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When Sustainability Meets Speculation: A Critical Review of Investor Overconfidence in ESG Stocks and the Market Outcomes

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ABSTRACT

The review paper attempts to compile, analyse, evaluate, and critique research papers from different geographies, including Italy and India. The paper explores and interprets five research papers, all of which focus on overconfidence, among other behavioural biases and their impacts on ESG decision-making. All the research papers are published after 2015, after the Paris Climate Agreement, which was an important marker for increased efforts from companies to improve their products and fit them to the highest standards of environmental, social, and governance aspects. The review paper explores their methodology, including its strengths and weaknesses; results, including the statistics and their implications; and limitations, those recognised by the authors and those that can be inferred. Finally, the review paper concludes the results and talks about the solutions that were provided by the five studies to try to mitigate the effects of overconfidence and other behavioural biases in ESG decision-making. All the papers have similar results: all five studies highlight the role played by cognitive biases, especially overconfidence bias, in poor decision-making in ESG investments. The studies have also found that the investors' values play a huge role in decision-making. Finally, the studies are suggesting many solutions, such as transparency by providing non-financial information, third-party certification of rating agencies and investor education about the basic pillars of ESG to mitigate the impacts of cognitive biases on decision-making.

Keywords: ESG, overconfidence bias, investors, decision-making, socially responsible investing, investor psychology, greenwashing, cognitive biases

Introduction

Overconfidence is investors' overestimation of skills and beliefs, leading to a poor risk assessment and suboptimal decision-making. This has played a significant role in investment

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decisions in stock markets globally. It has impacted stock market bubbles, which are events that take place in the market due to the proliferation of market value, which is closely followed by a fall in the value, causing a “bubble burst”, more commonly known as a “market crash” (Hayes et al., 2025).

Over the past decade, environmental concerns have taken precedence in global discussions, leading to many treaties and agreements, such as the Paris Climate Agreement signed in 2016.

Climate change has become a raging discussion in global diplomacy, and it has seeped into various industries globally. For instance, car manufacturers have switched to electric vehicles, while companies are racing to find renewable and sustainable energy sources. This has led to various commitments made by companies, with many setting targets to achieve carbon neutrality by 2030. Social changes are also being implemented rapidly as employee welfare and company culture gain increasing importance. Finally, there are changes in the governance structures too, with more stringent anti-corruption laws, increased surveillance of employee activity, and regulations of the laws of companies. These promises, however, have led to a huge issue in the stock market: overconfidence in Environmental, Social, and Governance (ESG) stocks. ESG criteria are a “set of standards for a company's behaviour used by socially conscious investors to screen potential investments” (Investopedia et al., 2024). ESG refers to environmental, which is the measure of how a company protects the environment; social, a company's relations with employees, customers, distributors, etc; and governance, the level of leadership, shareholder rights, internal control, etc. These sets of standards aid in making companies' behaviour more responsible. ESG investing is also known as impact investing or socially responsible investing (SRI). It is primarily practised to reduce the number of risky and unethical companies included in one's portfolio. However, many firms today don’t truly give attention to ESG reports and rather just try to check boxes. According to research from Market Screener into ESG reporting in workplaces, 50% of respondents consider ESG reporting to be a box-ticking exercise (Publicnow, 2022). Multinational corporations constantly greenwash investors into believing their environmental commitments, causing them to be overconfident about those companies’ stocks (United Nations, n.d.). Furthermore, others’ success and past accolades add to the investor's vulnerability and overconfidence.

This paper attempts to study the extent to which overconfidence has impacted ESG stocks and the consequences faced by investors due to it. It analyses and compares different studies with varying scopes, geographies, and timelines to focus on analysing how global events concerning climate change have furthered this overconfidence amongst investors. Furthermore, it explores the effects of certain bubbles, such as the 2021 ESG bubble in the United States of America. It is getting increasingly important to study this area of inquiry primarily due to its growing importance in investment decisions in recent years. Overconfidence bias, paired with other

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cognitive biases, falsifies investor judgments and leads to misguided investments. Being aware of this bias allows for rational decision-making and informed investments. The studies chosen for this paper were all published post-2016, which is when the Paris Climate Agreement was signed, and currently, there are 195 signatories. This shows the increasing importance of the environment and how it permeates various other disciplines, especially investing. This allows one to understand the impact of ESG and how deeply institutionalised it is in recent investment decisions. These studies are from various geographies: India, the USA, and Italy. This can help prove whether this is a universal problem or specific to a region/country.

