Financial Literacy and Fintech : A Double-Edged Sword for Millennial Investors' Behavioral Biases

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Abstract

Purpose : The current research focused on investigating the moderating effect of financial literacy and financial technology on the heuristic behavior of millennials.

Research Approach : The research was based on the primary data; a survey method questionnaire was prepared to collect the data needed for the present research. With the purposive sampling method, 526 responses were collected from millennial investors. The partial least square-structural equation modeling (PLS-SEM) method was applied to infer the moderating effect of financial literacy and financial technology on millennials' heuristic behavior.

Findings : The results showed that financial literacy significantly moderated the relationship between millennials' heuristics and behavioral biases, whereas financial technology had no moderating effect.

Research Implications : Millennial investors were slammed or benefited by the stock market performance. The research aimed to help them understand their behavioral changes during market anomalies. Financial advisors and regulatory bodies should consider the study's outcome as it contributes to mitigating the misconception of behavioral bias.

Originality : There are numerous articles describing individual investors' behavioral biases, but the current research's uniqueness was to measure the moderating effect of financial literacy and financial technology on millennials' heuristics and behavioral biases and a significant contribution to the world of research in behavioral finance.

Keywords : **millennial investors, financial literacy, financial technology, heuristics**

JEL Classification Codes : D31, G02, G11, G41, G53

Paper Submission Date : September 3, 2024 ; Paper sent back for Revision : January 28, 2025 ; Paper Acceptance Date : February 10, 2025 ; Paper Published Online : March 15, 2025

Human decision-making results from emotions, motivation, and cognition, and of late, the influence of these psychological factors on financial decision-making has been gaining recognition. While theories favor human rationality, the availability of information and experience contribute to human choices, but in reality, individuals face cognitive biases and time constraints that contradict rationality. The study of the irrational behavior of investors is called behavioral finance (Bird et al., 2023). Behavioral biases have the potential to damage an investor's investment decisions. Mental accounting, herd behavior, gambler's fallacy, loss aversion,

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DOI : https://doi.org/10.17010/ijf/2025/v19i3/174849

risk aversion, and belief-perseverance bias are just a few behavioral biases that cause substandard investment performance (Baulkaran & Jain, 2024). Various theories like the capital asset pricing model (CAPM), arbitrage pricing theory (APT), and efficient market hypothesis (EMH) argue that investors are rational and unbiased. Offering an alternative to the standard finance theories of the late 1990s, behavioral finance throws light on investors' irrational and biased behavior in economic and financial decisions, leading to inefficient markets (Ahmad, 2024). Behavioral theories have gained popularity over the decades as they have the potential to explore the impact of social and psychological factors on the stock market (Manzoor et al., 2023). The impact is widespread on portfolio management, quantitative finance, and investors' decision-making (Dzung et al., 2021).

As of August 2023, the aggregate retail investors in the Indian stock market reached 12.7 crore by adding 3.1 million demat accounts in a single month, which created a record in the Indian stock market history. Indian millennials actively participate in the world of stocks. Technology is imperative, and applications or trading platforms are available at low cost, so millennials are inseparable from mobile devices. Investors can open demat accounts free of cost and trade with an attitude of instant gratification (Singh, 2023). Millennials were born between 1981 and 1996 (Minzlaff et al., 2024). Studies mention different years to define millennials, such as millennials born between 1982 and 2004. With varied opinions about the range of age, they are born in the last two decades of the 20th century (Holmberg-Wright et al., 2017). More than 80% of millennials use online content, such as educational videos and blogs, to educate themselves on financial decisions. These cohorts rapidly adopt financial technology as it favors the availability of information and numerous applications to assist them in building a portfolio. The availability of fintech influences the financial behavior of an investor (Walsh & Lim, 2020). Known as the "First truly digital generation," it is vital to understand if millennials are financially literate along with technology natives. Financial literacy has multitudinous benefits as it helps investors diversify their risk (Lusardi & Oggero, 2017). Millennials are unique from the previous generations in terms of their decision-making, investment habits, and opinions. There is a paradigm shift in the financial market operations due to vast numbers of millennials participating in the stock market—their irrationality in investment clauses market anomalies. It is thus crucial to be financially educated to filter the required information and avoid biases (Rahadi et al., 2021).

Millennials, a substantial demographic and workforce segment, significantly influence stock market performance through their financial choices. Therefore, financial literacy is essential for informed investing, and its absence can lead to detrimental financial decisions. Fintech presents a double-edged sword; while offering accessible information and tools for simplified and affordable investing, it can also foster increased risk-taking and impulsive actions. Like all investors, millennials are vulnerable to behavioral biases. Recognizing and mitigating these biases is crucial for sound investment strategies. Acknowledging the influence of financial literacy and financial technology on behavioral biases is crucial.

Millennial investors are still susceptible to biases, even with readily available financial education resources and a plethora of fintech platforms offering diverse investment options in today's digital age. This issue warrants immediate and focused attention. At the same time, numerous studies have addressed the impact of behavioral biases on investment decision-making. However, we have limitations in the availability of previous studies on the moderating role of financial literacy and financial technology on behavioral biases. The present research focuses on understanding the impact of overconfidence, anchoring ability bias, gambler fallacy, and market information on heuristics. Further, this study explains the moderating role of financial literacy and financial technology on behavioral biases. The study will attract the interest of portfolio managers, financial advisors, regulatory bodies, and other finance practitioners due to its importance in understanding millennial investors in the Indian stock market.

