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A study on the impact of investment experience, gender, and level of education on overconfidence and self-attribution bias

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Abstract This paper aims at studying the impact of investment experience, gender, and level of education on two specific biases—overconfidence and self-attribution, and exploring the relationship between the two biases. Data collected from a sample of 309 mutual fund investors were analysed. The results show that overconfidence is higher among men than women and increases with investment experience and education. Self-attribution increases with education, but there is no significant association between self-attribution bias and gender, as also between self-attribution bias and investor's experience. The findings also show a significant association between self-attribution and overconfidence.

Introduction

Standard finance theory and economic models draw heavily upon two basic assumptions, namely, rationality and market efficiency. The assumptions of traditional economists portray humans as rational beings who always strive to maximise their utility. Fama (1965) defined "efficient market" as a market with (1) a large number of rational profit maximisers competing with each other to predict future values of individual securities, and (2) in which important current information is almost freely available to all participants. The proponents of behavioural finance continuously challenge this assumption and believe that numerous factors, including both rational and irrational thinking, drive investor behaviour. They believe that market price is not always a fair estimate of the underlying fundamental value of the firm, and that investor psychology can drive market prices and fundamental value very far apart (Shefrin, 2000). Empirical research and studies on investor behaviour have shown the existence of irrational thinking in investor decision making. Behavioural scientists brought in their knowledge of human behaviour to explain the reasons for over- and under-valuation of shares in the market. The paper Prospect Theory: An Analysis of Decision under Risk by Amos Tversky and Daniel Kahneman is considered a seminal work in behavioural finance (Kahneman & Tversky, 1979). Further, Shefrin and Statman's "Explaining Investor Preference for Cash Dividends" (Shefrin & Statman, 1984), De Bondt and Thaler's "Inefficiency in Asset Pricing" (1985), and Shiller's study on stock market bubbles and feedback theory (Shiller, 2000) have contributed significantly in understanding cognitive biases and their role in investment decision making.

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Investor biases

Shefrin (2007) defines bias as a predisposition towards error: It is a prejudice or a propensity to make decisions while already being influenced by an underlying belief. Psychologists have long studied the type of errors people are prone to in decision making. Studies emphasise that individuals are affected by psychological factors such as cognitive biases in their decision making, rather than being rational and wealth-maximising (Forbes, 2009).

This paper is an attempt to study the impact of investment experience, gender, and the level of education on two specific biases, overconfidence and self-attribution. It also aims at studying the relationship between overconfidence bias and self-attribution bias. The sections of this paper are arranged in the following order. The first section describes both overconfidence bias and self-attribution bias with their implications to the investor. This is followed by a review of earlier papers showing the impact of gender, experience, and level of education on overconfidence and self-attribution biases. The third section describes the methodology and questionnaire for the study. The fourth section includes the results, followed by discussion and conclusion.

Overconfidence bias

Overconfidence can be summarised as unwarranted faith in one's intuitive reasoning, judgments, and cognitive abilities (Pompian, 2006). Psychologists find overconfidence to be an all pervasive human characteristic (De Bondt & Thaler, 1995). Fischhoff, Slovic, and Lichtenstein (1977) observed that people are poorly calibrated when estimating probabilities. Events which they think are certain to occur actually occur only 80% of the time, and events they think are impossible occur approximately 20% of the time. Shefrin (2000) describes overconfidence with an example of driving. A research group was asked about their driving ability, and between 65 and 80% of the respondents rated themselves above average. Montier (2002) conducted a study of 300 professional fund managers in which 74% believed that they had delivered above-average performance and the remaining 26% believed that their performance was average. Almost all the respondents believed that their performance was average or better. In both these studies, overconfidence was measured through better than average effect which is an inclination in people to exaggerate their talents. On nearly any dimension that is both subjective and socially desirable, most people will see themselves as better than average (Myers, 1996).

Camerer and Lovallo (1999) found that overconfidence and optimism lead to excessive business entry, i.e., more people who are overconfident and optimistic about their relevant skills enter new business and quit later due to business failures. Barber and Odean (2000) note that overconfident investors overestimate the precision of their information and thereby the expected gains by trading. They also noted that individuals turned over their common stock investments about 70% annually.

Behavioural implications of overconfidence

Prior research suggests that investors are overconfident about their abilities to predict the future and they overestimate their ability to evaluate a company as a potential investment. Shefrin (2000) suggests that they may be blind to any negative information that can indicate that stocks should not be bought or sold. According to Barber and Odean (2001), overconfident investors trade excessively and this leads to poor returns. They underestimate the downside risk because they pay no heed to historical investment statistical performance, which results in poor portfolio performance; they also hold undiversified portfolios.