Analysis and Interpretation

ESG Investing and Behavioural Pitfalls

As behavioural biases become more prevalent in the investment world, a growing body of literature explores this multifaceted concern, specifically that of Environmental, Social, and Governance (ESG) investing. The twofold objective of making a financial return and, at the same time, being committed to socially responsible investment injects an element of complexity that can perplex retail and institutional investors equally. This subtle interplay regularly leads to irrational decision-making and inefficient investment decisions, demonstrating the need for a better understanding of the cognitive elements in play.

In this regard, some research has emerged to examine the complexity of how cognitive biases drive ESG investment choices. The study by Cruciani et al., 2024 investigates individual investors' preferences and behaviours, spotlighting the impact of behavioural biases that have influenced investment decisions in recent years. According to the study, investment strategies today focus greatly on social and environmental factors with a common goal of sustainability and financial stability, shifting the focus solely from financial returns. This makes decision-making complicated since investors must have a good knowledge of both aspects, which is an unlikely circumstance. The empirical findings of the study suggest that greater overconfidence amongst investors leads to an enhanced perception of one's financial acumen. Furthermore, warping one's judgment of his/her financial knowledge leads to suboptimal decision-making. The paper focuses on extending these trends to their Italian scope, providing details on the impact of overconfidence bias on investment decision-making in a specific cultural and geographical context.

Similarly, the study by Imade & Agbashe, 2024 demonstrates a comparable theme of the integration of sustainability and ESG factors in investment decisions, marking transformations in decision-making. The paper regards cognitive biases, such as overconfidence bias, as systematic errors which hinder investor judgments, coining it as "fraught with complexities." In addition to

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offering practical tactics and interventions to lessen these cognitive biases on human behaviour and decision-making, the study attempts to fully assess the impacts of these biases.

Complementing this debate, the study by Raut & Kumar, 2018 aims to highlight differences in perception for seven prominent behavioural biases, including overconfidence bias. This is done by focusing on "active individual stock market participants" from four Indian states: Jharkhand, Bihar, Odisha, and West Bengal. The study finds the behavioural biases that show "significant discrimination in investment decision-making between the two investor groups." The two investor groups are (a) experienced and (b) new to the market investors in investment decision-making.

The study by Deka et al., 2023 furthers this dialogue by focusing on ESG investments, which stem from global concerns of climate change and environmental conservation efforts. It aims to develop and validate a scale for calibrating and measuring the relationship between cognitive biases and risk perceptions with a focus on 438 samples from Indian retail investors. Through developing the scale, the study can foreground the impact of geographical context on behavioural biases. Finally, the paper aims to fill the gap caused by behavioural biases in ESG investing.

Lastly, the study by Upadhyaya & Sandanshive, 2023 aims to explore how behavioural factors affect ESG investments in India. The study's alternative hypothesis is that behavioural aspects are dependent on ESG factors, corresponding to the main research objective of the above studies as well.

Overall, all the above five studies have similar research objectives of exploring the underlying relationship between behavioural biases and socially responsible investing. The narrative raised by these studies spotlights the importance of understanding all ESG factors for investors from all geographies. They put forth the idea of increased awareness leading to ease in counteracting overconfidence biases amongst innumerable other cognitive biases.

Methodological Approaches to Studying Overconfidence in ESG Investing

The studies all employ different research methodologies to test their hypotheses and research objectives. These provide us with increased reliability and validity, especially construct validity. Comparing these methodologies shows how diverse methods provide better accuracy and truly reflect real-life circumstances.