The rapid growth of fintech can foster impulsive decision-making and overconfidence among millennials. Navigating these challenges requires financial education and an awareness of personal biases to avoid substantial

financial errors. To encourage responsible investing, policymakers and financial institutions must comprehend fintech's impact on millennial investors and develop appropriate regulations and educational initiatives. Therefore, the interplay of financial literacy, fintech, and behavioral biases is a crucial area of research as millennials navigate today's intricate financial world.

Theoretical Reinforcement and Literature

Heuristics

Standard finance tags investors as "rational," whereas behavioral finance considers investors "normal." Behavioral finance suggests investors make satisfying decisions with their cognitive and calculative abilities instead of optimal choices (Otuteye & Siddiquee, 2015). Emotional bias is a vital factor that affects investment decisions where investors depend on their sentiments. It is important to understand the various biases in order to make more sensible investments (Mandal & Riyat, 2024). The word "heuristics" is of Greek origin, meaning "to find." Individuals decide among the options due to a lack of time and commitment. Investors with heuristics rely on their intuition (intuitive decision-making) and make quick and impulsive decisions (spontaneous decision-making) (del Campo et al., 2016). Heuristics do not find the best solutions; they scaffold investors to get good enough solutions. This is often misunderstood as providing the second-best solution. Individuals with heuristic biases react fast and do not consider the logic models (Gigerenzer, 2008). Heuristics are a rule of thumb applied due to lack of time and information. They serve as mental shortcuts that individuals use to make decisions. Heuristics are not only restricted to investment decisions but are also common in computer science economics; therefore, heuristics are used as a problem-solving method that gives imperfect answers or not an optimal solution (Hjeij & Vilks, 2023).

The heuristic theory by Amos Tversky and Daniel Kahneman introduces three predominant biases: Availability, representativeness, and anchoring (Abdin et al., 2017). Availability bias is a judgemental heuristic in which investors give undue preference for readily and easily available information. This information is comprehended with their irrationality as investors fail to consider other highly correlated information influencing the stock performance (Farooq et al., 2015). Investors might buy the hot stocks and avoid or sell the poor-performing stocks as they are carried away with representative heuristics. Investors with representative heuristics interpret the past company performance as continuing to exist in the future, which may not be accurate (Boussaidi, 2013; Waweru et al., 2008). A rational investor would consider various related information before making an investment decision. Accurate decisions can be made with solid evidence and support of the information read, but irrational investors often settle for the initial information. They may skew their decision to buy or sell the securities based on the latest or first piece of information due to the anchor bias (Hien et al., 2013). When investors depend on their intuition with all their faith and overestimate their skills and knowledge, it is known as overconfidence bias. People often overvalue what they are not and undervalue what they are (Pompian, 2012). Investors or decision-makers with overconfidence fail to consider the risk associated with their actions (Costa et al., 2017).

Financial Literacy

Financial literacy among millennials has a significant influence on their investment intention. It significantly impacts investors' attitudes, preconceived beliefs, and social factors (Nag & Shah, 2022). Financial literacy directly impacts the effective implementation of financial and welfare policies in an economy; therefore, enhancing the financial knowledge of the people of a country is the need of the hour. Each sector in an economy

has a modern touch, and so does the financial sector. Financial literacy plays a vital role in understanding non-conventional operations of the financial sector (Lusardi & Mitchell, 2014). Significant differences exist among age groups, genders, education levels, etc. It influences investors during financial or investment decision-making (Lusardi, 2015).

Financial education or financial literacy influences an individual's financial behavior in managing cash, planning for savings and investments, contingencies, retirement plans, and tax savings. Conversely, a lack of knowledge can lead to free-spending, depending on a single source of income and financial dependency (Dewi et al., 2020). Financial literacy is part of human capital, enabling individuals to comprehend and apply their financial knowledge to make financial decisions. It takes significant pie and helps in navigating personal finance. Personal financial education and financial behavior contribute to financial literacy, which affects the financial well-being of an individual (Huston, 2010). Numerous financial and developmental initiatives by the government, the introduction of new financial products, changing political, demographic, and economic factors, and the comprehensive financial market are a few reasons people can improve their capacity to manage their funds (Weixiang et al., 2022).

The global financial crisis, the modernization of financial sectors, and digitalization led to widening the scope of financial education. Psychological factors such as financial attitudes, goal setting, budgeting habits, credit, insurance planning, retirement planning, and others influence financial literacy. Economic education's general and specific objectives are to ensure individuals make rational decisions, particularly financial decisions. Beyond all these, some individuals make wrong decisions, which is called irrational decision-making. There comes behavioral finance (Kehiaian, 2012). Financial literacy has a more significant effect on investment intention. Teachers need to share and spread awareness about money and money management. Financial literacy can be provided by collaborative efforts of experts with financial influencers as it reaches a more significant extent beyond the border (Nag & Shah, 2022).

Millennial Investors

Millennials, the "me generation," are well-educated and highly connected to technology and the world. There was a significant increase in first-time investors in the equity market post-pandemic; 70% were under 30. Their participation in the stock market proves that millennials are fascinated with the stock market, and it is due to social media links and easily accessible investment applications (Murlidharan, 2022). Millennials are an advanced, financially literate cohort. There is a significant relationship between highly financially literate millennials and participation in the stock market (Soekarno & Pranoto, 2020). They have distinct priorities in investment decision-making. With diversified behavior, they are enthusiastic about participating in the stock market (Ahuja & Kumar, 2025). Millennial investors are easily influenced by other investors, which is termed herd behavior, thus increasing irrationality. It is significant for them to have in-depth knowledge and to be flexible with constant changes in the market performance (Suresh & Loang, 2024).