Self-attribution bias

Self-attribution is a cognitive phenomenon by which people tend to attribute success to innate aspects such as talent and foresight, and attribute failures to situational factors. Individuals would take credit for successes and blame external factors for failures (Bradley, 1978). An example could be students attributing higher grades to their own intelligence and hard work, and citing unfair grading when they obtain lower grades. According to Heider (1958), in ambiguous situations, attributions are influenced by a person's "needs and wishes". Technically, self-attribution bias consists of

1. Self-enhancing bias—this refers to the tendency of people to claim an irrational degree of credit for their success
2. Self-protecting bias—this refers to the irrational denial of responsibility for failure

The self-attribution bias has a cognitive and a motivational component. According to Miller and Ross (1975) it is the limited information processing capacity of individuals that drives the self-attribution bias, which explains the cognitive component. The motivational approach argues that people make internal attributions for success and external attributions for failure to maintain their self-esteem and feel good about themselves (Zuckerman, 1979). The two motives for self-attribution are self-enhancement and self-presentation. The self-enhancing motivation helps individuals protect their self-esteem by creating causal explanations that serve to make them feel better. The self-presentation motivation refers to the drive to convey a desired image to others (Schlenker, 1980). Studies provide evidence to the existence of self-serving bias among students (Dunn, 1989). Studies by Daniel, Hirshleifer, and Subrahmanyam (1998), and Gervais and Odean (2001), formally introduced the self-attribution bias into standard learning models.

An investor who is susceptible to the self-attribution bias would attribute the rise in the value of an investment that is purchased to his/her being investment or business savvy and to bad luck or some external factor if it comes down in value.

Does self-attribution lead to overconfidence?

Studies have shown strong association between self-attribution and overconfidence. According to Hirshleifer (2001), overconfidence and self-attribution are static and dynamic counterparts. Self-attribution causes individuals to learn to be overconfident rather than converge on an accurate self-assessment. Billet and Qian (2005) explored managerial

self-attribution bias in mergers and acquisitions by looking at the sequence of deals made by individual acquirers. They examined the history of acquirers of US public companies from 1985–2002 and found that self-attribution of past success leads to hubris in decision making. The confidence developed from past acquisition leads companies to value destructive deals, suggesting that overconfidence stems from self-attribution bias. Gervais and Odean (2001) developed a model that describes how novice traders who are self-attributive and successful, eventually become overconfident and take high risk in investment. This is because they take inadequate degree of responsibility and fail to learn from losses, as they attribute losses to external factors. Their study finds that traders who are both young and successful trade the most and demonstrate more overconfidence. Feng Li (2010) studied the relationship between self-attribution bias and overconfidence using two settings that reflect the manager's belief about future cash flows. The study revealed that managers have self-serving attribution bias which leads to overconfidence. Hsu and Shiu (2007) analysed the investment performance of 6993 investors bidding in 77 discriminatory IPO auctions in the Taiwan market, taking the number of IPO auctions in which investors placed bids as being representative of their experience. This model of self-attribution bias predicts that experienced bidders become overconfident due to successful initial bids and are likely to bid again and again, leading to inferior performance.

According to Gervais and Odean (2001), the level of overconfidence decreases as an investor becomes more experienced. According to their framework, investors gain experience by participating in the stock market and thus the level of experience depends both on the amount of time spent on the stock market and the intensity of participation. Their study suggests that successful and inexperienced traders are more overconfident than experienced traders. Locke and Mann (2001) also suggest that traders with more experience are less likely to take more risk after a period of abnormally good profits than their less experienced counterparts. Menkhoff, Schmeling, and Schmidt (2013), in a study on overconfidence in the context of financial markets, found that investment experience and age have a significant impact on the level of overconfidence and that as age and experience increase, overconfidence decreases. Similarly, the experiments by Gloede and Menkhoff (2011) show that working experience of a professional is accompanied by less overconfidence.

Some of the other studies show just the opposite. Heath and Tversky (1991) and Frascara (1999) in their studies show that experts are more likely to be overconfident than relatively inexperienced subjects. In a study where individual overconfidence was investigated within the context of an experimental asset market in which 72 participants traded one risky asset on six markets, Kirchler and Maciejovsky (2002) found that the degree of overconfidence increases. Glaser and Weber (2007) in their experiments found that professional traders have a higher degree of overconfidence than students in the two tasks they analysed, namely, trend recognition and forecasting of stock price movement. Bhandari and Deaves (2006) found that highly educated and well paid males are susceptible to overconfidence. Studies by Deaves, Luders, and Schroder (2010), on the dynamics of overconfidence, show how overconfidence increases with experience and level of education. In light of the above contradictions, we wanted to test the following hypotheses

H1. Experienced investors are more overconfident than novice investors.
H2. Experienced investors are more self-attributive than novice investors.
H3. Overconfidence increases with the level of education.
H4. Self-attribution bias increases with the level of education.

Overconfidence and gender

Although men and women are found to be overconfident, studies have shown that the degree of overconfidence varies among them and men are more overconfident than women. Lewellen, Lease, and Schlarbaum (1977) found that men have a stronger tendency to overconfident behaviour than women. Lundeberg, Fox, and Punccohar (1994) claim that the higher degree of overconfidence in men is dependent on the task involved. Studies also show that the higher level of overconfidence in men is related to masculine jobs and also to the frequency of the feedback they receive (Beyer & Bowden, 1997; Lenney, 1977). Barber and Odean (2001) studied investment transactions of 35 000 households, between 1991 and 1997, and noted that overconfident investors overestimate the precision of their information and thereby the expected gains of trading. They also found that men are more overconfident than women, trade more and perform worse than women. Pompian and Longo (2004), in their study to create investment programmes, based on personality type and gender to produce better investment outcomes, have found that many personality types and both genders are differently disposed to numerous behavioural finance biases.

