Sustainable Development

WILEY

Sustainable Development

RESEARCH ARTICLE OPEN ACCESS

Sustainable Development Investment Decision: Do Environmental, Social and Governance (ESG) and Behavioral Biases Factors Matter?

Anshita Bihari[1] | Manoranjan Dash[1] | Kamalakanta Muduli[2] | Anil Kumar[3,4] | Sunil Luthra[5] | Arvind Upadhyay[3]

[1]Faculty of Management Sciences, Siksha 'O' Anusandhan University, Bhubaneswar, India | [2]Papua New Guinea University of Technology, Lae, Morobe Province, Papua New Guinea | [3]Guildhall School of Business and Law, London Metropolitan University, London, UK | [4]Jaipuria Institute of Management, Indore, India | [5]ATAL Cell, All India Council for Technical Education (AICTE), Delhi, India

Correspondence: Anil Kumar (a.kumar@londonmet.ac.uk)

Received: 1 May 2024 | **Revised:** 21 March 2025 | **Accepted:** 28 June 2025

Keywords: behavioral finance | business strategic | investment decision | sustainable | sustainable development

ABSTRACT

This paper investigates the critical factors involved and evaluates how environmental, social, and governance (ESG), along with behavioral biases, impacts sustainable investment decision making. The researchers employed purposive sampling with random sampling methods to gather data from retail investors; the data is then analyzed in two stages. The first stage involves using partial least squares structural equation modeling (PLS-SEM) to identify the significant factors influencing investment decisions. The second stage uses the results of SEM as input into an artificial neural networks (ANN) model, with the fusion of ANN and SEM explaining the high predictability of investment decision factors among investors. Using a multilayer perception model, the ANN explains the predictability of the predictors of investment decisions. It reveals the normalized importance values for the significant predictors—confirmation bias, endowment effect, hindsight bias, bandwagon effect, and ESG. By examining the biases from a behavioral finance perspective, a significant academic contribution is made in the context of retail investors, along with ESG as critical determinants influencing investment decisions. The study results enable investment firms to predict the extent to which their investment avenue programs impact investment decisions before developing these programs with appropriate ESG measures, thus enabling a sustainable investment ecosystem. The research contributes uniquely to the existing behavioral finance area by developing a framework to understand ESG dynamics and biases that collectively impact investment decisions.

1 | Introduction

Conventional financial theories—such as Expected Utility Theory, Markowitz principles, and the Capital asset pricing model (CAPM) model—assume that investors act rationally and make decisions based on all available information (Antony 2020). These models, meanwhile, fall short in understanding market anomalies such bubbles, breakdowns, and illogical investing behavior. By proving that psychological biases, emotions, and heuristics rather than reason mostly impact investing decisions, behavioral finance emerged in the 1980s challenged accepted wisdom (Kartini and Nahda 2021; Costa et al. 2019). Knowing these biases is essential since they could result in less-than-ideal decisions influencing both general financial markets and individual investors (Raheja and Dhiman 2020; Jain et al. 2020). Driven by growing awareness of sustainability, corporate responsibility, and ethical investing concerns-mostly environmental, social, and governance (ESG)-these elements have lately been very important in investment strategies (Raut et al. 2023; Rounok et al. 2023). Apart from a financial trend, ESG investing shows a dedication to sustainable development, so benefiting society as well as investors over long

terms (Sultana et al. 2018). The literature still mostly ignores the interaction between ESG and behavioral biases (BB) influencing investing choices (Park and Oh 2022; Raut et al. 2023). Few studies have looked at how particular biases—confirmation bias (CB), endowment effect (EE), hindsight bias (HB), and bandwagon effect (BE)-interact with ESG considerations in shaping investment choices (Jain et al. 2020), while past research has examined ESG investing and behavioral finance independently. Given the growing importance of ESG investing, understanding how these biases influence investor perceptions and decisions is imperative. Regardless growing ESG awareness barriers hinder the effective integration of ESG, it need to address the issues that can enhance ESG frameworks investment, and which can be aligned with sustainability goals to financial market it tries to find the problems, skepticism of investors to their short-term financial priorities by reviewing the secondary data on integration of ESG challenges. ESG has gained significant momentum as investors prioritize sustainability and ethical considerations in their decision making, but however it is not completely driven by financial returns but also influenced by complex egoistic and altruistic motivations (Raut et al. 2023), while the ESG shapes their attitudes and challenges such as ESG metric complexity, lack of transparency and standardization skepticism hinder for ESG investment strategies adoption (Deng 2024; Caceres 2024; Benuzzi et al. 2024; Sharma et al. 2024). The interaction between ESG and BB remains unexplored in context to retail investors. Traditional finance theories focused on rational whereas behavioral finance focused on biases impacting investors in decision making. Understanding ESG principles is crucial since they impact firm sustainability practices, investment flows, and financial performance. Misconceptions can skew ESG opinions, therefore influencing either ideal investment choices or opposition to ESG acceptance. Though ESG is becoming more and more important, challenges prevent its seamless integration. Dealing with problems that would strengthen ESG systems and match them with financial market sustainability goals is crucial. Psychological elements often shape investors' ESG decisions more than logical analysis; so, it is important to investigate how these biases affect the acceptance of ESG, thereby improving the investment decision (ID)-making. Existing studies examined independently ESG and behavioral finance which failed to explore how biases can affect the ESG ID and also conventional statistical modeling was used in ESG research which do not capture both linear and nonlinear relationship which limited the understanding of investor behavior (Salvi et al. 2024; Dmuchowski et al. 2023; Choudhary et al. 2024; Bhimavarapu et al. 2022). The absence of integration approach in behavioral finance with ESG context led to the creation of knowledge gap which may affect the policy and investment strategies. By means of an integrated framework and a two-stage model (partial least squares structural equation modeling [PLS-SEM] combined with artificial neural networks [ANN]) to enhance model accuracy, this research aims to close this gap and so provide insights on the influence of biases on IDs, so supporting the theory of behavioral finance, and matching ESG investments with sustainability objectives.

The study aims to answer the following key research questions:

RQ1. *How do individual investors perceive ESG criteria, and what are the key BB influencing their perceptions?*

RQ2. *How do cognitive and emotional biases, such as CB, EE, HB, and BE, interact with ESG factors in ID-making?*

RQ3. *What are the challenges and strategies for effectively integrating ESG criteria into IDs?*

By addressing these questions, the study contributes to the existing literature in three keyways. First, it extends Behavioral Portfolio Theory (BPT) by incorporating ESG considerations, providing a more comprehensive framework for ID-making. Second, it empirically demonstrates how specific BB influence ESG investing, offering new insights into sustainable finance. Third, it provides practical implications for investors, financial institutions, and regulators, enabling more informed investment strategies and policy development.

Considering the aforementioned factors and research inquiries, the following objectives are proposed.

- To explore the BB along with the ESG factors that have influence on ID-making.
- To examine the linkage between selected biases, namely the BE, CB, EE, HB, and ESG components.
- To investigate the strategies that individual investors can use to effectively incorporate ESG criteria into their decision-making process, as well as the potential challenges and barriers that may impede the incorporation of ESG criteria into IDs.

This study examines the potential for sustainable investment within the field of behavioral finance. It proposes a two-stage modeling strategy that combines ANN with PLSSEM methodology, empirically examining the impact of ESG issues and BB on ID-making. This study places a considerable focus on offering practical insights for investment businesses about the optimal utilization of ESG variables and BB in order to gain a competitive advantage.

The objectives stated above prompt the categorization of this work into various domains. Section 2 of the paper provides a comprehensive discussion of the theoretical context. In Section 3, the paper outlines the technique employed, encompassing the development and validation of the instrument. Section 4 of the manuscript presents the research findings. The results obtained from the investigation are examined in Section 5. Section 6 elaborates on the theoretical and practical contributions that are made. Future research directions and conclusions are presented in Section 7.

2 | Literature Review and Hypothesis Formulation

Conceptualization of the research begins with the finance and ID making and incorporating traditional finance theory to behavioral finance theory. Exploration of the transition from rational to irrational decision making has gained more importance in parlance with ESG investing due to the global financial crisis and moving toward achieving sustainability goals. This research attempts to fill the void in literature, the lack of empirical studies, standardization, and practical ESG implementation

methods, underscoring its significance for both academia and industry. Investors' ESG decisions are often influenced by psychological factors rather than rational analysis. Hence, it is important to investigate how theses biases affect the investors' ESG-based decision making, which can ultimately improve their ID making. The realization of the fact that knowledge of the influence of biases aligning with investors' selective ESG information and their beliefs (CB), overvaluation of non-ESG assets (EE), misjudging past investment success or failure (HB) and BE can help companies to formulate strategies to improve ESG-based ID making. This study is conducted to explore these relationships. The following section elaborates on a comprehensive review of relevant literature and offers the hypotheses that will guide the study.

2.1 | Previous Works

The findings of previous studies provide some very useful insights into the psychological biases playing a pivotal role in the process of decision-making of an investor in relation to investments in the financial market. Numerous cognitive biases, including overconfidence, herd behavior, and loss aversion, have been the focus of extensive research which show significant impact on IDs (Parveen et al. 2023; Badola et al. 2023; Bagchi et al. 2022; Chang and Luo 2021; Aigbovo and Ilaboya 2019; Barber and Odean 2001; Bikhchandani et al. 1992; Kahneman and Tversky 1979). These studies on behavioral economics in fields such fashion, restaurants, and technology adoption lack empirical evidence regarding its direct impact on ID-making. Further, though few researchers have covered BB influence on herding, trader expectations, and financial expert authority, ignored how directly it will affect IDs in long-term strategic planning or about its part in ESG investing. Jain et al. (2022) presented scale with reliable and valid for measuring BB and explored biases such as herding, overconfidence, loss aversion and regret aversion affecting ID-making. Rashid et al.'s (2021) investigation into the Pakistan stock market shows that confidence, optimism, and pessimism all have an impact on the decision to invest. In their research, Quaicoe and Eleke-Aboagye (2021) identify regret aversion and gambler fallacy as having a significant impact on investor decisions, concluding that psychological biases do play a role in IDs of investors in Ghana. These studies attempted to explore how HB influences decision-making in the stock market and other related spheres, but not focused much on how it influences investing decisions. Research conducted by Saivasan and Lokhande (2022) uncovers psychological and demographic factors that influence IDs. Familiarity, overconfidence, and anchoring biases, in addition to demographic factors, all play a role in investing decision-making. In their study on ID-making in real estate markets, Pandey and Jessica (2018) measure BB by taking into account anchoring bias, availability bias, representativeness bias, and regret aversion. These four types of bias are included when evaluating BB. In their research, Adil et al. (2021) discover that financial literacy, in addition to the effects of several biases such as overconfidence, herding, risk aversion, and the disposition effect, all play a part in the ID-making process. These studies focused mostly on how EE influences consumer risk-taking in lotteries, insurance decisions, and commodity trading as well as on sales and pricing practices. Lack of studies on emotional intelligence in ID-making and how it affects investors' readiness to diversify their portfolios and welcome risk. Emotional intelligence has been investigated in many spheres of economic decision-making and consumer behavior; nonetheless, its impact on ID-making from the standpoint of individual investors has not received much attention. Overconfidence and aversion to loss are the primary foci of Bhatia et al.'s (2021) research on biases in investing decision-making. Psychological biases, financial risk tolerance, and overconfidence are central to the outcomes of investor success in the Indian Capital market (Akhtar and Das 2020). Additional research that is relevant is outlined in Table 1. It could be observed, while earlier studies on BB such as CB, EE, HB, BE have been undertaken, ESG issues along with these biases call for clarity and a combined approach. Prior studies have also brought to light a number of limitations that call for additional investigation.

2.2 | Behavioral Biases and IDs

IDs are extremely important in the world of finance since they determine how money is distributed across different types of financial assets (Tiwari et al. 2023; Xiaoli et al. 2023). A traditional view of finance makes the assumption that investors are logical beings who make choices based on factual data. However, research in behavioral finance has shown that humans are susceptible to cognitive and emotional biases, which have a considerable impact on the financial decisions they make (Ahmad and Shah 2020; Kumar et al. 2023; Jain et al. 2023). Behavioral finance is a subfield of finance that studies human behavior in relation to financial markets (Rahman and Gan 2020). BB affect investor IDs significantly. However, the previous studies do not fully explain how the BB influence institutional and personal investment practices in financial markets. Investors with biases tend to show poor performance in making financial decisions in their short term or long-term investing (Jain et al. 2022; Hsu et al. 2021; Talwar et al. 2021).

2.2.1 | Confirmation Bias

CB can be seen in the inclination to seek out and assign more weight to data supporting one's past beliefs. This tendency usually leads to the ignoring of facts contradicting one's preconceptions, not just in the disciplines of economics and psychology but also in the methods used by scientific researchers (Peters 2022; Costa et al. 2017). CB can cause overconfidence and unreasonably positive assessments in the context of IDs; these can have an impact on outcomes in the financial and stock markets (Kumar and Prince 2023; Vorobyova et al. 2022; Barber and Odean 2001). This bias also drives people to search for material bolstering their agenda. This means that the influence of CB is considerable on financial market expectations since the expectations of optimistic and pessimistic traders differ more. Investors in potential hedging strategies will find this useful in determining wise IDs (Parveen et al. 2023; Trichilli et al. 2022). Research done in the past shows how CB affects how one views financial expert authority; in this case, decision-makers usually trust and give more power to financial advisers whose suggestions validate their own views (Zaleskiewicz and Gasiorowska 2021). A range of disciplines, including the stock market, medical and IT

TABLE 1 | Summary of relevant recent studies.