Financial Technology

Financial technology was at its infant stage in 2012, which later had significant evaluation and implications worldwide. The Oxford English Dictionary defines technology as "the branch of knowledge, dealing with applied science and mechanical art. Such knowledge is applied in the sphere of activity concerned with industry-manufacturing or service collectively" (Charness & Boot, 2016). The scope of digital finance using technology is immeasurable as it includes retail services and has grown to serve companies at the global level (Gupta & Agarwal, 2023).

The outcome of technology is innovation, which spreads more quickly than a virus. This is due to the people in the social system accepting the invention by learning and perceiving its characteristics and usefulness. The benefits of innovation, complexity, and compatibility are the significant traits an individual is concerned about before accepting innovation. People within a social system will undergo five different processes before accepting the innovation, starting from gaining knowledge about the new invention and its applicability in their personal and professional lives. Second, to develop an impression or attitude toward the technology, be it positive or negative. In the third stage, the decision to accept or reject will be set based on the pros and cons, followed by implementing the new idea in the fourth level and finally confirming the decision. These stages are also standard in businesses as well (Rogers & Karen, 2001). It is vital to have a valid measurement scale to measure the factors influencing people to accept the technology or innovation. The technology acceptance model (TAM) will be adopted to validate the acceptance of any technological innovation. Perceived usefulness and the perceived ease of use of technology are the fundamental factors determining the range of acceptance by people. The perceived usefulness is the extent to which the application can perform the job better. If the application performs a great job but it is hard to understand the perceived user's performance process, they may reject it. Perceived ease of use is equally significant; users should feel "free of effort" to accept the technology (Davis, 1989). Various factors influence individuals to accept online transactions, such as credibility, risk, and trust. Understanding individuals' online behavior is paramount (Baker et al., 2012). In addition to the abovementioned factors, economic value (time savings and cost reduction) is another vital factor determining the individual's intention to adopt transactions on E-platforms (Hendricks & Mwapwele, 2024). Financial institutions are changing their operational methodology from brick-and-mortar to online, with banks standing first in technology adoption. Customers are rapidly adopting e-banking services. Perceived usefulness and information influenced them to adopt and accept online banking.

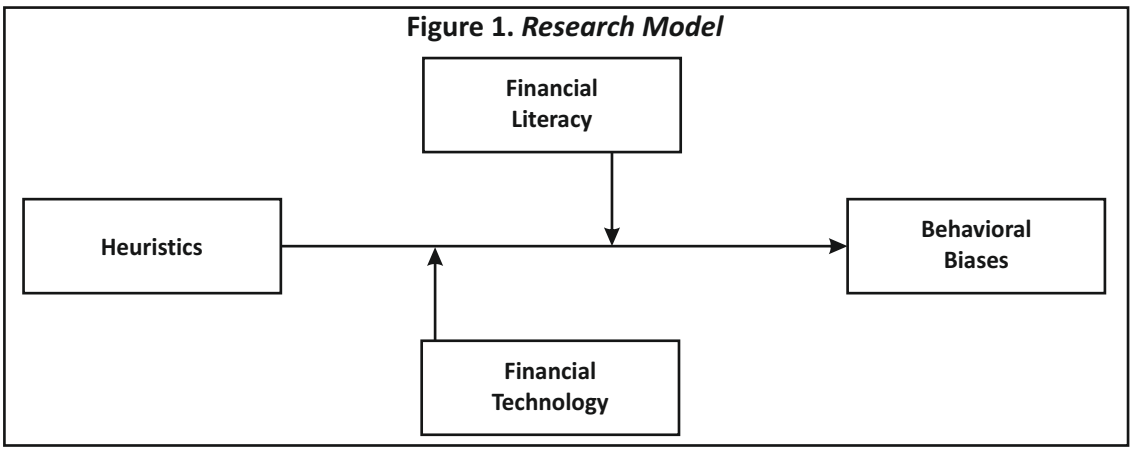
Objective

To investigate the moderating effect of financial literacy and financial technology on the heuristic behavior of millennials.

Research Model

The research model in Figure 1 visually depicts the relationships between four key concepts: Heuristics, financial

Figure 1. ***Research Model***



literacy, behavioral biases, and financial technology. Each box represents a variable being studied, and the arrows indicate the hypothesized direction of influence or relationship between the concepts.

Hypotheses

- **H01 :** Overconfidence has no significant influence on heuristic biases.
- **Ha1 :** Overconfidence significantly influences heuristic biases.
- **H02 :** Anchoring ability biases' fallacy has no significant influence on heuristics biases.
- **Ha2 :** Anchoring ability biases' fallacy significantly influences heuristics biases.
- **H03 :** Market information (Market factor) does not significantly influence heuristics biases.
- **Ha3 :** Market information (Market factor) significantly influences heuristics biases.
- **H04 :** Heuristics has no significant favorable influence on behavioral biases.
- **Ha4 :** Heuristics has a significant favorable influence on behavioral biases.
- **H05 :** Financial literacy does not significantly moderate the relationship between millennials' heuristics and behavioral biases.
- **Ha5 :** Financial literacy significantly moderates the relationship between millennials' heuristics and behavioral biases.
- **H06 :** Financial technology does not significantly moderate the relationship between millennials' heuristics and behavioral biases.
- **Ha6 :** Financial technology significantly moderates the relationship between millennials' heuristics and behavioral biases.

