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Impact of Behavioural Biases on Investment Performance: A Comparative Analysis of Investors from India, USA and UK

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Abstract

This study presents evidence towards the existence of behavioural biases while analysing the impact of such biases on the investors' investment performance in India, the USA, and the UK. Further, the study aims to investigate the moderating role of financial literacy on the relationship between behavioural biases and investment performance. It reveals that behavioural biases like affect heuristic, herding and status quo positively impact the investors' investment performance amongst Indian investors whereas loss aversion, overconfidence, availability, and representativeness biases positively impact the investors' investment performance amongst UK investors; and affect heuristic bias amongst USA investors. The findings divulge the negative impact of anchoring bias and mental accounting amongst Indian investors; availability bias, disposition effect, and overconfidence bias amongst USA investors; and affect heuristic and herding amongst UK investors. The study finds that a few of the behavioural biases impact investment performance positively, though less often. Hence investors should be cautious as these biases generally lead to irrational decision-making and might adversely influence the investors' investment performance in the long run. The study further concludes that financial literacy significantly moderates the relationship between anchoring bias and individuals' investment performance in India and affect heuristic in the USA. Interestingly, in the UK scenario, no significant moderating impact of financial literacy was found between any of the behavioral biases and investment performance.

Keywords: Behavioural Biases, Financial Literacy, Investment Performance-India, UK, USA

JEL Classification: G4, G5, D14

1. Introduction

Investors can display a range of problematic behaviours, stemming from a lack of information, technical proficiency, or overconfidence when investing. Many market participants act irrationally, guided by preconceptions like greed, fear, cognitive dissonance, and psychological instincts, which create mental accounting and anchoring biases. It is undeniable that emotions can sway investors' stock trading choices, sometimes leading to selling due to fear, prompted by a desire to escape uncertainty and a sense of dread. Behavioural finance argues that humans have limited rationality, owing to constraints like restricted information and psychogenic capacity, causing decision-makers to rely on heuristics and biases rather than reaching optimal solutions. Studies show that filters determined by experience shape human thinking, often leading to biased judgements, coloured by "rule of thumb" ideologies. These biases inevitably affect the rationality of investors in their decision-making processes.

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Table 1. Relative Performance- India vs. USA Indices

	March 30, 2022	Change in percentage					
		FY17	FY18	FY19	FY20	FY21	FY22
Sensex	58,569	16.9	11.3	17.3	-23.8	68.0	18.3
Nifty	17,465	18.5	10.2	14.9	-26.0	70.9	18.9
Nifty m-cap 100	29,692	34.9	9.1	-2.7	-35.9	102.4	25.3
Nifty s-cap 100	10,436	43.0	11.6	-14.4	-46.1	125.7	28.6
Dow Jones	35,229	16.8	16.6	7.6	-15.5	50.5	6.8

Source: Business Standard (March 2022)

Over the last twenty years, there has been a surge in research conducted by financial experts and psychologists examining the behaviour of investors. However, little empirical evidence exists to demonstrate the impact of behavioural biases on investment performance or returns, especially in India, and comparative studies across nations are negligible. The inadequate literature available on the disposition effect, mental accounting, affect heuristic, and status quo, particularly in the Indian stock market, underlines the significance of this study. There is a significant research gap that needs to be addressed to investigate the factors that influence investment decision-making and how they affect investment performance. This study aims to explore behavioural biases and their effect on investment performance among individuals in India, USA, and UK. There are numerous reasons for comparing the three countries. The top ten stock markets in the world include India, the UK, and the USA with market capitalisations of USD 3.40 trillion, USD 3.68 trillion, and USD 51.3 trillion[a], respectively. Despite the large market capitalisation gap between India and the US, the Indian markets have outperformed the Dow Jones in recent years, as shown in Table 1. Additionally, although there is a higher participation of individual investors in UK than in India, the market capitalisation of the Indian markets is closest to that of UK. Indian National Stock Exchange (NIFTY) achieved a USD 3 trillion market capitalisation in a relatively short duration from its inception in 1993, indicating its high compounding rate. However, there is still a significant disparity between the Indian economy and that of the US, with only around 4 percent of domestic household savings invested in equity by 520 million Indian investors compared to approximately 14 percent of domestic savings invested directly in the stock markets by 448 million Americans, with an additional 50 percent (16.64 million) holding indirect investments via 401(k) s, popularly known as employer-sponsored retirement plans.

Individual investors across these countries face different behavioural biases as their preferences are shaped by external influences like societal norms, culture, financial system, political system, legislatures, etc. This study intends to compare the impact of behavioural biases on investment performance. The increase in international investors' preference towards Indian markets indicates the potential increase in future investment in India. Extant studies have investigated the presence of different types of behavioural biases in developed economies only, leaving scant literature available on the comparison of different behavioural biases in various countries, with conclusive empirical evidence. Thus, the paper aims to answer the following research questions.

RQ1. To what extent are investors from India, USA, and UK influenced by behavioural biases and how deeply does it impact their investment performance?

RQ2. Does financial literacy moderate the relationship between behavioural biases and individuals' investment performance?

Focus on the empirical analysis of ten biases which are connected with investment behaviour, namely representativeness bias, anchoring bias, status quo bias, availability bias, herding effect, affect heuristic, disposition effect, loss aversion bias, mental accounting bias, and overconfidence bias have been considered herein. Table 2 discusses the description and consequences of the above-mentioned biases. These biases are based on the theory of bounded rationality, prospect theory, and the illusion of control theory of behavioural finance.

This study aims to assist existing and potential investors in comprehending the impact of influential behavioural factors on their investment decisions and rationalising them as much as possible, particularly during a time

[a] https://www.livemint.com/market/stock-market-news/indian-stock-market-overtakes-france-becomes-sixth-biggest-11631730375607.html

Table 2. Description of Behavioural Biases

Factor	Description	Key effects on Investors-Consequences
Anchoring Bias[1,2]	The tendency of investors to base their decisions on a particular piece of information, regarded as an 'anchor'	Overlooking investment opportunities, or wrong entry and exit time
Availability Bias[3,4]	The tendency of people to give credence to the most readily available data that comes to mind instantly	Overlooking investment opportunities, investing in the wrong stocks, failing to diversify
Affect Heuristic Bias[5,6]	Judgment guided by investors' current state of emotions	Misjudged risk-benefit analysis
Disposition Effect[7,8]	The tendency of investors to sell the winning shares (whose price has increased) and keep loss-making assets (whose price has dropped	Reduced returns as investors are not aware of when to quit and when to continue
Herding[9,10]	Willingness to follow the crowd	Falling into a growth trap leading to the formation of bubbles and suffering losses due to bubble bursts
Mental Accounting[11]	The tendency to arrange the portfolio into manageable mental compartments to be considered independently	Freezing their money in different accounts rather than contributing it for their wealth maximisation
Overconfidence Bias[12]	The tendency to overrate own wisdom, capabilities and precision of the information one possesses	Several trades, high risk, incurring more brokerage cost, high probability to suffer losses
Loss Aversion Bias[13]	The tendency of avoiding losses to acquire equivalent gains	Missed investment opportunity in good stocks due to high perceived risk, conservative portfolios, selling winners early, keeping losers for a long time, leading to diminishing returns
Representativeness[6,14]	The propensity to relate an uncertain event to a familiar or known event	Investing in overvalued assets, overlooking important information
Status quo Bias[15]	The tendency to do nothing or a liking for the present state of play	Missed investment opportunities in good stocks, failure to diversify

when global financial markets are becoming increasingly interconnected. By understanding common behavioural biases, investors can eliminate them, thus improving their chances of achieving positive and consistent returns. This study is unique as it provides practical verification of these irrationalities at the individual investor level. Further, previous studies have been limited to individual markets or small observation sets. In contrast, this paper presents a comparative analysis of behavioural biases amongst individual investors in India, USA, and UK.