Gervais and Odean's (2001) model shows that the investor's overconfidence arises from self-serving self-attribution bias. Studies by Deaux and Farris (1977), Meehan and Overton (1986), and Beyer (1990) show that men are more prone to self-attribution bias than women. In line with the above inquiry, the following hypothesis is formulated:

H5. Men are more overconfident than women.
H6. Men are more self-attributive than women.

As studies show a strong association between self-attribution bias and overconfidence, we also propose to test the following hypothesis:

H7. There is a relationship between self-attribution bias and overconfidence bias.

Methodology

To test the above mentioned hypotheses, primary data were collected from a sample of 309 mutual fund investors. The sample was chosen randomly from among mutual fund investors who visited a company in Bangalore, which is the registrar and transfer agent for mutual fund asset management companies (AMC). (Population samples are random when no bias determines their individual selection (Godden, 2004).) The study uses a survey research method, using a questionnaire

Table 1 Demographic profile of the respondents.

Gender			Marital status			Education		
	Count	Percent		Count	Percent		Count	Percent
Male	229	74.1	Married	218	71.2	High school	22	7.1
Female	80	25.9	Unmarried	88	28.8	Graduate	166	53.7
Total	309	100.0	Total	306	100.0	Post graduates	121	39.2
						Total	309	100.0
Type of investor			Occupation			Experience		
	Count	Percent		Count	Percent		Count	Percent
Direct	204	66.2	Finance	137	44.5	Less than 2 years	91	29.6
Indirect	104	33.8	Non- finance	171	55.5	2 years and above	216	70.4
Total	308	100.0	Total	308	100.0	Total	309	100.0

with questions on overconfidence bias and self-attribution bias. Overconfidence manifests itself in miscalibration, better than average effect, illusion of control, and unrealistic optimism. Overconfidence in this study is measured by "better than average effect" form of overconfidence (Glaser & Weber, 2007). The degree of better than average effect is measured using a Likert scale with five questions tapping this dimension. Self-attribution bias was also treated similarly. The scales used in earlier studies were adopted for this study. The response across gender, level of education, and investor's experience were studied. Investors with less than two years of investment experience were considered as less experienced (novice) investors and those with above two years of experience were considered experienced. Any investment decision process requires investors to understand that both firm specific factors and market variables are relevant. As studies do not clearly demarcate a novice from an experienced investor in terms of the number of years of investment experience, we assume that the initial years can be considered the novice period where the investor is still learning about the factors to be considered before an investment decision. Therefore, for the purpose of this study, we designate investors with less than two years of investment experience as novice investors and investors with more than two years of investment experience as experienced investors. Though the level of confidence and self-attribution at different levels of experience can give better insights, we limit our study to understanding overconfidence and self-attribution among novice investors and a larger group (at different levels of experience) with varied investment understanding, i.e. experienced investors.

To capture the dimension of overconfidence bias, a four point interval scale was used, ranging from *below average* to *well above average*. The respondents were asked to indicate their response which best described their feeling against each of the items. The questions were: (1) Relative to other drivers, how good are you on the road? (2) How good are you on your job? (3) How do you rate your personal level of investment? (4) Relative to other investors, how good are you? (5) How do you rate your ability to have predicted the 2008 recession (financial crisis)?

Similarly, to capture the dimension of self-attribution bias, the respondents were asked four questions with three choices against each. They were asked to choose the option that best described their feeling. (1) After making an investment, assume that you hear of a news report that has negative implications regarding the potential outcome of the investment you have just executed. How likely are you to then seek information that could confirm that you have made a bad decision? 2) When returns to your portfolio increase, what do you believe the change in performance is mainly due to? 3) After you have made 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 are sure you have located another good investment?

An analysis of variance (ANOVA) test was applied to test the significant difference between gender, level of education, and investor experience (independent variable) with the dependent variables, overconfidence bias and self-attribution bias. The correlation between overconfidence and self-attribution bias was carried out to find the degree of association between the two.

Analysis and results

Descriptive statistics

The demographic profile of the respondents is depicted in Table 1. (Direct investors are those who make their own investment decisions and indirect investors are those who consult a financial advisor for their investment decisions.)

Overconfidence bias

H1. Experienced investors are more overconfident than novice investors.

Table 2 shows the perception of the respondents categorised on the basis of their years of investment experience. The mean score for the attribute, "Relative to other drivers, how good are you on the road?" given by the less experienced investors is 2.57 and by experienced investors is 2.75. The ANOVA output shows an *F* value (ratio between two sample variances) of 2.282 and sig. (significant) value of 0.132. Since the sig. value is >0.05, the mean difference is not significant which implies that difference in response based on the years of experience is not significant. Similarly, the mean score for the attribute, "How good are you on your job?" given

Table 2 Overconfidence and experience.

