Investment Behavior of Secondary Equity Investors : An Examination of the Relationship Among the Biases

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Abstract

Behavioral finance attempts to explain the emotions in the stock market which lead to anomalous stock market behavior. Behavioral biases exhibited by the investors explain their irrational decision making. Knowledge about the interaction among the biases would help to comprehend the investors' financial personality better. Using a dataset of 436 secondary equity investors residing in Chennai, this study measured eight behavioral biases on a Likert scale through a questionnaire survey. The biases studied included mental accounting, anchoring, gambler's fallacy, availability, loss aversion, regret aversion, representativeness, and overconfidence. Significant relationships among the behavioral biases were documented in the study. The biases : (a) overconfidence, regret aversion, and anchoring biases ; (b) loss aversion and anchoring ; (c) representativeness, gambler's fallacy, and mental accounting ; (d) mental accounting and availability biases exhibited by the secondary equity investors were found to be interrelated. Hence, the financial advisors could improve their advice and recommend guidelines to the investors based on the biases they are likely to exhibit.

Keywords: **behavioral finance, behavioral biases, mental accounting, anchoring, gambler's fallacy, availability, loss aversion, regret aversion, representativeness, overconfidence, secondary equity market, equity investors' behavior**

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Investors trading in the secondary equity market are bombarded with abundant information and have a wide variety of stocks to choose from. Hence, emotions play a vital role in the decision making process in the stock market environment which results in irrational decisions. This irrationality leads to several anomalies in the stock market which are left unexplained by the classical financial theories. Behavioral finance helps to explain this irrationality by the concept of behavioral biases exhibited by the investors. Behavioral biases are the flaws of the human mind and the reason for all the irrationality in the stock market.

In this study, eight behavioral biases namely, mental accounting, anchoring, gambler's fallacy, availability, loss aversion, regret aversion, representativeness, and overconfidence are measured in a survey of secondary equity investors residing in Chennai. Five questions on a Likert scale were used to measure each bias. The relationship among the biases was determined in order to profile investors accordingly. Financial advisors need to do behavioral rebalancing of the investors' portfolio based on their behavioral profile and the biases they are likely to exhibit. Via behavioral rebalancing, the upside potential would be increased, thereby protecting the downside (Statman, 2018). Understanding the relationship among the behavioral biases is important for financial

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professionals as navigating consumer biases is an important component of behavioral finance (Gipple, 2018). Communication with the clients, that is, the investors becomes effective only when the biases they exhibit are identified and handled. Hence, knowledge about the relationship among the biases is crucial to good financial advice. This study is hence important for finance professionals.

Each behavioral bias leads to different investor behaviors. Mental accounting bias causes the investor to see the winning and losing stocks separately in different mental accounts in the mind. The anchoring bias causes the investors to adjust all the trading decisions based on an anchor like the purchase price of a stock. Gambler's fallacy causes the investors to anticipate the rise or fall of a stock market trend. The availability bias causes the investors to look at only the readily available information before making a stock market decision. The loss aversion bias causes investors to be averse to loss and losing stocks, and hence, hold them for longer periods. The regret aversion bias causes investors to look at the stock price movements of the stocks they have already sold and makes them regret if the price increases further post the sale of a stock. The representativeness bias causes investors to assume that past prices are representative of the future stock prices. The overconfidence bias causes investors to overestimate their skill set while taking investment decisions.

Literature Review

(1) History of Behavioral Finance : A more practical explanation of the financial anomalies explaining the behavior of the stock market investors was necessary. Understanding the financial personality of the investors and the analysis of the financial market's inefficiency became important. "Behavioral finance attempts to explain and improve people's awareness about psychological processes and the emotional factors that influence the investment decisions" (Virigineni & Rao, 2017, p.456).