The study is divided into five parts, with the introduction in the first part. In Section 2, an extensive review of how behavioral biases affect investors' decisions and the success of their investments is placed. Based on the objectives of the investigation, distinct hypotheses are listed in Section 3. This is followed by methods for collecting data and a comprehensive description of the research method used in the study. Section 4 deciphers the primary findings of the questionnaire survey regarding the way investors in India, the USA, and the UK invest their money. Finally, Section 5 summarises all the study results followed by a few suggestions on how to make more informed choices with no behavioral biases. Also, it incorporates the limitations, recommendations, and future scope for research.

2. Review of Literature and Formulation of Hypothesis

Based on the study's objectives, the formulation of the hypothesis has been depicted in Figure 1.

2.1 Behavioural Biases and Investment Performance

Investment performance refers to the return earned on the investment portfolio. Prior literature[16] has validated

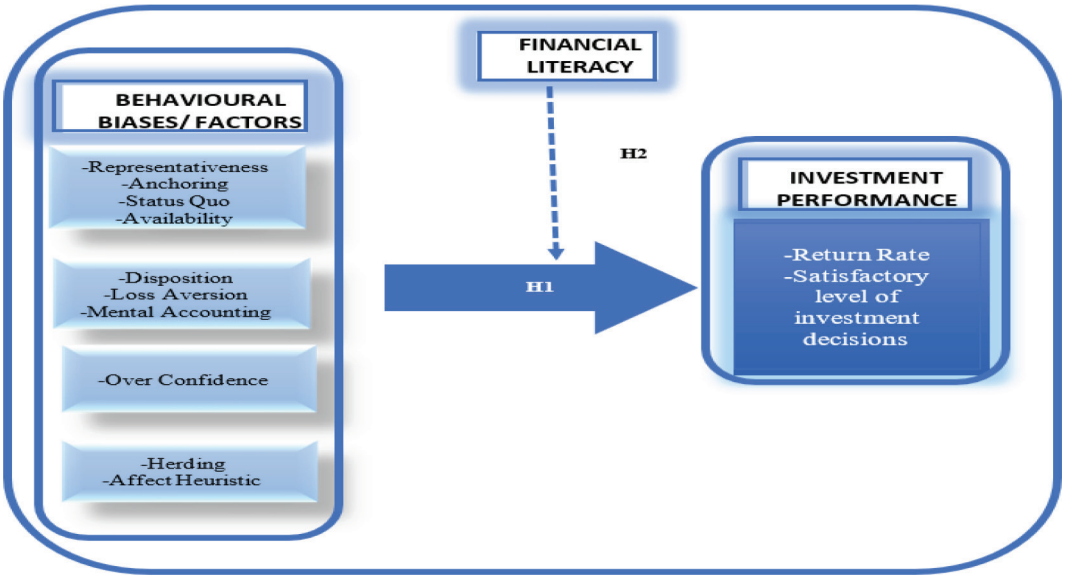


Figure 1. Formulation of Hypothesis.

that there exists a link between behavioural biases and investment performance. Few believe that overconfident investors who trade more could benefit from elevated results as overconfident investors have a higher amount of transactions and earn a higher investment profit over the long term, contrary to Warren Buffett who prescribes holding investments for a longer duration of time with minimum selling to reduce transaction cost and incidence of tax. Ul Abdin (2022)[17] established the illusion of control as a significant predictor of risk propensity and investment performance. A survey-based study[18] revealed that biases like "representativeness, overconfidence, anchoring, gamblers' fallacy, availability, loss aversion, mental accounting, and regret aversion affected the investors' choices". Kengatharan and Kengatharan (2014)[19] concluded that factors like choice of stock and overconfidence negatively affect investment performance, whereas anchoring affects it positively. The remaining elements, such as "the volume of stock, buying and selling decision, herding, loss aversion, regret aversion, market information, and customer preference, were found to have no impact on investment performance". A similar strand holds in the literature[20] that assessed the influence of psychological biases on the investors' performance in the Tehran Stock Exchange and revealed that availability bias, herding, and anchoring are the main influential factors for investors' performance. In addition to this, Laryea and Owusu (2023)[21] reveal that investors were prone to be significantly influenced by the anchoring bias. Das and Panja (2022)[22] also established the positive and significant impact of biases such as overconfidence, self-attribution and market reaction on investors' decision-making. Yousaf and Alokla (2023)[23] could not find herding in GCC (Gulf Cooperation Council) countries collectively though some traces are reported when these group countries were considered individually. This research aims to assess the influence of behavioural biases on individuals' investment performance by conducting a comparative analysis of investment behaviour in India, USA, and UK. Various factors that either promote or hinder rational decision-making have been examined to gain a comprehensive understanding of the overall impact.

2.2 Behavioural Biases, Financial Literacy, and Investment Performance

The importance of financial literacy in influencing investors' decisions has been widely discussed in the past. Prior literature[24] advocates that it is not only the unavailability of important information that is impacting investors' decision-making but the impatience level of uneducated investors, which has risen over a time. They found that the fund-holding timespan in the US has dropped from 3.75 years (1992) to 2.4 years (2000). Such a concept is called "chasing returns", where investors make hasty decisions rather than following their original investment plan. Here comes the role of financial literacy in making investment decisions. Financial literacy is defined as "the ability to use knowledge and skills to manage financial resources

effectively for a lifetime of financial well-being"[25]. It plays a crucial role in influencing the investment decision-making process of individual investors. Ates *et al.*(2016)[26] investigated the relationship between behavioural biases and financial literacy and found that financial literacy negatively influences framing, overconfidence, and loss aversion. Moreover, investors[27] possessing low financial literacy are more susceptible to overconfidence bias in comparison to highly literate investors. Another study by Lebdaoui *et al.* (2021)[28] established that financial literacy was negatively associated with overconfidence, while representativeness bias was positively associated with it. This suggests that investors who are financially literate tend to be less likely to be overly confident, but more likely to believe that future returns can be predicted using past returns. On the contrary, Mandell and Klein (2009)[29] validated that investors possessing a high level of financial knowledge are more prone to overconfidence bias as they overestimate their skills and wisdom. Financial literacy has also been found to improve investors' investment performance as more informed and financially aware investors can better exploit the available opportunities[30]. A quantitative study[31] validated financial attitude and financial behaviour as important antecedents of financial literacy among youngsters in India. Further, a financially literate person can overcome behavioural biases and are capable of making a sound investing decision. Though financial literacy has been studied as a critical factor, to what extent it influences behavioural biases, still needs to be examined. It is important to evaluate how closely the strings of behavioural biases are connected to financial literacy and its impact on individual investment performance. Based on the above arguments, the study attempts to test the following alternate hypotheses:

H_{a1}: The behavioural biases have an impact on the individuals' investment performance in India, the USA, and the UK.

H_{a2}: Financial literacy moderates the relationship between behavioural biases and individuals' investment performance in India, the USA, and the UK.