Attributes	Experience	N	Mean	Std. dev.	*F*-value	Sig.
Relative to other drivers, how good are you on the road?	Less than 2 years	89	2.57	1.021	2.282	.132
	More than 2 years	209	2.75	.854		
	Total	298	2.69	.909		
How good are you on your job?	Less than 2 years	89	2.80	.842	5.785	.017
	More than 2 years	212	3.02	.698		
	Total	301	2.96	.749		
How do you rate your personal level of investment?	Less than 2 years	89	2.22	.808	13.271	.001
	More than 2 years	212	2.61	.845		
	Total	301	2.50	.851		
Relative to other investors, how good are you?	Less than 2 years	81	2.35	.785	1.360	.244
	More than 2 years	213	2.47	.838		
	Total	302	2.43	.824		
How do you rate your ability to have predicted the 2008 recession (financial crisis)	Less than 2 years	86	1.95	.932	1.507	.221
	More than 2 years	211	2.09	.843		
	Total	297	2.05	.870		
Overconfidence bias	Less than 2 years	90	2.3878	.58465	7.623	.006
	More than 2 years	215	2.5815	.54766		
	Total	305	2.5243	.56483		

Std. Dev., Standard deviation; *F*-value, ratio of two sample variances; Sig., Significance level.

by the less experienced investors is 2.80 and by experienced investors is 3.02. The ANOVA output shows an *F* value of 5.785 and the sig. value is 0.017. Since the sig. value is <0.05, the mean difference is significant which implies that there is significant difference in response based on investor's experience.

The mean score for "How do you rate your personal level of investment?" given by the less experienced investors is 2.22 and by experienced investors is 2.61. The ANOVA output shows an *F* value of 13.271 and the sig. value is 0.001. Since the sig. value is <0.05, the mean difference is significant which implies that difference in response based on investor experience is statistically significant. The mean score for "Relative to other investors, how good are you?" given by less experienced investors is 2.35 and by experienced investors is 2.47. The ANOVA output shows the *F* value is 1.360 and sig. value is 0.244. Since the sig. value is >0.05, the mean difference is not significant which implies that difference in response based on level of experience is statistically not significant. The mean score for "How do you rate your ability to have predicted the 2008 recession (financial crisis)?" given by the inexperienced investors is 1.95 and by experienced investors is 2.09. The ANOVA output shows the *F* value is 1.507 and the sig. value is 0.221. Since the sig. value is >0.05, the mean difference is not significant which implies that difference in response based on investor experience is statistically not significant.

Therefore, the mean score for overconfidence bias given by investors with less than two years of experience is 2.3878 and by experienced investors is 2.5815. The ANOVA output shows an *F* value of 7.673 and sig. value of 0.006. Since the sig. value is <0.05, the mean difference is significant which implies that difference in response based on investor's level of experience is statistically significant. So the null hypothesis is rejected and it can be inferred that experienced investors who have more than two years of investment experience are more overconfident than less experienced investors.

Self-attribution and experience

H2. Experienced investors are more self-attributive than novice investors.

Table 3 shows the perception of the respondents categorised on the basis of their level of investment experience. The mean score for "After making an investment, assume that you hear of a news report that has negative implications regarding the potential outcome of the investment you have just executed. How likely are you then to seek information that could confirm that you have made a bad decision?" given by investors with less than two years of experience is 2.02, by investors with over two years of experience is 2.27. The ANOVA output shows an *F* value of 5.690 and sig. value of 0.018. Since the sig. value is <0.05, the mean difference is significant which implies that difference in response based on the years of experience is statistically significant. The mean score for "When returns to your portfolio increase, what do you believe the change in performance is mainly due to?" given by investors with less than two years of experience is 1.90, and by investors with over two years of experience is 1.70. The ANOVA output shows an *F* value of 6.915 and the sig. value is 0.009. Since the sig. value is <0.05, the mean difference is significant, which implies that there is significant difference in response based on investor experience. The mean score for "After you have made a successful trade, how likely are you to put your profits to work in a quick subsequent trade, rather than letting the money lie idle until you have located another good investment?" given by investors with less than two years of experience is 1.91, and by investors with over two years of experience is 1.96 .The ANOVA output shows an *F* value of 3.66 and a sig. value of 0.056. Since the sig. value is almost equal to 0.05, the mean difference is significant, which implies that difference in response based on investor's experience is statistically significant. The mean score for "Suppose your investment was less

Table 3 Self-attribution vs. experience.

Attributes	Experience	N	Mean	Std. dev.	*F*-value	Sig.
After making an investment, you hear a news report with negative implications. How likely are you to seek information that could confirm that you made a bad decision?	Less than 2 years	89	2.02	.797	5.690	.018*
	Over 2 years	214	2.27	.816		
	Total	303	2.19	.817		
When returns to your portfolio increase, what do you believe the change in performance is mainly due to?	Less than 2 years	91	1.90	.559	6.915	.009*
	Over 2 years	215	1.70	.623		
	Total	306	1.76	.610		
After a successful trade, how likely are you to put your profits into a quick subsequent trade, rather than letting the money lie idle until you have located another good investment?	Less than 2 years	91	1.96	.773	3.666	.056
	Over 2 years	215	2.15	.818		
	Total	306	2.09	.809		
Suppose your investment was less successful, what do you think is the reason?	Less than 2 years	91	1.91	.755	.323	.570
	Over 2 years	214	1.96	.691		
	Total	305	1.95	.760		
Self-attribution	Less than 2 years	91	1.9460	.43022	2.037	.155
	Over 2 years	214	2.0209	.41559		
	Total	306	1.9986	.42069		

*5% level of significance.
Std. Dev., Standard deviation; *F*-value, ratio of two sample variances; Sig., Significance level.

successful, what do you think is the reason?" given by investors with less than two years of experience is 1.91, and by investors with over two years of experience is 1.96. The ANOVA output shows an *F* value of 0.323 and sig. value of 0.570. Since the sig. value is >0.05, the mean difference is not significant.