It was during the 1990s when a new field called *behavioral finance* emerged in academic journals in order to explain the reasoning process of the investors and thus their irrationality. However, the foundation for behavioral finance was laid nearly 150 years ago. MacKay's *Extraordinary Popular Delusions and the Madness of Crowds* published in 1841 showcased the various panics and schemes in a chronological order. It explored how group behavior could be applied to today's financial markets. *The Crowd: A Study of the Popular Mind* by Le Bon elaborated crowd psychology and group behavior. The book, *Psychology of the Stock Market* by Selden published in 1912 was the first to apply psychology to the stock market directly, explaining the emotions behind the investors and traders in the markets. These three important works along with others marked the basis for the application of sociology and psychology to finance (Riccardi & Simon, 2000).

Shleifer and Summers (1990) put forward the two main blocks of behavioral finance : Investor sentiment and limited arbitrage. First is that investors are not fully rational and their claim for risky assets is not completely explained by the fundamental news, and hence, is affected by their sentiments. The irrationality of investors leads to irrational preferences and irrational decisions leading to the drift from the fundamental values. Second is the concept of limited arbitrage. In an ideal financial world, the arbitrageurs would nullify the noise created by the irrational investors and market efficiency would be restored. But in reality, arbitrage is risky and not all securities have perfect substitutes. Hence, arbitrage is limited. Both these blocks put together indicate that changes in investors' sentiments are not completely covered by the arbitrageurs. This, in turn, affects the returns of securities (Shleifer & Summers, 1990; Wouters, 2006).

Investors are susceptible to biases when they make investment decisions (Montier, 2002). Sahi and Arora (2012) defined the bias in the financial context as, "Individual Investor Bias is a tendency towards a certain disposition that guides the decision maker to a judgment in circumstances pertaining to financial investment decisions" (p.11). Hence, biases are the mistakes which investors make when the mental shortcuts (heuristics) are

used to simplify the process of manipulating excessive information. Behavioral biases drive the stock prices in the equity market and make them follow the behavioral cycle (Bruce, 2017). Biases shape not only the present investment decisions, but also influence investors' decisions made in the future (Mangala & Sharma, 2014).

Several researchers like Dangi and Kohli (2018) and Singh, Goyal, and Kumar (2016) applied many behavioral biases to study the behavior of individual investors. Raut and Das (2015) reviewed several behavioral finance articles and showed that social factors along with psychological patterns like anchoring, availability, and representativeness were the determinants of investors' decisions. Ahmad, Ibrahim, and Tuyon (2017) examined the behavior of institutional investors. This research paper examines the behavioral biases suggested by Chandra and Kumar (2012) and Jayaraj (2013). The eight behavioral biases considered in the study are elaborated below.

(2) Behavioral Biases

(i) Mental Accounting : "Mental accounting refers to the tendency of people to separate their money into separate accounts based on a variety of subjective criteria like the source of money and intent for each account" (Jayaraj, 2013, p.25).

Depending on the type of mental account, the tendency towards spending, saving, and risk varies. For example, if investors treat mental accounts like, college account, vacation account, and retirement account as safe accounts, then it would lead to sub - optimal returns as they would be the last to be used (Pompian, 2008).

(ii) Anchoring : "Anchoring bias occurs when investors are influenced by purchase points or arbitrary price levels, and tend to cling to these numbers when facing questions like 'should I buy or sell this investment?' " (Pompian, 2008, p.66).

Investors are better off at relative thinking than absolute thinking. Investors tend to base their hold/sell decisions based on illogical reference points, which serve as anchors for further adjustments. Investors resist redistribution of stocks in the portfolio if the price is below the purchase price which serves as an anchor (Pompian, 2008).

(iii) Gambler's Fallacy : Ray (2008) referred to gambler's fallacy as "a pervasive belief in regression to the mean" (p.53). That is, an upward (downward) trend should be completed by a downward (upward) trend. Hence, investors develop the propensity to anticipate the end of a series of good (bad) returns.

Kudryavtsev, Cohen, and Hon-Snir (2013) defined gambler's fallacy as "an (incorrect) belief in the negative autocorrelation of a non-autocorrelated random sequence" (p.35). That is, in a sequence where every event is independent, the fallacy of expecting a negative deviation is gambler's fallacy. The example is the roulette wheel, where after the occurrence of three red numbers, a black number is expected by the individual affected by gambler's fallacy.