3. Methodology

Primary data has been used to understand the investing behaviour in India, the USA, and the UK. After a comprehensive review of the literature in this field, a structured questionnaire was developed and administered via social media platforms, personal visits, mail, and investing groups among individual investors in India, the USA, and the UK. A total of 6200 questionnaires were sent to individual investors during the time period starting from October 2019 to September 2021. Participation in this survey was open to all the individuals who invest in any kind of alternatives, such as equity, real estate, fixed deposit/public provident fund (FD/PPF), mutual funds, or commodities. Convenience sampling was used to send questionnaires to respondents, as this is the most effective method to achieve the highest response rate. Out of the total questionnaires, 1260 responses were returned representing 20.32 percent response rate. 77 responses were not included in the analysis due to incomplete data. Therefore, a total of 1183 responses were considered for analysis. The questionnaire is divided into four parts, where the first section covers fundamental aspects of investing, including questions about the type of investment, investment experience, level of financial literacy, and the primary purpose of investing and the second part explores the impact of behavioural biases on investment decisions such as buying, selling, type of security, time horizon, volume of trade, and exit timing using thirty-six statements. The third section focuses on investment performance, featuring three statements to assess respondents' investments based on real return rate, expected return rate, and market return rate and finally, the fourth section captures the demographics. The categories of measurements used in the study have been mentioned in Appendix A. The study has employed the following methodology to test the indicative hypotheses.

3.1 Structural Equation Modeling (SEM)

Structural Equation Modeling (SEM) is a synthesis of factor analysis and path analysis, consisting of two components: (1) Confirmatory Factor Analysis (CFA) which is the measurement model and (2) a structural model for multiple regression. Existing literature[32] suggested three key advantages of using structural equation modelling over other approaches: Firstly, SEM necessitates careful consideration of data and hypothesis formulation, encouraging researchers to think critically. Furthermore, SEM enables the estimation and testing of relationships between latent variables. Lastly, SEM offers a more comprehensive and flexible approach to data analysis compared to individual standard statistical techniques commonly used in social and behavioural

Table 3. Recommended Thresholds for Validity and Reliability Measures

Measure	Indicates	Recommended Threshold
Factor loading	Indicator Reliability	Value > 0.6
Cronbach's Alpha	Scales' consistency and reliability	α > 0.6
Composite Reliability (CR)	Scales' consistency and reliability	CR > 0.7
Average Variance Extracted (AVE)	Convergent validity	AVE > 0.5
Maximum Shared Variance (MSV)	Discriminant Validity	MSV < AVE
Inter-construct correlations		square root of AVE is higher than the corresponding inter-construct correlations

Source: Adopted from Hair *et al.* (2010)

studies. The reliability and validity of the model have been established by analysing indicator reliability (using factor loading), Cronbach's alpha, composite reliability (using CR value), convergent validity (using AVE value), and discriminant validity (using AVE and MSV values). Different measures can be considered for evaluating the 'fit' of a structural equation model. Tables 3 and 4 depict the recommended threshold for all the validity measures and SEM fit measures respectively. The generalised relationship is depicted in Equation (1).

$$IP = \alpha + \beta_1(AN) + \beta_2(REP) + \beta_3(OB) + \beta_4(HE) + \beta_5(SQ) + \beta_6(AB) + \beta_7(DE) + \beta_8(LA) + \beta_9(MA) + \beta_{10}(AH) + \varepsilon \quad (1)$$

Where IP - investment performance, AN - anchoring, REP - representativeness, OB -overconfidence, HE - herding, SQ - status-quo, AB - availability bias, DE - disposition effect, LA - loss aversion, AH - affect heuristic, and MA - mental accounting.

3.2 Multi-Group Moderation Analysis

Multigroup moderation analysis is used in cases when the moderator is a categorical variable. This technique examines separate structural models for two or more groups or categories. Critical ratios for the differences in regression weights between groups are used to test the categorical moderation hypotheses.

4. Results and Discussion

Cronbach's alpha test was applied to evaluate the scales' reliability and internal consistency. Table 5 exhibits that all the scales are reliable enough to carry further analysis as Cronbach's alpha value is more than 0.6 in the case of India and USA. However, Cronbach's alpha value for the disposition effect is less than 0.6 in the UK scenario. Thus, this variable cannot be used for further analysis.

4.1 Impact Level of Behavioural Biases on the Individual's Investment Decisions

In line with a prior study[33], the impact level of behavioural biases on individual investment decisions has been measured using the mean value of all the biases. The interpretation criteria, (Table 6), have been used to indicate the impact level.

Table 4. Thumb Rules for Commonly used SEM Fit Measures

SEM Fit Measure	General Rule
CMIN/DF	Less than 3 (Ideal fit) Less than 5 (Reasonable fit)
Root Mean Square Error of Approximation (RMSEA)	Less than 0.05 (Good) Less than 0.08 (Acceptable)
The goodness of Fit Index (GFI)	Greater than or equal to 0.95 (Good)
Normal fit Index (NFI)	Close to 1 (Perfect fit) Greater than 0.9 (Acceptable)
Comparative Fit Index (CFI)	

Source: Adopted from Hair *et al.* (2010)

Table 5. Cronbach's Alpha Test for Scales

Factors	Statements	India		USA		UK	
		Cronbach's Alpha	Cronbach's Alpha (Standardized Items)	Cronbach's Alpha	Cronbach's Alpha (Standardized Items)	Cronbach's Alpha	Cronbach's Alpha (Standardized Items)
Anchoring	4	0.754	0.756	0.71	0.71	0.698	0.698
Representativeness	4	0.653	0.658	0.669	0.67	0.753	0.752
Status Quo	4	0.748	0.749	0.652	0.656	0.677	0.677
Availability Bias	3	0.642	0.643	0.798	0.799	0.712	0.718
Disposition Effect	3	0.684	0.684	0.623	0.633	0.533	0.544
Loss Aversion	4	0.623	0.625	0.818	0.822	0.847	0.848
Mental Accounting	2	0.613	0.62	0.644	0.649	0.655	0.656
Over Confidence	4	0.674	0.675	0.912	0.913	0.708	0.731
Herding	4	0.74	0.741	0.785	0.786	0.855	0.855
Affect Heuristic	4	0.811	0.811	0.877	0.877	0.816	0.816
Investment Performance	3	0.844	0.845	0.945	0.945	0.892	0.892

Source: Research output

Table 6. Interpretation Criteria Indicating Impact Level

Mean Value	Level of Impact
Mean value of less than 2.5	Low-level impact
Mean value from 2.5 – 3.5	Moderate level impact
Mean value of greater than 3.5	High-level impact

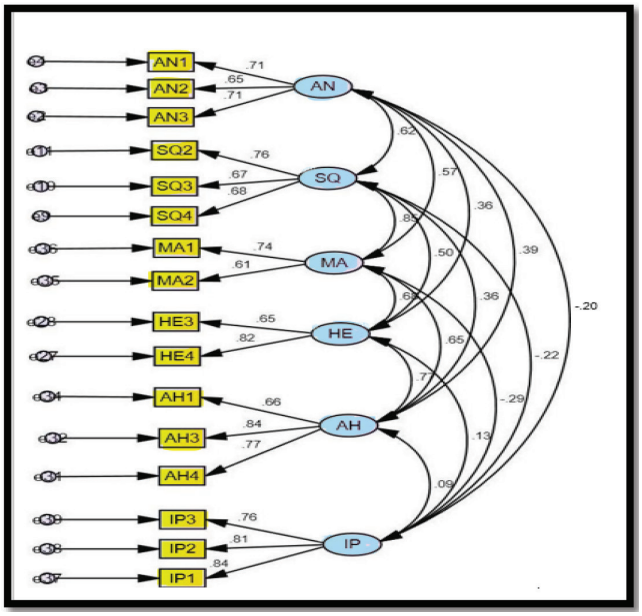
Source: Adopted from Luong and Thi Thu Ha (2011)

The behavioural biases examined have a moderate to high-level impact on the decision-making of investors in India and the US. Specifically, the representativeness bias demonstrates a high-level impact. In India, several biases, including anchoring bias, status quo bias, disposition effect, availability bias, mental accounting, overconfidence bias, herding effect, loss aversion bias, and affect heuristic bias, have a moderate level impact, due to the relatively early stage of investment in financial assets. In USA, overconfidence bias, herding effect, anchoring bias, representativeness bias, status quo bias, availability bias, and loss aversion bias show a high-level impact, while disposition effect, mental accounting, and affect heuristic bias have a moderate-level impact. Notably, no variable indicates a low influence on investors' decision-making in both India and the US.

