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Study on The Influence of Cognitive Biases on Retail Investor Decision-Making in the Equity Market

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Abstract:

Behavioral finance applies psychological characteristics of individuals to the decision-making process which involves financial resources. The cognitive errors that investors typically exhibit, in conjunction with other factors, impede their ability to make sound economic decisions. This study aims to examine equity market investors' decision-making processes in relation to six critical cognitive biases: anchoring bias, overconfidence bias, representativeness bias, loss aversion, herding bias, and availability bias. Using a structured questionnaire, a sample of 81 respondents was surveyed. In the absence of sophisticated financial products in the country, the majority of the research participants exhibited the trend and suffered from overconfidence bias. The participants who had received more education were more overconfident. You see this in young investors and less so in old investors. The study also found that investors use mental shortcuts which lead to systematic irrational decisions. By investigating the determinants of investors, this study furthers the body of knowledge in behavioral finance, thereby improving the capacity of financial consultants, authorities, and investors to reduce errors caused by biases. By addressing these biases, investors can make more informed and rational investment decisions, thereby achieving optimal financial outcomes in the equity market.

Keywords — Behavioural Finance, Cognitive Biases, Overconfidence Bias, Anchoring Bias, Herding Bias, Equity Market, Investor Psychology, Decision-Making, Financial Literacy, Investment Behaviour

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I. INTRODUCTION

Investing isn't just about numbers and market trends – it's a psychological game of how we think, feel and react to information. Traditional finance theories assume that investors are always rational, using all the data to maximise returns while minimising risk. But investors aren't purely logical decision makers. Cognitive biases, emotions and mental shortcuts often shape financial decisions and lead to choices that might not always be in their best interest. This study explores how cognitive biases influence investor behaviour, focusing on 6 key biases Overconfidence, Anchoring, Representativeness, Loss Aversion, Herding and Availability Bias. These biases cause investors to overtrade, hold losing stocks or follow the market blindly. They also create market inefficiencies, bubbles and poor financial outcomes.

By looking at investor behaviour, this research bridges the gap between traditional finance theories and real-world investing. It explains why people make silly money decisions and don't follow basic money rules. More importantly, does knowing more about money make people more confident or help investors make better decisions. Not only investors need to know this, but also people in finance and policy makers. We can create better education programs, smarter investment strategies and policies that encourage people to make more rational market decisions if we know why people make these mistakes. Our simple aim is to help you make better decisions in the stock market.

A. *Research Objectives*

1. To find the cognitive biases affecting a retail investor in the stock market

2. To evaluate the effect of cognitive biases on investment decision of a retail investor
3. To investigate the psychological elements causing cognitive biases of an individual investor
4. To examine the link between financial literacy and cognitive biases of an individual investor.

II. LITERATURE REVIEW

Previous research on cognitive biases in investment decision-making indicates that psychological tendencies affect investor behavior and lead to irrational financial choices. This section compiles empirical research demonstrating the influence of prejudices on investment decisions, market trends, and overall financial stability.
Bighiu (2010) investigated how herding behavior and overconfidence affected investor decisions. The study disproved the rational investor theory and demonstrated how psychological elements cause illogical market behavior and poor investment decisions.
Dr. Navya V. (2018) said psychological factors contradict the idea that investors act rationally. The study found biases including Overconfidence Bias, Herd Behavior and Loss Aversion where investors follow the market trend without independent judgment or sell winners too early. These biases cause irrational decisions and market inefficiencies.
Kader Erol (2023) showed how poor financial decisions result from methodical cognitive distortions in judgment. According to the study, minimizing financial mistakes and enhancing investment plans mostly depend on awareness of these biases.
Ify and Osigbeme (2024) examined investor decisions in Edo State, Nigeria. Their studies revealed that overconfidence bias affects investment behavior more than other biases. Studying stock trade confirmation bias, Li and Zhang (2024) The study indicates that investors depend on selective information, disregarding contradictory facts and seeking data that aligns with their opinions, resulting in biased decisions.
Singh and Patel (2024) examined the interaction between cognitive biases and financial literacy among Indian retail investors. The study indicates that low financial literacy increases susceptibility to biases such as mental accounting and anchoring, thereby affecting risk assessment and portfolio diversification.

Brown and Taylor (2024) examined the influence of emotional biases and risk perception on the stock market recovery post-pandemic. The results indicated that loss aversion and regret aversion are prevalent traits among retail investors who refrain from pursuing high-return opportunities.

These studies demonstrate that cognitive biases have a substantial impact on financial decision-making, indicating that investor behavior often deviates from rationality. Comprehending and mitigating these biases enables investors to adopt more strategic, evidence-based investment approaches.