S. no.	Authors	Country	Purpose	Considered input factors	Research methodology	Findings of the study
1	Raj (2025)	India	To evaluate how biases herd behavior, mental accounting and overconfidence affect retail investors investment decision with the moderation effect of age, income and gender.	Herding, mental accounting and overconfidence.	PLS-SEM was used for testing the data collected from 385 investors from India.	Herd behavior, overconfidence and mental accounting had effect on investor's investment decision with the age and gender having the moderating effect.
2	Banerjee et al. (2025)	UAE	To identify biases for investment decision in robo-advisory platform.	Mental accounting, regret aversion, loss aversion, hindsight, herding.	263 data was collected from respondents and probability sampling technique was used.	Age and income significantly affect mental accounting, herding and loss aversion.
3	Suresh (2024)	India	To measure the degree of influence of BB and financial literacy (FL) on investment related decisions.	Financial literacy, heuristic bias, herding, framing effect.	Data is collected using a structured questionnaire with SEM technique being used.	Both FL and BB have significant impact on investment decisions. Identified heuristic bias is positive, whereas framing, herd mentality and cognitive illusions have a negative association in formation of BB.
4	Choudhary et al. (2024)	India	To explore the level of impact of demography, personality traits and FL on cognitive biases of equity investors.	Personality trait, FL, annual family income and gender.	Binary logistic method is applied on data among millennial equity investors.	Demographic variables and personality traits are strong predictors of an investor's susceptibility to biases. Among these predictors, the most relevant is the financial factor. Other influential factors are literacy, gender, annual family income, availability, prejudice, and representative bias.
5	Parveen et al. (2023)	Pakistan	This study aims to examine behavioral finance research in developing countries, with a focus on COVID-19's impact on investor emotions, biases, and decision-making processes in the Pakistan Stock Exchange.	Representative bias, anchoring bias, overconfidence bias, disposition effect.	In this research SEM is utilized to observe COVID-19 epidemic impact on investor's behavior. Data from 401 k investors is acquired using a questionnaire-based approach.	Different kinds of psychological biases, including representative bias, anchoring heuristics, the disposition effect and overconfidence bias, influence investors while making decisions on the Pakistan Stock Exchange during the ongoing epidemic.
6	Singh et al. (2023)	India	Personality traits along with behavioral biases with risk tolerance as a moderator are considered in the research.	Personality traits (conscientiousness, extroversion, neuroticism) and behavioral biases (herding bias, disposition bias, anchoring bias), moderated by risk tolerance.	Cross-sectional methodology, using 847 participants (individual investors) participated in the survey. SEM model is used.	The study's results indicate that personality traits such as conscientiousness and extroversion exert a notable impact on behavior biases.

(Continues)

TABLE 1 | (Continued)

S. no.	Authors	Country	Purpose	Considered input factors	Research methodology	Findings of the study
7	Hossain and Siddiqua (2022)	Bangladesh	Investors in Bangladesh are considered to understand the impact of behavioral biases impacting their investment decision-making.	Biases identified are overconfidence, loss aversion, herding effect, risk perception.	281 investors actively involved in the Dhaka Stock Exchange participate in the survey for data collection.	This study concludes that emotional variables, specifically risk aversion and risk perception, significantly impact investment choices made by investors in Bangladesh who participate in the Dhaka Stock Exchange. These findings highlight the deviations observed from established theoretical principles.
8	Mittal et al. (2022)	India	To evaluate the existing body of literature related to behavioral biases in decision-making and to develop a framework that will pinpoint areas of research that require further investigation.	Herd instinct, availability biases, hindsight biases.	The study takes a systematic literature synthesis including publication year, research type, statistical techniques used and different biases taken. This funnel method reduces behavioral biases to six for future investigation.	Identified behavioral biases impacting investment decision with an eye on their future potential impact on stock market anomalies, and the need of early detection to improve investment decisions.
9	Ahmad et al. (2022)	Pakistan	To assess the degree of influence of heuristic biases on investor's decision making toward investment by using fundamental and technical irregularities as potential mediators.	Heuristic biases.	323 individual investors actively involved in Pakistan Stock Exchange participate in the survey with SEM technique used in validating the model.	The study finds that bias based on recognition and heuristic has a beneficial impact on decisions.
10	Jain et al. (2022)	India	The research objectives are to identify the key biases influencing investors in Punjab territory in India.	Herding, overconfidence and loss aversion biases.	In Punjab, India, a research methodology, that is, fuzzy analytic hierarchy technique is utilized to measure the relative significance of several behavioral biases; these influence individual equity investors' investment decisions.	The study concludes that the considered biases, that is, herding, overconfidence and loss aversion are the most powerful factors influencing individual equity investors' decisions in Punjab, India.
11	Holden and Tilahun (2020)	Ethiopia	The study assesses potential bias in risk aversion estimates resulting from endowment effects in a simplified iteration of the risky investment game, specifically tailored for individuals with limited educational backgrounds. Additionally, this study seeks to devise and evaluate an alternative version of the game that mitigates this bias and achieves a more equitable representation of risk aversion.	Endowment effect, loss aversion.	The study utilizes a field experiment involving a group of young individuals from the business sector with limited educational background. Experiment is used to assess any potential bias resulting from endowment effects in a modified version of the risk investment game. Additionally, the study aims to develop and analyze a game design that is more equitable in nature.	The research findings indicate that the utilization of a simplified risk investment game results in the generation of biased estimations of risk aversion. This bias can be attributed to the presence of endowment effects. However, it is seen that the implementation of a more balanced game design helps to ameliorate these effects. Further, it is inferred, that loss aversion does not play the role as the cause of the EE.

(Continues)

TABLE 1 | (Continued)

S. no.	Authors	Country	Purpose	Considered input factors	Research methodology	Findings of the study
12	Novianggie and Asandimitra (2019)	Indonesia	To investigate how BB with FL as a moderator influences investment decision-making.	Risk perception, bias, herding bias, representativeness, overconfidence and financial literacy.	Structured questionnaire and interview technique is used in collecting data.	This research concludes that several factors, namely, risk perception bias, herding bias, representativeness, overconfidence and FL exert a considerable influence on the investment decisions made by college students in Surabaya. Disposition effect and regret experience do not demonstrate any statistically significant impact in this context. They classify financial literacy as an IV rather than a moderator.
13.	Madaan and Singh (2019)	India	To study impact of behavioral biases on investment decisions among investors of India in the National Stock Exchange.	Overconfidence, anchoring, disposition effect, and herding behavior.	243 investors participate in the surveys; all are actively involved in the National Stock Exchange.	Overconfidence and herding have influence on investment decisions.

sectors, as well as finance markets stratified by gender, demonstrate the impact of CB (Areiqat et al. 2019; Elston 2020; Chang and Luo 2021). Though researchers have looked into CB in investor behavior and decision making, yet little study has been done on how CB interacts with other biases and other market variables. Consequently, we formulate the working hypothesis that the process of investing decisions is much influenced by CB.

H1. *CB influences IDs positively.*

2.2.2 | Endowment Effect

The work of Kahneman et al. (1990) on EE reveals that people have a propensity to place a higher value on things that they already own. This happens when people feel attracted to an object only because they own it, rather than because of the traits that it possesses in and of itself (Gal 2021; Macedo et al. 2007). According to Dommer and Swaminathan (2013), people who have a sentimental tie to their possessions have a tendency to seek a higher price when selling an item, rather than what they are willing to pay for it themselves. The EE is important because it illustrates the irrationality of human decision-making, the impact of loss aversion, and the inclination to prefer the status quo (Gal 2021). It is clear in previous research that parental IDs are influenced by children's preferences. Specifically, parents invest more money in girls who have a high initial endowment, whereas the situation is different for boys (Deng and Lindeboom 2022). Only a few prior studies observe the role of the EE as a form of behavioral bias in the IDs of business owners and managers (Parveen et al. 2023; Nobre et al. 2022). The endowment impact is seen when individuals are asked to trade consumer goods such as mugs, pens, and chocolate bars (Badola et al. 2023; Ştir and Zaiţ 2024; Clist et al. 2021), in games and lotteries (Holden and Tilahun 2022), and the risk level based on insurance and lotteries. Our opinions about things we own extend to other aspects of decision-making, such as choosing between different investment options. As a result, in order to investigate the impact of the EE, we test the following hypothesis.

H2. *EE has a significant impact on ID-making.*

2.2.3 | Hindsight Bias

Changing one's decisions based on what has already transpired is an example of the cognitive strategy known as HB (Fischhoff 1975). Some people have the misconception that it enables them to foresee the outcomes of events and alter their behavior accordingly based on the predictions they make. However, this bias can lead to irrational judgments because investors erroneously identify cause-and-effect relationships between occurrences that are not related, leading them to believe they can accurately forecast future events (Mittal 2022; Zahera and Bansal 2018; Biais and Weber 2009). Memory distortion, inevitability, and foreseeability are the three subtypes that fall under the umbrella of HB. Memory distortion occurs when past events are inaccurately remembered due to great emotional impact; inevitability reflects the tendency to believe that what has happened was inevitable despite having no influence over it; foreseeability refers to anticipating future outcomes (Kelman

et al. 1998; Blank et al. 2008; Groß and Bayen 2022). It is demonstrated in previous research that HB has a significant influence on decision-making. This is seen in different contexts including the stock market (Talwar et al. 2021; Hussain et al. 2013), legal decision-making (Giroux et al. 2016; Harley 2007), and medical decisions (Dawson et al. 1988). As a result, we propose the following hypothesis.

H3. *HB significantly affects ID-making.*

2.2.4 | Bandwagon Effect

The term "BE" was coined by Leibenstein in 1950 and describes the way in which the demand of individuals for a certain commodity at a particular price can be impacted by the actions of other individuals. It suggests that people may participate in a trend only because others are doing so (Boto-García and Baños-Pino 2022) even if there are no major hurdles to participation in the trend itself (Cho et al. 2022). Several studies have been conducted to study this effect. An example is where closed-loop subgame perfect equilibrium of an investment timing game is carried out in which players make simultaneous investments. This example shows that when the second mover's incremental profits rise above a specific threshold value, investors are more likely to join in on the BE (Kim and Deshmukh 2021). According to Misra et al. (2022), when there is a rise in the number of new investors, investors tend to favor safer liquid assets; they identify this bias as the BE. This effect can be seen in a variety of contexts, including political campaigns, the fashion industry, the restaurant industry, financial investments, and the process of adopting new technologies (Schmitt-Beck 2015; Shaikh et al. 2017; Wu and Lin 2017). On the basis of the evidence presented thus far, we forward the following hypothesis.

H4. *The BE significantly affects IDs.*

2.2.5 | ESG and ID

The swift integration of ESG standards helps to explain the rise in the frequency of some foreign investment patterns. ESG ideas describe how companies operate and provide a set of guiding ideas that investors should examine while deciding on investments (Raut et al. 2023; Umar et al. 2020). Socially conscious investments have grown in appeal to investors as behavioral finance offers them clear investment portfolios (Eurosif 2016; Ivanisevic 2019). Consequently, in recent years, behavioral finance has become one of the most exciting disciplines available to investors. Previous studies show that the process of making decisions about investments is much influenced by behavioral prejudices (Sachdeva et al. 2022). This is true even if profit and risk management drive investors mostly. Previous studies (Hsu 2022; Sachdeva et al. 2022; Jain et al. 2020) reveal how individual investors' investing decisions are influenced by behavioral prejudices. Recent studies reveal that using ESG data in personal investor corporate investing decisions has a significant influence (Park and Oh 2022). By reducing risk exposure and increasing return potential, ESG features also draw the risk management

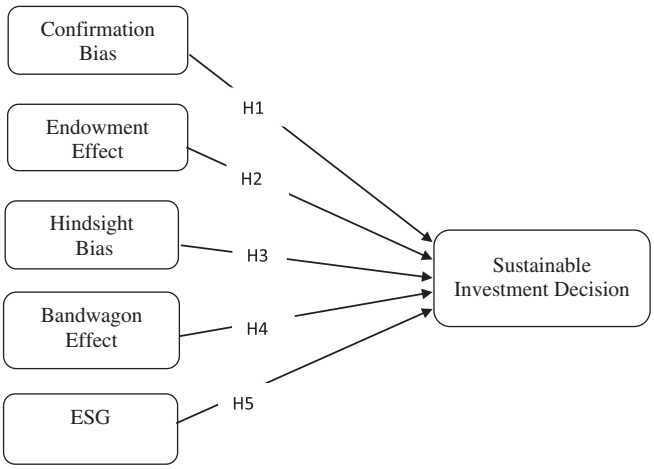

FIGURE 1 | Conceptual framework.

of sovereign wealth funds (SWFs) (Chen et al. 2022). Previous research reveals that ESG elements affect investor, company, and transformation toward Industry 4.0 (Al-Hiyari et al. 2023; Alkaraan et al. 2022; Jonwall et al. 2022) investment efficiency. Although the study of behavioral finance has historically focused on trader and investor behavior, the mediating function is not clearly known. By looking at the ways in which investor behavior—including CB, EE, HB, BE, and ESG issues—affects the success of investment trading, this study aims to close this gap. This study aims to take into account a range of external elements, including ESG, thereby increasing the profitability of investment prospects in the area. Consequently, the following hypothesis is put up.