(iv) Availability : "The availability heuristic operates on the notion that, 'if you can think of it, it must be important.' The availability of consequences associated with an action is positively related to perceptions of the magnitude of the consequences of that action" (Jayaraj, 2013, p.25).

Kudryavtsev et al. (2013) explained that availability heuristic was applied when people estimated the probability of an event based on the ease with which it could be imagined. Those that were distinctly explained and easier to depict and understand could be easily imagined. Investors tended to invest in firms which indulged in heavy advertising due to easy recall, despite the fact that the really good firms hardly advertise (Pompian, 2008).

(v) Loss Aversion : "Loss aversion refers to that people dislike losses more than they like gains. An even chance of

winning or losing a small amount of money would therefore be preferred to an even chance of winning or losing a large amount of money" (Gärling, Kirchler, Lewis, & Van Raaij, 2009, p.17).

Loss aversion has been termed as 'get-even-itis' by industry experts as investors hold on to losing investments with the hope of breaking even. This period of prolonged holding of losing investments might result in major negative effects on the portfolio returns (Pompian, 2008).

(vi) Regret Aversion : Bell (1982) coined the term decision regret which was the "consequence of decision-making under uncertainty" (p.961). In the stock market, the regret averse investors fear potential financial injury like facing a loss or letting go of profit, and hence, they hate being accountable for their own mistakes. This fear which surrounds investment decision making leads investors to make irrational choices. Regret averse investors tend to become very conservative in the long run due to losses experienced in the past as a result of high-risk choices. Regret aversion also leads to herding behavior among investors as investors are driven by common investment choices in order to avoid regret. Because of the regret aversion bias, investors tend to stay out of the market after a loss and also hold their losing positions for prolonged time periods due to fear of regret. On the other hand, they also have the propensity to hold the winning positions for long, fearing that the prices would increase after the sale (Pompian, 2006).

(vii) Representativeness : "According to representativeness, the subjective probability of an event, or a sample, is determined by the degree to which it : (i) is similar in essential characteristics to its parent population; and (ii) reflects the salient features of the process by which it is generated" (Kahneman & Tversky, 1972, p.430). This implies that when faced with uncertain events, people employ subjective probability to decide the more representative event as more likely to happen. "Representativeness is a cognitive bias in which an individual categorizes a situation based upon a pattern of previous experiences or beliefs about the scenario" (Jayaraj, 2013, p.24).

The representative heuristic makes investors take quick decisions at the cost of judging resemblances, which are merely superficial. This heuristic leads to unwanted importance given to the similarities between the events, thereby ignoring the variables critical for determining the probability of the event (Jayaraj, 2013).

(viii) Overconfidence : Overconfidence was defined by Cheng (2007) in terms of five dimensions as, "the tendency for people to overestimate their own abilities, their own prospects for success, the probability of positive outcomes, the accuracy of their own knowledge, and to perceive themselves more favorably than they perceive others" (p.60).

Overconfidence of the investors is the manifestation of various propensities. The overrating of an investor's stock picking ability by taking too much credit for the winners, believing blindly in the accuracy of the information in hand, overestimating the probability of favorable events, considering oneself better than the competitors in the same league, and the propensity to look at only the positive side, manifest into overconfidence of the investors.

(3) Review of Literature Related to Behavioral Biases : Some researchers identified the relationship among the behavioral biases. Agrawal (2012) explored the interaction among the behavioral biases : overconfidence, overoptimism, representativeness, familiarity, and limited attention. The propositions put forward were that an overconfident person is most likely to be over optimistic and there is a two-way relationship between the status quo bias and familiarity bias which is complimentary in nature. Igual and Santamaría (2017) proposed a conceptual framework explaining the interaction of the biases: loss aversion, overconfidence, and herding. Fernández, Garcia - Merino, Mayoral, Santos, and Vallelado (2009) demonstrated that herding bias was the result

of the interaction among the behavioral biases : illusion of control, self-attribution, overconfidence, hot-hand fallacy, and gambler's fallacy in an uncertain financial environment.