However, in UK, overconfidence bias has a low impact on respondent investors' decision-making, whereas other behavioural biases have a moderate to high-level impact. Specifically, herding effect, anchoring bias, status quo bias, representativeness bias, loss aversion bias, mental accounting, and affect heuristic bias demonstrate moderate-level impact. Though, availability bias shows a high-level impact on investors' decision-making implying that worldwide investors suffer from cognitive or psychological biases that often lead to investing blunders. The possible reason for this could be the shrinking trading volumes and investors losing confidence in the London Stock Exchange (LSE) over the past few years. Due to Covid-19 and global recession, poor productivity in the manufacturing sector, and uncertainty from Brexit, many renowned companies, such as Ferguson, Shore capital, Vedanta, Smith and Nephew, etc., have left LSE. Also, UK companies worldwide have recorded the most significant number of buybacks since 2008. Further, literature[33] establishes that during the initial days of Covid-19, insecurity and fear sentiment were highly correlated which led to pessimistic investor sentiment. All this has shaken investors' confidence as they are unwilling to transact in the UK stock market.

4.2 Impact of Behavioural Biases on the Individuals' Investment Performance

The researchers utilised CFA to confirm the presence of behavioural variables among investors and then employed



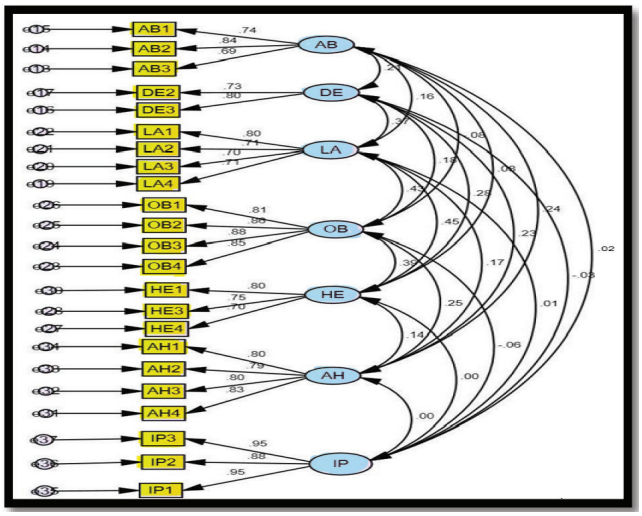
AN - Anchoring, SQ - Status-quo, MA - Mental accounting, HE - Herding, AH - Affect heuristic, IP - Investment performance
Source: Research output

Figure 2. Measurement Model for Indian respondents.

a structural equation model to examine the correlation between these variables and investment performance.

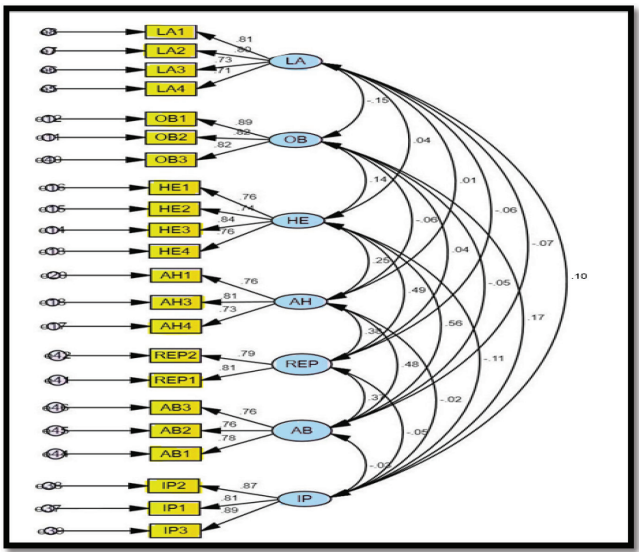
Figure 2 displays the outcome of the measurement model for Indian respondents, which showcases factor loadings, regression estimates, and variances. For a factor to be deemed valid, it must have a factor loading of at least 0.6 with its related constructs. Any factors with loadings below this threshold were excluded from the analysis, resulting in the removal of five biases: representativeness, overconfidence, disposition effect, availability bias, and loss aversion. Also, five statements (AN4, SQ1, HE1, HE2, AH2) were not considered for further analysis as their factor loading was less than 0.6. The validity and reliability of the measurement model were done for the remaining 16 variables holding a factor loading of more than 0.6. From Figure 2, it can be seen that all 16 items are found to have a factor loading of more than 0.6, indicating the constructs are reliable.

The result of the measurement model for the US is depicted in Figure 3. Four biases, namely status-quo (SQ1, SQ2, SQ3, SQ4), representativeness (REP1, REP2, REP3, REP4), mental accounting (MA1, MA2), and anchoring (AN1, AN2, AN3, AN4) were removed from the analysis. Also, three statements (DE1, DE4, HE2) were not considered for further analysis as their factor loading was less than 0.6. The model's validity and reliability were



AB - Availability bias, DE - Disposition effect, LA - Loss aversion, OB - Overconfidence, HE - Herding, AH - Affect heuristic, IP - Investment performance
Source: Research Output

Figure 3. Measurement Model for USA Respondents.



LA - Loss aversion, OB - Overconfidence, HE - Herding, AH - Affect heuristic, REP - Representativeness, AB - Availability bias IP - Investment performance
Source: Research Output

Figure 4. Measurement Model for UK Respondents.

done for the remaining 23 variables holding a factor loading of more than 0.6.

Figure 4 shows the results of the measurement model in the case of UK respondents. All the variables which failed to meet the threshold factor loading of 0.6 were removed

Table 7. Summary of the Measurement Models

Factor	India				USA				UK			
	Observed variable	CR	AVE	MSV	Observed variable	CR	AVE	MSV	Observed variable	CR	AVE	MSV
Anchoring Bias	AN1	0.73	0.516	0.327	-	-	-	-	-	-	-	-
	AN2											
	AN3											
Status Quo Bias	SQ2	0.745	0.51	0.214	-	-	-	-	-	-	-	-
	SQ3											
	SQ4											
Mental Accounting	MA1	0.728	0.506	0.024	-	-	-	-	-	-	-	-
	MA2											
Herding Effect	HE3	0.708	0.551	0.115	HE1	0.792	0.56	0.206	HE1	0.857	0.601	0.317
					HE3				HE2			
	HE4				HE4				HE3			
									HE4			
Affect Heuristic Bias	AH1	0.802	0.576	0.101	AH1	0.878	0.642	0.062	AH1	0.811	0.589	0.233
	AH3				AH2				AH3			
	AH4				AH3				AH4			
					AH4							
Availability Bias	-	-	-	-	AB1	0.768	0.624	0.057	AB1	0.811	0.588	0.317
					AB2				AB2			
					AB3				AB3			
Disposition Effect	-	-	-	-	DE2	0.739	0.587	0.14	-	-	-	-
					DE3							
Loss Aversion Bias	-	-	-	-	LA1	0.82	0.533	0.206	LA1	0.824	0.61	0.01
					LA2				LA2			
					LA3				LA3			
					LA4				LA4			
Overconfidence Bias	OB1	0.912	0.722	0.185	OB1	0.912	0.722	0.185	OB1	0.881	0.712	0.029
	OB2				OB2				OB2			
	OB3				OB3				OB3			
	OB4				OB4							
Representativeness Bias	-	-	-	-	-	-	-	-	REP1	0.776	0.634	0.237
									REP2			
Investment Performance	IP1	0.845	0.646	0.085	IP1	0.946	0.853	0.003	IP1	0.893	0.735	0.029
	IP2				IP2				IP2			
	IP3				IP3				IP3			