Research Methodology

Target Population

Since the research focuses on the role of financial literacy and financial technology in the behavioral biases of millennial investors, the population for the present study is millennial investors in the Indian stock market.

Sampling and Data Collection

The research is based on the primary data. A survey method questionnaire was prepared to collect the data needed for the present study. A purposive sampling method was considered when choosing the sample. Google Form was circulated to collect the data. The time period of data collection was from January to May 2024. Five hundred sixty-seven respondents from Southern India filled in the form. After taking cognizance of the responses, 526 responses were suitable for further analysis, while the rest of the responses were dropped due to inadvertence.

Development of the Questionnaire

A survey method questionnaire is prepared to collect the data needed for the present research. The questionnaire consists of demographic queries, questions on heuristics, level of financial literacy, financial technology, and behavioral biases. Investors' responses are quantified using a 5-point Likert scale, from *highly satisfied* (5) to *highly dissatisfied* (1). We made it clear that the information provided by investors will be kept highly confidential and used only for research. The questionnaire was thoroughly verified and validated by consulting academic experts and investment professionals. Respondents were guided with suggestions and clarification on how to fill out the questionnaire.

Variables

Heuristic bias was the exogenous variable, and behavioral bias was the response variable (endogenous variable). In addition, financial literacy and financial technology were considered the moderating variables.

Statistical Tools and Techniques

Smart-PLS was deployed to analyze the research model. The partial least square-structural equation modeling (PLS-SEM) method is appropriate for running the model. PLS-SEM is a powerful analytical method for evaluating interactions since it easily handles formative dimensions and reduces type II errors (Chin, 2010). Additionally, the nonparametric nature of PLS-SEM is highlighted as an additional significant benefit in several studies (Ketchen Jr., 2013; Rigdon, 2016; Sarstedt et al., 2018). This allows the method to be used in exploratory research with small samples and without requiring customarily distributed data. Finding the predictor variation is thus made easier when using structural models that include numerous item components and have both direct and indirect paths. PLS-SEM is selected over covariance-based SEM (CB-SEM) because of the measurement philosophy and the purpose of the analysis (i.e., to make predictions instead of confirmations). The PLS-SEM method was implemented by analyzing both the measurement and structural models (Edeh et al., 2022). The measurement model's construct measures were evaluated for internal consistency reliability, convergent validity, and discriminant validity. The constructs' reliability was assessed using Cronbach's alpha and composite reliability.

Analysis and Results

Socio-Economic Profile

Table 1 represents the results of descriptive statistics. Out of the respondents, approximately 73% were men, and the majority of the respondents fell in the age group of 25–30, adding to 53.6%. They showcase better educational

Table 1. ***Analysis of Respondents' Socio-Economic Profile (N = 526)***

S. No.	Socio-Economic Profile	Variables	Number	Frequency
1	Gender	Male	383	72.8%
		Female	143	27.2%
2	Age	25 – 30	282	53.6%
		31 – 35	139	26.5%

		36 – 40	105	19.9%
3	Marital Status	Single	300	57%
		Married	226	43%
4	Educational Qualification	UG	167	31.8%
		Masters	300	57%
		Ph.D.	32	6%
		Others	27	5.2%
5	Annual Income	Less than 360,000	133	25.2%
		360,001 – 480,000	63	11.9%
		480,001 – 600,000	38	7.3%
		600,001 – 720,000	80	15.2%
		Above 720,000	212	40.4%
6	Amount of Investment	Less than 100,000	307	58.3%
	in the Shares per	100,001 – 240,000	125	23.8%
	Annum	240,001 – 300,000	28	5.3%
		300,001 – 360,000	31	6%
		360,001 – 400,000	10	2%
		Above 400,000	25	4.6%
7	Amount of Share	Less than 100,000	414	78.8%
	Turnover per Annum	100,001 – 240,000	42	7.9%
		240,001 – 300,000	10	2%
		300,001 – 3,60,000	14	2.6%
		360,001 – 400,000	10	2%
		Above 400,000	36	6.6%
8	Years of Experience in	Less than 2 years	87	16.5%
	Investment	2 – 5 years	171	32.5%
		Above 5 years	268	51%
9	Occupation	Business/Profession	146	27.8%
		Employed	348	66.2%
		Agriculture/Others	32	6%
10	Locality	Rural Bengaluru	94	17.9%
		Urban Bengaluru	432	82.1%

qualifications, where 57% hold master's degrees and considerable years of experience of more than 5 years in investment, adding to 51% of the total respondents. This signifies that the sample chosen is more suited for further research to analyze investors' irrationality.

Reliability and Validity Check

Based on the research hypotheses, four latent variables, such as heuristics, financial literacy, financial technology, and behavioral biases, were derived with 12 observable variables. Cronbach's alpha and composite reliability tests were used to measure the internal consistency reliability. Table 2 shows the results of both the tests conducted.

Table 2. ***Results of the Reliability Check***

Factors Items	Item Loading	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
Overconfidence *(OC)*		0.765	0.769	0.68
OC1	0.834			
OC2	0.826			
OC3	0.814			
Anchoring Ability Biases *(AAB)*		0.781	0.781	0.695
AAB1	0.835			
AAB2	0.837			
AAB3	0.829			
Market Information *(MI)*		0.741	0.742	0.659
MI1	0.795			
MI2	0.84			
MI3	0.801			
Heuristics *(HeU)*		0.741	0.748	0.527
Financial Literacy *(FL)*		0.679	0.777	0.584
FL1	0.706			
FL2	0.678			
FL3	0.695			
Financial Technology *(FT)*	0.702	0.791	0.781	0.542
FT1	0.722			
FT2	0.748			
FT3	0.739			
Behavioural Bias *(BB)*		0.807	0.809	0.721
BB1	0.849			
BB2	0.83			
BB3	0.868			

Note. See Appendix.