Other studies found connections among the behavioral biases depending on the personality type of the investor. Lin (2011) examined the impact of the biases - herding, disposition effect, and overconfidence on the personality traits and demographics of investors in the Taiwan stock market. The study found that extraversion had a significant positive relation with overconfidence and herding, implying that investors with this trait would tend to follow others' opinions and would also hold on to losing stocks with the hope of revival. Jamshidinavid, Chavoshani, and Amiri (2012) studied the relation among the personality traits, demographics, and behavioral biases like overconfidence, herding, and disposition effect in the Tehran stock market. The study revealed that extraversion had a significant positive relationship with overconfidence and disposition effect, implying that extrovert investors had high confidence levels and preferred to hold on to losing stocks after obtaining profits from pre-sale stocks.

Objective of the Study

The main aim of this study is to determine the relationship among the behavioral biases like mental accounting, anchoring, gambler's fallacy, availability, loss aversion, regret aversion, representativeness, and overconfidence exhibited by the secondary equity investors residing in Chennai.

Sample and Methodology

The population for the study were the secondary equity investors residing in Chennai. The samples selected for the study were the members of the Tamilnadu Investors Association (TIA) and the clients of a popular financial services company, Integrated. The data were collected via the questionnaire survey method during the period of June 2015 to August 2015.

TIA was selected as it was the only formal body which allowed access to collect data from its members. During the Tamilnadu Investors Association (TIA) meetings, 65 questionnaires were distributed. Out of these 65 questionnaires, only 61 were returned ; 7 questionnaires were incomplete and hence could not be taken as valid. Among the rest of the 54 completed questionnaires, all of the filled up questionnaires were taken as eligible.

Integrated was selected as it was the only company which allowed access to collect data from its clients. The clients of Integrated were met in person and 360 copies of the questionnaire were distributed. Among the 360 questionnaires distributed, 320 questionnaires were returned, among which 15 questionnaires were incomplete and hence were considered as invalid. Among the 305 completed questionnaires, all the filled up questionnaires were taken as valid ; 77 questionnaires were completed through online questionnaire filling by investors selected via snow ball sampling techniques. Thereby, a total of 436 valid questionnaires were collected. The Table 1 illustrates the sample of the study.

Table 1. Sample of the Study

Data Source	Questionnaires Distributed	Questionnaires Returned	Incomplete Questionnaires	Valid Questionnaires
Integrated	360	320	15	305
TIA meeting	65	61	7	54
Online questionnaires	-	-	-	77
Total				**436**

Table 2. Mean Values of the Behavioral Biases

S.No	Biases	S.No	Variables	Mean	Total Mean
1.	**Mental Accounting**	a	You have a portfolio of say 10 stocks from different companies. If only two stocks depreciate by 50 %, will you be worried?	3.28	
		b	Do you assign different functions to different investments ? For example, do you invest money in separate accounts for purposes like child's marriage, education, etc.?	3.10	15.46
		c	Do you sell all the losing stocks on the same day?	2.42	
		d	Do you sell the winning stocks on different days ?	3.30	
		e	In your equity portfolio, do you always consider the winning stocks and the losing stocks separately?	3.36	
2.	**Anchoring**	a	You purchased some stock at a price of ₹ 2000. The price of that stock has come to ₹ 1500. You get to know some bad news about the company also. You are advised to sell it. You do not want to sell it as you believe that the prices will go back to ₹ 2000 (the purchase price) or more.	3.31	16.63
		b	You and your friend buy the same stock at ₹ 2000. Your friend, however, sold the stock at ₹ 2500. But you were holding on to the stock. Later, the price falls. You, however, hold your stock, waiting for the stock price to reach ₹ 2500 (the price at which your friend sold the stock).	3.32	
		c	Do you look at the 52 week high before you make the sell decision for a stock?	3.55	
		d	Do you look at the 52 week low before you make the buy decision for a stock?	3.50	
		e	You bought a stock for ₹ 200. Your friend has the same stock, but he bought it at ₹ 100. The value of the stock now is ₹ 150. Will you be worried?	2.95	
3.	**Gambler's Fallacy**	a	Recall your experiences in the stock market during the last couple of months/years, and tell us whether you are normally able to anticipate the end of a rising or falling trend ?	3.27	15.79
		b	Do you believe that a downward trend of the share prices should be followed by a reversal ?	3.52	
		c	Do you believe that the stock market cannot decline for a period of 4 years continuously ?	3.27	
		d	Do you believe that the market is volatile?	2.64	
		e	If in each month of the last 6 months, the Index value increased, would you expect the value of the Index to decrease in the 7th month?	3.09	
4.	**Availability**	a	You buy stocks, which are the current flavor of the market, which are recommended by leading analysts and brokers, which are vividly displayed in the media by repeated recommendations, and about which information is readily available; you don't bother to cross check all these information before acting upon them.	3.02	15.22
		b	You always consider all the necessary stock information before buying a stock and take effort to find the necessary information.	2.53	
		c	You generally buy a stock after continuous positive news about the stock.	3.50	
		d	You generally sell a stock after continuous negative news about the stock.	3.27	
		e	You prefer to buy stocks on the days when the value of the Index increases.	2.90	
5.	**Loss Aversion**	a	You want to play it safe and do not want to lose even a part of your capital. So, you prefer to invest your money in safe fixed income securities.	3.05	16.44
		b	Initially, you had 30% of your portfolio in technology stocks. When the technology stocks fell, you gradually increased your commitment up to 100%, hoping that there would be a complete reversal.	3	
		c	In a period of uncertainty in the stock market, when you have to sell the shares, you prefer to sell the winning stocks than the losing stocks.	3.03	
		d	You would sell the stock as soon as the stock price crosses your desired price level.	3.59	