Source: Research output

Table 8. SEM Fit Measures

SEM fit Measure	India	USA	UK
Chi-square divided by degrees of freedom (CMIN/DF)	4.58	1.469	1.633
Root Mean Square Error of Approximation (RMSEA)	0.067	0.042	0.052
The goodness of Fit Index (GFI)	0.940	0.909	0.898
Normal fit Index (NFI)	0.915	0.908	0.881
Comparative Fit Index (CFI)	0.934	0.968	0.949

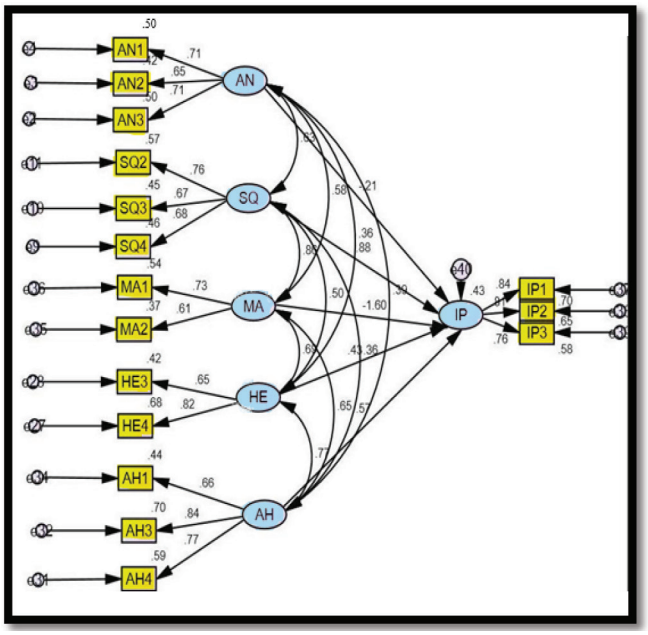
Source: Research output

from the analysis. Thus, four biases, namely, status-quo, mental accounting, anchoring, and disposition effect, were removed from the analysis. Also, four statements (REP3, REP4, AH2, OB4) were not considered for further analysis as their factor loading was less than 0.6. The validity and reliability of the measurement model were done for the remaining 22 variables.

Table 7 gives the summary of the measurement models. As is apparent, the CR value for all the scales was more than 0.7, indicating the measuring instrument's consistency and reliability. Also, all the factors have an AVE of more than 0.5, which further validates convergent validity. Moreover, it can be observed that the AVE values of all the factors are higher than the MSV values, thereby establishing an adequate discriminant validity of the measurement model. The measurement models for Indian, US, and UK respondents in the current study seem to have acceptable model fit (Table 8). However, in the case of UK, the sample's GFI value is marginally less than 0.9, but the GFI value is dependent on sample size. According to prior studies, a GFI value above 0.8[34] is acceptable.

Figure 5 illustrates the SEM Model used to analyse the correlation between behavioural biases and investment performance among Indian respondents. According to the model, five biases affect investment performance: anchoring bias (AN1, AN2, and AN3), status quo bias (SQ2, SQ3, and SQ4), mental accounting (MA1 and MA2), herding (HE3 and HE4), and affect heuristic (AH1, AH3, and AH4). Results from Table 9 show that both anchoring bias and mental accounting have significant negative impacts on investment performance. On the other hand, affect heuristic, herding, and status quo bias have significant positive impacts on investment performance.

Figure 6 exhibits the structural model for analysing the relationship between behavioural factors and investment performance of the USA respondents and infers that four biases have an impact on investment performance:

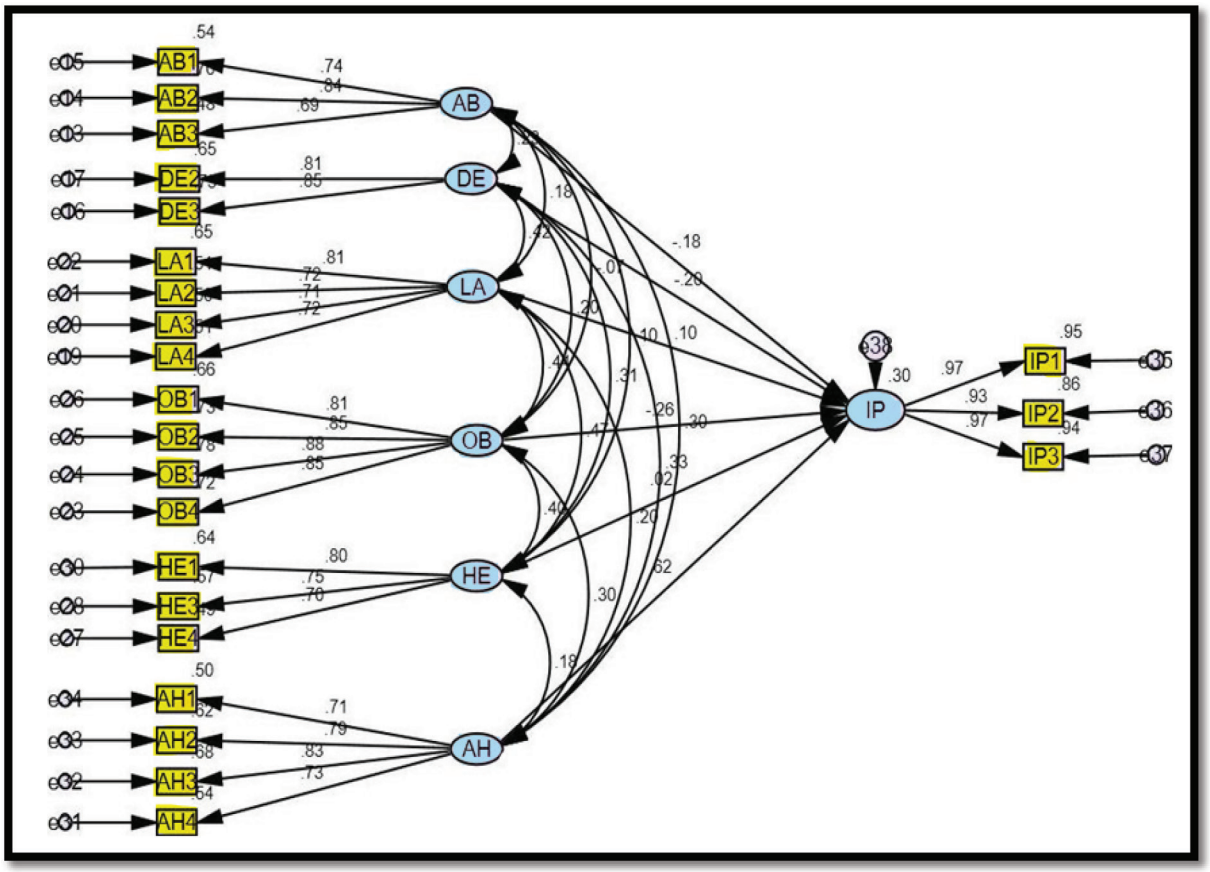


AN - Anchoring, SQ - Status-quo, MA - Mental accounting, HE - Herding, AH - Affect heuristic, IP -Investment performance
Source: Research output

Figure 5. Structural Model for Analysing the Relationship between Behavioural Biases and Investment Performance for the Indian Respondents.

availability bias, disposition bias, overconfidence bias, and affect heuristic. Availability bias, disposition effect, and overconfidence bias negatively influence investment performance (Table 9). On the contrary, the affect heuristic bias positively influences investment performance. However, the impact of herding and loss aversion is not significant.

