Indian Journal of Economics and Business
Vol. 20 No. 3 (December, 2021)

http://www.ashwinanokha.com/IJEB.php

Relating Behavioral Biases to Personality:An empirical investigation on prospective Investors

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Received: 27th August 2021
Revised: 17th September 2021
Accepted: 27th September 2021

Abstract: The descriptive status of behavioral economics theories has faced criticism about whether they may be predictive – a mainstay of traditional economics. The paper aims to achieve the objective of developing a model that may be applied to identify the behavioral and differential factors that may impact the financial choices of an individual, which in turn may be used for choice prediction.An investigation into the factors that influence individuals' financial choices is required to ensure a more efficient and stable financial market that is less vulnerable to asset pricing bubbles.Researchers have opined that behavioral bias can be affected by the decision-maker's personality. An individual's personality traits can be used in tandem with their biases to develop a behavioral pattern of financial choices. Such profiles may be used to classify the probable investors and then guide them to better decisions that can optimize the returns from their portfolio, with the added advantage of enhancing stock market movements. In this study, the researchers have investigated the relationship between the different kinds of biases. The correlation of the biases and the personalities was not only proposed through a self-developed questionnaire, but also validated through Structural Equation modelling. Based on such relationships, the investors have been classified into three different types – the overconfident investor, apprehensive investor and the final kind of investor is a gambler. The professional advisors may use these profiles to categorise their clientele and suggest better portfolios to them, according to their financial objective.

Keywords: Behavioral Bias, Personality Traits, Behavioral Profiles, Indian Individual Investors, Behavioral Economics.

Introduction

According to the Expected Utility Theory, the predictive model of human choices offered by neo-classical economics is an idealized model of human decision-making, making unbiased future

predictions (Richard Thaler, 1999). The ideal agents, often called rational, are presumed to drive the asset prices in financial markets. However, Kahneman and Tversky noticed that people made systematic errors in their perception of randomness (Daniel Kahneman & Tversky, 1972); (Tversky, 1969) known as behavioral biases. A behavioral bias is the *'predisposition towards error'*(H. Shefrin, 2007). As a theory that may explain the non-conformity of an individual's choices when faced with outcome uncertainty, the *Prospect Theory* (Daniel Kahneman & Tversky, 1979) is a leading alternative to the classical Expected Utility Theory (von Neumann & Morgenstern, 1944). The asymmetry of risk attitudes in the case of probable gains and losses, along with the disparities in the assessment of probabilities, were important implications of the Prospect Theory (van der Pligt, 2001).The field of behavioral economics allows for the possibility that individuals are not the perfect agents from economic theory; it accepts a person's biases and posits that all individuals are unique to a certain degree (Schumpe & Erb, 2015).Such differences may arise on account of situational or social settings.

Apart from the biases themselves, factors such as past experiences(E. Juliusson et al., 2005), (West et al., 2008), and individual differences (De Bruin et al., 2007) may influence decision-making. An individual's personality is the unique combination of specific patterns and characteristics that influence their behavior and motivation (Pervin, 2000).Personality is often used in common parlance to describe how an individual may behave (Gopal & Hemalatha, 2020).Different personalities may have different approaches to decision-making (Welsh et al., 2011). Since the impact of behavioral biases on decisions is well established in literature, and personality also manifests across the various choices people make, there may be a relationship between personality and behavioral biases. They may have a collective impact on the investment decisions of individuals. This research aims to find any potential connections between personality and behavioral biases present among individuals.

Since behavioral economics specialists have yet to reach a consensus regarding how behavioral biases interact and have an overall impact on financial decisions, it is yet to gain acceptance in academic circles truly. The criticism regarding the inability of behavioral economics to move from the descriptive approach to a normative one is well-founded.Most research is either conducted in controlled experiments, based on the results of field studies, or has merely focused on the impact of very selective biases on financial choices (Pūce, 2019). The descriptive status of behavioral economics theories has faced criticism about whether they may be predictive – a mainstay of traditional economics (McChesney, 2013).

The paper aims to achieve the objective of developing a model that may be applied to identify the behavioral and differential factors that may impact the financial choices of an individual, which in turn may be used for choice prediction. The paper measures how far the behavioral biasesand the individual differences of personality impact decision-making and whether any relationships exist between these two dimensions. Individual investors play a significant role in the Indian financial markets and thus their decisions also have a quantitative impact on the movements of the financial markets (Chandrasekhar & Malik, 2015). As mentioned above, most of the studies in behavioral economics are focused on the behavior of institutional investors or draw conclusions based on the results of experimental surveys. The results of such previous studies have yet to provide findings that may be generalized for the individuals who have a noticeable impact on the financial markets. Although the field of behavioral economics is the study of how behavioral biases can influence behavior, there is a differential in the extent of the manifestation of behavioral biases. The differential in the impact of biases may be linked to personality, the representation of distinct characteristics, and patterns in everyday decisions. In this study, the research investigates any probable relationship between an individual's personality and behavioral biases.

A limited appraisal of behavioral biases

Individual decision-makers irrational decisions have a quantifiable impact on the financial markets was proved by Thaler's paper 'Do the stock markets overreact?'(Bondt & Thaler, 1985), which initially met a dismissive attitude of the empirical economists. Their further work, 'psychology of preferences' (D. Kahneman & Tversky, 1982), proved that people's departure from objectivity in the framing of preferences due to seemingly inconsequential factors such as regret or experiences follow mathematical patterns and thus may be measurable. The external stimuli that the person experiences often influence the subjective valuation of the decision outcomes (Daniel Kahneman & Tversky, 1984). While faced with economic choices whose effects are unknown, people are often swayed by heuristics and biases. Richard Thaler, another theorist frombehavioral economics, wrote 'Misbehaving', a history of the development of behavioral economics, which iterated a list of 'anomalies', that proved that all human beings are prone to making seemingly irrational decisions(R. Thaler, 2015). In this work, he has identified many biases, which are listed below:

Confirmation bias – A term coined in the 1960s (Wason, 1960), it has been applied to economic, political and scientific context; it is the seeking of information that supports the previously formed judgments of the individual (Nickerson, 1998); (Jones & Sugden, 2001). A narrow search may be due to the fear of new, which encourages them to look for information that supports the known and established hypothesis (Bernard Barber, 1961). Researchers have suggested that the confirmation bias allows investors to be excessively attached to the information that confirms their own opinion and ignores information that does not (Leković, 2020). Investors with confirmation bias may not be willing to heed any information maybe negative about their held investments.

Gambler's Fallacy Bias – The misplaced belief that the happenstance of one event needs to be *'balanced'* by the happening of the opposite outcome can be first traced to the work of Murray Jarvik (Jarvik, 1951). The proposition that people find it difficult to separate their expectations from a random series of events and misjudge the probability of a particular event occurring was first proposed in the *Philosophical Essays on Probabilities* (Laplace, 1825). The economic implication of such a bias is that people prone to the bias will notice more streaks in the financial markets than exist (Gagnon-Bartsch et al., 2020).