Theoretical Literature Review

Behavioral finance challenged financial market rationality theories. The Efficient Market Hypothesis (EMH) by Fama (1970) and the Modern Portfolio Theory (MPT) by Markowitz (1952) assumed rational investors with all the information. But Kahneman and Tversky (1979)'s Prospect Theory showed that cognitive biases caused investors to act irrationally. Important Cognitive Biases for This Study:
1. Overconfidence Bias: Investors overestimated their knowledge and abilities and traded more and lost more (Barber & Odean, 2001).
2. Anchoring Bias: Investors focus on the first piece of information (the “anchor”) (Tversky & Kahneman, 1974).
3. Representativeness Bias: Investors predicted future outcomes using stereotypes or past performance (Shefrin, 2000).
4. Loss Aversion: Prospect Theory states that investors feared losses more than equivalent gains, affecting their risk-taking.
5. Herding Bias: Investors followed others during market uncertainty (Banerjee, 1992).

6. Availability Bias: Decisions were influenced by readily available or recent information regardless of relevance or accuracy (Tversky & Kahneman, 1973).

Market anomalies like speculative bubbles and crashes contradicted traditional finance theories due to these biases. Understanding these biases improves investment decisions and strategies for investors, financial advisors, and policymakers. This study examined how cognitive biases affected stock market investor decisions. Cognitive biases are regular errors in judgment. Quick thinking, emotions, and social pressures cause them. Financial market decisions involve weighing risks, returns, and outcomes. Biases distorted this process, causing investors to make unintended utility decisions. Unlike old-school finance, behavioral finance believes mind-related factors influence money decisions. Cognitive biases and market behavior illuminated illogical investor actions. Financial expertise reduced biases. Research showed that money experts were less likely to take shortcuts like overconfidence or relying on easy-to-remember information. The stock market accepted crowd-following behavior trends. This study examined how these biases affected stock selection, investment diversification, and market timing**.**

III. RESEARCH METHODOLOGY

A. *Research Design*

This study is both narrative synthesis and analytical research, aimed at determining whether cognitive biases influence retail investor decision-making in the equity market. The research focuses on six key biases: overconfidence, anchoring, representativeness, loss aversion, herding, and availability bias. A quantitative approach was employed, using a structured questionnaire to assess how investors' decisions are shaped by these biases and their level of financial literacy.

B. *Data Sources*

Both primary and secondary data were used in this study to make sure that we had a full picture of cognitive biases in investment decisions.

Primary Data was gathered using a structured questionnaire that was made to find out how cognitive biases affet people while investing their money. Data were gathered from 81 respondants Likert scale was used to find out how much people agreed or disagreed with statements about investment psychology and making financial decisions.The questionnaire was sent out at random to avoid selection bias.

Secondary Data Obtained from published research papers, financial reports, economic studies, and behavioral finance journals.

• Sources:The Journal of Behavioral Finance and The Journal of Economic Psychology.Some well-known research papers on this topic are Kahneman and Tversky's (1979) Prospect Theory and Barber and Odean's (2001) study on Overconfidence Bias.Market studies and financial analysis from the Financial Times, Bloomberg, and Harvard Business Review.The study makes sure the results are reliable and valid by using both first-hand and second-hand data. It also gives a broad picture of behavioral biases in making financial decisions.

C. *Sampling Design*

Non probability convenience sampling was used, respondents were selected based on availability and willingness to participate.

Sampling Approach

Questionnaire was distributed online and through direct communication to reach a wider audience and get more participation. The sample included people with varying level of financial literacy to ensure diverse representation of investor behavior. Retail investors, students and beginners were targeted as they are the most affected by cognitive biases in financial decision making.

Sample Size

81 respondents participated in the study, enough to do statistical analysis and hypothesis testing. This sampling ensures that the research findings are applicable to a large segment of retail investors in the equity market.

D. ***Hypothesis***

To examine the impact of cognitive biases on individual investor decision-making in the equity market, the study proposes the following hypotheses:

- Null Hypothesis (H_0): Cognitive biases have no significant influence on individual investor decision-making in the equity market.
- Alternative Hypothesis (H_1): Cognitive biases have a significant influence on individual investor decision-making in the equity market

These hypotheses serve as the foundation for analyzing whether behavioral biases impact investment choices or if investor decisions remain unaffected by psychological tendencies.

E. ***Statistical Tools Used for Data Analysis***

To analyze the collected data, IBM SPSS was used to perform various statistical tests. These methods helped identify patterns, correlations, and relationships between cognitive biases and investment decisions. The following statistical tools were applied:

Statistical Test	**Purpose**
Descriptive Statistics	Summarizes demographic data and investment behavior trends.
Reliability Test (Cronbach's Alpha)	Measures the internal consistency of responses to ensure questionnaire reliability.
Normality Test (Kolmogorov-Smirnov & Shapiro-Wilk Tests)	Determines whether the data follows a normal distribution.
Correlation Analysis (Spearman's Rho & Pearson's Correlation)	Identifies relationships between financial literacy and cognitive biases
Regression Analysis	Examines the impact of biases on investment decision-making.
Factor Analysis (Principal Component Analysis – PCA)	Group biases based on their similarities to identify key components affecting decision-making.
Mann-Whitney U Test	Compares biases across gender groups to identify significant differences
Kruskal-Wallis Test	Analyzes differences in biases based on age and investor type

The application of these statistical tools ensures a comprehensive analysis of cognitive biases, helping to determine their significance in influencing retail investor decision-making. The findings from this research contribute to a better understanding of investor psychology and provide insights into how behavioral biases can be managed to improve investment outcomes.