H5. *ESG factors positively influence ID.*

Based on the above discussions, a conceptual framework is depicted in Figure 1.

3 | Research Methodology

The systematic literature review (SLR) technique is followed in this research to critically examine the BB in IDs. SLR methodology provided a rigor, comprehensive, potential for bias, quality of inclusion studies and transparency (Pérez et al. 2024; Costa et al. 2017) in synthesis of existing literature using Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, thereby ensuring findings reliability and evidence based decision making by enabling high standard's in review methodology and original research being synthesized (Page et al. 2021; Yadav and Mangla 2024; Costa et al. 2019). The SLR adopted provided the theoretical substance and ensures the understanding of BB in ESG context. Survey based approach allowed the empirical validation of theses biases to the practical experience in IDs. PLS-SEM used in testing the hypothesis in complex models. The objective of employing SLR is to classify these biases and thoroughly analyze any new facts and evidence that emerge from previously published research papers including recent studies by Ali et al. (2023), Bihari et al. (2022), Suresh (2024), Eberhard (2023), Anggraini and Sholihin (2023), and Gupta et al. (2023). The search criteria for databases are set based on

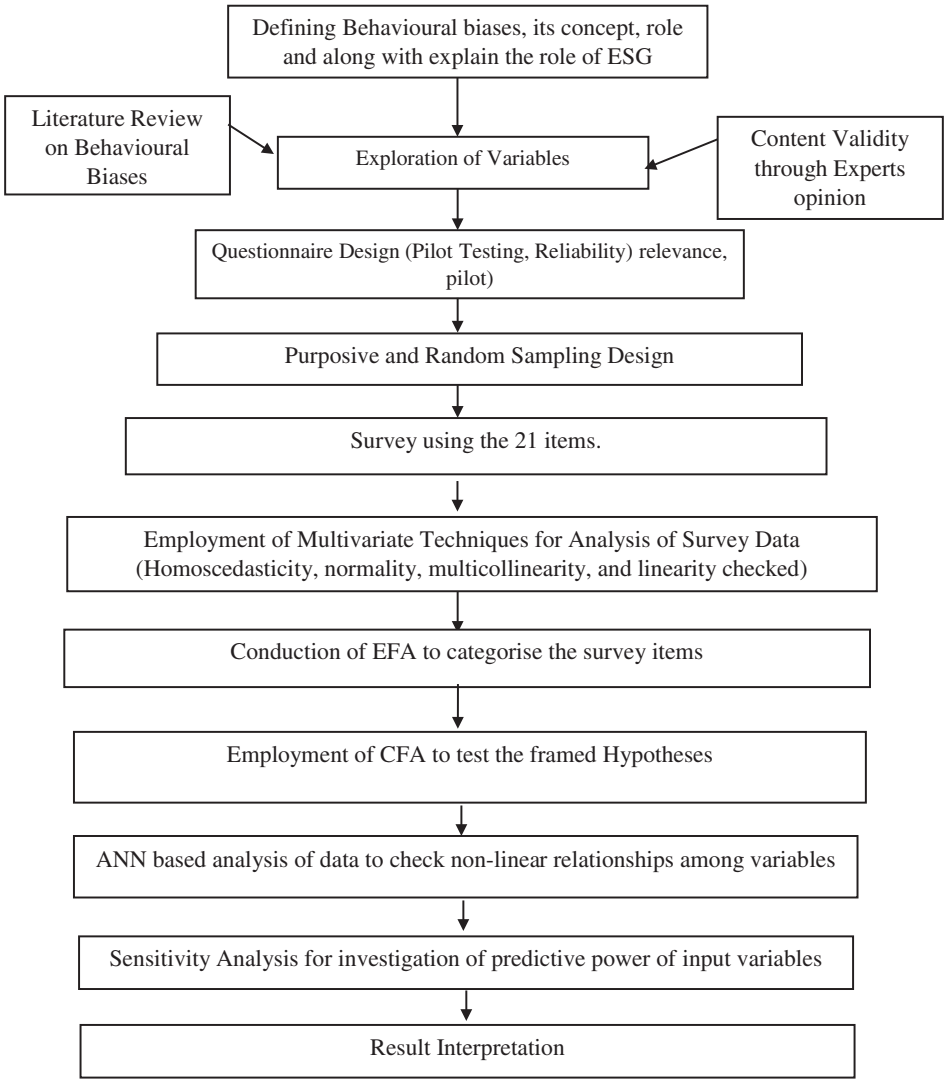

FIGURE 2 | Flow chart depicting methodological approach to this research.

the PRISMA protocols. The Web of Science (WoS) and Scopus databases are searched in order to retrieve papers encompassing a wide range of topics, while ensuring that the number of articles obtained remains manageable. The search through articles is based on the research questions to ensure that all the articles with a focus on BB and have linkage to ESG factors are captured. Keywords used in the search are "BB," "socially responsible investment" "behavioral finance," and "ESG factors for ID." Another important inclusion and exclusion criterion implemented in this article is the timeline; this restricts our study to consider articles only published from 2010 to 2023. This timeline justifies the incorporation of contemporary advances in the field. Around 170 articles are identified and selected for review based on the inclusion and exclusion criteria. The exclusion criteria encompasses research that focuses on a different demographic, investigates biases impacting investment channels other than the one under consideration, involve scale development, are irrelevant to the topic, or are not directly related to investor decision-making process. The search does not encompass book chapters, conference papers, or proceedings. The inclusion criterion encompasses articles written in the English language only. The SLR provides comprehensive knowledge about the topic while addressing the research questions systematically. It removes any potential bias in the selection of articles.

Figure 2 provides the flow chart demonstrating the steps followed to conduct the research. This examines the impact of several BB (confirmation, EE, hindsight, and BE) on IDs. Furthermore, the study attempts to investigate how ESG factors moderate these biases. By means of prediction and analysis of the degree of influence of these biases, the study seeks to help investors avoid illogical decisions and maximize their earnings.

A subgroup of the population having know-how about investing decisions and the financial markets is included in the survey. Data collection was done using a self-administered questionnaire. Employing CB-SEM (Saunders et al. 2015; Martínez-López et al. 2013), the investigation approximates covariance between the variables. The study also employs several methods to identify and resolve ethical issues inside the research. Six professionals from financial companies provide inputs to confirm content validity. These professionals handle several funds in addition to being exposed to the banking, financial, and insurance industries. Content validity of every item is also assessed using a measure of content validity index (I-CVI). I-CVI value items less

than 0.6 are dropped. Expert scores guide the computation of I-CVI value; this is found to be 0.87, indicating great content validity in the items (Raut 2020; Amos and Boakye-Agyeman 2023; Longerstaey et al. 2023; Sudhir et al. 2023).

The authors develop a questionnaire that assesses biases such as CB, EE, HB, BE, and the ESG construct using a five-point Likert scale of 1 (strongly disagree [SD]) to 5 (strongly agree [SA]) (Pompian 2011; Steininger et al. 2014; Onsomu 2014). A survey-based technique is the best method for the collection of primary data from a specific population with knowledge of financial markets and IDs. As a result, the data to be assessed is obtained subjectively from a relevant sector of the population using self-administered questionnaires (Sahi and Arora 2012). From October 2022 to February 2023, the questionnaire was disseminated to various categories of individual investors. The target population of the study was individual investors who are actively involved in financial markets, having certain level of knowledge and experience including ideas about biases and ESG and make ID. The sampling frame included investor from diverse portfolio like active market participation, exposure to investment in stock markets, mutual funds and other investment avenues and also professional in BFI sector and investors involved in stock trading in different financial institutions. Sampling unit was individual investor who are involved in independent ID or guided by agency for ID. Purposive sampling was used initially as the study focused on investors with financial knowledge and ensured knowledgeable respondents participated selectively it was used then from theses pool of investor selected simple random sampling technique was applied. Combined it satisfied the qualified and experienced investors. A total of 740 investors were approached to participate in the poll, but only 430 responded. The data received from 412 respondents was found to be complete in all respects and was selected for further analysis in this study, including EFA and CFA using SPSS 20 and Smart PLS 4.0 software (Nie et al. 1975; Arbuckle 2011). The PLS-SEM technique offers an advantage over CB-SEM because it can be applied to complicated models and growing theories; this aligns with the aim of our research. PLS-SEM is particularly attractive for conducting research in the fields of business and social sciences. It allows for meaningful analysis even with limited data, without the need of making assumptions about the distribution of the data unlike CB-SEM. This is especially relevant in business research, where small sample sizes and non-normal data are common. The model encompasses both formative and reflective measurements and is utilized to test hypotheses and anticipate the model's outcomes (Dash and Paul 2021; Chatterjee et al. 2023; Vaithilingam et al. 2024).

Common method bias (CMB) is a systematic inaccuracy that occurs when data is obtained from a single source in the same manner. This might result in overstated correlations or skewed estimations, undermining the validity of research findings (Chin et al. 2012). We evaluate CMB presence and intensity using the single-factor test developed by Harman and the marker variable approach. The setting and the degree of the bias define the interpretation of the CMB. A frequent benchmark for gaging the degree of CMB (Kock et al. 2021) is looking at the fraction of variance explained by the common factor in Harman's single-factor test. Less than half of the variance is accounted for by the common component, so CMB is said to be limited. The presence of the CMB is regarded to be more important if the common component explains more than half of the variance. In our case, we see that CMB is just at 23%. We also investigate another approach sometimes referred to as the "marker variable technique," in which we add a variable to the model connected to the data collecting technique but not theoretically tied to the construct of interests. If the marker variable is not significantly connected to the construct of interest, CMB is considered as negligible. If the marker variable is strongly correlated with the construct of interest, then the presence of CMB is seen to be more crucial. Both approaches reveal CMB absence; so, the model can be kept (Podsakoff et al. 2003).

4 | Results and Findings

4.1 | Demographic Factors

Table 2 contains demographic information about respondents, along with their investment experience. In this poll, we received responses, with 269 responses from male respondents (65%) and the rest from female respondents (35%).

TABLE 2 | Socio-economic attributes.

Description	Frequency	Percentage (%)
Gender		
Male	269	65
Female	143	35
Age (in years)		
< 25	78	19
26–35	148	36
36–45	132	32
46–55	37	9
> 55	17	4
Educational qualification		
Diploma	87	21
Bachelor's degree	103	25
Master	189	46
MPhil or PhD	33	8
Annual income		
Up to 5 lakhs	136	33
5–10 lakhs	173	42
10–15 lakhs	70	17
> 20 lakhs	33	8
Experience (in years)		
1–5	243	59
5–10	112	27
10–15	45	11
> 15	12	3

4.2 | Evaluation of Statistics Information and Correlation Matrix Result

The statistical information and correlation between the studied constructs are represented in Table 3. This can be used to quantify the direction and connection among the variables in order to observe their strength and link. There is a positive and significant association between the ID and all of the components that are taken into consideration in the study—CB, the EE, HB, and the BE. The ESG moderator has a significant and beneficial influence on all of the variables. In order to evaluate the hypotheses, six different constructs are taken into consideration, each of which has a different number of elements.

In order to uncover the intricate structure of the data, we begin by carrying out an analysis of each construct and each item inside it using the validity of constructs, convergent validity, and discriminant validity. Cronbach's alpha and composite reliability are used to determine the validity of each piece of data for the constructs being tested (Cronbach and Meehl 1955; Hair et al. 2016). The threshold limit for composite reliability should be greater than 0.6. A Cronbach's alpha of 0.726 is calculated for the construct of investment choice, consisting of four components. Cronbach's alpha for HB with four items has 0.787, the BE with three items has 0.620, and the ESG construct with four pieces has 0.651. This is followed by CB with three items having 0.660, the EE with three items having 0.890, and HB with four items having 0.787. The threshold limit of Cronbach's alpha, also known as composite reliability, is 0.6, which all of the items in the study achieve. Therefore, each of the variables in this investigation can be relied upon. The average variance explained (AVE) is utilized so that the convergent validity can be evaluated. Fornell and Larcker (1981) and O'Leary-Kelly and Vokurka (1998) both suggest that the value of the AVE should be greater than 0.5. The factor loadings of each item for each of the constructs are shown in Table 4. An exploratory factor analysis is conducted on all items, yielding a Kaiser–Meyer–Olkin (KMO) value of 0.89. Additionally, the Bartlett's sphericity test indicates statistical significance. The items are subjected to maximum-likelihood and Varimax rotation to maximize the factor variances. Then, as advised by Iguacel et al. (2024), Nguyen et al. (2023), and Yılmaz et al. (2024), the exploratory factor analysis is carried out using the PCA method. The elements found have eigenvalues more than one. Multicollinearity in the data is found using the variance inflation factor (VIF) (Khatti et al. 2024; Li et al. 2024; Wang et al. 2024). Analysis of the link between independent factors and the VIF values uses multiple linear regression (MLR). This study ranges in VIF values from 1.03 to 1.16, showing no multi-collinearity. Furthermore, the Durbin–Watson statistics span 1.21–1.65, indicating absence of autocorrelation.