		e	You would hold the stock till the stock reached your desired price level.	3.77	
6.	**Regret Aversion**	a	Before you take a decision to buy a stock, you take into account all the consequences of your decision.	3.78	16.83
		b	You postpone selling losing stocks as you want to avoid regretting later.	3.26	
		c	You speedup selling the winning stocks in order to enjoy the feeling of success.	3.34	
		d	Do you continue to monitor the winning stocks you have already sold and regret if the prices went up further ?	3.04	
		e	If a stock is bought at ₹ 2000, the pain of seeing it fall to ₹ 1000 is more than the joy of seeing it rise to ₹ 3000. The pain of regret is always greater than the feeling of joy.	3.41	
7.	**Represent-ativeness**	a	Do you think that the past performance of a stock indicates the stock's future returns?	3.36	15.90
		b	Do you think it is easier to make the stock purchase decision when the stock has many positive resemblances to the past?	3.50	
		c	You can see patterns in the stock prices even when the prices seem very volatile.	3.27	
		d	You would immediately buy a stock suggested by your favorite financial advisor/TV channel.	2.92	
		e	You would immediately buy a stock suggested by a friend, on whose advice you had made a profit earlier.	2.85	
8.Overconfidence		a	Though the stock purchase decision is a difficult task, you are confident now after having gained much experience over the years in the stock market.	3.47	16.98
		b	You are sure about how you interpret the information available about the stock.	3.32	
		c	Most of the profits you made in the stock market are because of your own expertise in this field.	3.39	
		d	You see a higher probability of success than failure in your stock trading decisions.	3.31	
		e	Since you collect extensive information about the stock you are about to purchase, you are positive about the outcome of your decision.	3.49	

Data Analysis and Discussion

The eight behavioral biases, namely : mental accounting, anchoring, gambler's fallacy, availability, loss aversion, regret aversion, representativeness, and overconfidence were measured based on five questions each on a Likert scale. The scores were then added to calculate the total score of each of the biases. The reliability score of the behavioral biases measured was determined by way of Cronbach's coefficient alpha technique, which indicated acceptable internal consistency (0.826). The individual means of each of the variables and the total means of the biases are given in the Table 2.

The mean and standard deviation of the total scores of the eight biases are given in the Table 3, ranked in the descending order. Overall, all the scores are higher than 15 in the range between 25 *(highest)* and 5 *(lowest)*, indicating that the respondents seemed to be exhibiting all the behavioral biases. However, though the scores for the behavioral biases are positive, they are not very high. This implies that the respondents were more conservative in their responses. The overconfidence bias was the highest ranked, followed by regret aversion, anchoring, loss aversion, representativeness, gambler's fallacy, mental accounting, and availability being the lowest.