The result of the structural model for UK respondents has been depicted in Figure 7, which shows that six biases have an impact on investment performance: loss aversion, overconfidence bias, herding bias, representativeness bias, and availability bias. Affect heuristic and herding have a negative influence on investment performance



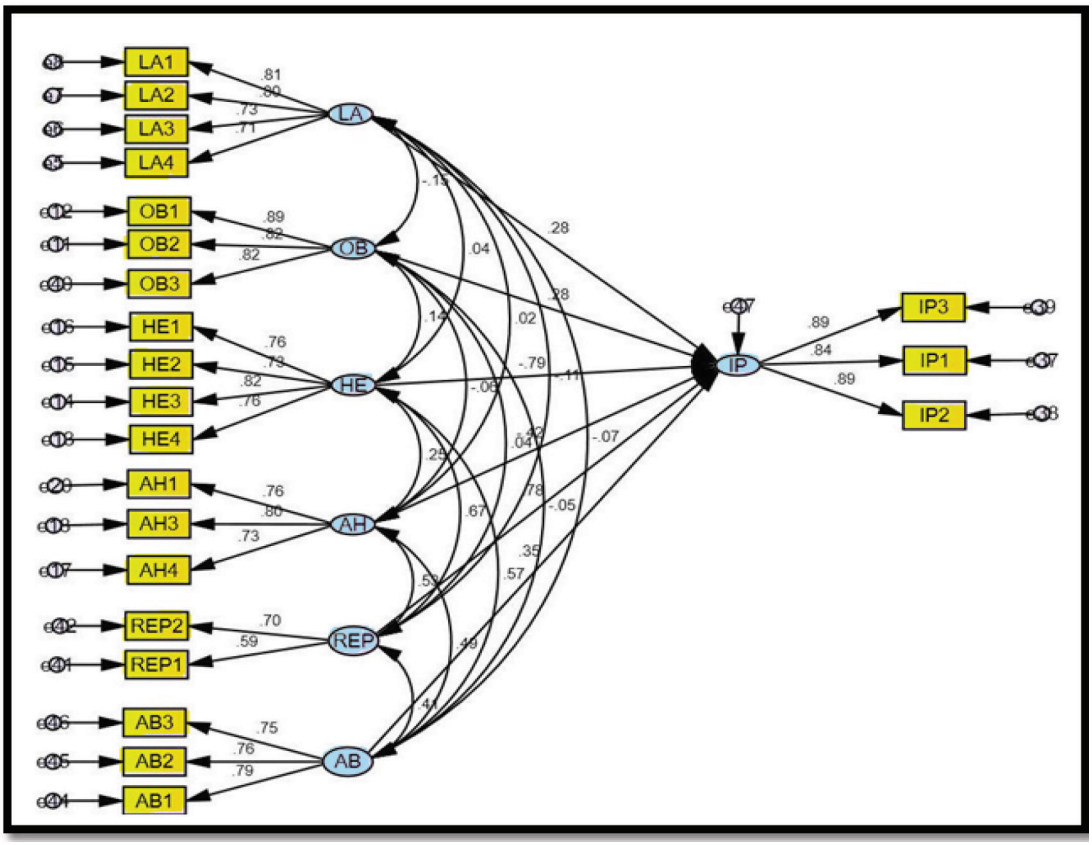
AB - Availability bias, DE - Disposition effect, LA - Loss aversion, OB - Overconfidence, HE - Herding, AH - Affect heuristic, IP - Investment performance

Source: Research Output

Figure 6. Structural Model for Analysing the Relationship between Behavioural Biases and Investment Performance for the US respondents.

(Table 9). On the contrary, loss aversion, overconfidence bias, availability bias, and representativeness bias have a positive influence on investment performance.

Based on these results, our first alternate hypothesis H_{a1} is not rejected. In other words, the behavioural factors have a significant impact on the investment performance of individual investors in India, the USA, and the UK. The structural model results validate the existence of status-quo bias amongst Indian respondents, positively impacting their investment performance. Indians have a habit of saving using traditional methods and holding the same investment for long term, irrespective of its return. Since humans have limited mental bandwidth, they get confused due to the availability of too many options. Thus, sticking with the status quo lessens the number of choices they have to make. Moreover, such investors believe the returns are higher for their choices as they are fully acquainted and possess thorough knowledge regarding the same. The results also show strong support for herding bias among the Indian investors, which positively impacts their investment performance. Though in uncertain periods herding increases, which is visible in the tenure of study due to Covid-19. This signifies that individuals in India are more willing to follow the decisions of popular analysts, large groups, friends, relatives, or noise traders, and they depend more on information from the masses instead of their own. Moreover, they quickly get influenced by other investors' decisions of choosing investments, volume, buying, selling, and react quickly to the changes of other investors' decisions in anticipation of a positive return. Our results offer great support to prior studies[19,34,35] though their results depicted scenarios from Kenya, Vietnam, and Sri Lanka, respectively. Further, the findings divulge strong support for the



LA- Loss aversion, OB - Overconfidence, HE - Herding, AH - Affect heuristic, REP - Representativeness, AB - Availability bias IP - Investment performance

Source: Research Output

Figure 7. Structural Model for Analysing the Relationship between Behavioural Biases and Investment Performance for the UK Respondents.

Table 9. Standardised Regression Coefficient between the Factors/Constructs

Relation	Regression Estimate (India)	Regression Estimate (USA)	Regression Estimate (UK)
IP←AN	-0.207**		
IP←MA	-1.604***		
IP←AH	0.572***	0.620***	-0.416***
IP←HE	1.427**	0.022	-0.786***
IP←SQ	0.882***		
IP←AB		-0.184**	0.345**
IP←DE		-0.200**	
IP←OB		-0.265***	0.275**
IP←LA		0.103	0.285**
IP←REP			0.777***

** For p-value<0.1 and p-value>0.05*

*** For p-value<0.05 and p-value>0.001*

**** For p-value<0.001*

Source: Research Output USA. This signifies that investors have a significant tendency to overrate their knowledge, abilit

existence of loss aversion bias among UK investors, which positively influences investment performance. Therefore, respondents prefer to avoid stocks with high volatility. Our findings do contradict exiting literature[34,35] which claim that loss aversion keeps investors away from supernormal profits as high risk leads to a high return. Considering the availability bias, the results reveal that UK investors give more weightage to the most readily available data that comes to mind instantly while making their judgment. Investors prefer to invest in known options without examining other alternatives.

However, anchoring bias has a significantly negative impact on Indian investors' investment performance in accordance with prior studies[1,2]. The respondents tend to hold a security till it reaches a specific price or a target, resultantly, they might be reluctant to exit the wrong position, wait for the stock to reach its anchored entry point, and end up with heavier losses. This exhibits the negative impact of mental accounting bias on the Indian investors' investment performance, as they hold loss-making equity to reach their entry price irrespective of the loss of compounding. It indicates that individuals overlook the nexus between different investment alternatives and classify their investments into various categories like "a new car," "vacation," "retirement," etc., which is nothing less than a farce. They create separate mental buckets of money for different accounts, wherein they freeze their money, irrespective of the fact that a cautious investment of this money in the markets at the appropriate point might harvest significant returns. The findings establish the negative impact of overconfidence bias on investors' investment performance in the USA. This signifies that investors have a significant tendency to overrate their knowledge, abilities, and investment trading skills. All this implies a negative impact on their investment performance. The results support some findings[9,36], and are contrary to the existing studies[17,34] which claim that overconfidence positively impacts investors' investment performance.

Although some of the behavioural biases are found to impact investment performance positively, investors should be cautious as they can lead to irrational decision-making and might adversely influence the investors' investment performance in the long run.