Discriminant validity is a typical measure in SEM that attempts to explain the constructs that are conceptually unrelated to each other and do not correlate with each other significantly (O'Leary-Kelly and Vokurka 1998; Shook et al. 2003; Shah and Goldstein 2006). This measure seeks to explain the conceptually unrelated constructs in a way that can be understood. Fornell and Larcker (1981) state that the calculated square root of the AVE on the diagonal needs to be higher than the correlation on the values that are off the diagonal in order to evaluate the discriminating validity. The results of discriminating validity testing for each of the constructs are listed in Table 5. The discriminant validity of the formative model may be evaluated by the utilization of the Heterotrait–Monotrait ratio (HTMT) of the correlations (Henseler et al. 2015). In Table 6, an index of all of the HTMT results is presented. It is necessary for the HTMT ratio to be lower than 0.85, and all of the indexed results should demonstrate discriminant validity. After determining all of the outcomes based on the measuring model of the investigation, we proceed to construct the model of the research study as depicted in Figure 1.

4.3 | Structural Model Assessment

In order to test each study hypothesis and evaluate the outcomes of the structural model depicted in Figure 3, the predictive relevance and linkages among the components, as well as the strength and quality of this model, are determined. The predictive significance of the model (Q^2), the path coefficient (β-value), the coefficient of determination (R^2), T-statistics value, and the effect size (f^2) are the five important measures utilized in the evaluation of this model. In order to evaluate the aforementioned four important criteria, a bootstrapping study is carried out. According to Hair et al. (2011), the values 0.75, 0.50, and 0.25 for the coefficient of determination (R^2) can be regarded as high, moderate, and low, respectively. The results indicate that the value of R^2 is low in this investigation. The exogenous structure does have predictive relevance for the endogenous structure if the value of the model's predictive relevance (Q^2) is greater than zero (Hair et al. 2011). This recommendation suggests that the

TABLE 3 | Correlation matrix among constructs.

Constructs	Cronbach's alpha (α)	Mean	SD	1	2	3	4	5	6
ID	0.726	3.798	1.044	1.000					
CB	0.660	3.882	0.971	0.381**	1.000				
EE	0.890	3.873	0.979	0.419**	0.313**	1.000			
HB	0.787	3.826	0.912	0.257**	0.125**	0.261**	1.000		
BE	0.620	3.972	0.983	0.211**	0.123**	0.294**	0.287**	1.000	
ESG	0.651	3.788	1.031	0.312**	0.112**	0.339**	0.341**	0.351**	1.000

Note: **Correlation is significant.

TABLE 4 | Measurement model statistics.

Constructs	Items	Factor loading	Cronbach's alpha (α)	Composite reliability	AVE
Investment decision (ID)	ID1	0.694	0.726	0.742	0.568
	ID2	0.814			
	ID3	0.668			
	ID4	0.776			
Confirmation bias (CB)	CB1	0.745	0.660	0.661	0.823
	CB2	0.817			
	CB3	0.752			
Endowment effect (EE)	EE1	0.813	0.890	0.896	0.567
	EE2	0.953			
	EE3	0.951			
Hindsight bias (HB)	HB1	0.710	0.787	0.843	0.617
	HB2	0.750			
	HB3	0.784			
	HB4	0.855			
Bandwagon effect (BE)	BE1	0.648	0.620	0.650	0.593
	BE2	0.814			
	BE3	0.783			
ESG	ESG 1	0.645	0.651	0.663	0.521
	ESG2	0.657			
	ESG3	0.722			
	ESG4	0.753			

TABLE 5 | Discriminant validity.

Constructs	ID	CB	EE	HB	BE	ESG
ID	0.722					
CB	0.474	0.753				
EE	0.310	0.280	0.754			
HB	0.432	0.322	0.409	0.785		
BE	0.398	0.247	0.446	0.363	0.770	
ESG	0.369	0.442	0.261	0.416	0.374	0.782

TABLE 6 | Heterotrait–Monotrait ratio (HTMT).

Constructs	ID	CB	EE	HB	BE	ESG
ID	—					
CB	0.642	—				
EE	0.417	0.378	—			
HB	0.244	0.364	0.129	—		
BE	0.509	0.282	0.242	0.255	—	
ESG	0.554	0.375	0.476	0.154	0.247	—

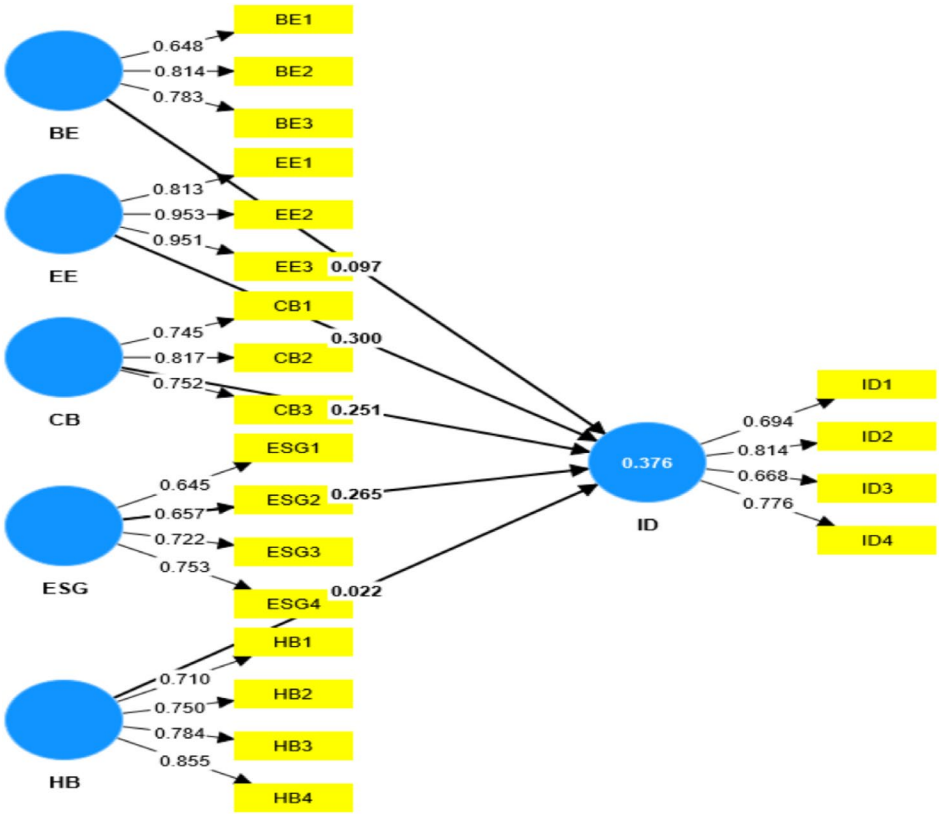

FIGURE 3 | The structural model.

exogenous structure does have predictive relevance for the endogenous structure. The results of R^2, redundancy, and community tests that are performed in this investigation are presented in Table 6. The f^2 measures the extent to which exogenous latent constructs affect the endogenous latent constructs. By analyzing the structural model, researchers can examine the relationship to explain the selected endogenous variables. Table 7 represents R^2, redundancy, and communality results.

TABLE 7 | R^2, redundancy and communality results.

Constructs	R^2 adj.	Q^2	f^2
ID	0.364	0.334	
CB			0.084
EE			0.119
HB			0.001
BE			0.013
ESG			0.103

4.4 | Structural Model and Hypothesis Testing

To measure the direct linkage between the constructs needed to test the hypothesis, Table 8 is presented to represent the hypothesis for the estimated path for the considered variables. Thus, calculations can be made using the *t*-value and confidence interval for the link between them. The outcomes, the statistical significance of ($\beta = 0.251$, $t = 4.875$, $p = 0.00$), show the connection of CB with ID, that is, H1 is statistically significant; for EE with ID, that is, H2 ($\beta = 0.300$, $t = 5.916$, $p = 0.001$) has a statistically significant connection between them; H3 shows that there is no significant association between HB with ID since ($\beta = 0.022$, $t = 0.301$, $p = 0.763$); for the direct effect of BE on ID, that is, H4 having ($\beta = 0.097$, $t = 2.034$, $p = 0.472$) is statistically insignificant; for the sustainability ID-making considered construct ESG, the H5 ($\beta = 0.265$, $t = 4.101$, $p = 0.00$) has a statistically significant impact on IDs.

To examine the non-linear relationships between independent variables (IV) and dependent variables (DV), artificial neural network (ANN) is employed (refer Figure 4), which allows us to identify significant predictors based on their normalized importance ranking. ANN is a computational model comprising nonlinear data modeling tools with input and output layers together with one or two hidden layers. All layers' neurons are coupled with corresponding weights, which the training algorithm iteratively modulates to minimize mistakes and produce accurate predictions. Within the model, these synaptic weights—which stand for the connection strengths between neurons—form reservoirs of information. Against noise, outliers, and limited sample size, ANN shows resilience. By use of several iterations of the learning process, mistakes can be reduced, hence improving prediction accuracy. As Tan et al. (2014) indicate, ANN provides better accuracy and durability than linear models. SEM-PLS struggles to fit non-linear correlations although it is rather good for capturing linear relationships for hypothesis testing. On the other hand, as shown by both Hew et al. (2016) and Tan et al. (2014), ANN can identify these non-linear correlations. The

TABLE 8 | Hypothesis confirmation: Significance of model paths (direct effect).

Hypothesis	Path	β (co-efficient)	p	t	Significance
H1	CB → ID	0.251	0.000	4.875	Supported***
H2	EE → ID	0.300	0.000	5.916	Supported***
H3	HB → ID	0.022	0.763	0.301	Not supported*
H4	BE → ID	0.097	0.472	2.034	Not supported*
H5	ESG → ID	0.265	0.00	4.101	Supported***

Note: *$p < 0.05$, ***$p < 0.001$.

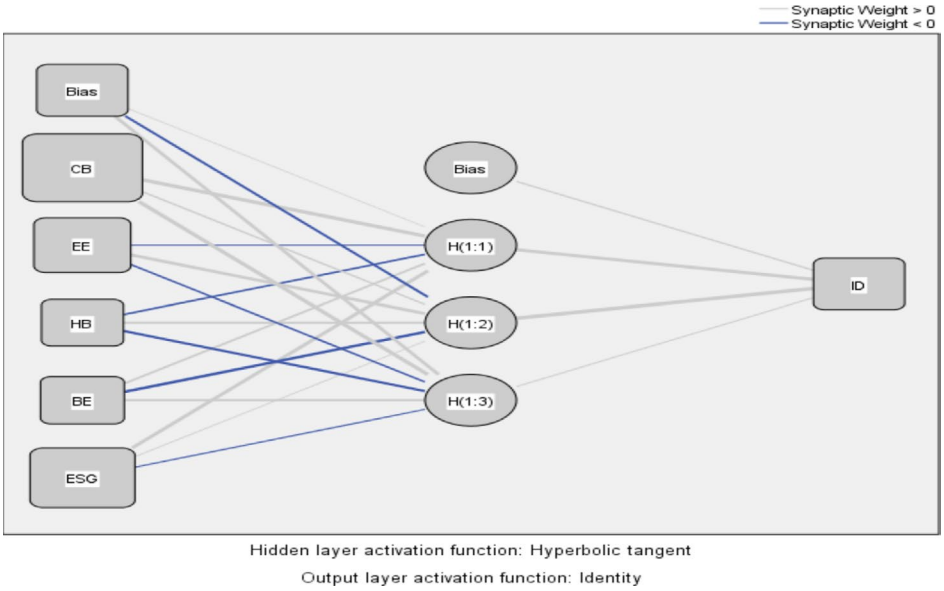

FIGURE 4 | Artificial neural network diagram.

second phase of the PLS-SEM method uses the ANN approach to evaluate the relevance of the predictors by ascertaining the degree of complexity in both linear and non-linear correlations between the latent constructs since the PLS-SEM method found a linear link. Given the presence of non-linear connections, ANN is utilized to identify the relevant predictors from the PLS-SEM analysis and to rank their normalized importance (Leong et al. 2020; Wang et al. 2023; Dadhich and Hiran 2022). In accordance with the methodology employed by Liébana-Cabanillas et al. (2017), we select the input neurons for the ANN model as the factors which are found to be significant through SEM-PLS path analysis. While PLS-SEM establishes the causal link among the variables, ANN concentrates on the non-linear interaction present among them and hence improves the prediction accuracy. Two-stage SEM produces the obvious relationship effects; the second stage added the predictive modeling powers. The second stage is more suitable for dynamic data sets as investor behavior varies over time. If the goal is predictive accuracy, ANN and PLS-SEM would be superior; Bayesian technique can be an alternative for verifying the robustness of the results further if the focus is on hypothesis testing and causal inference.

This analysis is executed using IBM SPSS software, employing the feed-forward backpropagation algorithm. In this algorithm, inputs are transmitted along a forward path, and estimated errors are propagated in reverse. Sigmoid activation is utilized for the input layer, while multilayer perceptrons are employed for the hidden layers, aligning with the recommendations of Sharma and Kumar (2020). Multiple iterations of the learning process are carried out to minimize errors and enhance prediction accuracy. In this research, 70% of the samples are allocated for the training phase, reserving the remaining 30% samples for testing. A ten-fold cross-validation procedure is employed, and the root mean square error (RMSE) is calculated as shown in Table 9. The average RMSE values for training and testing are relatively small, measuring 0.095 and 0.090, respectively, indicating excellent model fit. To assess the strength of the model, a sensitivity analysis is conducted to measure the predictive power of the input neurons, as shown in Table 10. The most significant predictor of the ID is CB, with a 100% importance rating, followed by the EE with 67.65%, HB with 56.3%, the BE with 54.9%, and ESG with 48.3%.

