out of total number, of 130 circulated questionnaires 69 could finally be elicited which were then analyzed on the basis of various attributes.

Structured questionnaire was drafted with adaptations from “*Behavioural Finance and Wealth Management*”, Michael. M. Pompian, John Wiley & Sons (2006) [9] to see the presence of two behavioural biases, namely, Overconfidence Bias and Self-Attribution Bias at the time of investment. Every question carries either 2 or 3 or 4 options. Score was assigned to the questionnaire on the basis of degree of biasness. Higher score been given to an option indicating more biasness.

Questionnaire validation was done by two independent subjects to ensure appropriateness and avoid overlapping of question structure. The questionnaire had mainly closed ended questions. Relevant range of options was also given to respondents (for questionnaire, see Annexure). Responses were analyzed using e-questionnaires and those collected physically by the researchers.

For the purpose of determining relation between a particular bias type and investor characteristic such as male/female, broker/ non broker and age, MANN-WHITNEY U test, a non-parametric test was employed.

The test involves the calculation of a statistic, usually called U, whose distribution under the null hypothesis is known. In the case of small samples, the distribution is tabulated, but for sample sizes above ~20 there is a good approximation using the normal distribution. There are two ways of doing this.

First, all the observations are arranged into a single ranked series. That is, all the observations are ranked without regard to which sample they are in.

- The sample are chosen for which the ranks seem to be smaller (The only reason to do this is to make computation easier). This is called "sample 1," and the other sample "sample 2."
- Each observation is taken in sample 1; the numbers of observations are counted in sample 2 that have a smaller rank (count a half for any that are equal to it). The sum of these counts is U.

For larger samples, a formula can be used:

- The ranks are added for the observations which came from sample 1. The sum of ranks in sample 2 follows by calculation, since the sum of all the ranks equals N(N + 1)/2 where N is the total number of observations.
- U is then given by:

$$U_1 = R_1 - \frac{n_1(n_1 + 1)}{2}$$

Where n1 is the sample size for sample 1, and R1 is the sum of the ranks in sample 1. Note that there is no

specification as to which sample is considered sample
1. An equally valid formula for U is

$$U_2 = R_2 - \frac{n_2(n_2 + 1)}{2}.$$

The smaller value of U1 and U2 is the one used when consulting significance tables. The sum of the two values is given by

$$U_1 + U_2 = R_1 - \frac{n_1(n_1 + 1)}{2} + R_2 - \frac{n_2(n_2 + 1)}{2}.$$

Knowing that $R_1 + R_2 = N(N + 1)/2$ and $N = n_1 + n_2$.

Also, to see the probability of any respondent being biased depended on investor characteristics like age, gender etc LOGIT model is used which takes into account only binary dependent variable, i.e, which can take either the value of 0 or 1. The logit of a number p between 0 and 1 is given by the formula:

$$\text{logit}(p) = \log\left(\frac{p}{1-p}\right) = \log(p) - \log(1-p).$$

The natural logarithm with base e is most often used as a base of the logarithm function. The "logistic" function of any number α is given by the inverse-logit:

$$\text{logit}^{-1}(\alpha) = \frac{1}{1 + \exp(-\alpha)} = \frac{\exp(\alpha)}{1 + \exp(\alpha)}$$

Or

$$\text{Pr}(y_i = 1 | x_i, \beta) = 1 - \frac{e^{-x_i'\beta}}{1 + e^{-x_i'\beta}} = \frac{e^{x_i'\beta}}{1 + e^{x_i'\beta}}$$

which is based upon the cumulative distribution function for the logistic distribution.

The If p is a probability then $p/(1 - p)$ is the corresponding odds, and the logit of the probability is the logarithm of the odds; similarly the difference between the logit of two probabilities is the logarithm of the odds ratio (R), thus providing a shorthand for writing the correct combination of odds ratios only by adding and subtracting:

$$\log(R) = \log\left(\frac{p_1/(1-p_1)}{p_2/(1-p_2)}\right) = \log\left(\frac{p_1}{1-p_1}\right) - \log\left(\frac{p_2}{1-p_2}\right) = \text{logit}(p_1) - \text{logit}(p_2).$$

IV. SURVEY FINDINGS

The results of each technique used to fulfil the objectives of the study are given separately dividing this section into the following parts:

- Personal Profile – Investor Category
- Results of Mann-Whitney U test
- Results of LOGIT model

The survey mainly aims at identifying the type of biases that operate while making investment. Also to identify if a particular bias is more related to an investor type such as broker or non broker, male or female and investor age.