The item loading for the latent constructs ranged from 0.678 to 0.868, indicating adequate validity. Table 2 also displays Cronbach's alpha ranges between 0.679 and 0.807 and composite reliability ranges between 0.742 and 0.809, all of which exceeded the limit of 0.70 (0.60 in exploratory study), indicating good reliability among the measures (Edeh et al., 2022). This investigation achieved convergent validity when factoring item loadings exceeded 0.60 and composite reliability exceeded 0.70. Previously, numerous entries were eliminated because they did not fulfill this condition.

The average variance extracted (AVE) statistics (>0.50) and factor loading results (>0.60) demonstrate the scale items' convergent validity (Fornell & Larcker, 1981; Siow et al., 2017). Discriminant validity was assessed by matching the AVE square root values and correlations between components (Table 3).

Discriminant validity using the Fornell–Larcker criterion compares the square root of the AVE with the correlation of latent constructs. The criteria for validating the square root of the AVE is that it should be greater

Table 3. ***Fornell–Larcker Criterion for Discriminant Validity***

	AAB	*BB*	*FL*	*FT*	*MI*	*OC*
AAB	**0.834**					
BB	0.254	**0.849**				
FL	0.177	0.328	**0.695**			
FT	0.221	0.354	0.401	**0.736**		
MI	0.313	0.371	0.294	0.518	**0.812**	
OC	0.168	0.21	0.711	0.228	0.183	**0.825**

Note. The bolded values represent the square root of the average variance extracted (AVE) used to assess discriminant validity. The other values in the table are correlation coefficients between the variables.

Table 4. ***HTMT Assessment of Discriminant Validity***

	AAB	*BB*	*FL*	*FT*	*MI*	*OC*
AAB						
BB	0.32					
FL	0.225	0.391				
FT	0.302	0.494	0.57			
MI	0.409	0.478	0.362	0.705		
OC	0.214	0.269	1.104	0.347	0.24	

than the correlation with other latent constructs (Ab Hamid et al., 2017). Accordingly, the values in bold (Table 3) validate the same; hence, they meet the validity criteria. Furthermore, the study used the Heterotrait–Monotrait (HTMT) method to determine discriminant validity. Table 4 represents the results.

The HTMT approach is recommended because it "offers the best balance between high detection and low arbitrary violation (i.e., false positive) rates" (Voorhees et al., 2016). HTMT ratios smaller than 0.85 are commonly recommended to ensure discriminant validity (Henseler et al., 2015). The results (Table 4) show that HTMT ratios are lower than the indicated value (0.85).

Structural Model Assessment

The relevance of path coefficients in the structural model was assessed using 95% bias-corrected and accelerated (BCa) bootstrap confidence intervals and 5,000 re-samples. Based on the blindfolding technique with an omission distance of 7, the structural model has predictive value because the endogenous variable's cross-validated redundancy result was more extensive than zero (Chin, 2013; Suhan & Achar, 2016). Furthermore, the overall model fit, measured by the standardized root mean square residual as a model validation index, is less than 0.08, indicating that the model is satisfactory (Hu & Bentler, 1999). Figure 2 represents the PLS-SEM.

Furthermore, the R^2 of endogenous variables is 0.217, indicating that the independent variables account for 21.7% of the variance in behavioral bias. Rasoolimanesh et al. (2022) indicated that R^2 values of more than 20% are regarded as high in behavioral studies. The bootstrapping technique demonstrates that all four factors strongly affect the link between constructs, as evidenced by the absence of zero in 95% BCa (bootstrap confidence intervals). The path coefficient is significant if the "confidence interval does not contain zero value" (Edeh et al., 2022). Table 5 helps to better understand the path model.