4.3 Moderating Role of Financial Literacy

The study conducted a multivariate moderation analysis to evaluate the moderating role of financial literacy. Respondents were categorised into two groups based on whether they had attended an investing course, which was used as a proxy for evaluating their financial literacy. Respondents who had attended an investing course were placed in the "financially literate" group and alternatively in the "financially illiterate" group. To test the categorical moderation hypotheses, the critical ratios for the differences in regression weights between financial literacy groups (investing course attended yes/no) were used.

From Table 10, we can infer that anchoring bias shows no impact on the investment performance of financially literate respondents, whereas it significantly and negatively impacts the investment performance of financially illiterate respondents. Thus, it can be said that financial literacy significantly moderates the relationship between anchoring bias and individual investment performance, i.e., investors with low literacy levels believe that anchoring bias has a significantly negative impact on their investment performance. However, investors with a high literacy level consider no effects of anchoring bias on their investment performance. Nevertheless, financial literacy did not have a significant moderating effect on other behavioural biases (mental accounting, affect heuristic, herding, and status-quo) and individuals' investment performance in India. In case of USA, we can infer that affect heuristic bias shows no impact on the investment performance of financially literate respondents, whereas it significantly and positively impacts the investment performance of financially illiterate respondents. Thus, establishing that financial literacy significantly moderates the relationship between affect heuristic and investors' investment performance. However, financial literacy does not have a significant moderating effect on the relationship between other behavioural biases (availability bias, disposition effect, loss aversion, overconfidence bias, and herding) and the investment performance of investors in the USA. Moreover, financial literacy does not significantly affect the relationship between behavioural biases (loss aversion, overconfidence bias, herding, affect heuristic, and availability bias) and the investment performance of UK investors. The study did not reject the second alternate hypothesis for India and the USA, while rejecting it for the UK.

The findings suggest that attending an investing course may not be enough to mitigate behavioural biases in the complex and uncertain financial environment, and that experience in worldwide stock markets may be more important. Our findings support prior literature[37,38] which

Table 10. Results of Multi-Group Moderation Analysis

Particulars	India			USA			UK		
Moderating role of financial literacy between	Financially literate	Financially illiterate	Δ Z score	Financially literate	Financially illiterate	Δ Z score	Financially literate	Financially illiterate	Δ Z score
Anchoring bias and investment performance	0.146	-0.385*	-2.04*	-	-	-	-	-	-
Mental accounting bias and investment performance	-0.439*	-1.74*	-0.867	-	-	-	-	-	-
Affect heuristic and investment performance	0.181	0.744	0.921	-0.155	0.317*	3.303	-0.086	-0.071	0.628
Herding effect and investment performance	0.263*	0.279*	0.03	0.04	-0.084	-0.497	-0.16*	0.162*	1.398
Status quo bias and investment performance	-0.294	1.133*	1.36	-	-	-	-	-	-
Availability bias and investment performance	-	-	-	-0.087*	-0.132	-1.152	0.243*	0.451	-0.663
Disposition effect and investment performance	0.054*	0.057*	0.352	-	-	-	-	-	-
Loss aversion bias and investment performance	-	-	-	-0.095	-0.058	-0.763	0.148*	0.129*	-0.12
Overconfidence bias and investment performance	-	-	-	-0.114	0.161	1.33	0.116	0.267*	0.857

**significant at 5%

Source: Research Output

validates no significant moderating role of financial literacy amongst behavioural biases and investment performance. Further research is needed to identify other factors that may influence the relationship between behavioural biases and investment performance. Creating a nudge to mitigate these biases would prove advantageous for the investors.

5. Conclusion, Implications and Scope for Future Research

The present study investigates the impact of behavioural biases on investment performance across three different countries - India, USA, and the UK. The results demonstrate that external influences like societal norms, culture, financial system, political system, and legislatures shape individuals' preferences, leading to distinctive levels of risk tolerance, portfolio management style, investing patterns, behavioural anomalies, and more. The study reveals that behavioural biases significantly impact investors' investment performance, and investors must evaluate both the negative and positive influences of biases before making any investing decisions.

The study concludes that financial literacy significantly moderates the relationship between anchoring bias and individuals' investment performance in India and affect heuristic in the USA. Interestingly, in the UK scenario, no significant moderating impact of financial literacy was found between any of the behavioural biases and investment performance. The finding suggests that attending investing courses alone may not help investors to mitigate their behavioural biases in a complex and uncertain financial environment. Perhaps, experience matters the most in worldwide stock markets compared to a financial course. Other factors may also influence the relationship between behavioural biases and investment performance. Financial literacy may perhaps help combat these biases when seasoned investors deploy money in a time-bound and disciplined manner. Investing is

a scientific process where volatile alternatives cannot generate consistent returns.

5.1 Suggestions to Individual Investors

Benjamin Graham once said, "Individuals who cannot master their emotions are ill-suited to profit from the investment process". While it is impossible to completely avoid behavioural biases, investors can take steps to reduce their impact. Adopting a goal-based investing strategy can provide a framework for more rational and objective decision-making, reducing biases such as loss-aversion and recency bias. This strategy involves staying focused on long-term goals and investing in stocks with a durable competitive advantage and a cushion of safety compared to other sectors. Key parameters such as CAGR (compound annual growth rate), price to earnings ratio, debt to equity ratio, gross profit margin, operating profit margin, return on equity, free cash flow, and dividend yield can be used to identify stocks with a moat. To avoid investing in dubious companies, investors should develop a predictive framework that incorporates an exhaustive checklist for accounting and corporate governance checks. As investors approach their financial goals, they should execute a de-risking strategy by moving from shares into bonds or cash to preserve capital and protect against market volatility. By sticking to their financial plan, assessing their risk appetite, establishing an appropriate asset allocation strategy, and periodically rebalancing their portfolios, investors can make sound investment decisions. Ultimately, remaining unemotional and examining scenarios calmly and logically is key to successful investing.

To effectively solve any problem, the first step is to acknowledge and understand it, and to assess its impact on people's quality of life. This study provides conclusive evidence of existence of behavioural biases among investors in the USA, UK, and Indian markets. These biases have a significant impact on the performance of individual portfolios and overall wealth generation. Investment decisions free from these biases can result in significantly higher wealth creation. Financial advisors, portfolio managers, and regulatory authorities can use these findings to develop policies that encourage long-term investments and to recognise different types of behavioural anomalies. This study can also help investors make better investing decisions that can impact their financial success. Policy makers have the potential to mitigate the influence of biases on the performance of individual investors by implementing indexation benefits for long-term holdings, which would in turn lower the frequency of transactions and minimize tax implications. Portfolio managers have a chance to impose administrative costs in the form of a reduced percentage, which is adjusted based on the frequency of transactions. These costs are postponed for a period of two to three years, allowing for the potential of compounding within the investment. People who are interested in investing can compare their own biases to those that were found to be significant in the research and apply cognisant investing to fight them.

Future research can focus on analysing the role of individual factors such as demographics, personality, emotional intelligence, investors' sentiments, and cultural background on investing behaviour and investment performance. Additionally, other respondents like non-profit organizations, institutional investors, financial intermediaries, investment firms, banks, insurance companies, and equity investment companies may be considered in future research for developing appropriate models either for selling or financial counselling.