Personal Profile – Investor Category

Beginning with the appropriate survey it was considered appropriate that the investor category be identified. Data was collected from different investment categories so that adequate representation can be given to different market participants. Further investment categorization will also help us in understanding if investment perception and bias varies accordingly to different classes. Hence, the respondents were divided into broker and non broker.

Out of 69 respondents, a majority of the respondents were non brokers i.e. 54 (78%) and the rest were brokers i.e. 15 (22%). There were 26 (38%) female respondents and 43 (62%) male respondents. Respondents having more than 35 years of age were 23 (33%) and rest of them (67%) were below the age of 35 years.

Results of Mann-Whitney U test

In this, an attempt was made to find out whether a particular bias can be attributed to some personal characteristics like gender, broker/non- broker etc. In this, null hypothesis states that there is no difference between the mean scores of two categories and alternative hypothesis states that there is difference between the mean scores of two categories. For eg.

H_0 : mean score of males is equal to mean score of female

H_1 : mean score of males is not equal to mean score of females.

Investor bias attribution to age

The mean U statistic for the series is 493.5 with standard error equal to 75.33

Overconfidence bias

Mean score of respondents having age more than 35 is significantly not different from mean score of respondents having age less than 35 at 10 % level of significance with $R_1 = 584$ and $R_2 = 1365$

Self attribution bias

Mean score of respondents having age more than 35 is significantly not different from mean score of respondents having age less than 35 at 10 % level of significance with $R_1 = 491$ and $R_2 = 1275$

Above results show that the presence of both the biases can't be attributed to age as in both the cases, null hypothesis is accepted and alternate is rejected.

Investor bias attribution to male/ female characteristics

The mean U statistic for the series is 572 with standard error equal to 82.27

Overconfidence bias

Mean score of males is significantly different from mean score of females at 10 % level of significance with $R_1 = 1408$ and $R_2 = 610$

Self attribution bias

Mean score of males is significantly different from mean score of females at 10 % level of significance with $R_1 = 1328$ and $R_2 = 480$

Above results show that the presence of bias can be attributed to gender as in both the cases, null hypothesis is rejected and alternate is accepted. Hence, both self-attribution and overconfidence bias can be attributed to gender.

Investor bias attribution to broker/ non broker characteristics

The mean U statistic for the series is 412.5 with standard error equal to 69.87

Overconfidence bias

Mean score of broker is significantly not different from mean score of non brokers at 10 % level of significance with $R_1 570$ and $R_2 1448$.

Self attribution bias

Mean score of broker is significantly different from mean score of non brokers at 10 % level of significance with $R_1 259$ and $R_2 1549$.

Above results show that the presence of bias can be attributed to whether a person is a broker or a non-broker in the case of self-attribution but not in case of overconfidence bias, as null hypothesis is rejected and alternate is accepted in case of self-attribution bias.

With regard to each bias a score has been assigned using the key designed with higher scores to options with higher degree of biasness. After, evaluation of all the response sheets they were categorised as biased and unbiased. For this purpose, an average of highest and lowest score of a bias was taken. For this, all the questions of one bias were identified and the highest and the lowest scores of every question were added to calculate the highest and the lowest score for the bias and the average was calculated. After that, all the respondents with scores more than the average were termed as biased or unbiased.

The findings for these biases are as follows:

Overconfidence bias; 36 of 69 respondents were found to be biased giving us an aggregate of 52% biased respondents and 48% unbiased.

Self attribution bias; majority of respondents (52 i.e. 75%) were found to be unbiased whereas 25% biased.

Results of LOGIT model

LOGIT model was used to predict using personal characteristics whether a person will be suffering from a particular bias or not. LOGIT model is used here as the dependent variable is taken to be whether a person is suffering from a particular bias or not and it can take the value of either 1 or 0. Independent variables showing different characteristics are again taken here in the form of dummy variables having values 0 or 1. For each bias, 3 dummy independent variables were used in regression model, namely, age, gender and whether a person is a broker or non-broker. The following LOGIT equation is used for estimation:

$$L_i = \ln (P_i / (1-P_i)) = \beta_1 + \beta_2 * \text{Age} + \beta_3 * \text{Gender} + \beta_4 * \text{Broker}$$

Where

- L_i represents odds ratio which indicates that the respondent will be biased to the probability that he will not be biased given certain personal characteristics such as age, gender etc.
- P_i = Probability that a respondent is suffering from the which takes the value of 1 if the respondent is biased otherwise 0
- 1 is assigned if the respondent's age is more than or equal to 35, otherwise 0.
- 1 is assigned if the respondent is female, otherwise 0
- 1 is assigned if the respondent is broker, otherwise 0

Following tables shows the results of the LOGIT model. All the coefficients with respect to these two biases which are significant at 10% level of significance are highlighted. From the tables, it can be seen that none of the prob (LR statistic) is significant for both the biases. In case of overconfidence bias, age is the only significant factor @ 10% level of significance. Its coefficient is negative which shows that the logit value or the odds ratio will decline by 1.14 units. It means that with increase in age this overconfidence bias reduces.