5 | Discussion

Most importantly, in view of the global issues identified by the Paris Climate Agreement and the UN Sustainable Development Goals, there is an increasing need to mobilize investor decision-making toward sustainable investments. The aim of the research is to explore biases such as CB, EE, HB, BE, and ESG and how they affect IDs. We validate the data to evaluate each hypothesis

TABLE 9 | RMSE values.

Neural networks	Size (training)	SSE	RMSE	Size (testing)	SSE	RMSE	Size of sample
NN1	281	3.220	0.107	131	1.720	0.115	412
NN2	299	2.247	0.087	113	0.885	0.088	412
NN3	279	2.558	0.096	133	1.336	0.100	412
NN4	276	2.459	0.094	136	0.805	0.077	412
NN5	283	2.358	0.091	129	0.811	0.079	412
NN6	296	2.254	0.087	116	0.892	0.088	412
NN7	285	2.872	0.100	127	0.635	0.071	412
NN8	288	3.228	0.106	124	1.476	0.109	412
NN9	290	2.417	0.091	122	0.74	0.078	412
NN10	301	2.21	0.086	111	0.907	0.090	412
Mean		2.582	0.095		1.021	0.090	
SD		0.389	0.008		0.359	0.014	

TABLE 10 | Sensitivity analysis.

Sensitivity analysis					
ANN	**CB**	**EE**	**HB**	**BE**	**ESG**
NN1	0.232	0.222	0.208	0.126	0.212
NN2	0.319	0.172	0.057	0.196	0.256
NN3	0.398	0.178	0.127	0.092	0.205
NN4	0.444	0.236	0.043	0.027	0.249
NN5	0.388	0.118	0.239	0.081	0.173
NN6	0.53	0.257	0.104	0.042	0.067
NN7	0.34	0.16	0.182	0.198	0.119
NN8	0.472	0.173	0.149	0.094	0.112
NN9	0.444	0.182	0.101	0.086	0.187
NN10	0.306	0.207	0.172	0.168	0.148
(Average importance)	0.3873	0.1905	0.1382	0.111	0.1728
(Normalized importance %)	100	67.6	56.3	54.9	48.3

using construct validity, convergent validity, and discriminant validity. Then, from confirmatory factor analysis, model fit indices are assessed to determine the importance of the factor loadings of each construct. After validating and assessing the data, the PLS-SEM result reveals a low coefficient of determination of 0.364. In addition to the structural model, we notice redundancy and community outcomes. A structural model is used to test the hypotheses; this shows that the construct CB, that is, (H1), has a considerable effect on IDs. According to previous research, investors are most impacted by this prejudice, although it has no substantial impact based on gender (Onsomu 2014; Alrabadi et al. 2018) Nevertheless, it indeed plays a significant role in the stock market (Singh and Kumar 2022; Parveen et al. 2020). The endowment impact (H2) influences IDs significantly. According to preceding literature, we see the effect in risky investment games (Holden and Tilahun 2022), on the stock market (Furche and Johnstone 2006), and in lotteries (Anagol et al. 2018). HB (H3) has little effect on ID-making. Previous studies identify its influence in the financial market (Hussain et al. 2013) and investment choices (Mittal 2022). However, the construct of the BE (H4) does not exhibit a significant impact on IDs, although the confirmation of its significance level is pending after evaluating the model fit indices and conducting model path analysis. There are few studies on this bias in IDs. Past studies have confirmed its effect in the digital environment (Steininger et al. 2014), predicting its effect on online brand messaging (Wu and Lin 2017), the stock market (Prasetyo and Rahadi 2022), and the healthcare industry (Hsuan and Rhay 2012). The final H5 shows that the ESG construct has a considerable impact on investing decisions. Environmental, ethical, and socially responsible investments entice investors in the same way that behavioral finance provides a clear investment portfolio; it is regarded as one of the best prospects for investors looking to invest in recent decades (Eurosif 2016; Ivanisevic 2019).

Each factor of this study is examined, leading us to conclude that investors make investing decisions based on emotional biases such as market trend, past beliefs, loss fear, and prior experience rather than studying and understanding the practical situation. Thus, understanding BB is essential because correcting biases caused by emotions and beliefs is extremely challenging. Many investors rely on the advice of financial consultants when making IDs. As a result, financial advisors must also grasp emotional behavior and its consequences. This study's findings are congruent with those of Ritika and Kishor (2022) and Jain et al. (2022). Most economic principles are predicated on the notion that humans make logical and sensible decisions after carefully analyzing all of the circumstances and evidence. However, behavioral economics has grown in popularity in recent years as

it investigates how psychological, cognitive, and emotional aspects influence individuals' investing decisions. ESG integration becomes more crucial and difficult for investors. These concerns include the business rationale for ESG integration, the quality of ESG data, a lack of sufficient standards, and behavioral issues. Surprisingly, scholars and practitioners appear to concur on the significance of these difficulties. In this study, we address these difficulties and integrate ESG to create more sustainable and responsible portfolios. Before making an investment, all types of investors must have information and a solid understanding of the model scale of behavioral factors such as emotional biases. Not only investors, but also financial advisors, must comprehend human behaviors in order to effectively serve their emotional clientele.

This study systematically investigates the interplay of cognitive and emotional biases with ESG criteria in investing decisions, therefore improving the behavioral finance model by including ESG elements. Given global environmental concerns, this integration is relevant since it shows how prejudices could affect IDs over logical analysis in some situations, therefore enriching decision theory. While also looking at how ESG reduces BB, the theoretical contribution clearly links the results to current behavioral finance models, including prospect theory and heuristics theory. This places the research in respect to theories of sustainable finance, thus affecting investment patterns connected with sustainability. Practically speaking, investors should acknowledge their own prejudices that affect their ESG investment choices; meanwhile, financial advisers have to understand investor psychology in order to properly guide and help them to overcome irrational behavior. Policymakers and institutions can also use these statistics to increase awareness, inform investors, and promote environmentally friendly investing policies. Regarding useful contributions, it suggests the development of strategies to evaluate ESG's integrated prejudices. It also underlines how investor attitude and behavior are influenced by ESG aspects. One could compare the generalization of the survey with international results on BB and opinions about ESG all around. The focus has been on theoretical contributions that result in useful applications, therefore addressing generalizability issues and hence having a significant impact.

5.1 | Framework Development

It is commonly acknowledged that a large number of investors, whether individuals or institutions, are now emphasizing sustainability and ESG factors. The world of sustainable investing can be perplexing for many investors due to differing language and practices. This uncertainty stems from a lack of agreement on language as well as the reality that sustainable investing is not a standardized investment strategy. According to this study, sustainable investing strives to address both financial issues as well as positive ESG consequences. Sustainable investing is a complex topic with numerous concepts and techniques, as well as a lack of terminology agreement. It is not a single, separate technique but rather a deliberate and rigorous approach to recognizing and resolving the challenges and issues affecting investments today. The framework "Motivations, Strategies, and Portfolios" outlines the characteristics of sustainable investment that different types of investors can easily understand. A sustainability lens can improve investments by controlling risks and identifying new opportunities while also avoiding negative outcomes and promoting positive outcomes for people and the planet. Investors are increasingly considering sustainability concerns in their decision-making, whether as individuals or institutional decision-makers.

Figure 5 depicts six approaches to addressing sustainability concerns in ID-making; these include enforcing exclusions, freezing ESG risks, pursuing ESG opportunities, practicing active ownership, focusing on sustainability subjects, and evaluating the impact. These approaches can help investors select assets that benefit people and the environment while also improving their own portfolios and controlling risk. The aforementioned motive and six sustainable investment methodologies may play various roles in investment portfolios, ranging from non-existent to dominant. The methodology can be used to target exposure to preferred approaches as well as assess and compare sustainable funds and portfolios. The framework offers investors a consistent reference point for understanding sustainable investing, identifying appropriate investments, and evaluating funds and portfolios. Thus, investors should examine these three elements of sustainable performance in their decision-making process.

6 | Implications

For numerous reasons, the theoretical implications of the research topic are important. The research throws light in the Indian context on how the rational decision-making process is related to BB among investors. It also identifies that poor financial knowledge makes investors prone to biases in their decision-making.

6.1 | Policy Implications

Developing policies that not only include ESG criteria but also take BB into account is essential in the global corporate environment of today to inspire investors to make ethical and sustainable IDs. This method supports value-based investing decisions and moral behavior. Policies should thus concentrate on raising the consistency of ESG measures in view. Investors should thus give the long-term sustainability and societal effects of their investments top priority along with their financial returns (Salvi et al. 2024; Gupta et al. 2023; Kanoujiya et al. 2023; Bhimavarapu et al. 2022). The examination of ESG elements should be included in investor risk assessment strategies; the findings of the research help to support this process. These findings might help to further enable the creation of an ESG-sustainable behavioral finance ecosystem by means of a policy framework. An ecosystem with several stakeholders—government agencies, financial institutions, corporate companies—could combine behavioral prejudices and ESG alignment into investor decision-making, thus promoting a society that welcomes a sustainable and ethical approach to finance (Sood et al. 2023). Promoting both societal value and strong financial stability will help to support the national economic development (Dmuchowski et al. 2023). The results of this study could also be useful in creating legislation emphasizing improving investor financial literacy by means of courses teaching about biases, therefore addressing individual

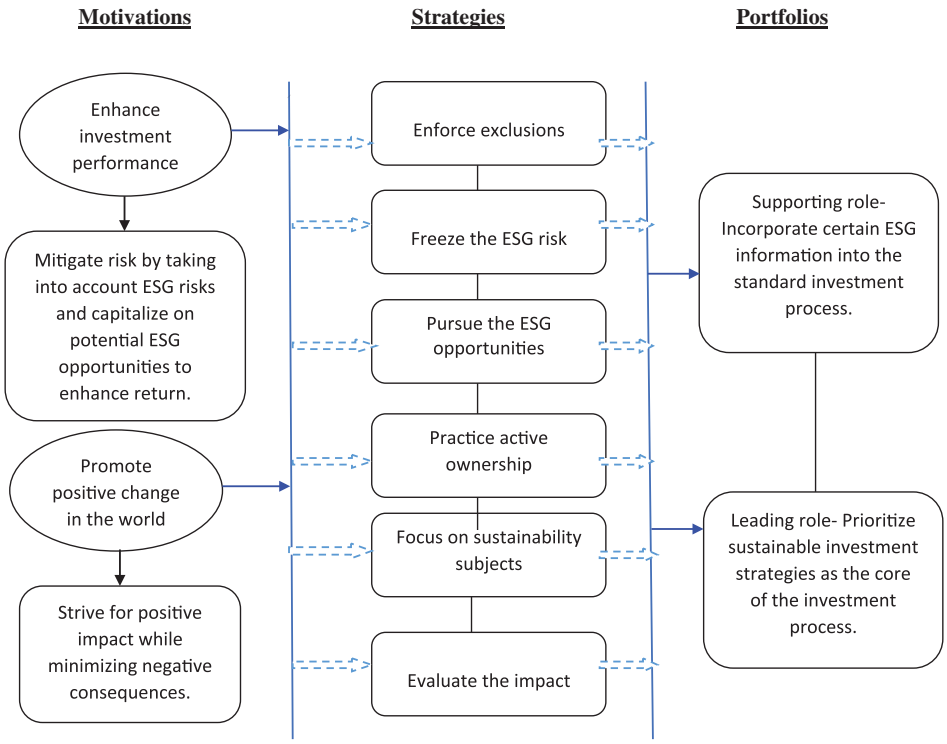

FIGURE 5 | Strategic sustainable framework.

prejudices. These can assist in informed and logical decision-making for methods of sustainable investing. By including the ESG element—which helps to reach sustainable goals—through more awareness—this in turn could help to improve investor decision-making. This would also encourage involvement in alliances with financial institutions to apply behavioral insights in motivating investors to include sustainable options and include ESG criteria in their portfolios (Benuzzi et al. 2024; Sharma et al. 2024).

6.2 | Practical Implications

For individual investors, the results of this study have significant pragmatic relevance. The results can help them to stress sustainability in their IDs and implement a strategic investment approach. They can look at businesses dedicated to sustainable development and so help the government, society, and environment. Investing in sustainable businesses helps individual investors actively promote environmentally friendly behaviors and help to create a more sustainable future for all. Moreover, people have the possibility to get financial gains and match their investments with their moral values (Lee and Suh 2022; Paetzold et al. 2022). The results will also inspire sectors to create operational policies in order to draw in ethical investors. Companies who show great dedication to ESG criteria and give sustainability top importance are more likely to draw in money and consumers. Adopting sustainable practices helps businesses to reduce their environmental effect, improve their operational efficiency, and lower risks connected to social and environmental issues. This finally helps businesses to strengthen relationships with stakeholders (Baratta et al. 2023), boost reputation, draw in fresh business, and lower expenses related to social and environmental hazards (Barauskaite and Streimikiene 2021). Achieving the goals stated in the UN Sustainable Development Goals agenda—which includes eradicating poverty, protecting the environment, and guaranteeing prosperity for all—by means of sustainable investment seems possible. Encouragement of investors to change their decision-making toward sustainable investments is absolutely necessary in line with the UN Sustainable Goals and the Paris Climate Agreement.