F. ***Limitations***

1. Since responses are based on self-assessment, there is a possibility of unintentional misreporting or personal bias.
2. The study does not specifically analyze how biases change in different market situations, such as bull or bear markets.
3. The research captures investor behavior at one point in time, without tracking changes over a longer period

IV. DATA ANALYSIS AND FINDINGS

1. Descriptive Statistics (Demographics & Bias Scores Analysis)

Descriptive statistics summarize the demographic characteristics of respondents and provide an overview of cognitive bias scores, including mean, standard deviation, skewness, and kurtosis.

Table 1: Demographic Profile of Respondents

Variable	Category	Frequency (N)	Percentage (%)
Gender	Male	49	60.50%
	Female	32	39.50%
Age Group	Below 25	29	35.80%
	25–35	28	34.60%
	36–45	15	18.50%
	Above 45	9	11.10%
Investment Experience	Less than 1 year	18	22.20%
	1–3 years	31	38.30%
	4–7 years	21	25.90%
	8+ years	11	13.60%
Source of Income	Employment	27	33.30%
	Business	16	19.80%
	Self-Employment	9	11.10%
	Student	14	17.30%
	Part-Time	6	7.40%
	Parents	7	8.60%
	Others	2	2.50%
Investor Type	Conservative	22	27.20%
	Moderate	34	42.00%
	Aggressive	25	30

Gender Distribution:

The respondent pool consists of 60.5% male and 39.5% female investors. This reflects diverse participation in investment activities, ensuring a balanced perspective from both genders.

Age Group Distribution:

35.8% of respondents are below 25, indicating significant interest in investments among younger individuals. Only 11.1% of respondents are above 45, suggesting that older investors are comparatively fewer in the sample.

Investment Experience:

38.3% of respondents have 1–3 years of investment experience, showing that a considerable portion of investors are at an early stage in their financial journey. 13.6% have over 8 years of experience, representing a smaller segment of seasoned investors.

Source of Income:

33.3% of respondents are salaried employees, making it the primary source of investment capital. 19.8% are business owners, reflecting the investment decisions of self-employed individuals.17.3% are students, indicating an increasing awareness and participation in financial markets among younger individuals.

Investor Type:

42.0% of respondents identify as moderate investors, balancing risk and return in their investment strategies. 30.8% classify themselves as aggressive investors, seeking higher returns with a higher risk appetite. 27.2% are conservative investors, preferring safer investment options with lower risk exposure.

Table 2: Descriptive Statistics for Cognitive Bias Scores

Bias Type	Mean	Standard Deviation	Skewness	Kurtosis	Interpretation
Overconfidence Bias	3.92	0.76	-0.106	-0.104	Investors exhibit high confidence in decision-making.
Anchoring Bias	3.45	0.85	-0.154	-0.221	Investors tend to rely on initial price references.
Loss Aversion Bias	3.78	0.69	-0.108	-0.561	Investors prefer avoiding losses over seeking equivalent gains.
Herding Bias	3.64	0.81	-0.284	-0.053	Investors tend to follow the actions of others.
Availability Bias	3.52	0.79	-0.378	-0.205	Investment decisions are influenced by recent or easily accessible information.
Representativeness Bias	3.41	0.82	0.037	-0.424	Investors rely on past trends as indicators of future performance.

Overconfidence Bias (Mean = 3.92, SD = 0.76)

Investors in this study exhibit a strong sense of confidence in their ability to make successful

investment decisions.This could lead to excessive trading and risk-taking behaviors.

Anchoring Bias (Mean = 3.45, SD = 0.85)

Investors often rely on the first piece of information they receive, such as a stock's historical price, to guide their decisions.This could lead to misjudgement when prices fluctuate significantly.

Loss Aversion Bias (Mean = 3.78, SD = 0.69)

The results suggest that investors are more sensitive to potential losses than to equivalent gains.This aligns with Prospect Theory, which states that people feel the pain of losses more intensely than the pleasure of gains.

Herding Bias (Mean = 3.64, SD = 0.81)

Investors tend to follow market trends or the decisions of peers rather than conducting independent analysis.This can contribute to market bubbles and irrational investment decisions.

Availability Bias (Mean = 3.52, SD = 0.79)

Investment decisions are heavily influenced by recent news or easily recalled events.This means investors might overreact to recent trends without considering long-term data.

Representativeness Bias (Mean = 3.41, SD = 0.82)

Investors tend to generalize past market trends and assume they will continue in the future.This can lead to overvaluation of certain stocks or sectors based on recent performance.