Whether a person is a broker or a non-broker has an impact on whether a person will be suffering from the self-attribution bias or not as its coefficient is significant @ 10% level of significance. The sign of the coefficient is negative which indicates that the logit value of self-attribution bias will decrease by 1.594 units if a person is broker. It may be due to the fact that because since they are actively involved in the market, they think that the market is the ultimate thing. McFadden R-squared value for the biases is not very high which shows that the model is not a good fit.

TABLE I. LOGIT RESULTS

Overconfidence Bias	β (s)	Prob.	McFadden R-squared
C	0.58124	0.1746	0.051154
Age	-1.1494	0.0862*	LR statistic
Gender	-0.7367	0.1976	4.8864
Broker	0,7739	0.3218	Prob. (LR statistic) = 0.180306
Self Attribution Bias	β (s)	Prob.	McFadden R-squared
C	-0.731637	0.0961*	0.051093
Age	0.547378	0.4271	LR statistic
Gender	-0.799696	0.2117	3.9365
Broker	-1.594743	0.0928*	Prob. (LR statistic) = 0.268394

V. SUMMARY

The study is undertaken to see whether the behavioural finance has a role to play in the investment decision making process. This study analyses the presence of two biases, namely, overconfidence bias and self-attribution bias. Structured questionnaire was used with 69 respondents for analysis to see whether the subjects are suffering from the above mentioned biases or not and to analyze whether different personal characteristics of subjects make them more prone to certain kinds of biases or not.

Mann-Whitney U test shows that the presence of bias can be attributed to gender but not to age as in the case of both the biases. Also, the presence of bias can be attributed to whether a person is a broker or a non-broker in the case of self-attribution bias.

LOGIT model suggests that with increase in age, the overconfidence-bias reduces. This result is in contrast of the above test but results from the LOGIT model are more reliable as it is a better and more sophisticated technique. According to LOGIT results, whether a person is a broker or a non-broker has an impact on whether a person will be suffering from the self-attribution bias. It may be due to the fact that because since brokers are actively involved in the market, they think that the market is the ultimate thing.

Hence, it can be concluded that psychology does play a role in investment decision making process and its role can't be negated.

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APPENDIX

Dear Participant,

This questionnaire is designed to study the role of human behaviour for making investments. The information you provide will help us better understand this role. Because you are the one who can give us a correct picture of the same. I request you to respond to the questions frankly & honestly. Your response will be kept *strictly confidential*. Thank you very much for your time and cooperation. We greatly appreciate your help in furthering this research endeavour.

Cordially,

Kanu Jain & Sahaj Wadhwa

Personal Details

Name: _____ Gender: _____

Age: _____ years Occupation: _____

Question 1: How easy do you think it was to predict the global financial crisis in September of 2008? (Overconfidence Bias)

- Easy
- Somewhat easy
- Somewhat difficult
- Difficult

Question 2: When returns to your portfolio increase, to what do you believe the change in performance is mainly due? (Self-attribution Bias)

- Your investment skill
- A combination of investment skill and luck
- Luck

Question 3: After making an investment, assume that you overhear a news report that has negative implications regarding the potential outcome of the investment you've just executed. How likely are you to then seek information that could confirm that you have made a bad decision? (Self-attribution Bias)

- Unlikely
- May Be
- Likely

Question 4: After you make a successful trade, how likely are you to put your profits to work in a quick, subsequent trade, rather than letting the money idle until you've located another good investment? (Self-attribution Bias)

- When I sell a profitable investment, I usually invest the money again right away.
- I will usually wait until I find something I really like before making a new investment.
- Some combination of choices A and B.

Question 5: How much control do you believe you have in picking investments that will outperform the market? (Overconfidence Bias)

- Absolutely no control
- Little if any control
- Some control
- A fair amount of control

Question 6: From 1986 through 2004, the compound annual return for equities was 10.4 percent. In any given year, what returns do you expect on your equity investments to produce? (Overconfidence Bias)

- Below 10.4 percent
- About 10.4 percent
- Above 10.4 percent.
- Well above 10.4 percent

This questionnaire has been adopted from Pompian, M., "Behavioural finance and wealth management", John Wiley and Sons (2006) [8].