Hindsight bias - The existence of the hindsight bias had been indirectly referred to by historians and philosophers (Hexter, 1961) and has been proved to exist in experiments, where people attempt to rationalize the past after the outcome has occurred (Baruch Fischhoff & Ruth Beyth, 1975). If the decision-maker believes that the past was foreseeable, and holds no surprises, they may ignore the opportunity to improve their comprehension (Fischhoff, 1975).When the past outcome was adverse, even the professionals believed that such result was more foreseeable (Strohmaier et al., 2020); financial managers are no exception, being excessively confident of the power of their estimation (Hussain et al., 2013). Research into the hindsight bias reveals that the people's retrospective adjustments to the probability of a certain outcome may be affected by their familiarity with the process itself (Christensen-Szalanski & Willham, 1991).

Mental accounting bias –Mental accounting bias is the process of tracking, evaluating, and organising financial activities according to some mental shortcuts (R. H. Thaler, 1999). Traditional economics ignores the impact of previous outcomes on the current choices, and the mental accounting framework suggests that choices under uncertainty are influenced by previous gains or losses (R. Thaler, 1985). The first empirical evidence regarding such a psychological approach to accounting for wealth was provided by Kahneman and Tversky (Tversky & Kahneman, 1981). Studies have proved that mental accounting may also explain spending patterns of income (Sui et

al., 2021). The mental accounting bias may also have links with the **house money bias**, which leads to individuals changing risk preferences with increasing wealth.

Anchoring and adjustment bias – Tversky and Kahneman's seminal work on anchoring and adjustment (Tversky & Kahneman, 1974) paved the way for research into anchoring and adjustment heuristic. Often linked to biases such as the hindsight bias, preference reversal and other egocentric biases, relying on a particular piece of information as an 'anchor' and 'adjust' from such anchor till a reasonable estimate is reached, known as the anchoring and adjustment bias (Epley & Gilovich, 2006). The anchoring bias affects the ability of an individual to update the information that they receive, and they may resist making the adjustments required for a more accurate prediction (Joyce & Biddle, 1981). Individuals seldom consider any events unique – they process all events through the pre-existing beliefs, knowledge and theories for interpretation (Nisbett & Ross, 1980).

Recency bias - The tendency to dismiss older information in favour of recent information (Fudenberg et al., 2013)is known as recency bias. The impact of recency bias on a judgment has been proved in experiments (Hogarth & Einhorn, 1992)(Stewart et al., 2004). It affects the quality of decision-making to the extent that even strong emotions cannot moderate the impact of such biases on decisions made by individuals (Rudiawarni et al., 2020). The recency bias influences the investors to have tunnel vision about the persistence of the current economic conditions for the foreseeable future (Feldman, 2011).

Loss aversion bias - The 'S'- shaped value function of Prospect Theory was a marked deviation from the Markowitz model (Markowitz, 1952), which had, till then, served as the representation of the value derived from expected utility theory. Loss Aversion was proposed to be the reason behind such asymmetric value function (Kahneman & Tversky, 1979). According to the authors, loss aversion is a steeper utility function for losses rather than equivalent gains (Schmidt & Zank, 2005), meaning that people are more sensitive to losses than gains. The extent of such sensitivity maybe due to individual predispositions and the environment they face (Rakow et al., 2020).

Overconfidence bias–It has often been suggested as the most prevalent in decision-making (Plous, 1993).Overconfident individuals also believe that they have performed better than their peers and that their belief is superior (Moore & Healy, 2008). Overconfident investors often overreact to any information they may receive (Parveen et al., 2020), and engage in excessive trading(Barber & Odean, 2001), which has adversely affected investment returns(Odean, 1998).

Status quo bias – A clear preference for continuing the existing circumstances, even at the cost of ignoring new, more beneficial options.Its impact on decision making was proved by experiments of choice (Daniel Kahneman et al., 1991; Samuelson & Zeckhauser, 1988). Often represented as an extreme dislike of change, it may occur due to the fear of any potential downsides to such change (Soofi et al., 2020). Even market-makers such as institutional investors are influenced by the status quo bias (El Harbi & Toumia, 2020). Status quo bias is often combined with loss aversion bias and the endowment effect, as investors keep holding on to the investments with which they emotionally identify or may maintain the status quo to avoid any loss.

Endowment bias - A market requires that sellers and buyers reach a mutually acceptable price for the tradeable asset. Laboratory experiments, however, found that individuals are often unwilling to trade with items they have ownership of, even recently(Knetsch & Sinden, 1984)(Strahilevitz & Loewenstein, 1998). People overvalue the assets that they own, and buyers of the same tend to understate the amount they are willing to pay, causing issues over negotiated prices (Knez et al., 1985)(Daniel Kahneman et al., 1991), perhaps being excessively influenced by their emotions

(Martinez et al., 2011). However, recent research has found that when people make decisions for others, such as when portfolio managers make decisions for their clients, they may be willing to pay more than the beneficiary (Ifcher & Zarghamee, 2020).

Regret aversion bias –When faced with an option, people often clearly prefer the safer one. Research shows that people's motivations aim to reduce any regret they may feel in the future (Zeelenberg et al., 1996). Regret aversion has also been linked to the **'framing'** bias and **'preference reversal'** bias(Loomes & Sugden, 1982).Regret theory also has applications in the preference of investors for cash dividends (H. M. Shefrin & Statman, 1984). It may be why people are more fearful of losing than excited about gaining, i.e. **risk aversion**(Daniel Kahneman & Tversky, 1979).

Herding – Herding is rooted in Keynes' sociological forces that shape conventions during uncertainty (Keynes, 1936), which may be motivated, in part, due to concerns about their reputation (Scharfstein & Stein, 1990). Individuals' mimic the decisions of other individuals and often prefer to follow group decisions rather than relying on private information (Baddeley, 2010). Mimicry may be due to the decision-maker expecting that optimal solution may be reached by following the actions of the preceding individual (Bikhchandani et al., 1992)(Banerjee, 1992). Herding has a significant role in asset pricing and financial markets (Chauhan et al., 2020).

Although the research in behavioral economics has picked up the pace, research is still to establish the biases conclusively among individuals. Further, the studies are conducted inexperiments under laboratory settings, which may or may not be predictable. The neoclassical economists consider economics as an empirical science. Its main objective is to provide theories and techniques that are instrumental in understanding real-world phenomenon(Stigler, 1983). Where neoclassical economics offers an approximation for human decision-making processes, the field of behavioral economics isrestricted chiefly to finding evidence of biases in experiments. Research into the decision-making processes in real-life scenarios is still an area that needs more empirical research to prove the predictive capabilities of the theories of behavioral economics. The biases owe their existence to the application of psychological insights to economics. Consequently, most of the seminal work is focused on proving the existence and impact of specific biases rather than considering them as parts of a functioning whole that shape an individual's decisions. Further, the above-mentioned probable congruency in the presentation of the biases may mean that rather than studying the vast majority of biases, new groups of biases based on their correlation may be proposed. These groups may be used as a representation of the various biases.