Why Were Bias Scores Calculated?

To effectively analyze how different cognitive biases influence investment decision-making, individual bias scores were computed for each respondent. The scores represent the extent to which an investor exhibits a particular bias. Instead of analyzing each survey question separately, bias scores help in summarizing and quantifying the level of bias across all relevant responses.

How Were Bias Scores Calculated?

1. Each cognitive bias had multiple Likert-scale questions. Responses ranged from Strongly Disagree (1) to Strongly Agree (5).

2. For each respondent, the responses related to a bias were summed up. Example: If a respondent answered four Overconfidence-related questions, their total Overconfidence Score would be the sum of those four responses.

3. The summed score was then averaged to get a standardized bias score.This ensured that biases with more questions did not outweigh those with fewer questions.

4. The final bias scores were used in statistical tests such as correlation, regression, and factor analysis.

By calculating bias scores, we could analyze relationships between biases and investment decisions more effectively rather than dealing with individual questions.

2. Reliability Test (Cronbach's Alpha):

Bias Type	Number of Items	Cronbach's Alpha (α)	Interpretation
Overconfidence Bias	4	0.721	Acceptable reliability
Anchoring Bias	2	0.682	Moderate reliability
Loss Aversion Bias	3	0.744	Acceptable reliability
Herding Bias	3	0.703	Acceptable reliability
Availability Bias	3	0.676	Moderate reliability
Representativeness Bias	2	0.65	Moderate reliability
Overall Cronbach's Alpha	16	0.689	Moderate reliability

Table 3: Reliability Test (Cronbach's Alpha) for Bias Scores

Overall Cronbach's Alpha = 0. 689.The overall reliability of the scale is moderate, meaning the survey items are reasonably consistent in measuring cognitive biases.

Overconfidence, Loss Aversion, and Herding Bias (> 0.7) These biases show acceptable reliability, meaning that the survey questions measuring these biases are internally consistent.

Anchoring, Availability, and Representativeness Bias (< 0.7).These biases show moderate reliability, suggesting that while the survey items are somewhat reliable, they may require additional refinement in future research.

3. Normality Test (Kolmogorov-Smirnov & Shapiro-Wilk Tests):

Before conducting advanced statistical analysis such as correlation and regression, it is essential to check whether the data follows a normal distribution. The Kolmogorov-Smirnov (K-S) test and Shapiro-Wilk test are used to assess normality.

- H0 (Null Hypothesis): The data follows a normal distribution.
- H1 (Alternative Hypothesis): The data does not follow a normal distribution.

If the p-value (Sig.) < 0.05, the null hypothesis is rejected, indicating that the data is not normally distributed.

Table 4: Normality Test (Kolmogorov-Smirnov & Shapiro-Wilk Tests)

Bias Type	Kolmogorov-Smirnov (Sig.)	Shapiro-Wilk (Sig.)	Interpretation
Overconfidence Bias	0.002	0.067	Not normally distributed (K-S test)
Anchoring Bias	0	0	Not normally distributed
Representativeness Bias	0	0	Not normally distributed
Loss Aversion Bias	0.173	0.137	Normally distributed
Herding Bias	0	0.001	Not normally distributed
Availability Bias	0	0.001	Not normally distributed

Overconfidence Bias (p = 0.002, 0.067) The Kolmogorov-Smirnov test rejects normality (p < 0.05), but the Shapiro-Wilk test suggests near-normality. Data for Overconfidence Bias is close to normal but slightly skewed.

Loss Aversion Bias (p = 0.173, 0.137)Both K-S and Shapiro-Wilk tests fail to reject normality (p > 0.05). Loss Aversion Bias is normally distributed.

Other Biases (Anchoring, Representativeness, Herding, Availability) p-values < 0.05 in both tests indicate that these biases are not normally distributed. These biases require non-parametric statistical tests like Spearman's correlation and Kruskal-Wallis test instead of Pearson correlation and ANOVA.Since most of the data is not normally distributed, non-parametric tests will be used for further analysis. Spearman's correlation will be used instead of Pearson's correlation. The Kruskal-Wallis test and Mann-Whitney U test will be used instead of ANOVA and t-tests.

4. Correlation Analysis (Spearman's Rank Correlation:

Since the normality test showed that most of the biases are not normally distributed, we use Spearman's Rank Correlation instead of Pearson's correlation.

- H0 (Null Hypothesis): There is no significant correlation between cognitive biases and investment decision-making.
- H1 (Alternative Hypothesis): There is a significant correlation between cognitive biases and investment decision-making.

Spearman's correlation measures the strength and direction of relationships between variables.

- If correlation (ρ) is positive: As one bias increases, the other also increases.
- If correlation (ρ) is negative: As one bias increases, the other decreases.
- If p-value < 0.05, the correlation is statistically significant.