This study is important since it emphasizes the difficulties investors have with including ESG problems and helps to explain the growing relevance of including ESG elements in IDs. The study emphasizes the need for financial advisers to know their clients' emotional behavior and how this affects investing decisions. The study also offers a framework meant to improve understanding of emotional biases among financial advisers and investors. Before making an investment, this framework will help possible investors to properly evaluate and analyze the link between risk and return. ESG ratings improve the accuracy of data used for IDs, so policies must be developed to guarantee global openness and consistent reporting criteria for different ESG indicators. This helps investors to be able to implement different investment approaches. Environmental issues centered on the shift to low carbon practices and the participation of stakeholders can have either a good or negative impact on the surroundings. Giving information on corporate policies and activities connected to climate change top priority will help investors better match their portfolios with the move toward low carbon practices. Clear information on environmental issue disclosure will let investors with sustainability goals use the ESG approach as a more efficient and improved tool for balancing their investment portfolios and risk management. Leveraging the positive and negative valuation effects allows investors to align their portfolios with particular climate strategies and maximize market performance.

6.3 | Theoretical Contributions

This research makes substantial contributions to the study of finance by offering insights into emotional, cognitive biases, psychological factors, and socially responsible aspects that influence the decision-making process of investors. ESG factors receive considerable attention in behavioral finance research in the current market. The emphasis on socially responsible investing demands that ESG factors and their influence on BB need to be explored to give a better understanding of the behavioral finance theory. Additionally, the intersection between ESG and BPT, although not directly influential, presents an opportunity for further research. Exploring the combination of ESG, BPT, and behavioral finance can provide valuable insights for future investment perspectives. Both BPT and behavioral finance emphasize the significance of understanding investor behavior from the ESG viewpoint, making it a valuable addition to the knowledge base.

7 | Conclusion and Future Research

This paper addresses three research areas concerning the opinions of individual investors on ESG criteria and how they are taken into investing decisions. Regarding the first study question, we look at how particular Indian investors understand ESG criteria and pinpoint the key factors influencing their impressions. We find that ESG criteria significantly influence investing decisions and that assets with environmental, ethical, and social responsibility appeal to investors.

As the second theme is investigated, it is discovered that cognitive and emotional biases as well as the inclusion of ESG elements in investing decisions correlate. Emotional biases—such as market patterns, past beliefs, loss anxiety, and prior experience—have a greater influence on IDs than logical decision-making, we discover. Whereas HB and the BE have little effect, CB and the EE have a significant influence on investing decision-making.

Lastly, we look at the third research question through the possible obstacles and challenges that might hinder the integration of ESG criteria into IDs as well as the ways that individual investors might properly include ESG criteria into their decision-making process. All things considered, the studies add to the body of already known information on behavioral finance and the function of ESG. For financial advisers and regular investors, it offers insightful analysis of several angles for making more environmentally friendly investment selections.

In future, focus could be placed on conducting studies on a broader scale across many nations in the Asia-Pacific area, with an emphasis on the cultural values of those nations. Additionally, the role that institutional investors and financial intermediaries play in supporting the incorporation of ESG factors into ID-making could be investigated. The influence of ESG integration on business behavior and corporate social responsibility could be explored.

There are some limitations of this study. The sample size for the research is limited to only retail investors in India; this may reduce the generalizability of the findings. Secondly, the research does not take into account the cultural aspects that are part of the integrated framework of ESG considerations and their impact on the decision-making process regarding investments. Finally, no consideration is given to the inherent biases that are introduced when investors are in possession of self-reported information obtained from a variety of stock exchange sources.

References

Adil, M., Y. Singh, and M. S. Ansari. 2021. "How Financial Literacy Moderate the Association Between Behaviour Biases and Investment Decision?" *Asian Journal of Accounting Research* 7, no. 1: 17–30.

Ahmad, M., and S. Z. A. Shah. 2020. "Overconfidence Heuristic-Driven Bias in Investment Decision-Making and Performance: Mediating Effects of Risk Perception and Moderating Effects of Financial Literacy." *Journal of Economic and Administrative Sciences* 38, no. 1: 60–90.

Ahmad, M., Q. Wu, and Y. Abbass. 2022. "Probing the Impact of Recognition-Based Heuristic Biases on Investment Decision-Making and Performance." *Kybernetes* 52: 4229–4256. https://doi.org/10.1108/K-01-2022-0112.

Aigbovo, O., and O. J. Ilaboya. 2019. "Does Behavioral Biases Influences Individual Investment Decisions." *Management Science Review* 10, no. 1: 68–89.

Akhtar, F., and N. Das. 2020. "Investor Personality and Investment Performance: From the Perspective of Psychological Traits." *Qualitative Research in Financial Markets* 12, no. 3: 333–352.

Al-Hiyari, A., A. I. Ismail, M. C. Kolsi, and O. H. Kehinde. 2023. "Environmental, Social and Governance Performance (ESG) and Firm Investment Efficiency in Emerging Markets: The Interaction Effect of Board Cultural Diversity." *Corporate Governance: The International Journal of Business in Society* 23, no. 3: 650–673.

Ali, O., W. Abdelbaki, A. Shrestha, E. Elbasi, M. A. A. Alryalat, and Y. K. Dwivedi. 2023. "A Systematic Literature Review of Artificial Intelligence in the Healthcare Sector: Benefits, Challenges, Methodologies, and Functionalities." *Journal of Innovation & Knowledge* 8, no. 1: 100333.

Alkaraan, F., K. Albitar, K. Hussainey, and V. G. Venkatesh. 2022. "Corporate Transformation Toward Industry 4.0 and Financial Performance: The Influence of Environmental, Social, and Governance (ESG)." *Technological Forecasting and Social Change* 175: 121423.

Alrabadi, D. W. H., S. Y. Al-Abdallah, and N. I. A. Aljarayesh. 2018. "Behavioral Biases and Investment Performance: Does Gender Matter? Evidence From Amman Stock Exchange." *Jordan Journal of Economic Sciences* 5, no. 1: 77–92.

Amos, D., and N. A. Boakye-Agyeman. 2023. "Content Validation of Value-Adding Indicators for Corporate Real Estate Management: Insights From a Developing Country." *Journal of Corporate Real Estate* 25, no. 1: 77–97.

Anagol, S., V. Balasubramaniam, and T. Ramadorai. 2018. "Endowment Effects in the Field: Evidence From India's IPO Lotteries." *Review of Economic Studies* 85, no. 4: 1971–2004.

Anggraini, P. G., and M. Sholihin. 2023. "What Do We Know About Managerial Ability? A Systematic Literature Review." *Management Review Quarterly* 73, no. 1: 1–30.

Antony, A. 2020. "Behavioral Finance and Portfolio Management: Review of Theory and Literature." *Journal of Public Affairs* 20, no. 2: e1996.

Arbuckle, J. L. 2011. *IBM SPSS Amos 20 User's Guide*, 226–229. Amos Development Corporation, SPSS Inc.

Areiqat, A. Y., A. Abu-Rumman, Y. S. Al-Alani, and A. Alhorani. 2019. "Impact of Behavioral Finance on Stock Investment Decisions Applied

Study on a Sample of Investors at Amman Stock Exchange." *Academy of Accounting and Financial Studies Journal* 23, no. 2: 1–17.

Badola, S., A. K. Sahu, and A. Adlakha. 2023. "A Systematic Review on Behavioral Biases Affecting Individual Investment Decisions." *Qualitative Research in Financial Markets* 16: 448–476. https://doi.org/10.1108/QRFM-05-2022-0095.

Bagchi, S., D. Mukherjee, D. Mohanty, and A. Verma. 2022. "Influence of Behavioral Biases While Making Decision on Mutual Fund Investment." *Journal of Information and Optimization Sciences* 43, no. 7: 1733–1747.

Banerjee, A., R. P. Kumar, and R. Mohnot. 2025. "Embedding Behavioral Biases Into Robo-Advisory Platforms-Case of UAE Investors." *Journal of Risk Finance* 26, no. 1: 41–55.

Baratta, A., A. Cimino, F. Longo, V. Solina, and S. Verteramo. 2023. "The Impact of ESG Practices in Industry With a Focus on Carbon Emissions: Insights and Future Perspectives." *Sustainability* 15, no. 8: 6685.

Barauskaite, G., and D. Streimikiene. 2021. "Corporate Social Responsibility and Financial Performance of Companies: The Puzzle of Concepts, Definitions and Assessment Methods." *Corporate Social Responsibility and Environmental Management* 28, no. 1: 278–287.

Barber, B. M., and T. Odean. 2001. "The Internet and the Investor." *Journal of Economic Perspectives* 15, no. 1: 41–54.

Benuzzi, M., K. Klaser, and K. Bax. 2024. "Which ESG+ F Dimension Matters Most to Retail Investors? An Experimental Study on Financial Decisions and Future Generations." *Journal of Behavioral and Experimental Finance* 41: 100882.

Bhatia, A., A. Chandani, R. Divekar, M. Mehta, and N. Vijay. 2021. "Digital Innovation in Wealth Management Landscape: The Moderating Role of Robo Advisors in Behavioural Biases and Investment Decision-Making." *International Journal of Innovation Science* 14, no. 3/4: 693–712.

Bhimavarapu, V. M., S. Rastogi, and R. Abraham. 2022. "The Influence of Transparency and Disclosure on the Valuation of Banks in India: The Moderating Effect of Environmental, Social, and Governance Variables, Shareholder Activism, and Market Power." *Journal of Risk and Financial Management* 15, no. 12: 612.

Biais, B., and M. Weber. 2009. "Hindsight Bias, Risk Perception, and Investment Performance." *Management Science* 55, no. 6: 1018–1029.

Bihari, A., M. Dash, S. K. Kar, K. Muduli, A. Kumar, and S. Luthra. 2022. "Exploring Behavioural Bias Affecting Investment Decision-Making: A Network Cluster Based Conceptual Analysis for Future Research." *International Journal of Industrial Engineering and Operations Management* 4, no. 1/2: 19–43.

Bikhchandani, S., D. Hirshleifer, and I. Welch. 1992. "A Theory of Fads, Fashion, Custom, and Cultural Change as Informational Cascades." *Journal of Political Economy* 100, no. 5: 992–1026.

Blank, H., S. Nestler, G. von Collani, and V. Fischer. 2008. "How Many Hindsight Biases Are There?" *Cognition* 106, no. 3: 1408–1440.

Boto-García, D., and J. F. Baños-Pino. 2022. "Social Influence and Bandwagon Effects in Tourism Travel." *Annals of Tourism Research* 93: 103366.

Caceres, A. P. D. L. V. 2024. "Drivers of Value Creation and the Effect of ESG Risk Rating on Investor Perceptions Through Financial Metrics." *Sustainability* 16, no. 13: 5347. https://doi.org/10.3390/su16135347.

Chang, C. J., and Y. Luo. 2021. "Data Visualization and Cognitive Biases in Audits." *Managerial Auditing Journal* 36, no. 1: 1–16.

Chatterjee, S., R. Chaudhuri, S. Gupta, U. Sivarajah, and S. Bag. 2023. "Assessing the Impact of Big Data Analytics on Decision-Making Processes, Forecasting, and Performance of a Firm." *Technological Forecasting and Social Change* 196: 122824.

Chen, G., B. Wei, and L. Dai. 2022. "Can ESG-Responsible Investing Attract Sovereign Wealth Funds' Investments? Evidence From Chinese Listed Firms." *Frontiers in Environmental Science* 10: 807.

Chin, W. W., J. B. Thatcher, and R. T. Wright. 2012. "Assessing Common Method Bias: Problems With the ULMC Technique." *MIS Quarterly* 36, no. 3: 1003–1019.

Cho, E., J. Kim-Vick, and U. J. Yu. 2022. "Unveiling Motivation for Luxury Fashion Purchase Among Gen Z Consumers: Need for Uniqueness Versus Bandwagon Effect." *International Journal of Fashion Design, Technology and Education* 15, no. 1: 24–34.

Choudhary, S., M. Yadav, and A. P. Srivastava. 2024. "Cognitive Biases Among Millennial Indian Investors: Do Personality and Demographic Factors Matter?" *FIIB Business Review* 13, no. 1: 106–117.

Clist, P., B. D'Exelle, and A. Verschoor. 2021. "An Endowment Effect for Risk Levels: Evidence From a Ugandan Lab." *Journal of Economic Behavior & Organization* 182: 297–310.

Costa, D. F., F. D. M. Carvalho, and B. C. D. M. Moreira. 2019. "Behavioral Economics and Behavioral Finance: A Bibliometric Analysis of the Scientific Fields." *Journal of Economic Surveys* 33, no. 1: 3–24.

Costa, D. F., F. de Melo Carvalho, B. C. Moreira, and J. W. do Prado. 2017. "Bibliometric Analysis on the Association Between Behavioral Finance and Decision Making With Cognitive Biases Such as Overconfidence, Anchoring Effect and Confirmation Bias." *Scientometrics* 111, no. 3: 1775–1799.

Cronbach, L. J., and P. E. Meehl. 1955. "Construct Validity in Psychological Tests." *Psychological Bulletin* 52, no. 4: 281–302.

Dadhich, M., and K. K. Hiran. 2022. "Empirical Investigation of Extended TOE Model on Corporate Environment Sustainability and Dimensions of Operating Performance of SMEs: A High Order PLS-ANN Approach." *Journal of Cleaner Production* 363: 132309.