Studies in behavioral economics have intensified in India in the last decade (Mushinada & Veluri, 2019; Prosad et al., 2015), though most of them are for institutional investors. Institutional investors are significant participants in the financial markets, undoubtedly, but that does not signify that the individuals are to be ignored. The individual investors, in multitudes, do have a measurable impact on the market efficiency. In one of the largest stock exchanges in India, the National Stock Exchange, nearly 45% of the trading turnover was contributed by the retail investor group (Shah, 2021). An investigation into the factors that influence individuals' financial choices is required to ensure a more efficient and stable financial market that is less vulnerable to asset pricing bubbles. The seminal studies that have been included in the literature section are mostly restricted to experiments or are the study of the specific biases. The studies are relevant to the extent of identification of the biases and their manifestation among people; they are, however, yet to be studied in a holistic context, where their interrelationships and their overall impact on decision making is presented.

How does personality shape decisions?

Behavioral economics has the basic premise of imperfect human beings and their different choices; they often make decisions motivated by reasons other than utility maximization(R. H. Thaler, 2015).In the realm of the more human factors influencing financial choices, individual personality also plays a role (Brown & Taylor, 2014)(Chitra & Ramya Sreedevi, 2011).An individual's personality is the unique pattern of enduring thoughts, feelings and actions that define a person (Bernstein et al., 2008).However, since psychology is yet to offer a standardized definition of a personality, the trait theory is more accepted in academic circles. The trait theories attempt to measure the an individual's personality based on certain stable, unique characteristics (Allport, 1937).There are various approaches to describing personality, such as Cattell's 16 factor theory (Cattell, 1950), the Big Five Model (Cattell et al., 1970).The MBTI® has often been linked to the Big Five Model, as some of the traits are correlated (McCrae & Costa, 1989). Many researchers have replicated the Big Five Model of personality traits reliably(Digman, 1990). It has been proved with reliable results across cultures and gender, and age (Allik & Mccrae, 2002). Researchers have opined that the Five-Factor Model is a replicable model that can be applied across various fields while inculcating an array of personality constructs that can be used to explore the relationship between personality and other phenomena (Hogan, 1987).The FFM is considered the model that captures the individual differences while retaining the various processes of personality (McCrae & John, 1992). Since this paper is concerned with the presence of biases among individuals and the different ways they manifest, coupled with individual differences of personality, the FFM seems to be the most appropriate model to be applied. Considering the country of origin for the Five-Factor Model is culturally caucasian there are quite a few departures from the original taxonomy in the Indian context (Nandy & Kakar, 1980; Narayanan et al., 1995). The authors have applied the Five-Factor Model to identify any relationships between different personalities and behavioral biases in this research.However, due to the aforementioned differences in the cultural context, the researchers modified some of the model items to identify the different types of individual traits on the five-factor continuum.

Openness to experience – People who are more open to experience are consideredimaginative, flexible in behaviour, curious, and liberal in values (Paul T. Costa & McCrae, 1989). Closed people are often set in their ways, lack curiosity, hold traditional values, uninterested in art (Paul T. Costa & McCrae, 1989). Often characterized as articulate, expressive, and humorous, they prefer to present their creativity in their social interaction along with their opinions and emotions (Sneed et al., 1998)(Marcus et al., 2006).

Conscientiousness – It is the ability to be goal-directed, follow prescribed norms and delay gratification (O. P. John & Srivastava, 1999). Conscientious individuals are likely to be careful regarding goal selection and optimize existing goals (Bajor & Baltes, 2003). Conscientiousness is often a predictor of how well a person's performance will be in the workplace (Bajor & Baltes, 2003). Industriousness, reliability, impulse control, and conventional beliefs were considered behaviors that represent conscientiousness (Roberts et al., 2005).

Extraversion– The features of extraversion emerged in Jung's work (Jung, 1921). Extraverts are often more talkative, assertive, energetic, and active (Lucas et al., 2000). Those who score low on this dimension are more reserved, quiet, shy, or silent (O. John, 1990). and are expected to perform well in leadership roles (Depue & Collins, 1999) and tend to be more hopeful (Paul T. Costa & McCrae, 1980).

Agreeableness – Agreeable individuals are perceived to be more trustworthy, compliant, altruistic, and modest (Paul T. Costa et al., 1991). Often found to manifest similarly as conscientiousness (Matthews & Oddy, 1993), it is often suggested that agreeable individuals are more responsive to

communication from others and more empathetic (W.G. Graziano & Tobin, 2009). Agreeable people perform well in groups, as they are cooperative and less prone to competitiveness (William G. Graziano et al., 1997).

Neuroticism – Generally associated with negative feelings such as fear, embarrassment, anger or sadness, (P. T. Costa & McCrae, 1992). Neurotic individuals are also prone to impulsivity and distressing emotions (P. T. Costa & McCrae, 1992). Other dimensions of this trait may be emotional volatility, excessive reaction to minor changes in the environment (Lahey, 2009), ranging from hostility to jittery or being upset (Watson et al., 1988). The dimension of neuroticism ranges from neuroticism to emotional stability (Digman, 1990).

Each individual is a unique combination of all these personality traits. Since this paper is studying them in the context of their impact on financial decision-makingand any potential relationships between them and the biases themselves, a probable investor profile will be proposed on the discovered personality profiles. Developing an investor profile based on such personality types will also help the advisors suggest more tailored advice that will encourage them to meet their long-term investment strategies while maintaining flexibility in their portfolio. Self-awarenessmay alsobenefit in reducing any inadvertent mispricing of assets in the financial markets, as the awareness of being vulnerable to certain biases will nudge the investors towards better choices.

Objective of the study

The economists set store by the principle that the market prices are accurate signals about how the optimal allocation of resources must be done (Grossman, 1981). Further research reveals that people behave differently by speculating, acting impulsively, or maintaining under-diversified portfolios, leading to sub-par performance in the financial markets (Barber & Odean, 2013). Yet, most of the studies are focused on the institutional investors, who may earn superior returns (Barber & Odean, 2013),neglecting individualsto their detriment. Researchers have opined that behavioral bias may be affected bygender (Bhandari & Deaves, 2006)(Malik et al., 2021), age (Kumar & Goyal, 2016), income (Dhar & Zhu, 2006), and personality traits (Rzeszutek, 2015) of the decision-maker.There are numerous models of personality traits; however, the most prevalent is the five-factor model of personality, which the study has used. However, an individual's personality traits can be used in tandem with their biases to develop a behavioral pattern of financial choices. Such profiles may be used to classify the probable investors and then guide them to better decisions that can optimize the returns from their portfolio, with the added advantage of enhancing stock market movements.

Methodology

Survey Instrument Development

A questionnaire-based survey method was used to collect data from respondents and test the proposed research model. The questionnaire consists of statements measuring seventeen constructs, with each construct being measured with three statements. The survey instrument was developed by carrying out a thorough survey of past literature and identifying the identifying features of the chosen variables. Since most of the studies carried out on the factors influencing investment choices of individuals are either based on Western investors or on have been carried out in laboratory settings, the researchers have developed the items. The questionnaire consists of two sections – the first section is about the respondent's personal information, and the second consists of the various statements of the behavioral biases. A total of 51 items were used to measure the 17 constructs. The items were self-constructed after consulting relevant literature and language experts

regarding the syntax of the statements. Each respondent was offered pre-coded choices ranging from 1(strongly disagree) to 5(strongly agree) on the Likert scale for each statement. Since there has been no consensus regarding the measurement of behavioral biases, the researchers have adopted some questions from the seminal work done in the area. The statements are not framed in monetary terms to avoid the investors overanalysing their response to the questions. As an individual's behavior is in the realm of psychological research, overt statements may not be able to measure the undiscovered biases in the individual. Thus, statements were framed in a manner that would not indicate the objective of the research to the respondent.