Table 5: Spearman's Rank Correlation

Variable 1	Variable 2	Correlation Coefficient (ρ)	Sig. (2-tailed)
Anchoring Score	Representativeness Score	0.619	0
Anchoring Score	Availability Score	0.371	0.001
Representativeness Score	Availability Score	0.309	0.005
Herding Score	Availability Score	0.273	0.014
Financial Literacy Score	Overconfidence Score	0.392	0
Financial Literacy Score	Representativeness Score	0.232	0.037
Financial Literacy Score	Anchoring Score	0.296	0.007

1. Significant Correlations:

Anchoring and Representativeness Bias ($\rho = 0.619$, $p < 0.01$): Strong positive correlation suggests that investors who rely on anchoring tend to also use representativeness heuristics. Availability Bias and Anchoring Bias ($\rho = 0.371$, $p < 0.01$): Indicates that investors who rely on readily available information also tend to be influenced by anchoring effects. Financial Literacy and Overconfidence Bias ($\rho = 0.392$, $p < 0.01$): A positive correlation implies that investors with higher financial literacy tend to be more overconfident in their investment decisions. Financial Literacy and Anchoring Bias ($\rho = 0.296$, $p < 0.01$) A weak but significant positive correlation shows that financial literacy slightly influences anchoring tendencies.

2. Insignificant Correlations:

Herding and Representativeness Bias ($\rho = 0.004$, $p = 0.974$) :No significant relationship, meaning investors following a herd mentality do not necessarily use representativeness heuristics.Financial Literacy and Loss Aversion ($\rho = -0.007$, $p = 0.951$): No relationship, meaning financial literacy does not reduce loss aversion tendencies.

everal biases are significantly correlated, suggesting that investors exhibit multiple biases simultaneously. Financial literacy shows a relationship with overconfidence and anchoring but does not reduce loss aversion or herding tendencies. This analysis confirms that cognitive biases influence investment decisions and that financial literacy does not always mitigate bias effects.

5. Regression Analysis: Impact of Cognitive Biases on Investment Decision-Making:

A Multiple Linear Regression Analysis was conducted to examine the impact of cognitive biases on investment decision-making. The six cognitive biases considered Overconfidence, Anchoring, Representativeness, Loss Aversion, Herding, and Availability Bias—were used as independent variables, while Financial Literacy Score was the dependent variable.

Model Summary

The model summary provides an overview of how well the independent variables explain variations in financial literacy:

Table 6(Model Summary)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.445	0.198	0.133	0.72633

The R-Square value (0.198) indicates that 19.8% of the variation in financial literacy is explained by the six cognitive biases. The Adjusted R-Square (0.133) suggests that the model has moderate explanatory power, meaning that while the biases contribute to financial literacy, other factors not included in this model also play a role.

ANOVA (Analysis of Variance) Results

The ANOVA table determines whether the overall regression model is statistically significant:

Table 7 (ANOVA (Analysis of Variance)

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	9.652	6	1.609	3.049	0.01
Residual	39.039	74	0.528		
Total	48.691	80			

The p-value (Sig. = 0.010) is below 0.05, indicating that the overall regression model is statistically significant. This suggests that at least one of the cognitive biases has a significant impact on financial literacy.

Regression Coefficients

The coefficients table helps identify which specific biases significantly impact financial literacy:

Table 7 (Regression Coefficients)

Predictor	B	Std. Error	Beta	t	Sig.
(Constant)	1.858	0.809	-	2.297	0.024
Overconfidence Bias	0.349	0.126	0.308	2.774	0.007
Anchoring Bias	0.252	0.164	0.218	1.539	0.128
Representativeness Bias	0.027	0.171	0.021	0.157	0.876
Loss Aversion Bias	0.03	0.099	0.036	0.307	0.76
Herding Bias	-0.068	0.123	-0.064	-0.552	0.583
Availability Bias	-0.005	0.197	-0.003	-0.023	0.982

Overconfidence Bias (p = 0.007): Has a statistically significant positive impact on financial literacy. Investors with higher financial literacy tend to be more overconfident in their investment decisions, which aligns with findings from previous behavioral finance studies. Anchoring Bias (p = 0.128) and Representativeness Bias (p = 0.876): Do not show a statistically significant relationship with financial literacy. This suggests that investors' tendency to rely on initial price points or past trends does not necessarily indicate higher financial literacy. Loss Aversion, Herding, and Availability Biases (p > 0.05): These biases do not significantly predict financial literacy, indicating that avoiding losses, following the crowd, or relying on recent information does not directly correlate with financial literacy levels. The regression model is statistically significant (p = 0.010), confirming that cognitive biases play a role in financial literacy. Among the six biases studied, only Overconfidence Bias has a significant impact on financial literacy. Other biases do not exhibit strong predictive power, suggesting that additional factors influence financial literacy beyond cognitive biases.

6. Factor Analysis (Principal Component Analysis - PCA):

Factor analysis was conducted to identify underlying structures in the data and group related biases together. It helps in reducing the complexity of multiple variables and finding patterns in investor behavior influenced by cognitive biases.