The mean score for self-attribution of respondents based on the years of experience given by investors with less than two years of experience is 1.9460, and by investors with over two years of experience is 2.0209. The ANOVA output shows an *F* value of 2.037 and a sig. value of 0.155 Since the sig. value is >0.005, the mean difference between respondents based on their experience is not significant which implies that there is no significant difference between the years of experience in investment and self-attribution. So, the null hypothesis is accepted.

Overconfidence and level of education

H3. Overconfidence increases with the level of education.

Table 4 shows the perception of the respondents categorised based on their level of education. The mean score for "Relative to other drivers, how good are you on the road?" given by the high school educated investors is 2.24, by graduates is 2.73, and by post graduates it is 2.74. The ANOVA output shows an *F* value of 2.955 and a sig. value of 0.54. Since the sig. value is >0.05, the mean difference is not significant which implies that difference in response based on the level of education is not significant. The mean score for "How good are you on your job?" given by the high school educated investors is 2.52, by graduates is 2.96, and by post graduates is 3.04. The ANOVA output shows an *F* value of 4.369 and a sig. value of 0.013. Since the sig. value is <0.05, the mean difference is significant which implies that there is significant difference in response based on investor's level of education. The mean score for "How do you rate your personal level of investment?" given by the high school educated investors is 2.05, by graduates is 2.40, and by post graduates is 2.72. The ANOVA output shows an *F* value of 7.942 and a sig. value of 0.000. Since the sig. value is <0.05, the mean difference is significant which implies that difference in response based on investor's level of education is statistically significant. The mean score for "Relative to other investors, how good are you?" given by the high school educated investors is 1.89, by graduates is 2.38, and by post graduates is 2.61. The ANOVA output shows the *F* value is 7.505 and sig. value is 0.001. Since the sig. value is <0.05, the mean difference is statistically significant. The mean score for "How do you rate your ability to have predicted the 2008 recession (financial crisis)" given by the high school educated investors is 1.44, by graduates is 2.02, and by post graduates is 2.18. The ANOVA output shows the *F* value is 5.952 and the sig. value is 0.003. Since the sig. value is <0.05, the mean difference is statistically significant. The mean score for overconfidence given by the high school educated investors is 2.0881, by graduates is 2.4908, and by post graduates is 2.6583. The ANOVA output shows an *F* value of 10.503 and sig. value of 0.000. Since the sig. value is <0.05, the mean difference is significant which implies that difference in response based on level of education is statistically significant. So the test shows that overconfidence increases with the level of education and so the null hypothesis is rejected.

Self-attribution and level of education

H4. Self-attribution bias increases with the level of education.

Table 5 shows the perception of the respondents categorised on the basis of their level of education. The mean score for "After making an investment, assume that you hear of a news report that has negative implications regarding the potential outcome of the investment you have just executed. How likely are you then to seek information that could confirm that you have made a bad decision?" given by the high school educated investors is 0.2.10, by graduates is 0.2.09, and by post graduates is 0.2.35. The ANOVA output shows the

Table 4 Overconfidence and level of education.

Attributes	Education	N	Mean	Std. dev.	*F*-value	Sig.
Relative to other drivers, how good are you on the road?	High school	21	2.24	.944	2.955	0.54
	Graduate	165	2.73	.918		
	Post graduate	114	2.74	.813		
	Total	300	2.70	.909		
How good are you on your job?	High school	21	2.52	.750	4.369	0.13
	Graduate	162	2.96	.742		
	Post graduate	120	3.04	.738		
	Total	303	2.96	.748		
How do you rate your personal level of investment?	High school	20	2.05	.826	7.942	0.000
	Graduate	163	2.40	.783		
	Post graduate	120	2.72	.909		
	Total	303	2.50	.857		
Relative to other investors, how good are you?	High school	19	1.89	.809	7.505	.001
	Graduate	165	2.38	.760		
	Post graduate	120	2.61	.863		
	Total	304	2.44	.822		
How do you rate your ability to have predicted the 2008 recession (financial crisis)	High school	18	1.44	.616	5.952	0.003
	Graduate	164	2.02	.836		
	Post graduate	117	2.18	.906		
	Total	299	2.05	.867		
Overconfidence	High school	21	2.0881	.50396	10.503	.000
	Graduate	166	2.4908	.55430		
	Post graduate	120	2.6583	.54900		
	Total	307	2.5287	.56584		

Std. Dev., Standard deviation; *F*-value, ratio of two sample variances; Sig., Significance level.

Table 5 Self-attribution vs. education.