VARIABLES	LITERATURE ADAPTED FROM:	ITEMS
1. Status Quo	(Samuelson & Zeckhauser, 1988)	**SQ1$_r$** I try to experiment with new ideas irrespective of their outcome or the type of benefits they produce. (R)
		SQ2 I dislike any kind of changes in my lifestyle, irrespective of the benefits.
	(Kahneman et al., 1991)	**SQ3** I always stick to the existing conditions even when a change would
2. Recency	(Fudenberg et al., 2013)	**R1$_r$** Past history is important to predict the future, thus old information is very
	(Stewart et al., 2004)	**R2$_r$** To judge any current phenomena, I always rely more on historical data
	(Feldman, 2011)	**R3** The perfect outcome of any event can only be predicted when the latest information is used, ignoring the past history.
3. House Money	(R. H. Thaler & Johnson, 1990)	**HM1$_r$** If I win a lottery, I spend it to improve my daily standard of living. (R)
		HM2 I feel more confident about my choice in risky situations if I have been successful in my previous trials.
	(Peng et al., 2013)	**HM3** I spend money on unnecessary luxury items only when I receive some money suddenly, which is not at all expected by me.
4. Hindsight	(Fischhoff, 1975)	**HN1** Outcomes of any decisions always seem obvious and predictable to me after they have occurred.
	(Hussain et al., 2013)	**HN2** It is always possible to forecast the outcome of any event correctly however complex the mechanism may appear.
		HN3$_r$ Correct prediction of any complex event is always a chance of luck. (R)

5. Overconfidence	(Doukas & Petmezas, 2007)	**OC1** Most of the time, my decisions are far superior to others.
	(Moore & Healy, 2008)	**OC2** I am the best among my friends at handling complex situations.
		OC3$_r$ My other friends are far superior to me when it comes to taking a decision in a complex situation. (R)
6. Anchoring	(Tversky & Kahneman, 1992)	**AN1** While making decisions, I always set clear expectations of what the
	(Tversky & Kahneman, 1974)	**AN2** It is always better to rely on some information as a base to take future
	(Nisbett & Ross, 1980)	**AN3$_r$** While taking decisions for a current project, I seldom consider the
7. Gambler's Fallacy	(Nilsson et al., 2008)	**GF1$_r$** Predicting the outcomes of a future event based on past results of
	(Lyons et al., 2013)	**GF2** There is no true randomness in real life as all events are interrelated in some way or the other.
		GF3 If it did not rain for three consecutive days during the monsoon, I would always predict rain on the fourth day.
8. Herding Bias	(Baddeley, 2010)	**HD1** I always accept group decisions even when I realize they are wrong.
	(Bikhchandani et al., 1992)	**HD2$_r$** I always behave in such a manner that I am separately identified from the crowd. (R)
		HD3 I believe that the public opinion is usually correct.
9. Endowment Effect	(Knetsch & Sinden, 1984)	**EE1$_r$** I am always willing to sell even my personal possessions if I get satisfactory price. (R)
	(Strahilevitz & Loewenstein, 1998)	**EE2** I find it difficult to dispose of items that have sentimental value for me.
		EE3 I am unwilling to sell off my family heirlooms even if I face financial crises.

10. Confirmation Bias	(Bernard Barber, 1961)	**CB1** I only search for information that ultimately supports my ideas.
	(Nickerson, 1998)	**CB2** Information that does not support my expectations always irritates me.
		CB3$_r$ I always like to thoroughly analyse any contradictory ideas and change my opinion accordingly. (R)
11. Risk Aversion	(Tversky & Kahneman, 1992)	**RA1$_r$** I enjoy the challenges of dealing with uncertain and risky situations. (R)
	(Tversky & Kahneman, 1981)	**RA2** I prefer a longer route over a shorter, but dangerous road, even in a hurry.
		RA3 I utterly dislike to get involved in any situation with the slightest chance of danger or risk.
12. Loss Aversion	(Kahneman & Tversky, 1979)	**LA1** When I make decisions, I always worry more about losses.
	(Tversky & Kahneman, 1992)	**LA2** I do not like making decisions that have even a minimal chance of making losses.
		LA3$_r$ While taking a decision I do not care about any losses or any negative outcomes. (R)
13. Openness to Experience	(Paul T. Costa & McCrae, 1989)	**Open1** My interests cover a wide span of area.
	(Sneed et al., 1998a)	**Open2$_r$** I cannot stand complex intellectual and philosophical discussions. (R)
		Open3 I am always enthusiastic about new, experimental ideas.
14. Conscientiousness	(Roberts et al., 2004)	**Cons1** I cannot tolerate casual persons who do their jobs shabbily.
		Cons2$_r$ I am a forgetful person and often misplace important office documents. (R)
	(Roberts et al., 2005)	**Cons3** I lead a highly disciplined life and maintain a rigorous daily routine.

15. Extraversion	(Eysenck & Eysenck, 1964)	**Extra1** I like to spend my leisure time in company of other people.
	(Eysenck et al., 1992)	**Extra2$_r$** I like to maintain a low profile in any assembly, meeting or gathering.
	(Guilford & Zimmerman, 1949)	**Extra3** I am a fun loving and happy-go-lucky type person.
16. Agreeableness	(W.G. Graziano & Tobin, 2009)	**Agree1** I am a very compassionate type of person.
		Agree2$_r$ I never forgive anyone who wants to harm me. (R)
	(Paul T. Costa et al., 1991)	**Agree3** I am usually sympathetic to other people's problems.
17. Neuroticism	(P. T. Costa & McCrae, 1992)	**Neuro1** I always feel nervous before I start a new job or project.
		Neuro2$_r$ I stay relaxed even in a crisis situation. (R)
	(DeYoung et al., 2007)	**Neuro3** I often become agitated for no apparent reason.
Control Variable	Authors	**ID** My investment decision is strongly dependent on my personality, opinion and understanding.

Table 1: Development of the questionnaire

Pre-testing and Questionnaire Validation

The face and content validity of the questionnaire was finalized by consulting the experts in academia and professionals in investment management. Post such expert consultation; the preliminary questionnaire was distributed among 140 investors to recognize any ambiguity in the statements, to avoid any confusion among the respondents. Questionnaire modifications were made based on the feedback of the experts and the pilot respondents to standardize the questionnaire. The questionnaire is two dimensional – personality traits and behavioral biases, presented in a disorderly manner to avoid bias from the respondents. However, both these dimensions were analysed separately. The reliability of each variable was judged through Cronbach's alpha, and the items that had low internal consistency were discarded. Reliability results led to the items measuring behavioral biases being reduced to 22 from 36 and personality traits from 15 to 9 items. Since many variables are being measured, and there is no *a priori* hypothesis regarding the relationships between personality traits and the manifestation of behavioral biases, the researchers applied exploratory factor analysis. (Refer to Table below). The reliability of the overall instrument of both dimensions was gauged through Cronbach's Alpha, above 0.7, and thus in the acceptable range (Cho & Kim, 2015).