Paired sample *t* - test has been used to determine the relationship among the variables in a number of studies in different fields. Tsai and Huang (2008) used paired sample *t* - test to determine the relationship among the ethical climate types, three components of organizational commitment, and job satisfaction facets among the nurses in Taiwan. Woodman and Hardy (2003) used paired sample *t* - test to determine the relationship between self

Table 3. Descriptive Statistics of Biases

S.No	Bias	Mean	*S.D*
1	Overconfidence total	16.98	4.017
2	Regret Aversion total	16.83	3.674
3	Anchoring total	16.63	3.845
4	Loss Aversion total	16.44	3.772
5	Representativeness total	15.90	3.821
6	Gambler's Fallacy total	15.79	2.791
7	Mental Accounting total	15.46	3.596
8	Availability total	15.22	3.002

Table 4. Paired Sample *t* - test : Overconfidence Bias

S.No	Pairs	Mean	*S.D*	*T*	*p*-value (2-tailed)
1	Overconfidence - Representativeness	1.083	4.677	4.833	**0.000****
2	Overconfidence - Regret Aversion	0.163	4.352	0.781	0.435
3	Overconfidence - Loss Aversion	0.539	4.792	2.349	**0.019***
4	Overconfidence - Availability	1.761	4.793	7.675	**0.000****
5	Overconfidence - Gambler's Fallacy	1.188	4.285	5.79	**0.000****
6	Overconfidence - Anchoring	0.358	5.321	1.404	0.161
7	Overconfidence - Mental Accounting	1.518	5.351	5.925	**0.000****

Note : ** - rejected at 0.01 level * - rejected at 0.05 level

Table 5. Paired Sample *t* - test : Regret Aversion Bias

S.No	Pairs	Mean	*S.D*	*T*	*p* - value (2-tailed)
1	Regret Aversion - Loss Aversion	0.376	3.597	2.184	**0.030***
2	Regret Aversion - Representativeness	0.920	3.498	5.490	**0.000****
3	Regret Aversion - Availability	1.599	3.872	8.622	**0.000****
4	Regret Aversion - Gambler's Fallacy	1.025	4.004	5.346	**0.000****
5	Regret Aversion - Anchoring	0.195	4.209	0.967	0.334
6	Regret Aversion - Mental Accounting	1.356	4.469	6.334	**0.000****

Note : ** - rejected at 0.01 level * - rejected at 0.05 level

confidence and cognitive anxiety. Hence, in this study, by using paired sample *t* - test, significant differences between each pair of the eight biases were determined.

The paired sample *t* - test results (in Table 4) and the descriptive statistics results (in Table 3) show that the overconfidence bias level is significantly higher than all other biases except regret aversion and anchoring biases because of the higher mean. This implies that the respondents exhibited higher overconfidence bias when compared to most other biases, that is, representativeness, loss aversion, availability, gambler's fallacy, and mental accounting.

The paired sample *t* - test results (in Table 5) show that regret aversion bias level is significantly higher than loss aversion, representativeness, availability, gambler's fallacy, and mental accounting biases except the anchoring bias. This implies that the respondents exhibited higher regret aversion bias when compared to most other biases.

Hence, based on Tables 4 and 5, there are no significant differences among overconfidence bias, regret aversion bias, and anchoring bias. Respondents prone to overconfidence bias were hence most likely to exhibit regret aversion bias and anchoring bias. Similarly, respondents prone to regret aversion bias were most likely to exhibit the same level of overconfidence bias and anchoring bias, and respondents prone to anchoring bias were most likely to exhibit the same level of regret aversion bias and overconfidence bias.

The paired sample *t* - test results (in Table 6) show that the anchoring bias level is significantly higher than representativeness, availability, gambler's fallacy, and mental accounting biases except the loss aversion bias. This implies that there is no significant difference between anchoring bias and loss aversion bias. Hence, respondents prone to anchoring bias were most likely to exhibit loss aversion bias. Similarly, respondents prone to loss aversion bias were most likely to exhibit anchoring bias.