Attribute	Education	N	Mean	Std. dev.	*F*-value	Sig.
After making an investment, you hear a news report with negative implications. How likely are you to seek information that could confirm that you made a bad decision?	High school	21	2.10	.768	3.774	.024
	Graduate	165	2.09	.840		
	Post graduate	119	2.35	.777		
	Total	305	2.19	.8818		
When returns to your portfolio increase, what do you believe the change in performance is mainly due to?	High school	22	1.95	.722	1.720	.181
	Graduate	165	1.78	.598		
	Post graduate	121	1.70	.601		
	Total	308	1.76	.610		
After a successful trade, how likely are you to put your profits into a quick subsequent trade, rather than letting the money lie idle until you have located another good investment?	High school	22	2.00	.690	4.538	.011
	Graduate	165	1.98	.808		
	Post graduate	121	2.26	.804		
	Total	308	2.09	.808		
Suppose your investment was less successful, what do you think is the reason?	High school	22	1.82	.853	3.980	.020
	Graduate	165	1.87	.649		
	Post graduate	120	2.09	.745		
	Total	307	1.95	.710		
Self-attribution	High school	22	1.9697	.46115	6.177	.002
	Graduate	165	1.9288	.41209		
	Post graduate	21	2.1012	.40700		
	Total	308	1.9995	.42053		

Std. Dev., Standard deviation; F-value, ratio of two sample variances; Sig., Significant level.

F value to be 3.774 and sig. value to be 0.024. Since the level of significance is <0.05, the mean difference is significant which implies that difference in response based on the level of education is significant. The mean score for "When returns to your portfolio increase, what do you believe the change in performance is mainly due to?" given by high school educated investors is 1.95, by graduates is 1.78, and by post graduates is 1.70. The ANOVA output showed the *F* value is 1.720 and significant value is 0.181. Since the level of significance is greater than 0.05, the mean difference is not significant, which implies that there is significant difference in response based on investor education. The mean score for "After you have made a successful trade, how likely are you to put your profits to work in a quick subsequent trade, rather than letting the money lie idle until you have located another good investment?" given by high school educated investors is 2.00, by graduates is 1.98, and by post graduates it 2.26. The ANOVA output showed the *F* value is 4.538 and significant value is 0.011. Since the level of significance is less than 0.05, the mean difference is significant which implies that difference in response based on investor education is statistically significant.

The mean score for "Suppose your investment was less successful, what do you think is the reason?" given by high school educated investors is 1.82, by graduates is 1.87, and by post graduates is 2.09. The ANOVA output showed the *F* value is 3.980 and significant value is 0.020. Since the level of significance is less than 0.05, the mean difference is significant which implies that difference in response based on their level of education is statistically significant.

The mean score for self-attribution of respondents based on the level of education given by high school educated investors is 1.9697, by graduates is 1.9288, and by post graduates is 2.1012. The ANOVA output shows an *F* value of 6.177 and a sig. value of 0.002. Since the sig. value is <0.005, the mean difference between respondents at different levels of education is significant which implies that self-attribution increases with education and the null hypothesis is rejected.

Overconfidence and gender

H5. Men are more overconfident than women.

Table 6 shows the perception of the respondents categorised on the basis of their gender. The mean score for "Relative to other drivers, how good are you on the road?" given by male respondents is 2.75 and by female respondents is 2.55. The ANOVA output shows an *F* value of 2.691 and sig. value of 0.102. Since the sig value is >0.05, the mean difference is not significant which implies that difference in response based on gender is not statistically significant. The mean score for "How good are you on your job?" given by male respondents is 2.98 and by female respondents is 2.90. The ANOVA output shows an *F* value of 0.723 and sig. value of 0.396. Since the sig. value is >0.05, the mean difference is not significant which implies that difference in response based on gender is not significant. The mean score for "How do you rate your personal level of investment?" given by the male respondents is 2.61 and by female respondents is 2.22. The ANOVA output shows an *F* value of 12.693 and significant value of 0.000. Since the sig. value is <0.05, the mean difference is significant which implies that difference in response based on gender is statistically significant. The mean score for "Relative to other investors, how good are you?" given by male respondents is 2.53 and by female respondents is 2.18. The ANOVA output shows an *F* value of 11.053 and a sig. value of 0.001. Since the sig. value is <0.05, the mean difference is significant which implies that difference in response based on gender is statistically significant. The mean score for "How

Table 6 Overconfidence vs. gender.

Attributes	Gender	N	Mean	Std. dev.	*F*-value	Sig.
Relative to other drivers, how good are you on the road?	Male	224	2.75	.893	2.691	.102
	Female	76	2.55	.944		
	Total	300	2.70	.904		
How good are you on your job?	Male	224	2.98	.751	.723	.396
	Female	79	2.90	.744		
	Total	303	2.96	.749		
How do you rate your personal level of investment?	Male	224	2.61	.840	12.693	.000*
	Female	79	2.22	.842		
	Total	303	2.50	.859		
Relative to other investors, how good are you?	Male	225	2.53	.824	11.053	.001*
	Female	79	2.18	.764		
	Total	304	2.44	0.822		
How do you rate your ability to have predicted the 2008 recession (financial crisis)	Male	221	2.14	.908	10.399	.001*
	Female	78	1.78	.677		
	Total	299	2.05	.867		
Overconfidence	Male	228	2.5983	.55685	13.974	.000*
	Female	79	2.3278	.54648		
	Total	307	2.5287	.56584		

*Significant at 0.05 level.
Std. Dev., Standard deviation; *F*-value, ratio of two sample variances; Sig., Significance level.

Table 7 Self-attribution vs. gender.