For the sake of a less complex structure, the varimax rotation was used in combination with Principal Components Analysis technique. The PCA will help in a more straightforward interpretation (Wu, 2014) with minimal data loss (Jollife & Cadima, 2016).

Discussion of EFA Results:

The responses of the individuals are clear regarding the impact of behavioral biases among individuals; they act as a motivating factor behind decision-making. The KMO-Bartlett test of sphericity of both distinct sections for biases and personality traits is above 0.7, proving that the test is helpful for the detection of an underlying structure. The variables of behavioral bias and personality traits were able to explain 59% and 70% of the variance, respectively, making it clear that they both have an important role in individual financial choices. The first hypothesis regarding the impact of behavioral biases on financial decisions is accepted. The reduction of twelve behavioral biases to three significant factors, based on the inter-relationship between the biases, clarifiesthat although they are distinct in theory, the manifestation of certain biases is similar among the individual affected by them. The first factor has six items, the second has five items, while the third has four items. The dimension reduction of personality traits from five factors to three is helps create a checklist of the different behaviors that the respondents present. Any cross-relationship between the biases and the personality traits is to be investigated through Structural Equation Modelling. The dimension reduction techniques revealed the following results:

EFA results of behavioral biases:

Table 2 Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.703	.710	22

Table 3 KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.822
Bartlett's Test of Sphericity	Approx. Chi-Square	3087.140
	df	105
	Sig.	.000

Table 4 Rotated Component Matrix

	Component		
	1	2	3
OC3r My other friends are far superior to me when it comes to taking a decision in a complex situation	0.853		
OC1 Most of the time my decisions are far superior to others	0.822		
R3 The perfect outcome of any event can only be predicted when the latest information is used, ignoring past history	0.774		
R1r Past history is important to predict the future, thus the old information is very important to make the right decisions.	0.766		
AN2 It is always better to rely on some information as a base to take future decisions	0.735		
CB2 Information that does not support my expectations always irritates me	0.653		
SQ2 I dislike any kind of changes in my lifestyle, irrespective of the benefits		0.821	
RA3 I utterly dislike to get involved in any situation with the slightest chance of danger or risk		0.816	
RA1r I enjoy the challenges of dealing with uncertain and risky situations		0.805	
EE3 I am unwilling to sell off my family heirlooms even if I face financial crises		0.797	
LA1 When I make decisions, I always worry more about losses		0.739	
GF2 There is no true randomness in real life all events are interrelated			0.805
HM2 I feel more confident about my choice in risky situations if I have been successful in my previous trials			0.7
HD1 I always accept group decisions even when I realize they are wrong			0.673
HN1 Outcomes of any decisions always seem obvious and predictable after have occurred			0.67
SQ3 I always stick to the existing conditions even when a change would have more benefits			
LA2 I do not like decisions that have even a minimal chance of making losses			
EE2 I find it difficult to dispose of items that have sentimental value for me			
CB1 I only search for information that ultimately supports my ideas			
AN1 While making decisions, I always set clear expectations of what the outcomes should be			
GF3 If it did not rain for 3 consecutive days during the monsoon I would always			
HN3r Correct prediction of any complex event is always a chance of luck			

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 4 iterations.

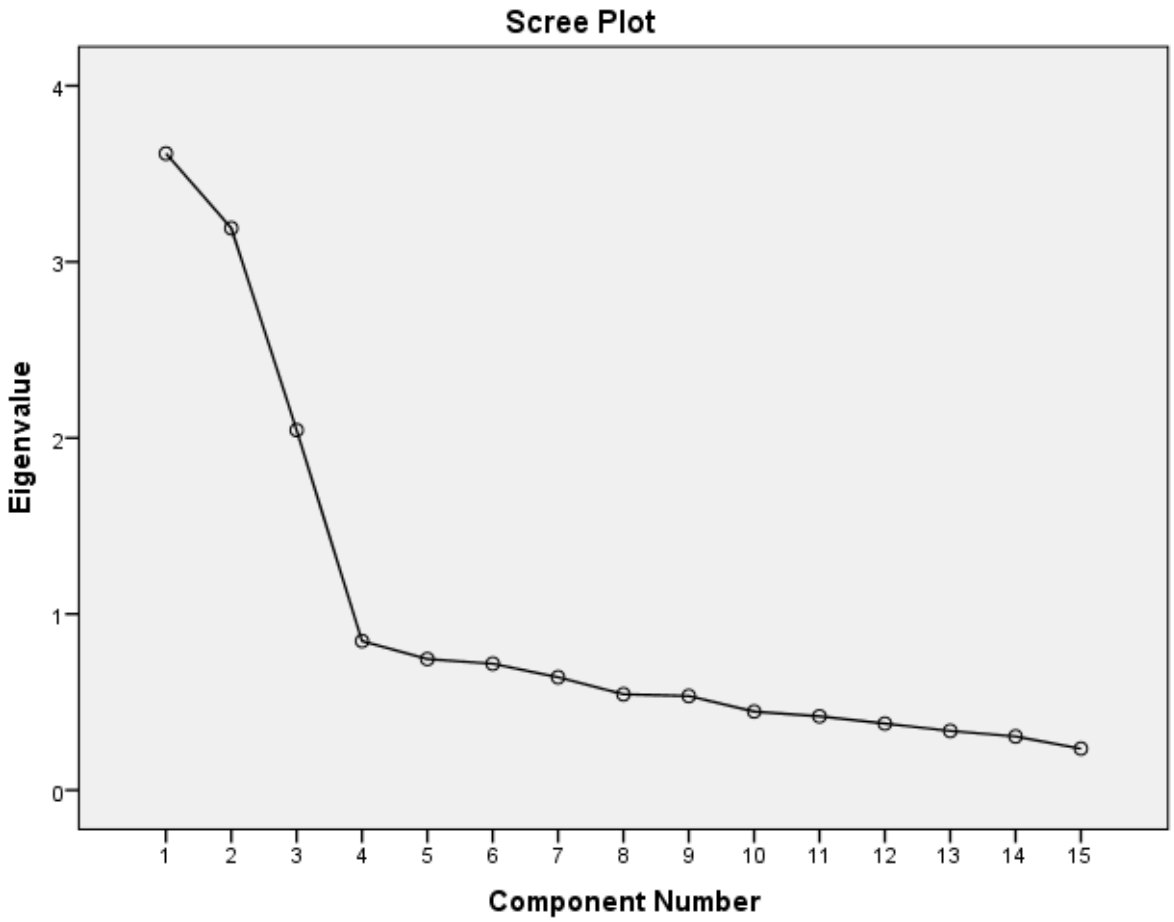

Figure 1 - Scree Plot of behavioral bias

Parti pris decision-making:

Presumptuous justifier: The first factor is a combination of overconfidence, recency, confirmation and anchoring. These individuals tend to be excessively confident regarding their achievements and seek information confirming their pre-formed opinions. They also tend to rely excessively on the most recent piece of information.