The paired sample *t* - test results (in Table 7) show that the loss aversion bias level is significantly higher than the representativeness, availability, gambler's fallacy, and mental accounting biases. This implies that the respondents exhibited higher loss aversion bias when compared to most other biases.

The paired sample *t* - test results (in Table 8) show that the representativeness bias is significantly higher than the availability bias. There is no significant difference among representativeness, gambler's fallacy, and mental accounting biases. This implies that respondents who exhibited representativeness bias were most likely to exhibit gambler's fallacy and mental accounting biases. Similarly, the respondents who exhibited gambler's fallacy bias were most likely to exhibit representativeness bias and mental accounting bias. Also, the respondents who

Table 6. Paired Sample *t*- test : Anchoring Bias

S.No	Pairs	Mean	*S.D*	*T*	*p* - value (2-tailed)
1	Anchoring - Representativeness	0.725	4.370	3.463	**0.001****
2	Anchoring - Loss Aversion	0.181	4.080	0.927	0.354
3	Anchoring - Availability	1.404	3.903	7.509	**0.000****
4	Anchoring - Gambler's Fallacy	0.830	4.055	4.275	**0.000****
5	Anchoring -Mental Accounting	1.161	4.056	5.974	**0.000****

Note : ** - rejected at 0.01 level

Table 7. Paired Sample *t* - test : Loss Aversion Bias

S.No	Pairs	Mean	*S.D*	*t*	*p* - value (2-tailed)
1	Loss aversion - Representativeness	0.544	3.841	2.955	**0.003****
2	Loss Aversion - Availability	1.222	3.842	6.645	**0.000****
3	Loss Aversion - Gambler's Fallacy	0.649	4.232	3.203	**0.001****
4	Loss Aversion - Mental Accounting	0.979	4.379	4.67	**0.000****

Note : ** - rejected at 0.01 level

Table 8. Paired Sample *t* - test : Representativeness Bias

S.No	Pairs	*Mean*	*S.D*	*t*	*p* - value (2-tailed)
1	Representativeness - Availability	0.679	4.056	3.495	**0.001****
2	Representativeness - Gambler's Fallacy	0.106	4.287	0.514	0.608
3	Representativeness - Mental Accounting	0.436	4.562	1.995	**0.047***

** - rejected at 0.01 level * - rejected at 0.05 level

Table 9. Paired Sample *t* - test : Gambler's Fallacy Bias

S.No	Pairs	Mean	*S.D*	*t*	*p*-value (2-tailed)
1	Gambler's Fallacy - Availability	0.573	3.511	3.41	**0.001****
2	Gambler's Fallacy - Mental Accounting	0.33	3.812	1.809	0.071

** - rejected at 0.01 level

Table 10. Paired Sample *t* - Test : Mental Accounting Bias

S.No	Pairs	Mean	*S.D*	*T*	*p* - value (2-tailed)
1	Mental Accounting - Availability	0.243	4.097	1.239	0.216

exhibited mental accounting bias were most likely to exhibit gambler's fallacy bias and representativeness bias.

The paired sample *t* - test results (in Table 9) also prove the same. Also, the gambler's fallacy bias is significantly higher than the availability bias. The paired sample *t* - test results (in Table 10) show that there is no significant difference between mental accounting and availability biases. Hence, respondents who exhibited mental accounting bias were most likely to exhibit availability bias. Similarly, the respondents who exhibited availability bias were most likely to exhibit mental accounting bias.

The main findings of these paired sample *t* - tests are :

↳ Respondents prone to overconfidence bias were most likely to exhibit regret aversion bias and anchoring bias as the respondents did not significantly differ in these biases. Similarly, the respondents prone to regret aversion bias were most likely to exhibit overconfidence bias and anchoring bias, and respondents prone to anchoring bias were most likely to exhibit regret aversion bias and overconfidence bias. One of the main assumptions of regret theory includes the comparison of the actual results with the results foregone and the resulting regret which follows if the foregone results are better (Zeelenberg, Beattie, Van der Pligt, & de Vries, 1996). Hence, in each case, the results forgone served as an anchor and the comparisons become relative to that anchor. Hence, investors prone to regret aversion were most likely to exhibit anchoring bias.