	Gender	N	Mean	Std. dev.	*F*-value	Sig.
After making an investment, you hear a news report with negative implications. How likely are you to seek information that could confirm that you made a bad decision?	Male	226	2.19	0.83		
	Female	79	2.19	0.786	0.02	0.096
	Total	305	2.19	0.818		
When returns to your portfolio increase, what do you believe the change in performance is mainly due to?	Male	228	1.7	0.601	9.43	0.002
	Female	80	1.94	0.603		
	Total	308	1.76	0.61		
After a successful trade, how likely are you to put your profits into a quick subsequent trade, rather than letting the money lie idle until you have located another good investment?	Male	228	2.09	0.805	0.006	0.94
	Female	80	2.1	0.821		
	Total	308	2.09	0.808		
Suppose your investment is less successful, what do you think is the reason?	Male	228	1.96	0.738	0.333	0.565
	Female	79	1.91	0.624		
	Total	307	1.95	0.71		
Self-attribution	Male	228	1.9861	0.43183	0.884	0.348
	Female	80	2.0375	0.37005		
	Total	308	1.9995	0.42053		

Std. Dev., Standard deviation; *F*-value, ratio of two sample variances; Sig., Significance level.

do you rate your ability to have predicted the 2008 recession (financial crisis)?" given by the male respondents is 2.75 and by female respondents is 2.55. The ANOVA output shows an *F* value of 10.399 and sig. value of 0.001. Since the sig. value is <0.05, the mean difference is significant which implies that difference in response based on gender is statistically significant.

The mean score for overconfidence given by male respondents is 2.5983 and by female respondents is 2.3278. The ANOVA output shows an *F* value of 13.974 and a sig. value of 0.000. Since the sig. value is <0.05, the mean difference is significant which implies that difference in response based on gender is statistically significant. So the test shows that men are more overconfident than women, and the null hypothesis is rejected.

Self-attribution vs. gender

H6. Men are more self-attributive than women.

Table 7 shows the perception of the respondents categorised on the basis of their gender. The mean score for "After making an investment, assume that you hear of a news report that has negative implications regarding the potential outcome of the investment you have just executed. How likely are you then to seek information that could confirm that you have made a bad decision?" given by male respondents is 2.19, and by female respondents is 2.19. The ANOVA output shows an *F* value of .002 and sig. value of 0.964. Since the sig. value is >0.05, the mean difference is not statistically significant. The mean score for "When returns to your portfolio increase, what do you believe the change in performance is mainly due to?" given by male respondents is 1.70, and by female respondents is 1.94. The ANOVA output shows an *F* value of 9.439 and a sig. value of 0.002. Since the sig. value is <0.05, the mean difference is significant, which implies that there is significant difference in response based on investor gender. The mean score for "After you have made a successful trade, how likely are you to put your profits to work in a quick subsequent trade, rather than letting the money lie idle until you have located another good investment?" given by male respondents is 2.09 and by female respondents is 2.10. The ANOVA output shows an *F* value of 0.006 and a sig. value of 0.940. Since the sig. value is >0.05, the mean difference is not significant which implies that difference in response based on investor's gender is not statistically significant. The mean score for "Suppose your investment is less successful, what do you think is the reason?" given by male respondents is 1.96 and by female respondents is 1.91. The ANOVA output shows an *F* value of 0.333 and a sig. value of 0.565. Since the sig. value is >0.05, the mean difference is not significant.

The mean score for self-attribution of respondents based on their genders given by male respondents is 1.9861 and by female respondents is 2.0375. The ANOVA output shows an *F* value of 0.884 and sig. value of 0.348. Since the sig. value is >0.005, the mean difference between respondents based on their gender is not significant which implies that self-attribution has no significant relationship with the gender of the respondents and the null hypothesis is accepted.

Overconfidence and self-attribution

H7. There is a relationship between self-attribution bias and overconfidence bias.

To find the degree of association between overconfidence and self-attribution, a correlation analysis was carried out (Fig. 1). As shown in Fig. 1, the relationship is positive at 0.136, which indicates the strength of association between the two variables. The sig. value is 0.009 (Table 8). As the sig. value is <0.05, the association is significant, implying that there is a correlation between self-attribution and overconfidence. So, the null hypothesis is rejected.

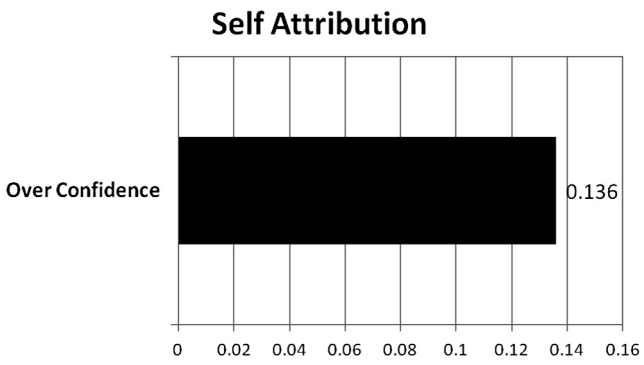

Figure 1 Correlation—overconfidence and self-attribution.

Table 8 Overconfidence and self-attribution.

	Overconfidence
Self-attribution	0.136
Sig. (1-tailed)	.009
N	306

Self-attribution as a predictor of overconfidence

The statistically significant correlation coefficient indicates that the observed sample data provide ample evidence to reject the null hypothesis. The coefficient of determination (r^2) can be used to more fully interpret r (correlation coefficient). The coefficient of determination is defined as the percent of variation in the values of dependent variable (Y) that can be explained by the independent variable (X). This technique results in a percent value which makes interpretation much clearer. To define the pattern of the existing relationship in correlation, the regression analysis is used.