Emotional misoneist: The presence of loss aversion, risk aversion, endowment effect and status quo mean that individuals of this group are sentimentally attached to their owned investments and are apprehensive of change. Exposure to risk leads them to be preoccupied with the probability of loss, and thus they may prefer to remain in their existing circumstances.

Nostalgic collectivist: Gambler's fallacy, herding, house money and hindsight bias are grouped into a single factor. Investors prefer to find patterns in share market movements and frame their expectations accordingly. Investors may be influenced by their past successes and the opinions of others around them, going so far as to ignore their private opinions.

EFA Results on Personality Traits:

Table 5 Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.725	.735	9

Table 6 KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.798
Bartlett's Test of Sphericity	Approx. Chi-Square	1535.997
	df	36
	Sig.	.000

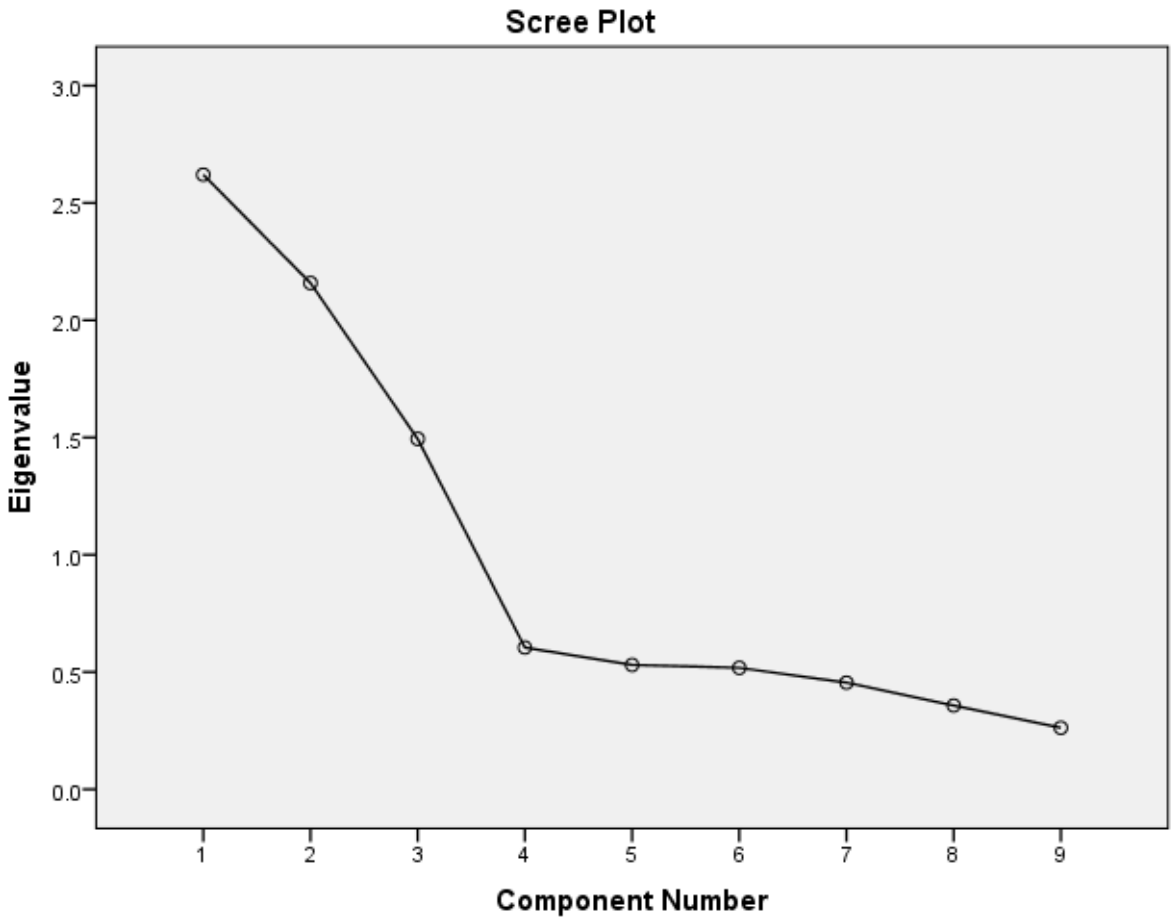

Figure 2 Scree Plot for personality traits

	Component		
	1	2	3
Agree1 I am a very compassionate type of person	0.85		
Cons3 I lead a highly disciplined life and maintain a rigorous daily routine	0.807		
Open3 I am always enthusiastic about new, experimental ideas	0.795		
Neuro3 I often become agitated for no apparent reason	0.78		
Neuro1 I always feel nervous before starting a new job		0.9	
Extra1 I like to spend my leisure time in company of other people		0.847	
Open2r I cannot stand complex intellectual decisions		0.764	
Cons1 I cannot tolerate casual persons who do their jobs shabbily			0.862
Extra3 I am a fun loving happy go lucky type person			0.858

Table 7 Rotated Component Matrix

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 4 iterations.

Dispositional Sketch:

Industrious convivial: Individuals who predominantly display the traits of extraversion and conscientiousness are grouped into this factor. Such individuals have the self-image of being cheerful, easy-going while remaining responsible about their work obligations. The individual may be assertive and talkative and more likely to be optimistic while displaying leadership qualities.

High-strung sociable: Neurotic, extraverted and less open to experiences, they may find themselves more comfortable among a crowd of like-minded individuals who may find it difficult to accept new situations. As they are likely to be sociable and considered responsible, they may be influenced by others.

Solicitous disciplinarian: Compassionate, disciplined, enthusiastic, but prone to bouts of moodiness, these individuals are responsible but may tend to be anxious. This factor includes the responses of those individuals who are enthusiastic about new experiments and may be sympathetic to others needs but maybe too excitable and often have issues with emotional regulation. Agreeable, conscientious individuals who tend to be neurotic and willing to be more open to new experiences are classified into this group.

Validation of developed instrument through SEM

Population, Sampling and Data Collection

The present study includes investors from major metropolitan cities who are not investment professionals. Metropolitan cities were selected as most investments in the financial markets originate from such cities. Consequently, the non-professional investors in these markets may make sub-optimal choices of investment. A deeper understanding of the factors that influence their choices may be in order to encourage better decisions based on the investors' personalities. According to (Hair, 1998);(Hinkin, 1995)the criterion for sample size selection is that each item must have a corresponding ten respondents. The study employed systematic random sampling techniques for the collection of data. Since one of the main objectives of the researchers was to develop a standardized instrument that could measure the presence of behavioral biases and attempt to link them with the presence of certain personality traits, researchers would need to access the same set of respondents from the initial survey to compare if the results matched the final survey response. As the researchers are associated with educational institutes that offer graduation courses, the students who completed graduation were chosen for the initial pilot survey. The final survey was therefore carried out on individuals who had completed graduation and had essential financial awareness. A larger sample was taken to avoid any sampling bias. Respondents were either approached in physical mode or through e-mail. A total of 800 questionnaires were distributed, and 570 were received. After discarding the incomplete responses, 550 were considered for the study.