Figure 2. ***Partial Least Squares Path Modeling***

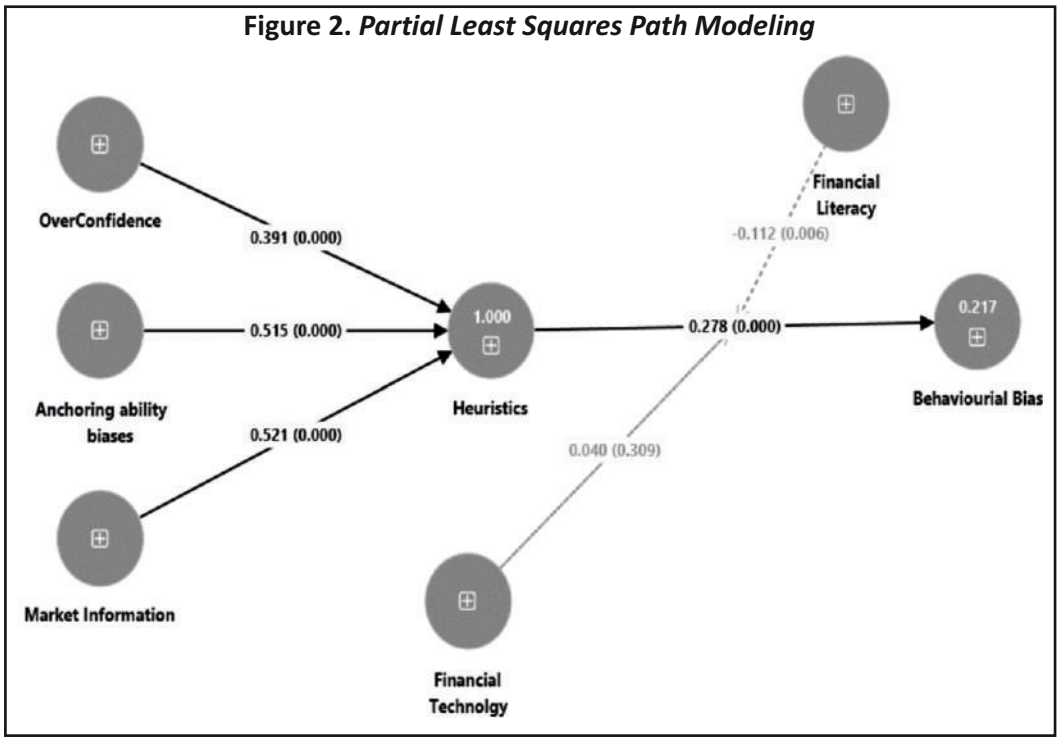


Table 5. ***Determinants of Behavioral Biases***

	Standardized Beta Coefficient	Standard Deviation	Bootstrap *t*-value	*p*-value	BC 95% Bootstrap CI
OC –> HeU	0.391	0.038	10.371	0.000	0.308, 0.460
AAB –> HeU	0.515	0.029	17.493	0.000	0.461, 0.578
MI –> HeU	0.521	0.029	18.296	0.000	0.474, 0.584
Heu –> BB	0.278	0.054	5.184	0.000	0.18, 0.391

Standardized beta coefficients show that overconfidence (OC) has a considerable impact on heuristics (HeU) (B1= 0.391, Bootstrap *t*-value= 10.371, $p < 0.05$). It is thus concluded that Ha1 is supported. The standardized beta coefficients indicate that anchoring ability bias (AAB) has a substantial effect on heuristics (HeU) (B2 = 0.515, Bootstrap *t*-value= 17.493, $p < 0.05$). Therefore, Ha2 is likewise supported. The standardized beta coefficients indicate that market information strongly influences heuristics (B2 = 0.521, Bootstrap *t*-value = 18.296, $p < 0.05$) as predicted by Ha3. As a result, Ha3 is supported. Support is resilient for Ha4, which posits that heuristics positively influence behavioral bias (B4 = 0.278, Bootstrap *t*-value= 5.184, $p < 0.05$). Thus, Ha4 is upheld as expected.

The Moderating Effect of Financial Literacy and Financial Technology

The moderating effects were determined by computing the mean-centered indicator values prior to moderator variable multiplication with predictor variables (also known as interaction terms). Ping (1995) verified this method as a viable approach for evaluating path models with latent variable interactions. Table 6 shows the results of the path estimates and bootstrap *t*-values for the interaction effect.

Table 6. ***Moderating Effects of Financial Literacy and Financial Technology***

	Standardized Beta Coefficient	Standard Deviation	Bootstrap *t*-value	*p*-value	BC 95% Bootstrap CI
FL × HeU –> BB	–0.112	0.04	2.778	0.006	–0.185, –0.033
FT × HeU –> BB	0.040	0.039	1.018	0.308	0.03, 0.121

Financial literacy has a significant moderating effect on the relationship between heuristic (B7 = –0.112) and behavioral bias, as $p < 0.05$. In contrast, financial technology does not have a significant moderating effect on the relationship between heuristic (B8 = 0.04) and behavioral bias, as *p*-value >0. 05. Hence, Ha5 is accepted, while Ha6 is not accepted.

The three lines in Figure 3 represent the relationship between heuristic (*x*-axis) and behavioral bias (*y*-axis). The middle line represents the relationship between the average level of moderator variables and financial literacy. The other two lines represent the relationship between heuristics and behavioral bias at a higher level (mean value of financial literacy plus one standard deviation unit) and lower level (mean value of financial literacy minus one standard deviation unit) of the moderator variable, financial literacy. As we can see, the relationship between the heuristics and behavioral bias is negative for all three lines, as indicated by their negative slope. Hence, a higher level of financial literacy goes in hand with lower behavioral biases. In addition, we can analyze the moderating effect's slope in greater detail. The upper line represents a high level of the moderator construct; financial literacy has a steeper slope, indicating that a higher level of financial literacy has led to a stronger relationship between heuristics (*x*-axis) and behavioral bias (*y*-axis).

Similarly, Figure 4 shows that the upper line, which represents the higher level of the moderator construct financial technology, does not have a steeper slope, indicating financial technology does not have a stronger relationship between heuristic (*x*-axis) and behavioral bias (*y*-axis).