Dash, G., and J. Paul. 2021. "CB-SEM vs PLS-SEM Methods for Research in Social Sciences and Technology Forecasting." *Technological Forecasting and Social Change* 173: 121092. https://doi.org/10.1016/j.techfore.2021.121092.

Dawson, N. V., H. R. Arkes, C. Siciliano, R. Blinkhorn, M. Lakshmanan, and M. Petrelli. 1988. "Hindsight Bias: An Impediment to Accurate Probability Estimation in Clinicopathologic Conferences." *Medical Decision Making* 8, no. 4: 259–264.

Deng, B. 2024. "Examining the Influence of ESG Reporting on Investment Strategies: The Crucial Role of Accounting Information." *Environment, Social and Governance* 1, no. 1: 44–51.

Deng, Z., and M. Lindeboom. 2022. "A Bit of Salt, a Trace of Life: Gender Norms and the Impact of a Salt Iodization Program on Human Capital Formation of School Aged Children." *Journal of Health Economics* 83: 102614.

Dmuchowski, P., W. Dmuchowski, A. H. Baczewska-Dąbrowska, and B. Gworek. 2023. "Environmental, Social, and Governance (ESG) Model; Impacts and Sustainable Investment–Global Trends and Poland's Perspective." *Journal of Environmental Management* 329: 117023.

Dommer, S. L., and V. Swaminathan. 2013. "Explaining the Endowment Effect Through Ownership: The Role of Identity, Gender, and Self-Threat." *Journal of Consumer Research* 39, no. 5: 1034–1050.

Eberhard, K. 2023. "The Effects of Visualization on Judgment and Decision-Making: A Systematic Literature Review." *Management Review Quarterly* 73, no. 1: 167–214.

Elston, D. M. 2020. "Confirmation Bias in Medical Decision-Making." *Journal of the American Academy of Dermatology* 82, no. 3: 572.

Eurosif. 2016. "European SRI Study." http://www.eurosif.org/wp-content/uploads/2016/11/SRI-study-2016-HR.pdf.

Fischhoff, B. 1975. "Hindsight Is Not Equal to Foresight: The Effect of Outcome Knowledge on Judgment Under Uncertainty." *Journal of Experimental Psychology: Human Perception and Performance* 1, no. 3: 288–299.

Fornell, C., and D. F. Larcker. 1981. "Structural Equation Models With Unobservable Variables and Measurement Error: Algebra and Statistics." *Journal of Marketing Research* 18, no. 3: 382–388.

Furche, A., and D. Johnstone. 2006. "Evidence of the Endowment Effect in Stock Market Order Placement." *Journal of Behavioral Finance* 7, no. 3: 145–154.

Gal, D. 2021. "Why the Sun Will Not Set on the Endowment Effect: The Endowment Effect After Loss Aversion." *Current Opinion in Psychology* 39: 12–15.

Giroux, M. E., P. I. Coburn, E. M. Harley, D. A. Connolly, and D. M. Bernstein. 2016. "Hindsight Bias and Law." *Zeitschrift für Psychologie* 224, no. 3: 2190–8370.

Groß, J., and U. J. Bayen. 2022. "Older and Younger Adults' Hindsight Bias After Positive and Negative Outcomes." *Memory & Cognition* 50, no. 1: 16–28.

Gupta, S., N. Walia, S. Singh, and S. Gupta. 2023. "A Systematic Literature Review and Bibliometric Analysis of Noise Trading." *Qualitative Research in Financial Markets* 15, no. 1: 190–215.

Hair, J. F., C. M. Ringle, and M. Sarstedt. 2011. "PLS-SEM: Indeed a Silver Bullet." *Journal of Marketing Theory and Practice* 19, no. 2: 139–152.

Hair, J. F., Jr., M. Sarstedt, L. M. Matthews, and C. M. Ringle. 2016. "Identifying and Treating Unobserved Heterogeneity With FIMIX-PLS: Part I–Method." *European Business Review* 28, no. 1: 63–76.

Harley, E. M. 2007. "Hindsight Bias in Legal Decision Making." *Social Cognition* 25, no. 1: 48–63.

Henseler, J., C. M. Ringle, and M. Sarstedt. 2015. "A New Criterion for Assessing Discriminant Validity in Variance-Based Structural Equation Modeling." *Journal of the Academy of Marketing Science* 43: 115–135.

Hew, T. S., L. Y. Leong, K. B. Ooi, and A. Y. L. Chong. 2016. "Predicting Drivers of Mobile Entertainment Adoption: A Two-Stage SEM-Artificial-Neural-Network Analysis." *Journal of Computer Information Systems* 56, no. 4: 352–370.

Holden, S. T., and M. Tilahun. 2020. *Endowment Effects and Loss Aversion in the Risky Investment Game (No. 01/20)*. Centre for Land Tenure Studies Working Paper.

Holden, S. T., and M. Tilahun. 2022. "Endowment Effects in the Risky Investment Game?" *Theory and Decision* 92, no. 1: 259–274.

Hossain, T., and P. Siddiqua. 2022. "Exploring the Influence of Behavioral Aspects on Stock Investment Decision-Making: A Study on Bangladeshi Individual Investors." *PSU Research Review* 8, no. 2: 467–483. https://doi.org/10.1108/PRR-10-2021-0054.

Hsu, Y. L. 2022. "Financial Advice Seeking and Behavioural Bias." *Finance Research Letters* 46: 102505.

Hsu, Y. L., H. L. Chen, P. K. Huang, and W. Y. Lin. 2021. "Does Financial Literacy Mitigate Gender Differences in Investment Behavioral Bias?" *Finance Research Letters* 41: 101789.

Hsuan, L., and H. W. Rhay. 2012. "Bandwagon and New Technology Adoption in Hospital Industry: The Moderating Roles of Positive Performance Experience and Technology Investment Similarity." *African Journal of Business Management* 6, no. 27: 7987–7994.

Hussain, M., S. Z. A. Shah, K. Latif, U. Bashir, and M. Yasir. 2013. "Hindsight Bias and Investment Decisions Making Empirical Evidence Form an Emerging Financial Market." *International Journal of Research Studies in Management* 2, no. 2: 77–88.

Iguacel, I., I. Antón, F. Urcola, M. Ariño, and B. Martínez-Jarreta. 2024. "Assessing Patient Satisfaction With Telephone-Based Consultations Before, During and After the COVID-19 Pandemic in Spain." *Atencion Primaria* 56, no. 2: 102792.

Ivanisevic, H. A. 2019. "Exploring the Strategic Variety of Socially Responsible Investment: Financial Performance Insights About SRI Strategy Portfolios." *Sustainability Accounting, Management & Policy Journal* 10, no. 3: 545–569.

Jain, J., N. Walia, and S. Gupta. 2020. "Evaluation of Behavioural Biases Affecting the Investment Decision-Making of Individual Equity Investors by Fuzzy Analytic Hierarchy Process." *Review of Behavioral Finance* 12, no. 3: 297–314.

Jain, J., N. Walia, M. Kaur, and S. Singh. 2022. "Behavioural Biases Affecting Investors' Decision-Making Process: A Scale Development Approach." *Management Research Review* 45, no. 8: 1079–1098.

Jain, R., D. Sharma, A. Behl, and A. K. Tiwari. 2023. "Investor Personality as a Predictor of Investment Intention–Mediating Role of Overconfidence Bias and Financial Literacy." *International Journal of Emerging Markets* 18, no. 12: 5680–5706.

Jonwall, R., S. Gupta, and S. Pahuja. 2022. "Socially Responsible Investment Behavior: A Study of Individual Investors From India." *Review of Behavioral Finance* 15, no. 6: 865–888.

Kahneman, D., and A. Tversky. 1979. "Prospect Theory: An Analysis of Decisions Under Risk." *Econometrica* 47, no. 2: 263–291.

Kahneman, D., J. L. Knetsch, and R. H. Thaler. 1990. "Experimental Tests of the Endowment Effect and the Coase Theorem." *Journal of Political Economy* 98, no. 6: 1325–1348.

Kanoujiya, J., K. Singh, and S. Rastogi. 2023. "Impact of Environmental, Social and Governance Engagements on Financial Distress Under Competition: Evidence From Non-Financial Firms Listed in India." *International Journal of Corporate Governance* 13, no. 3: 277–296.

Kartini, K., and K. Nahda. 2021. "Behavioral Biases on Investment Decision: A Case Study in Indonesia." *Journal of Asian Finance, Economics and Business* 8, no. 3: 1231–1240.

Kelman, M., D. Fallas, and H. Folger. 1998. "Decomposing Hindsight Bias." *Journal of Risk and Uncertainty* 16, no. 3: 251–269.

Khatti, J., K. S. Grover, H. J. Kim, K. B. A. Mawuntu, and T. W. Park. 2024. "Prediction of Ultimate Bearing Capacity of Shallow Foundations on Cohesionless Soil Using Hybrid Lstm and Rvm Approaches: An Extended Investigation of Multicollinearity." *Computers and Geotechnics* 165: 105912.

Kim, K., and A. Deshmukh. 2021. "Bandwagon Investment Equilibrium of Investment Timing Games." *Engineering Economist* 66, no. 4: 265–278.

Kock, F., A. Berbekova, and A. G. Assaf. 2021. "Understanding and Managing the Threat of Common Method Bias: Detection, Prevention and Control." *Tourism Management* 86: 104330.

Kumar, J., and N. Prince. 2023. "Overconfidence Bias in Investment Decisions: A Systematic Mapping of Literature and Future Research Topics." *FIIB Business Review*: 23197145231174344.

Kumar, V., R. Dudani, and K. Latha. 2023. "The Big Five Personality Traits and Psychological Biases: An Exploratory Study." *Current Psychology* 42, no. 8: 6587–6597.

Lee, M. T., and I. Suh. 2022. "Understanding the Effects of Environment, Social, and Governance Conduct on Financial Performance: Arguments for a Process and Integrated Modelling Approach." *Sustainable Technology and Entrepreneurship* 1, no. 1: 100004.

Leong, L. Y., T. S. Hew, K. B. Ooi, and J. Wei. 2020. "Predicting Mobile Wallet Resistance: A Two-Staged Structural Equation Modeling-Artificial Neural Network Approach." *International Journal of Information Management* 51: 102047.

Li, J., Y. Chen, J. Jiao, et al. 2024. "Gully Erosion Susceptibility Maps and Influence Factor Analysis in the Lhasa River Basin on the Tibetan Plateau, Based on Machine Learning Algorithms." *Catena* 235: 107695.

Liébana-Cabanillas, F., V. Marinković, and Z. Kalinić. 2017. "A SEM-Neural Network Approach for Predicting Antecedents of m-Commerce

Acceptance." *International Journal of Information Management* 37, no. 2: 14–24.

Longerstaey, O., H. Godwin, R. Mussa, et al. 2023. "Content Validation of Needs Assessment Survey for Remote Education Initiative in Tanzania." *African Journal of Emergency Medicine* 13, no. 4: 328–330.

Macedo, J. S., R. Marcon, E. A. Menezes, and P. Nunes. 2007. "Prospect Theory: A Study of the Endowment Effect." *Revista Contemporânea De Contabilidade* 4, no. 8: 11–28.

Madaan, G., and S. Singh. 2019. "An Analysis of Behavioral Biases in Investment Decision-Making." *International Journal of Financial Research* 10, no. 4: 55–67.

Martínez-López, F. J., J. C. Gázquez-Abad, and C. M. Sousa. 2013. "Structural Equation Modelling in Marketing and Business Research: Critical Issues and Practical Recommendations." *European Journal of Marketing* 47, no. 1/2: 115–152.

Misra, R., J. M. Prosad, S. Ashok, and P. Goel. 2022. "A Qualitative Examination of Changing Investment Preferences, Sentiments and Behavioural Tendencies in COVID-19: A Special Case of Indian Individual Investors." *Qualitative Research in Financial Markets* 14, no. 4: 602–620.

Mittal, S. K. 2022. "Behavior Biases and Investment Decision: Theoretical and Research Framework." *Qualitative Research in Financial Markets* 14, no. 2: 213–228.

Mittal, S., S. Bhattacharya, and S. Mandal. 2022. "Characteristics Analysis of Behavioural Portfolio Theory in the Markowitz Portfolio Theory Framework." *Managerial Finance* 48, no. 2: 277–288.

Nguyen, M. T., Q. H. Vu, V. H. Truong, and H. H. Nguyen. 2023. "A Comprehensive Evaluation of Private Sector Investment Decisions for Sustainable Water Supply Systems Using a Fuzzy-Analytic Hierarchy Process: A Case Study of Ha Nam Province in Vietnam." *Heliyon* 9, no. 9: e19727.

Nie, N. H., D. H. Bent, and C. H. Hull. 1975. *SPSS: Statistical Package for the Social Sciences*. Vol. 227. McGraw-Hill.

Nobre, F. C., M. J. D. C. Machado, and L. H. N. Nobre. 2022. "Behavioral Biases and the Decision-Making in Entrepreneurs and Managers." *Revista de Administração Contemporânea* 26, no. 1: e200369. https://doi.org/10.1590/1982-7849rac2022200369.en.

Novianggie, V., and N. Asandimitra. 2019. "The Influence of Behavioral Bias, Cognitive Bias, and Emotional Bias on Investment Decision for College Students With Financial Literacy as the Moderating Variable." *International Journal of Academic Research in Accounting, Finance and Management Sciences* 9, no. 2: 92–107.