H_0. The independent variable self attribution is not a significant predictor of the dependent variable, overconfidence bias.
H_1. The independent variable self-attribution is a significant predictor of the dependent variable, overconfidence bias.

Table 9a shows the r^2 value of 0.018, which provides an indication of the explanatory power of the regression model. It is the percentage of variance in the dependent variable explained by the independent variable. In this case, 1.8 percentage of variance in overconfidence is explained by the self-attribution bias.

The ANOVA model shows an F value of 5.696 and a sig. value of 0.018 (Table 9b). As the sig. value is <0.05, we reject the null hypothesis and can infer that the independent variable self-attribution is a significant predictor of the dependent variable overconfidence.

Table 9c shows both the unstandardised and standardised beta coefficient between independent and dependant variable. Unstandardised beta is used to estimate the regression equation. The y-intercept is 2.161 and the slope of the regression line is $b_1 = 0.183$ .The calculated t-value is 2.387 and the sig. value is .018.

The estimated equation is $Y = 2.161 + 0.183 \times X_1 + e$. An increase in one unit of independent variable (X1) increases the dependent variable overconfidence by 18.3 percentage. It can be inferred that self attribution is a significant predictor of overconfidence bias.

Discussion and conclusion

This study has indicated that investors' experience in investment has an impact on overconfidence bias and self-attribution bias among mutual fund investors. The findings of earlier studies are contradictory. Studies by Gervais and Odean (2001), Locke and Mann (2001), Menkhoff et al. (2013), and Gloede and Menkhoff (2011) show that the level of overconfidence decreases as an investor becomes experienced. However, studies by Heath and Tversky (1991), Frascara (1999), Kirchler and Maciejovsky (2002), Bhandari and Deaves (2006), Glaser and Weber (2007), and Deaves et al. (2010) show that overconfidence increases with experience. In line with these findings, our findings also suggest that overconfidence increases with experience. Self-attribution bias shows a slightly higher mean for experienced investors compared to novice investors. However, the difference is not significant. The studies by Bhandari and Deaves (2006) and Deaves et al. (2010) have shown that overconfidence increases with education. Our study also proves that both overconfidence and self-attribution bias increase with the level of education. The level of self-attribution is more or less equal for those with high school education and graduates, and higher for post graduates.

When it comes to the role of gender on overconfidence and self-attribution bias, most studies confirm that men are overconfident and highly self-attributive when compared to women. Lewellen et al. (1977), Lundeberg et al. (1994), Lenney (1977), Beyer and Bowden (1997), Barber and Odean (2001) and Pompian and Longo (2004) have in their studies empirically proved that men are more overconfident than women. Our study also finds that men are more overconfident than women. Gervais and Odean's (2001) model shows that investor's overconfidence arises from self-serving self-attribution bias. Studies of Deaux and Farris (1977), Meehan and Overton (1986), and Beyer (1990) also show that men are more prone to self-attribution bias than women. But this study shows a slightly higher mean value for women compared to men. But the difference is not statistically significant. So, our study does not show any significant difference in the self-attributive bias between men and women. However, the study shows significant level of correlation between self-attribution bias and overconfidence. Self-attribution bias is also a significant predictor of overconfidence bias. This is in line with the studies by Gervais and Odean (2001) which show that repeated success among traders leads to overconfidence. Studies by Feng Li (2010) and Hsu Yenshan and Shiu Cheng-Yi (2007) also suggest self-attribution bias leading to overconfidence. So the results of our study show that: (1) the level of overconfidence increases as investor's experience in investment increases, (2) there is no such statistical significance in the association between self-attribution and investor's experience, (3) the level of overconfidence increases with the level of education, (4) self-attribution bias increases with the level of education. (5) Men are more overconfident than women, (6) there is no significant relationship between the gender of the

Table 9 (a) Model summary. (b) Analysis of Variance (ANOVA). (c) Model: Coefficients.

(a)

Model	Independent variable	Dependent variable	r	r^2	Adjusted r^2	Std. error
1	Self-attribution	Over- confidence	0.136	0.018	0.015	0.562

(b)

Model		Sum of squares	Df	Mean square	F	Sig.
1	Regression	1.798	1	1.798	5.696	0.018
	Residual	95.953	304	0.316		
	Total	97.751	305			

(c)

Coefficients

Model		Unstandardised coefficients	Standardised coefficients		T	Sig.
		B	Std. error	Beta		
1	(Constant)	2.161	0.157		13.777	0.000
	Self-attribution	0.183	0.077	0.136	2.387	0.018

Predictors: (Constant), self-attribution.
Dependent variable: Overconfidence.
Df: degrees of freedom.

respondents and their level of self-attribution, and (7) there is an association between overconfidence bias and self-attribution bias. This study confirms the presence of bias among mutual fund investors. Investor experience, level of education, and gender do have an impact on investor bias. Further there is an association between self-attribution and overconfidence bias. Controlled experimental studies can throw further insights on the relationship between the variables. This study contributes to the existing literature on bias, especially the influence of demographic variables on overconfidence and self-attribution bias. From the investors' perspective, an understanding of the psychology and emotions underlying investment decisions can help both financial advisors and individual investors in formulating their financial goals better.

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