Figure 3. ***Simple Slope Analysis for Financial Literacy***

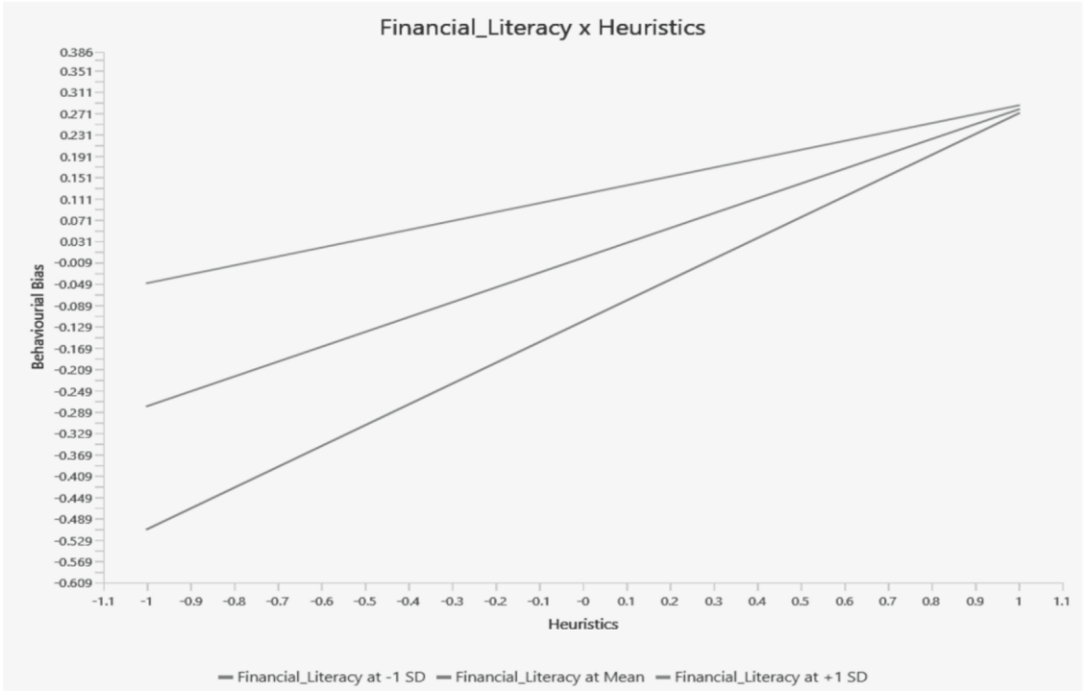


Figure 4. ***Simple Slope Analysis for Financial Technology***

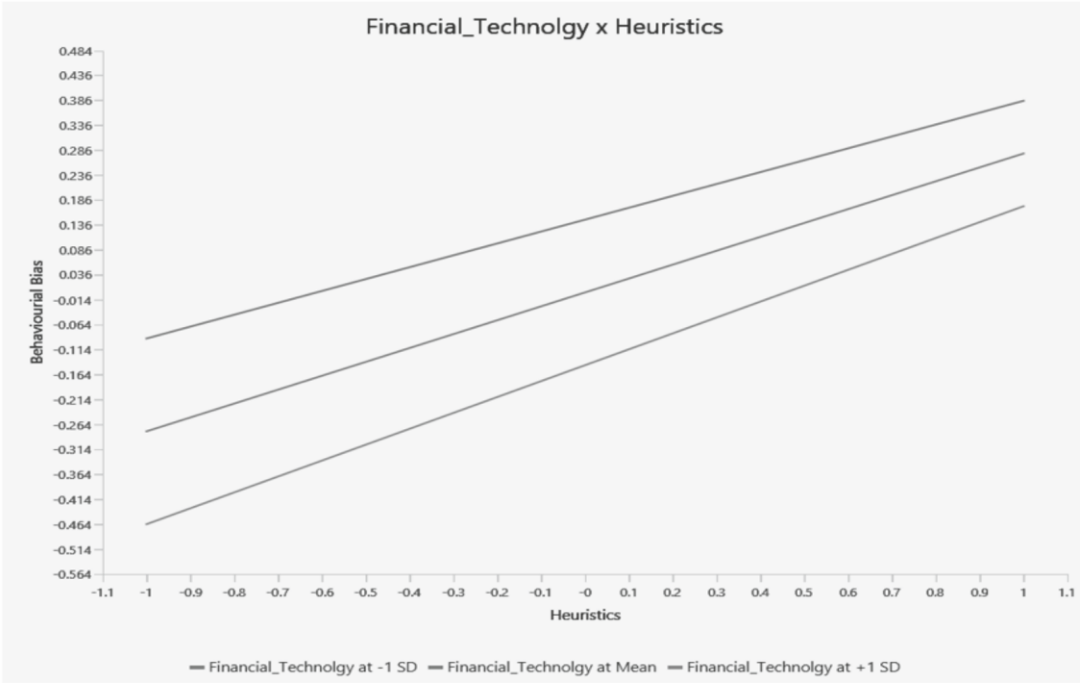


Table 7. ***Hypotheses Testing Results***

Hypotheses	Statement	Results
Ha1	Overconfidence significantly influences heuristic biases.	**Accepted**
Ha2	Anchoring ability biases' fallacy significantly influences heuristic biases.	**Accepted**
Ha3	Market information (Market factor) significantly influences heuristics biases.	**Accepted**
Ha4	Heuristics has a significant positive influence on behavioral biases.	**Accepted**
Ha5	Financial literacy significantly moderates the relationship between the heuristics and behavioral biases of millennials.	**Accepted**
Ha6	Financial technology significantly moderates the relationship between millennials' heuristics and behavioral biases.	**Not Accepted**