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Appendices

Appendix A: Types of Measurement

Group	Dimensions	Measurement
Basic investing information	Classifying: Financial literacy (attended any investing course or not), type of investment, type of investor, the core purpose of investing, level of investment knowledge	Nominal scale
	Classifying and ranking order of: investors' experience	Ordinal scale
Behavioral biases influencing investment decisions	Anchoring bias (AN1, AN2, AN3, AN4)	5-point Likert scale
	Status-quo bias (SQ1, SQ2, SQ3, SQ4)	
	Representativeness bias (REP1, REP2, REP3, REP4)	
	Affect-heuristic (AH1, AH2, AH3, AH4)	
	Herding (HE1, HE2, HE3, HE4)	
	Disposition effect (DE1, DE2, DE3)	
	Availability bias (AB1, AB2, AB3)	
	Loss aversion (LA1, LA2, LA3, LA4)	
	Mental accounting (MA1, MA2)	
	Over-confidence (OB1, OB2, OB3, OB4)	
Investment performance	Return rate and satisfaction of investment decisions (IP1, IP2, IP3)	5-point Likert scale
Personal information	Classifying: Gender, Profession	Nominal
	Classifying and ranking order of: age, educational level, income	Ordinal

Source: Author's contribution

Appendix B: Questionnaire

1. Have you attended any course on Investing?
Yes ☐ No ☐

2. Please specify which type of investments are you most comfortable in investing:

Equity	☐	Mutual funds	☐
Real Estate	☐	Gold/ Silver	☐
Fixed deposit/ PPF	☐	Others _____	

3. What kind of an investor are you?

Speculative (short-term)	☐	Capital Long (long term)	☐	Both	☐

4. What is the core purpose of investing to you?

	Equity	Real Estate	Gold/Silver	MFs	FD/PPF
Wealth maximisation	☐	☐	☐	☐	☐
Securing the well-being of my family	☐	☐	☐	☐	☐
Important life goals	☐	☐	☐	☐	☐
Getting rich instantly	☐	☐	☐	☐	☐
Tax benefits	☐	☐	☐	☐	☐

Others _____

5. For how long have you been investing?

Less than 1 year	☐	1 to 5 years	☐	5 to 10 years	☐
10 – 20 years	☐	More than 20 years	☐		

6. Which of the following best describes your level of investment knowledge?

Very limited (few knowledge)	☐
Basic knowledge (understand the differences between stocks, bonds and GICs)	☐
Fair amount of knowledge (aware of different investment options and their risks)	☐
Considerable knowledge (understand different investment philosophies)	☐
Extensive knowledge (complete understanding of investment products and strategies)	☐

BEHAVIORAL FACTORS INFLUENCING YOUR INVESTMENT DECISIONS

7. Please evaluate the degree of your agreement with the impacts of behavioral factors on your investment decision making

** Mark only one box per row.*

	Strongly Disagree	Disagree in part	Neutral	Agree in part	Strongly Agree
AN1: I forecast the changes in prices in the future based on the recent prices.	☐	☐	☐	☐	☐
AN2: I always compare the purchase price with the market price at the time of selling.	☐	☐	☐	☐	☐
AN3: I rely on my previous experiences for my next investment.	☐	☐	☐	☐	☐
AN4: I hold security to a price for selling as I want to sell only if it reaches a specific price or a target.	☐	☐	☐	☐	☐

	Strongly Disagree	Disagree in part	Neutral	Agree in part	Strongly Agree
REP1:I usually rely on immediate past performance of the stock before making my investment decision.	☐	☐	☐	☐	☐
REP2:I believe it is possible to find the future value of an investment through a detailed analysis of past performance.	☐	☐	☐	☐	☐
REP3:I prefer 'hot' investments and avoid those that have performed poorly in the recent past.	☐	☐	☐	☐	☐
REP4: I use trend analysis of some representative investment to make my investment decisions.	☐	☐	☐	☐	☐
OB1:I believe that my skills and knowledge can help me outperform the market.	☐	☐	☐	☐	☐
OB2:I usually rely on my "gut feelings" for making investment decisions.	☐	☐	☐	☐	☐
OB3:I make investment decisions with not much previous research.	☐	☐	☐	☐	☐
OB4:I perceive that the past investment failure was more of bad luck than it was my own poor judgment	☐	☐	☐	☐	☐
HE1:I often use information gained from news, magazines, or trading groups when making investment decisions.	☐	☐	☐	☐	☐
HE2:I prefer to invest in those investments that my friends and relatives have invested.	☐	☐	☐	☐	☐
HE3:I usually get influenced by other investors' decisions of choosing investments, volume, buying, selling, and holding.	☐	☐	☐	☐	☐
HE4:I usually react quickly to the changes of other investors' decisions and follow their reactions.	☐	☐	☐	☐	☐
SQ1:I usually get confused regarding where to invest due to too many options, so I prefer to invest in the same type of investments again and again.	☐	☐	☐	☐	☐
SQ2:I believe the returns are higher for investments that I am familiar with.	☐	☐	☐	☐	☐
SQ3:When seeking for new investment alternatives, I think about them but end up doing nothing.	☐	☐	☐	☐	☐
SQ4:I avoid investing in unfamiliar investment options even if they have recently offered higher profit.	☐	☐	☐	☐	☐
AB1:I prefer to invest in known options rather than a new or unfamiliar ones.	☐	☐	☐	☐	☐
AB2:I consider my friends' & relatives' information as the reliable reference for my investment decisions.	☐	☐	☐	☐	☐
AB3:I often rely on the company's recent financial data when making investment decisions.	☐	☐	☐	☐	☐
DE1:I tend to hold on to investments losing value because I know the prices will revert soon.	☐	☐	☐	☐	☐
DE2:I prefer to sell as soon as their price starts increasing.	☐	☐	☐	☐	☐
DE3:I feel disappointed about holding losing investments too long than about selling winning investments too soon.	☐	☐	☐	☐	☐
LA1:After a prior loss, I become more risk-averse.	☐	☐	☐	☐	☐

	Strongly Disagree	Disagree in part	Neutral	Agree in part	Strongly Agree
LA2:I intend to sell my investments immediately; it goes back to the purchased price.	☐	☐	☐	☐	☐
LA3:I prefer not to invest in investments with high volatility.	☐	☐	☐	☐	☐
LA4:After a prior gain, I become more risk-seeking than usual.	☐	☐	☐	☐	☐
MA1:I ignore the connection between different investment possibilities.	☐	☐	☐	☐	☐
MA2:I classify my investments into categories like "a new car," "vacation," etc.	☐	☐	☐	☐	☐
AH1:I avoid investing on a day I have a bad mood.	☐	☐	☐	☐	☐
AH2:I prefer to invest when I am happy.	☐	☐	☐	☐	☐
AH3:I prefer to invest in the festival season as they are considered auspicious and bring good luck.	☐	☐	☐	☐	☐
AH4:I usually do not invest during the inauspicious time of the year.	☐	☐	☐	☐	☐

INVESTMENT PERFORMANCE

8. Please give your opinions about the levels of agreement for the following statements:

	Strongly Disagree	Disagree in part	Neutral	Agree in part	Strongly Agree
IP1: The return rate of my recent investment meets my expectation	☐	☐	☐	☐	☐
IP2: My rate of return is equal to or higher than the average return rate of the market	☐	☐	☐	☐	☐
IP3: I feel satisfied with my investment decisions in the last year (including selling, buying, choosing options, and deciding the volumes)	☐	☐	☐	☐	☐

PERSONAL INFORMATION

9. Gender: Female ☐ Male ☐ Other: ☐

10. Please, choose your age group:

Under 25 years ☐ Between 26 -35 years ☐ Between 36-50 years ☐

Between 51- 65 years ☐ Over 65 years ☐

11. Please, choose your education group:

High school and lower ☐ Under-Graduate ☐

Bachelor ☐ Master ☐

Doctorate ☐ Other_____.

12. Please, choose your profession group:

Student ☐ Executive, Senior technician, employer, manager ☐ Home-maker ☐

Self employed ☐ Academic, Researcher, Director, Doctor ☐ Retired ☐

Other_____.

13. Please estimate your average monthly income:

Less than 25000	☐	25001- 50000	☐
50001- 75000	☐	75000- 100000	☐
More than 100000	☐		

END