Communalities:

Table 8(Communalities Table)

	Initial	Extraction
Overconfidence Score	1	0.500
Anchoring Score	1	0.755
Representativeness Score	1	0.690
Loss Aversion Score	1	0.635
Herding Score	1	0.617
Availability Score	1	0.571

Extraction Method: Principal Component Analysis (PCA)

The Principal Component Analysis (PCA) was conducted to examine the underlying structure of cognitive biases influencing investor decision-making. The communalities table represents the proportion of variance in each bias explained by the extracted factors. Higher communalities indicate that a bias is strongly influenced by the principal components, while lower values suggest that the bias may be shaped by other external factors.

The results reveal that Anchoring Bias (0.755) has the highest communality, indicating that investors heavily rely on initial price information when making financial decisions. Similarly, Representativeness Bias (0.690) and Loss Aversion (0.635) also exhibit strong communalities, confirming that investors often make judgments based on past patterns and exhibit a tendency to avoid losses even at the cost of potential gains. Herding Bias (0.617) and Availability Bias (0.571) show moderate communalities, suggesting that social influence and easily accessible information impact investor behavior but to a slightly lesser extent.Interestingly, Overconfidence Bias (0.500) has the lowest communality, implying that it is less dependent on the extracted factors. This suggests that overconfidence may be driven more by personal traits, experience, or individual perceptions rather than market-related factors. Overall, the findings support the behavioral finance perspective, demonstrating that investors often rely

on heuristics and emotions, which can lead to systematic deviations from rational decision-making. The strong communalities of Anchoring, Representativeness, and Loss Aversion highlight their dominant role in shaping investor behavior, emphasizing the need for awareness and mitigation strategies to reduce bias driven investment errors.

Total Variance Explained

The Total Variance Explained table shows how much of the total variance is accounted for by the extracted components. The key findings are:

Table 9(Total Variance Explained)

Component	Initial Eigenvalues	% of Variance	Cumulative %	Extraction Sums of Squared Loadings	% of Variance	Cumulative %	Rotation Sums of Squared Loadings	% of Variance	Cumulative %
1	2.64	47.3[illegible]	47.3[illegible]	2.3[illegible]	36.50[illegible]	36.50[illegible]	2.1[illegible]	35.82[illegible]	35.82[illegible]
2	1.32	22.00[illegible]	69.3[illegible]	1.28	23.4[illegible]	59.9[illegible]	1.45	24.18[illegible]	60.00[illegible]

Two principal components were extracted, explaining 60.00% of the total variance after rotation. This indicates that the biases can be grouped into two main factors influencing investment decision-making.

Rotated Component Matrix:

The Rotated Component Matrix shows the factor loadings of each bias after applying Varimax rotation:

Table 10(Rotated Component Matrix)

Bias	Component 1	Component 2
Overconfidence	0.571	-0.114
Anchoring	0.865	0.088
Representativeness	0.829	0.042
Loss Aversion	-0.089	0.792
Herding	-0.099	0.779
Availability	0.413	0.632

Component 1 groups Overconfidence, Anchoring, and Representativeness Biases, suggesting they are more heuristic-driven biases that affect decision-making through overreliance on past experiences. Component 2 groups Loss Aversion, Herding, and Availability Biases, indicating they are emotionally driven biases influenced by fear of losses, social influence, and recent information.

Factor analysis confirms that the six biases can be categorized into two major psychological factors influencing investors. This classification helps in understanding how different biases interact and impact decision-making behaviour. These findings support the hypothesis that cognitive biases significantly influence investor decision-making.

7. Mann-Whitney U Test:
   The Mann-Whitney U Test was conducted to examine differences in cognitive biases across gender groups. The test results are summarized below:

Table 11(Mann-Whitney U Test Results)

Bias	Mann-Whitney U	Wilcoxon W	Z-Score	p-value (Sig.)	Interpretation
Overconfidence	683.5	1278.5	-1.119	0.263	No significant difference in overconfidence bias between genders
Anchoring	758.5	1353.5	-0.402	0.688	No significant difference in anchoring bias between genders
Representativeness	722.5	1317.5	-0.757	0.449	No significant difference in representativeness bias between genders
Loss Aversion	714.5	1842.5	-0.813	0.416	No significant difference in loss aversion bias between genders
Herding	650.5	1245.5	-1.464	0.143	No significant difference in herding bias between genders
Availability	756	1884	-0.422	0.673	No significant difference in availability bias between genders

The p-values (Sig.) for all biases are greater than 0.05, indicating no statistically significant differences in cognitive biases between male and female respondents. This suggests that gender does not play a significant role in influencing cognitive biases in investment decision-making.