O'Leary-Kelly, S. W., and R. J. Vokurka. 1998. "The Empirical Assessment of Construct Validity." *Journal of Operations Management* 16, no. 4: 387–405.

Onsomu, Z. N. 2014. "The Impact of Behavioural Biases on Investor Decisions in Kenya: Male vs Female." *International Journal of Research in Humanities, Arts and Literature* 2, no. 6: 87–92.

Paetzold, F., T. Busch, S. Utz, and A. Kellers. 2022. "Between Impact and Returns: Private Investors and the Sustainable Development Goals." *Business Strategy and the Environment* 31, no. 7: 3182–3197.

Page, M. J., J. E. McKenzie, P. M. Bossuyt, et al. 2021. "The PRISMA 2020 Statement: An Updated Guideline for Reporting Systematic Reviews." *PLoS Medicine* 18, no. 3: e1003583. https://doi.org/10.1371/journal.pmed.1003583.

Pandey, R., and V. M. Jessica. 2018. "Measuring Behavioural Biases Affecting Real Estate Investment Decisions in India: Using IRT." *International Journal of Housing Markets and Analysis* 11, no. 4: 648–668.

Park, S. R., and K. S. Oh. 2022. "Integration of ESG Information Into Individual Investors' Corporate Investment Decisions: Utilizing the UTAUT Framework." *Frontiers in Psychology* 13: 899480.

Parveen, S., Z. W. Satti, Q. A. Subhan, and S. Jamil. 2020. "Exploring Market Overreaction, Investors' Sentiments and Investment Decisions in an Emerging Stock Market." *Borsa Istanbul Review* 20, no. 3: 224–235.

Parveen, S., Z. W. Satti, Q. A. Subhan, N. Riaz, S. F. Baber, and T. Bashir. 2023. "Examining Investors' Sentiments, Behavioral Biases and Investment Decisions During COVID-19 in the Emerging Stock Market: A Case of Pakistan Stock Market." *Journal of Economic and Administrative Sciences* 39, no. 3: 549–570.

Pérez, D., R. Acosta Vega, S. Salazar-Galán, J. Á. Aranda, and F. Sabater. 2024. "Toward Systematic Literature Reviews in Hydrological Sciences." *Water (Basel)* 16, no. 3: 436.

Peters, U. 2022. "What Is the Function of Confirmation Bias?" *Erkenntnis* 87, no. 3: 1351–1376.

Podsakoff, P. M., S. B. MacKenzie, J. Y. Lee, and N. P. Podsakoff. 2003. "Common Method Biases in Behavioral Research: A Critical Review of the Literature and Recommended Remedies." *Journal of Applied Psychology* 88, no. 5: 879–903.

Pompian, M. M. 2011. *Behavioral Finance and Wealth Management: How to Build Investment Strategies That Account for Investor Biases*. Vol. 667. John Wiley & Sons.

Prasetyo, A. A., and R. A. Rahadi. 2022. "A Conceptual Study on the Influence of Financial Literacy and Behavioral Biases on Generation Z Investment Decision Making in the Stock Market." *Himalayan Journal of Economics and Business Management* 3, no. 2: 2709–3549.

Quaicoe, A., and P. Q. Eleke-Aboagye. 2021. "Behavioral Factors Affecting Investment Decision-Making in Bank Stocks on the Ghana Stock Exchange." *Qualitative Research in Financial Markets* 13, no. 4: 425–439.

Raheja, S., and B. Dhiman. 2020. "How Do Emotional Intelligence and Behavioral Biases of Investors Determine Their Investment Decisions?" *Rajagiri Management Journal* 14, no. 1: 35–47.

Rahman, M., and S. S. Gan. 2020. "Generation Y Investment Decision: An Analysis Using Behavioural Factors." *Managerial Finance* 46, no. 8: 1023–1041.

Raj, G. 2025. "Biases and Investment Decision: An Analysis of Demographics Using PLS-MGA." *International Journal of Accounting and Information Management*. https://doi.org/10.1108/IJAIM-08-2024-0282.

Rashid, K., Y. B. Tariq, and M. U. Rehman. 2021. "Behavioural Errors and Stock Market Investment Decisions: Recent Evidence From Pakistan." *Asian Journal of Accounting Research* 7, no. 2: 129–145.

Raut, R. K. 2020. "Past Behaviour, Financial Literacy and Investment Decision-Making Process of Individual Investors." *International Journal of Emerging Markets* 15, no. 6: 1243–1263.

Raut, R. K., N. Shastri, A. K. Mishra, and A. K. Tiwari. 2023. "Investor's Values and Investment Decision Towards ESG Stocks." *Review of Accounting and Finance* 22, no. 4: 449–465.

Ritika and Kishor, N. 2022. "Development and Validation of Behavioral Biases Scale: A SEM Approach." *Review of Behavioral Finance* 14, no. 2: 237–259.

Rounok, N., A. Qian, and M. A. Alam. 2023. "The Effects of ESG Issues on Investment Decision Through Corporate Reputation: Individual Investors' Perspective." *International Journal of Research in Business and Social Science (2147-4478)* 12, no. 2: 73–88.

Sachdeva, M., R. Lehal, S. Gupta, and S. Gupta. 2022. "Influence of Contextual Factors on Investment Decision-Making: A Fuzzy-AHP Approach." *Journal of Asia Business Studies* 17, no. 1: 108–128 1558–7894.

Sahi, S. K., and A. P. Arora. 2012. "Individual Investor Biases: A Segmentation Analysis." *Qualitative Research in Financial Markets* 4, no. 1: 6–25.

Saivasan, R., and M. Lokhande. 2022. "Influence of Risk Propensity, Behavioural Biases and Demographic Factors on Equity Investors' Risk Perception." *Asian Journal of Economics and Banking* 6, no. 3: 373–403.

Salvi, A., N. Nirino, E. Battisti, and I. Gianfrancesco. 2024. "Payout Policy and ESG: A European Investigation." *Research in International Business and Finance* 68: 102189.

Saunders, M., P. Lewis, and A. Thornhill. 2015. *Research Methods for Business Students*. 7th ed. Pearson education.

Schmitt-Beck, R. 2015. "Bandwagon Effect." In *The International Encyclopedia of Political Communication*, 1–5. Wiley. https://doi.org/10.1002/9781118541555.wbiepc015.

Shah, R., and S. M. Goldstein. 2006. "Use of Structural Equation Modeling in Operations Management Research: Looking Back and Forward." *Journal of Operations Management* 24, no. 2: 148–169.

Shaikh, S., A. Malik, M. S. Akram, and R. Chakrabarti. 2017. "Do Luxury Brands Successfully Entice Consumers? The Role of Bandwagon Effect." *International Marketing Review* 34, no. 4: 498–513.

Sharma, A., and A. Kumar. 2020. "A Review Paper on Behavioral Finance: Study of Emerging Trends." *Qualitative Research in Financial Markets* 12, no. 2: 137–157.

Sharma, U., A. Gupta, and S. K. Gupta. 2024. "The Pertinence of Incorporating ESG Ratings to Make Investment Decisions: A Quantitative Analysis Using Machine Learning." *Journal of Sustainable Finance & Investment* 14, no. 1: 184–198.

Shook, C. L., R. L. Priem, and J. E. McGee. 2003. "Venture Creation and the Enterprising Individual: A Review and Synthesis." *Journal of Management* 29, no. 3: 379–399.

Singh, A. K., and M. Kumar. 2022. "Analyzing the Relationship Between Psychological Biases and Initial Public Offerings Investment Decision-Making in India." *Management and Labour Studies* 47, no. 4: 407–430.

Singh, Y., M. Adil, and S. I. Haque. 2023. "Personality Traits and Behaviour Biases: The Moderating Role of Risk-Tolerance." *Quality and Quantity* 57, no. 4: 3549–3573.

Sood, K., P. Pathak, J. Jain, and S. Gupta. 2023. "How Does an Investor Prioritize ESG Factors in India? An Assessment Based on Fuzzy AHP." *Managerial Finance* 49, no. 1: 66–87.

Steininger, D. M., M. Lorch, and D. J. Veit. 2014. "The Bandwagon Effect in Digital Environments: An Experimental Study on Kickstarter.com." *Multikonferenz Birtschaftsinformatik* 2014: 546–556.

Şti r, M., and A. Zaiţ. 2024. "Impact of Direct Interaction With Virtual Objects Through Touchscreens on Enhancing Psychological Ownership and Endowment Effect." *International Journal of Human-Computer Interaction* 40, no. 5: 1049–1070.

Sudhir, C., S. D. Kalpande, and R. C. Gupta. 2023. "Development and Validation of TPM Implementation Practices in Industries: Investigation From Indian SMEs." *Operations Management Research* 16, no. 4: 1814–1829.

Sultana, S., N. Zulkifli, and D. Zainal. 2018. "Environmental, Social and Governance (ESG) and Investment Decision in Bangladesh." *Sustainability* 10, no. 6: 1831.

Suresh, G. 2024. "Impact of Financial Literacy and Behavioural Biases on Investment Decision-Making." *FIIB Business Review* 13, no. 1: 72–86.

Talwar, S., M. Talwar, V. Tarjanne, and A. Dhir. 2021. "Why Retail Investors Traded Equity During the Pandemic? An Application of Artificial Neural Networks to Examine Behavioral Biases." *Psychology & Marketing* 38, no. 11: 2142–2163.

Tan, G. W. H., K. B. Ooi, L. Y. Leong, and B. Lin. 2014. "Predicting the Drivers of Behavioral Intention to Use Mobile Learning: A Hybrid SEM-Neural Networks Approach." *Computers in Human Behavior* 36: 198–213.

Tiwari, A. K., E. J. A. Abakah, X. Shao, T. L. Le, and M. N. Gyamfi. 2023. "Financial Technology Stocks, Green Financial Assets, and Energy Markets: A Quantile Causality and Dependence Analysis." *Energy Economics* 118: 106498.

Trichilli, Y., S. Gaadane, M. Boujelbène Abbes, and A. Masmoudi. 2022. "Impact of the Confirmation Bias on Returns, Expectations and Hedging of Optimistic and Pessimistic Traders Before and During COVID-19 Pandemic." *EuroMed Journal of Business* 19: 338–365. https://doi.org/10.1108/EMJB-03-2022-0046.

Umar, Z., D. Kenourgios, and S. Papathanasiou. 2020. "The Static and Dynamic Connectedness of Environmental, Social, and Governance Investments: International Evidence." *Economic Modelling* 93: 112–124.

Vaithilingam, S., C. S. Ong, O. I. Moisescu, and M. S. Nair. 2024. "Robustness Checks in PLS-SEM: A Review of Recent Practices and Recommendations for Future Applications in Business Research." *Journal of Business Research* 173: 114465.

Vorobyova, K., T. M. Alkadash, and C. Nadam. 2022. "Investigating Beliefs, Attitudes, and Intentions Regarding Strategic Decision-Making Process: An Application of Theory Planned Behavior With Moderating Effects of Overconfidence and Confirmation Biases." *Specialusis Ugdymas* 1, no. 43: 367–381.

Wang, L., X. Li, H. Zhu, and Y. Zhao. 2023. "Influencing Factors of Livestream Selling of Fresh Food Based on a Push-Pull Model: A Two-Stage Approach Combining Structural Equation Modeling (SEM) and Artificial Neural Network (ANN)." *Expert Systems With Applications* 212: 118799.

Wang, Z. L., F. Tao, H. J. Leng, Y. H. Wang, and T. Zhou. 2024. "Multi-Scale Analysis on Sustainability and Driving Factors Based on Three-Dimensional Ecological Footprint: A Case Study of the Yangtze River Delta Urban Agglomeration, China." *Journal of Cleaner Production* 436, no. 10: 140596.

Wu, T. Y., and C. A. Lin. 2017. "Predicting the Effects of eWOM and Online Brand Messaging: Source Trust, Bandwagon Effect and Innovation Adoption Factors." *Telematics and Informatics* 34, no. 2: 470–480.

Xiaoli, G., M. Xiaoyang, and F. Khalid. 2023. "Impact of Financial Environment on Household Risk Financial Asset Selection: A Micro Perspective." *International Review of Economics and Finance* 85: 137–145.

Yadav, N., and K. Mangla. 2024. "Exploring Sustainable Investment Frontiers: A Bibliometric Analysis on Current Trends and Hurdles in Incorporating ESG Into Investment Decision-Making." *Journal of Informatics Education and Research* 4, no. 3: 2836–2844.

Yılmaz, H., H. D. Özyakar, and M. M. Dağ. 2024. "Exploratory Factor Analysis of Manure Utilization for Sustainable Dairy Farming: Evidence From Crop-Dairy Farming Systems in Turkey." *Waste Management Bulletin* 1, no. 4: 164–171.

Zahera, S. A., and R. Bansal. 2018. "Do Investors Exhibit Behavioral Biases in Investment Decision Making? A Systematic Review." *Qualitative Research in Financial Markets* 10, no. 2: 210–251.

Zaleskiewicz, T., and A. Gasiorowska. 2021. "Evaluating Experts May Serve Psychological Needs: Self-Esteem, Bias Blind Spot, and Processing Fluency Explain Confirmation Effect in Assessing Financial Advisors' Authority." *Journal of Experimental Psychology: Applied* 27, no. 1: 27–45.