Table 7 presents the results of a study investigating the moderating effect of financial literacy and financial technology on the heuristic behavior of millennials. Specifically, the study finds that overconfidence significantly influences heuristic biases (Ha1, Accepted). Consequently, individuals who are overly confident in their knowledge or abilities are more likely to exhibit heuristic biases in their decision-making, as overconfidence leads to flawed judgments and a reliance on mental shortcuts. Moreover, the anchoring ability biases fallacy significantly influences heuristic biases (Ha2, Accepted). In other words, the tendency to rely heavily on the first piece of information offered ("anchor") leads to heuristic biases, with the initial anchor distorting subsequent judgments and estimations. Similarly, market information (market factor) significantly influences heuristics biases (Ha3, Accepted). Therefore, the information available in the market significantly affects the heuristic biases people use, as market factors like trends, news, and volatility can trigger specific heuristics. Furthermore, heuristics have a significant positive influence on behavioral biases (Ha4, Accepted). This confirms that the use of mental shortcuts directly contributes to the development of behavioral biases. Additionally, financial literacy

significantly moderates the relationship between heuristics and behavioral biases of millennials (Ha5, Accepted). Thus, financial literacy plays a crucial role in mitigating the impact of heuristics on behavioral biases, enabling millennials with higher financial literacy to make more rational decisions. Conversely, financial technology significantly moderates the relationship between millennials' heuristics and behavioral biases (Ha6, Not accepted). Hence, financial technology, as a factor, does not significantly influence the relationship between heuristics and behavioral biases, implying that access to or use of financial technology doesn't necessarily improve millennials' ability to overcome biases driven by heuristics.

Theoretical and Managerial Implications

Millennial investors should understand that they contribute significantly to the market anomalies affecting stock performance. Financial advisors, regulatory bodies, and investment professionals must create fundamental awareness among investors about the investment in the stock market. Predominantly, investors should improve the quality of awareness/education concerning stock market operations. The outcome of the present study will help financial advisors, investment professionals, and regulatory bodies better comprehend millennials' rationality. Better training and awareness will avoid irrationality among individuals and reduce dependency on fintech results. Additionally, millennial investors will understand that excessive dependency on financial technology will lead to greater irrationality. The study findings will be perspective-shifting for investors to be more financially literate. The present study enhances and supports the existing theories of irrationality in investment.

Conclusion

The present study focuses on moderating the effect of financial literacy and financial technology on the heuristic behavior of millennials. The objective is to understand whether the irrationality of millennial investors can be mitigated with the interference of financial literacy and financial technology. The results show that the behavioral biases of millennials will change, with financial literacy being a moderating variable. This signifies that if investors are financially educated, it will help them mitigate the irrationality of the investment process. On the other hand, financial technology shows no significant influence on the irrationality of millennial investors. Investors are prone to behave irrationally irrespective of the availability of fintech resources. To conclude, financial technology can be used as a source of information, but with a better understanding and profound analysis of the stock performance, it is suggested that investors make a rational decision.

Limitations of the Study and Scope for Further Research

The data collection for the present study is based on purposive sampling, which may suffer from sampling biases. A random sampling design could be selected to gather the data for further research. The study focuses on millennial investors' irrationality in the equity market. It could be extended to mutual funds, and other investors, such as Gen Z, could also be considered. Furthermore, experimental and econometric studies would greatly help in understanding the irrationality of millennial investors.

Authors' Contribution

Mr. Sunil N. conceived the idea, and with the help of Dr. Sathish Kumar B., the conceptual framework was

developed. A detailed study of the related literature was done by Mr. Sunil N. using related terms. Mr. Sunil N. and Dr. Sathish Kumar B. structured the research methodology. Mr. Sunil N. took care of data collection and executed it with the help of Dr. Sathish Kumar B. Mr. Sunil N. contributed to the present study's scripting and formal writing. Dr. Sathish Kumar B. and Mr. Sunil N. conducted an extensive review.

Conflict of Interest

The authors certify that they have no affiliations with or involvement in any organization or entity with any financial or non-financial interest in the subject matter or materials discussed in this manuscript.

Funding Acknowledgment

The authors received no financial support for this article's research, authorship, and publication.

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Appendix

Factors Items	Codes
Overconfidence (OC)	***OC***
I believe that my skills and knowledge of the stock market can help me to outperform the market.	*OC1*
I am usually able to anticipate the end of good or poor market returns at the NSE/BSE.	*OC2*
I buy 'hot' stocks and avoid stocks that have performed poorly in the recent past.	*OC3*
Anchoring Ability Biases (AAB)	***AAB***
I prefer to buy local stocks than international stocks because the information of local stocks is more available.	*AAB1*
I forecast the changes in the stock price in the future based on recent stock prices.	*AAB2*
When making investment decisions, I tend to rely heavily on the first piece of information I receive, even if it might be outdated or irrelevant.	*AAB3*
Market Information (MI)	***MI***
I consider carefully the price changes of stocks that I intend to invest in.	*MI1*
Market information is important for my stock investment.	*MI2*
I put the past trends of stocks under consideration for my investment.	*MI3*
Heuristics (HeU)	***HeU***
Financial Literacy (FL)	***FL***
Planning and implementation of regular savings and investment programs is vital.	*FL1*
Before purchasing anything, I ask myself if I have paid my necessary expenses.	*FL2*
I find maintaining adequate financial records is significant.	*FL3*
Financial Technology (FT)	***FT***
Online trading increases my effectiveness in stock transactions.	*FT1*
Digital layout and appearances allow you to access and locate the related information easily.	*FT2*
I trust online stock trading services.	*FT3*
Behavioural Bias (BB)	***BB***
When a stock I own goes up in value, I convince myself that it will continue to rise indefinitely.	*BB1*
I frequently check my stock portfolio multiple times a day, leading to impulsive trading decisions.	*BB2*
I have a tendency to believe that past stock market trends will continue into the future.	*BB3*

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