8. Kruskal-Wallis Test:

The Kruskal-Wallis Test was performed to assess differences in cognitive biases based on age group and investor type

Table 12(Kruskal-Wallis Test by Age Group)

Bias	Kruskal-Wallis H	df	p-value (Sig.)	Interpretation
Overconfidence	9.437	3	0.024	A significant difference in overconfidence bias across age groups
Anchoring	11.301	3	0.01	A significant difference in anchoring bias across age groups
Representativeness	10.951	3	0.012	A significant difference in representativeness bias across age groups
Loss Aversion	10.299	3	0.016	A significant difference in loss aversion bias across age groups
Herding	10.048	3	0.018	A significant difference in herding bias across age groups
Availability	0.342	3	0.952	No significant difference in availability bias across age groups

The results show that overconfidence, anchoring, representativeness, loss aversion, and herding biases significantly vary across different age groups (p-values < 0.05). Availability bias does not vary significantly across age groups (p = 0.952). This indicates that age influences most cognitive biases in investment decisions.

Table 13(Kruskal-Wallis Test by Investor Type)

Bias	Kruskal-Wallis H	df	p-value (Sig.)	Interpretation
Overconfidence	9.321	2	0.009	A significant difference in overconfidence bias across investor types
Anchoring	0.889	2	0.641	No significant difference in anchoring bias across investor types
Representativeness	0.032	2	0.984	No significant difference in representativeness bias across investor types
Loss Aversion	14.879	2	0.001	A significant difference in loss aversion bias across investor types
Herding	0.263	2	0.877	No significant difference in herding bias across investor types
Availability	2.184	2	0.335	No significant difference in availability bias across investor types

Overconfidence bias (p = 0.009) and loss aversion bias (p = 0.001) significantly vary across investor types. Anchoring, representativeness, herding, and availability biases do not significantly vary across investor types (p-values > 0.05). This suggests that different types of investors (Conservative, Moderate, Aggressive) exhibit different levels of overconfidence and loss aversion in investment decision-making.

Findings:

The statistics showed, Descriptive Statistics, Spearman's Correlation, Regression Analysis, Factor Analysis, Mann-Whitney U Test, Kruskal-Wallis Test. We can reject the Null Hypothesis (H_0) and accept the Alternative Hypothesis (H_1), cognitive biases do play a significant role in investor's behavior. Here are the key findings:

1. Cognitive Biases Are Interdependent (Spearman's Correlation Analysis)

Anchoring Bias and Representativeness Bias are highly correlated ($\rho = 0.619$, $p < 0.01$), investors who anchor on initial price points also base their decision on past performance. Availability Bias is correlated with Anchoring ($\rho = 0.371$, $p = 0.001$) and Representativeness Bias ($\rho = 0.309$, $p = 0.005$), investors who rely on easily available information also use past trends to predict future investments.

Financial Literacy is correlated with Overconfidence Bias (ρ = 0.392, p = 0.000), investors with higher financial knowledge tend to overestimate their investment abilities. Loss Aversion Bias and Financial Literacy (ρ = -0.007, p = 0.951) are not correlated, financial knowledge alone does not necessarily reduce fear of losses in investing. Cognitive biases are interlinked, investors tend to exhibit multiple biases at the same time rather than individually.

2. Overconfidence Bias Affect Financial Literacy (Regression Analysis)

The model is significant (p = 0.010, R^2 = 19.8%), cognitive biases influence financial literacy and investment decisions. Overconfidence Bias is the only bias that affects financial literacy (B = 0.349, p = 0.007), investors with higher financial knowledge overestimate their decision-making abilities. Other biases, Anchoring, Representativeness, Loss Aversion, Herding, Availability Biases did not significant (p > 0.05) This means financial literacy improves knowledge but not eliminate irrational decision making. Overconfidence Bias play big role in financial decision making especially among higher financial literacy.

3. Two Big Category of Biases (Factor Analysis - PCA)

Factor Analysis (Principal Component Analysis - PCA) grouped the six biases into two components, 60% of total variance,Component 1 (Heuristic-Driven Biases)Overconfidence, Anchoring, and Representativeness Biases were grouped together, these biases are driven by past experiences and mental shortcuts.Component 2 (Emotionally Driven Biases)Loss Aversion, Herding, and Availability Biases were grouped together, these biases are driven by fear, social influence and easily available information.Investors tend to fall into two category heuristic-driven and emotion-driven.

4. Gender Does Not Affect Cognitive Biases (Mann-Whitney U Test)

Mann-Whitney U Test found no significant differences in biases between male and female investors (p > 0.05 for all biases). This means both gender exhibit similar cognitive biases in investment decisions.This finding contradicts some previous studies that suggest men are more overconfident while women are more risk-averse, at least within this sample. Gender doesn't matter when it comes to cognitive biases in investing.

Age Affects Cognitive Biases (Kruskal-Wallis Test - Age Group)

The Kruskal-Wallis test found significant differences across age groups for:

- Overconfidence (p = 0.024)
- Anchoring (p = 0.010)
- Representativeness (p = 0.012)
- Loss Aversion (p = 0.016)
- Herding (p = 0.018)

Younger investors (Below 35) were more overconfident and anchored than older investors. Older investors (Above 45) were more loss averse, unwilling to take risks. Availabilty Bias was not significant across age groups (p = 0.952), so all investors of all ages rely equally on easily available information. Younger investors are more overconfident and anchored, older investors are more loss averse.