↳ Respondents prone to anchoring bias were most likely to exhibit more or less the same level of loss aversion bias. Similarly, respondents prone to loss aversion bias were most likely to exhibit anchoring bias. Barberis and Huang (2001) documented that the impact of loss aversion on the investor depended on the previous history of gains and losses. A loss which followed a previous loss was more hurtful than usual. On the other hand, a loss which followed a previous gain was less hurtful than usual. Hence, the sensitivity to the loss depended on the cushioning of the previous gain or the burning of the previous loss. Hence, the previous gain or loss served as an anchor which affected the loss averse nature of the investor. Thus, investors prone to loss aversion were most likely to exhibit anchoring bias. The correlation coefficient between the loss aversion bias and the anchoring bias is also high (0.426) and significant at alpha value even less than 0.001, thereby reinforcing this relationship.

↳ Respondents who exhibited representativeness bias were most likely to exhibit gambler's fallacy and mental accounting biases. Similarly, the respondents who exhibited gambler's fallacy bias were most likely to exhibit representativeness bias and mental accounting bias. Also, the respondents who exhibited mental accounting bias were most likely to exhibit gambler's fallacy bias and representativeness bias. Representativeness, believing that small samples should also be representative of the underlying process (Kahneman & Tversky, 1972), is the source of gambler's fallacy (Johnson & Tellis, 2005). Hence, investors prone to gambler's fallacy were most likely to exhibit representativeness bias.

↳ Respondents who exhibited mental accounting bias were most likely to exhibit availability bias. Similarly, the respondents who exhibited availability bias were most likely to exhibit mental accounting bias. "The study of mental accounting is a study of the mental representation of information" (Soman, 2004, p.382). When individuals are faced with a purchase decision, they look at the availability of budgets (Heath & Soll, 1996). Hence, the latest available information plays an important role in the formation of decision frames or the mental accounts. Hence, investors prone to mental accounting bias were more likely to exhibit availability bias.

Research Implications

This paper aims to create awareness among the investors about what behavioral biases they are most likely to exhibit because of the presence of one bias. This awareness could help the investors to keep a check on these biases while making investment decisions in the stock markets. By understanding oneself better in terms of one's weaknesses, the investors could strive to make better investment decisions and thereby avoid irrational blunders. Market efficiency could be improved in the long run if the investors could make better investment decisions. The knowledge of the relationship among behavioral biases would help financial advisors in their preliminary diagnosis of the investors' behavior and would also improve the quality of their financial advice. They can also sketch out better customized investment plans for the investors and also streamline their irrational preferences.

Conclusion

This study finds the relationship among the behavioral biases exhibited by the secondary equity investors in Chennai by using a questionnaire survey of 436 respondents. Eight behavioral biases namely, mental accounting, anchoring, gambler's fallacy, availability, loss aversion, regret aversion, representativeness, and overconfidence were measured on a Likert scale. The important relationships among the behavioral biases determined were that the biases : (a) overconfidence, regret aversion, and anchoring biases ; (b) loss aversion and anchoring ; (c) representativeness, gambler's fallacy, and mental accounting ; and (d) mental accounting and availability biases of the secondary equity investors were interrelated. Hence, this study would enable investors to become aware of the behavioral biases they are most likely to exhibit because of the presence of one bias and in the long run, avoid the biases, thereby leading to a more rational stock market environment.

Limitations of the Study and Scope for Future Research

This study is limited to only the secondary equity investors residing in Chennai. It is desirable to extend this research to other parts of the country so that further generalization of the results is possible. Also, the behavior of other stock market players like primary equity investors, mutual fund investors, and financial advisors could also be studied to enhance the understanding of their behavior. Other behavioral biases like hindsight bias, herd behavior, overreaction bias, conservatism, etc. could also be studied to get a wider perspective on investor behavior.

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