Common Method Bias

The common method bias is attributed to the measurement method in the field of behavioral research. The measurement error threatens the validity of the conclusions drawn about the inter-construct relationships and maybe random or systematic. One of the primaryreasons for the systematic measurement error may be due to method variance, which may arise due to many reasons such as the item content, scale type, response format, and general context (Fiske, 1982). As the study is based on individual respondents, it may be possible that the study suffers from leniency bias, where the

respondents modify their responses to appear more socially desirable(Podsakoff et al., 2003). Since some of the items are used to measure personality traits, they may be phrased in a manner to reflect some socially desirable behaviours. Harman's Single Factor test was applied to identify the presence of such bias. After all the items included in the exploratory factor analysis were loaded onto a single factor in an unrotated factor solution, the variance explained came to 20% approximately, well below the specified threshold of 50% (Harman, 1960; Podsakoff et al., 2003).

Sample Characteristics

The total 550 respondents are from Kolkata/Delhi/Mumbai etc. The highest number of respondents are males (70%), with 80% being graduates while 30% are females, among whom 150 are graduates, and the rest are post-graduates or have professional education along with their graduation.

Analysis of structural relationships:

Based on the results of the Exploratory Factor Analysis, a structural model was proposed. The fitness of the measurement model was gauged by the CFA using AMOS 23. The results of the first Confirmatory Factor Analysis did not meet the criteria. On a closer look at the correlations between the variables themselves, there were close associations between certain behavioral biases and personality traits. The fit indices meet the minimum threshold criterion. The results supported the results of the EFA., i.e., and there are three significant latent biases and three major personality types that affect the investment choices of an individual.

It was observed from the final model that the ratio χ^2/df is 4.05, which is lower than the threshold value of 5.00 (Schumacker & Lomax, 2004). Since there have been no past studies in this realm, the Comparative fit index (CFI), goodness of fit index (GFI) and normed fit index (NFI) values are 0.860, 0.855 and 0.823, respectively, are deemed to be acceptable (Bollen, 1989)(V. Costa & Sarmento, 2019)(Zikmund, 2003)(Baumgartner & Homburg, 1996).

Table 8RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.131	.855	.838	.766
Saturated model	.000	1.000		
Independence model	.273	.357	.303	.330

Table 9Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.823	.817	.860	.856	.860
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

Table 10 RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.075	.070	.079	.000
Independence model	.196	.192	.200	.000

The value of root mean square error of approximation (RMSEA) and standardized root mean square residual (SRMR) are 0.075 and 0.0883, respectively, quite below the threshold of 0.10(Steiger, 1990). The CFA loading threshold was set at 0.50 (Hair et al., 2006). The final CFA loadings are shown in Table 3. Convergent validity, discriminant validity (DV) and composite reliability (CR) were established based on CFAloadings and correlation coefficient. Table 11reveals satisfactory results for all validity and reliability parameters. The average variance extracted (AVE) values of all six constructs exceed 0.50, and CR values exceed 0.6, thereby establishing convergent validity and composite reliability(Bagozzi & Yi, 1988). The discriminant validity correlation coefficient of a given construct should not exceed the square root of the AVE of each construct (Fornell & Larcker, 1981). Discriminant validity results are shown in Table 11, which depicts that correlation of all constructs is below their respective square root of AVE values (shown diagonally in highlighted cells).

Table 11Discriminant Validity Results

Source: Researcher's calculation (based on results of AMOS)

Construct Variables	Items	Std. Loadings	AVE	CR	Sq. Correlation of Constructs					
					Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
Presumptuous Justifier	OC3r	0.78	0.524	0.869	1	.483	0.498			
	OC1	0.71								
	R1r	0.72								
	R3	0.74								
	CB2	0.7								
	AN2	0.69								
Emotional misoneist	SQ2	0.76	0.542	0.855	0.483	1	0.493			
	EE3	0.76								
	RA1r	0.69								
	RA3	0.73								
	LA1	0.74								
Nostalgic collectivist	HM2	0.58	0.372	0.701	0.498	0.493	1			
	HN1	0.6								
	HD1	0.56								
	GF2	0.69								
Industrious convivial	Extra3	0.75	0.501	0.665				1	0.45	.44
	Cons1	0.66								
High-strung sociable	Neuro 1	0.85	0.604	0.819				0.45	1	0.44
	Extra1	0.8								
	Open2r	0.67								
Solicitous disciplinarian	Agree1	0.82	0.548	0.828				0.44	.44	1
	Cons3	0.77								
	Neuro3	0.67								
	Open3	0.69								

Discussion of Results

The hypothesis that personality traits have a relationship with behavioral biases was tested through Structural Equation Modelling. The interrelationships among the constructs and the constructs' reliability along with the validity of the proposed model were checked. SEM was carried out on the 550 responses. The results supported the EFA results and revealed a few underlying relationships between

personality traits and behavioral biases and their collective impact on investment decisions. Using the constructs and their relationships, the researchers aim to provide a predictive model of investment behavior. The discussion regarding the results and the interrelationships between the factors is carried on below:

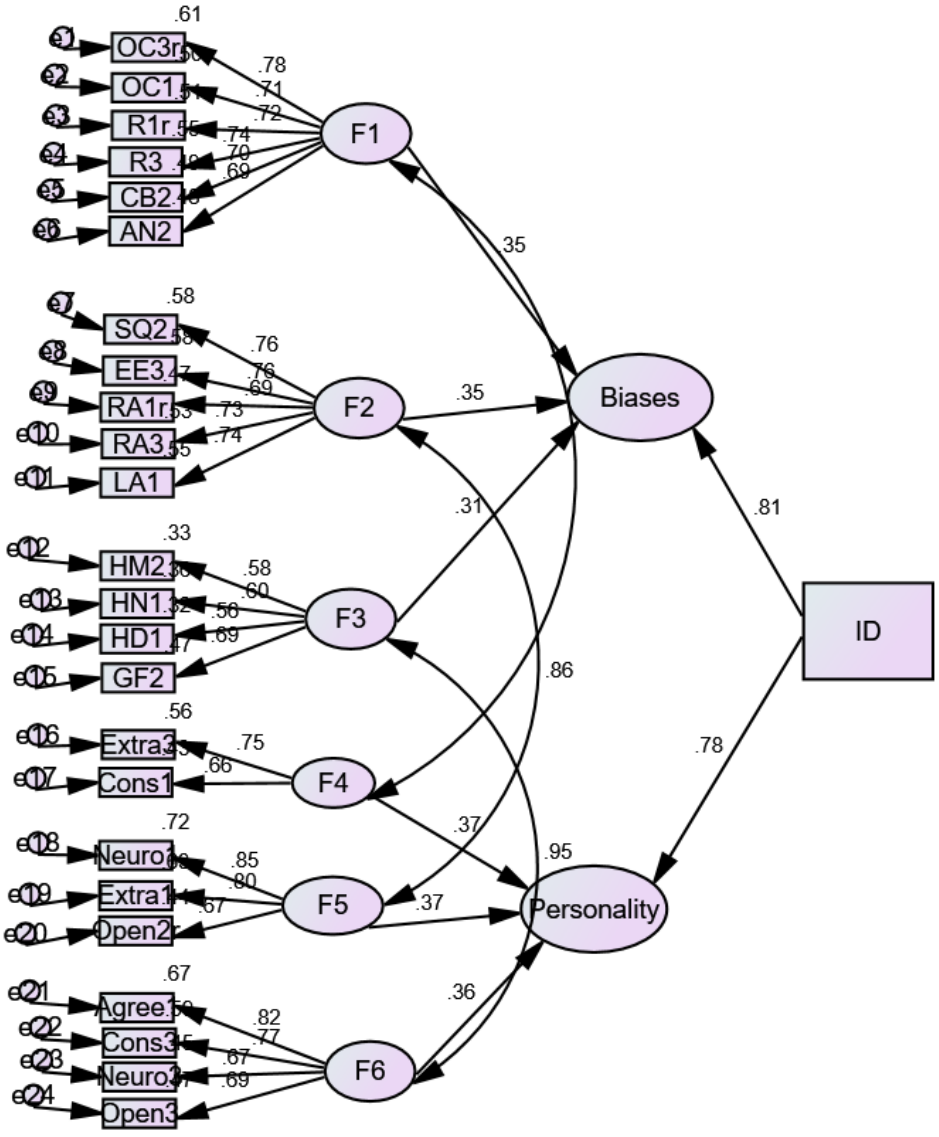

Figure 3 Structural model

Source: Researcher's Ideation

Development of behavioral profile of individual investors:

Based on the EFA results, the researchers proposed a structural model that was mapped through AMOS. Further, the underlying relationships between the dispositional sketch and parti pris decision-making were investigated. Based on such relationships, a profile of the respondents is proposed. The profile is a combination of the investor's partisan tendencies and their demeanour regarding financial choices. The three overarching profiles have been explained below, along with the researcher's appellation:

Construct 1: (Easy-going Presumptuous justifier): Factor 1 and Factor 4 - The investor is prone to overconfidence and finds it easier to recall the more recent instances, which they may use as anchors to make their judgment. Further, to reaffirm their judgment, they will look for evidence that confirms the same. They tend to be extraverted and conscientious. These investors will quickly attribute any successes to themselves and will make choices that they deem correct, irrespective of the reality. May invest in companies that have recently been in the news without analysing the performance history and may set their investment expectations according to an arbitrary anchor. However, they will be careful when choosing their investments and may prefer to advise their peers in social settings while avoiding information that does not meet their predisposed judgments.

Construct 2: (Nervous Fixated Sentimentalist) Factor 2 and Factor 5 – The investor displays a dislike of change, hyper-sensitivity to losses and is intolerant of uncertainty. They attach emotional value to the items they own and find it difficult to dispose of them, even when faced with a financial crisis. They tend to be neurotic, extraverted but less open to new experiences. Since they may be emotionally volatile, they will look for choices that reduce any uncertainty, even if it means less return on their investments. They may show a clear preference towards fixed-income instruments and may find it difficult to diversify their portfolio. They may also find it difficult to dispose of any underperforming investments, if they have held them for an extended period or even if they feel solidarity with the company. Since they also display sociable traits, they may prefer to rely more on the judgment of their peers. These investors may learn to make better decisions if they are made more aware of the various financial choices.

Construct 3: (Thrill-seeking agitated gambler) Factor 3 and Factor 6 –The investors may be affected by their past experiences and make unconscious associations between unrelated events. Past successes make them more willing to take risks, and while observing a series of unrelated events, they tend to predict the outcomes by identifying false patterns. Investors may believe that share prices are about to fall since they have been rising for a while and vice-versa. They may base their observance of patterns on the general market sentiment and are affected by other's choices. Since the stock market movements are presumed to be random, their inability to identify random events that are distinct from each other may leave them blind to their own mistakes and have excessive belief in their power of outcome prediction. They are open to new experiences, sociable, responsible, and agreeable, observant but perhaps not objective enough to judge outcomes on facts rather than prior experiences. They may be more experimental with their investments but not necessarily learn from their own past mistakes. They may also be at risk of making decisions based on their observance of patterns that may not exist in reality and prefer to move with the multitude, especially when faced with uncertain situations. They may have a diverse portfolio, but not necessarily an optimal one or a balanced one, since they are agreeable, may prefer to merely follow suggestions from their peers rather than their judgment, while being influenced by past performance, which may or may not repeat in the future.

Conclusion

The paper aimed to investigate the relationships between the biases and the extent to which the individual differences in a person's disposition influence the manifestation of the biases itself. An assessment of extant literature reveals there is yet to be a consensus regarding the influence of biases on decisions or their interrelationships. Further, the severity of the biases may be moderated by the individual differences, measured through applying the Five-factor model. In this study, the researchers have investigated the relationship between the different kinds of biases. Based on such relationships, the investors have been classified into three different types – the overconfident investor, who relies more on the recent piece of information and prefers to seek and confirm their prejudice, basing their expectations on any arbitrary past information. The second type is an apprehensive investor, who fears any probability of risk, and dislikes change. They are sentimental about their belongings and are excessively focused on the chance of losses. The final kind of investor is a gambler who may notice patterns, even among a series of events that are not correlated. Further, they may find themselves changing their risk preferences contingent on past outcomes, going so far as to believe that they knew the outcome of an event before the occurrence of such an outcome.

The study has considered the impact of personality to understand the other antecedents of how biases influence behavior. The personality of an individual has been measured through the Five-Factor Model. There are three archetypical personalities – the first is a nonchalant but somewhat responsible individual who likes being in the company of others while maintaining diligence in work. The second category of individuals are fearful when faced with new challenges, and thus, less likely to be curious about new experiences, but may prefer to be with friends. The final type of individuals may be sympathetic, regimented and sociable. They, however, may tend to have trouble with mood regulation, often feeling anxious due to no particular reason.

An individual's personality traits are considered a relatively consistent pattern of thoughts and feelings about external stimuli. Investigating such characteristic patterns with the presentation of biases in decisions will help develop a theory that can deduce the reasons behind the differences in the embodiment of the biases among the different types of individuals. Further, the results of the survey not only confirm the noticeable impact of biases and answer the question about whether a more compact group of biases can represent the plurality of biases. The correlation of the biases and the personalities was not only proposed through a self-developed questionnaire, but also validated through Structural Equation modelling. It contributes to the rather egregious lack of studies on the motives behind individual investment decisions and proposes three major profiles based on the interrelationships of individual personalities and biases. The professional advisors may use these profiles to categorise their clientele and suggest better portfolios to them, according to their financial objective. Individual investors may also become more aware of the biases that may influence their financial choices based on their personality. Better decisions at the individual level will also help more stable and transparent asset pricing (Szyszka, 2013). The market analysts, although professionals are not exempt from human error. They have been proved to be prone to herding bias (Trueman, 1994) and bouts of overoptimism (Cowen et al., 2006). The overall profiles are well-rounded enough to lay the groundwork for how such individuals may make decisions, yet succinct enough for the professional advisors to be easily applied conveniently.

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