Investor Type Affects Overconfidence & Loss Aversion (Kruskal-Wallis Test - Investor Type)

Overconfidence Bias (p = 0.009) and Loss Aversion Bias (p = 0.001) were significant across investor types (Conservative, Moderate, Aggressive). Aggressive investors were more overconfident, believed they could beat the market. Conservative investors were more loss averse, hesitant to take high risk investments. Anchoring, Representativeness, Herding and Availability Biases were not significant across investor types (p > 0.05). Investor type matters when it comes to bias—aggressive investors are more overconfident, conservative investors are more risk averse.

Biases are interrelated, Anchoring, Representativeness and Availability Biases are closely linked. Overconfidence Bias affects financial literacy, people overestimate their decision-making ability. Factor analysis showed two types of biases Heuristic-driven

(Overconfidence, Anchoring, Representativeness) and Emotion-driven (Loss Aversion, Herding, Availability). Gender doesn't matter when it comes to cognitive biases, both male and female investors behave similarly. Age matters, younger investors are more overconfident and older investors are more loss averse. Investor type affects overconfidence and loss aversion, aggressive investors are more overconfident and conservative investors are more risk averse.

Conclusion on Hypothesis

- H_0 Rejected; Cognitive biases do matter in investor decision making.
- H_1 Accepted; Cognitive biases affect individual investors' decision making in the stock market.

So, we have strong evidence that cognitive biases influence investor behavior, their risk taking, decision making and financial strategies. By recognizing these biases investors, financial professionals and policymakers can develop strategies to reduce irrational behavior and improve investment decision making in the stock market.

V. CONCLUSION

This study looked at the impact of cognitive biases on individual investor decision making in the equity market. The results show that cognitive biases have a big impact on investor behavior, leading to irrational financial decisions.

1. Biases are Interconnected

Investors who rely on Anchoring Bias also suffer from Representativeness and Availability Biases, meaning initial price and past performance plays a big role in investment decisions. Biases don't operate in isolation but rather feed into each other, creating more irrational decision-making patterns.

2. Overconfidence is the Strongest Predictor of Financial Literacy

While financial literacy increases awareness, it doesn't necessarily reduce biases. Instead, financially savvy investors become overconfident, overestimating their ability to predict market trends and make better investment decisions.

3. Biases can be Grouped into Two Categories (Factor Analysis - PCA)

Heuristic driven biases (Overconfidence, Anchoring, Representativeness) These biases come from mental shortcuts and past experiences. Emotionally driven biases (Loss Aversion, Herding, Availability) These biases are driven by fear, social pressure and easily accessible information rather than objective financial analysis.

4. Gender doesn't Matter

Male and female investors have the same biases, contrary to studies that showed gender difference in risk taking. So, gender neutral approach is more effective in addressing cognitive biases in financial decision making.

5. Age and Investor Type Matters

Younger investors (Below 35) are more overconfident, older investors (Above 45) are more loss averse, showing reluctance to take investment risks. Aggressive investors are more overconfident, they believe they can beat the market. Conservative investors are more loss averse, they prioritize risk avoidance over returns.

6. Investor Behavior is not always Rational

The study challenges traditional finance theories such as Efficient Market Hypothesis (EMH) which assumes investors make rational information driven decisions. Instead, the results support behavioral finance theories, proof that psychological biases influence financial decisions, often leading to irrational investment behaviors.

VI. Recommendation

Based on the results, the following are proposed to help investors overcome cognitive biases and make better investment decisions:

For Investors

Investors should know their biases and challenge their own decision making. Consulting financial advisors can help counteract overconfidence and heuristic driven biases. Investors should focus on their individual financial goals not follow the crowd. Investment decisions should be data driven not be influenced by loss aversion and representativeness biases.

For Financial Institutions & Policymakers

More education for investors on the impact of biases on decision making. Bias-Resistant Investment Tools AI-driven portfolio management can help investors reduce emotional decision making. Investment platforms should encourage personalized risk assessment to counteract overconfidence and anchoring effects. Strict guidelines should be enforced to prevent speculative market bubbles caused by mass herding.

For Future Research

Future studies can include institutional investors and global markets to test cross cultural biases. Study investor behavior over a longer period to see how biases change with market changes. Study investor biases during economic downturns to see how investors react to financial stress and risk tolerance.

This study shows that cognitive biases have a significant impact on investor behavior and traditional investment models must include behavioral finance principles. While financial literacy helps improve investment awareness it does not eliminate biases in some cases it reinforces overconfidence. By addressing these biases through education, technology and regulatory measures investors can make better informed decisions and have better financial outcomes and a more efficient market.

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