The study by Cruciani et al., 2024 developed a questionnaire for their research. The paper conducted a literature review to build the structure of the survey, which included the following sections: socio-demographic characteristics, risk attitude, financial literacy, behavioural biases, ESG knowledge and preferences, and financial advice. The study uses primary data from 48

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individual investors, with the focus being on Italian retail investors. The investor demographics are largely equal, with ~48% females and with even income distribution. The sample size is a bit small, however, and the data set consisted of close friends, which increases the likelihood of biases like social desirability bias being included in the results. This sample also prevents generalizability to a greater population. The paper uses an Ordinary Least Squares (OLS) Regression model, which is a justified choice for a couple of reasons. Firstly, the dependent variables were continuous variables, such as overconfidence, and OLS regression is generally suitable for such cases. Furthermore, OLS regression is a good model for finding a linear relationship between two variables and presents the results in the form of a simple coefficient, which is universally understood.

Similar to the above study, the study by Imade & Agbashe, 2024 conducts a qualitative analysis using surveys for primary data. Furthermore, they also utilise quantitative data in the form of market data as their secondary data. The study uses a sample data set with retail and institutional investors from around the world (US, Europe, etc). The study also uses various case studies, such as the Volkswagen Emissions Scandal. This helps with establishing recurring patterns among case studies from different time periods and geographies. For instance, the study uses case studies and connects them to specific behavioural biases, such as BP's Deepwater Horizon Oil Spill and the role played by overconfidence bias in the case study. This not only shows the real-world implications of behavioural biases such as overconfidence but also complements theory with applications. However, not using any quantitative/empirical data is a huge drawback since empirical data can validate the conceptual frameworks and can help with generalisations and drawing cause-and-effect conclusions.

The study by Raut & Kumar, 2018 collected data "using a convenience sampling method" from the following Indian geographies: "Dhanbad, Bokaro, Jamshedpur and Ranchi in Jharkhand; Patna in Bihar; Bhubaneswar and Cuttack in Odisha; Asansol, Durgapur and Kolkata in West Bengal". The convenience sampling method suggests that the sample may not be generalisable, given that the convenience sampling method makes it a non-random and non-representative sample. Out of the 400 distributed questionnaires, 229 questionnaires were used given the purpose of their study and their criteria. The survey also used a 5-point Likert scale for framing "all items seeking information about investment behaviour". Finally, to find behavioural patterns, the study used a factor analysis to "analyse the total correlation for each variable and to compute the factor score". This was used in the later process of "discrimination analysis", where they checked the "discrimination among investors for behavioural biases"

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Fig. 1 The Formula Used for Discriminant Analysis by Raut & Kumar, 2018

$$D = V_1X_1 + V_2X_2 + \ldots\ldots\ldots\ldots + V_iX_i + a$$

where

D = discriminate function
v = weight of the variable (the larger the weight, the better the predictor)
X = respondents' score for the variable
a = constant, analogous to residual in linear regression
i = the number of predictors

The discrimination analysis helped the authors find a difference between the groups in the study. Before conducting this, a content validity test, validity of items test, and reliability of factors test were run. The method was generally appropriate given the practicality of collecting data, and their method allowed for processing the data systematically. Furthermore, their validity and reliability checks were also robust. However, convenience sampling and limited geographical scope largely stunted their scope.

The study by Deka et al., 2023 also uses primary data from 438 Indian retail investors through a questionnaire similar to the second study. In Fig. 2, the mapping of factors done by the authors can be seen. This was used for their hypothetical model, where the column on the left shows the latent variables. Additionally, the study used the 5-point Likert scale for data collection using a structured questionnaire similar to the study by Raut & Kumar, 2018. There was a largely even split of males and females, except for ages 46–60 years, with 64.22% males, and 60+ years, with 71.93% males, which allowed for generalizability. However, there was a huge number of graduates, approximately 48.86% of the 438 retail investors, compared to other qualification levels. Moreover, due to the research method being a survey, there could be social desirability bias, and a cross-sectional study means that a change in investors' behaviour isn't accounted for, which would have otherwise allowed us to explore the change in behaviour over the years. The cross-sectional study used a 5-point Likert scale, and for its analysis, it applied structured equation modelling using Amos 26. SEM is a good choice since it helps model more indirect variable connections - biases to risk perception to ESG decision-making. SEM is also good to test theories based on a conceptual framework, which is exactly what the study was exploring. Finally, the study also used exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) to "assess the reliability of the scales".

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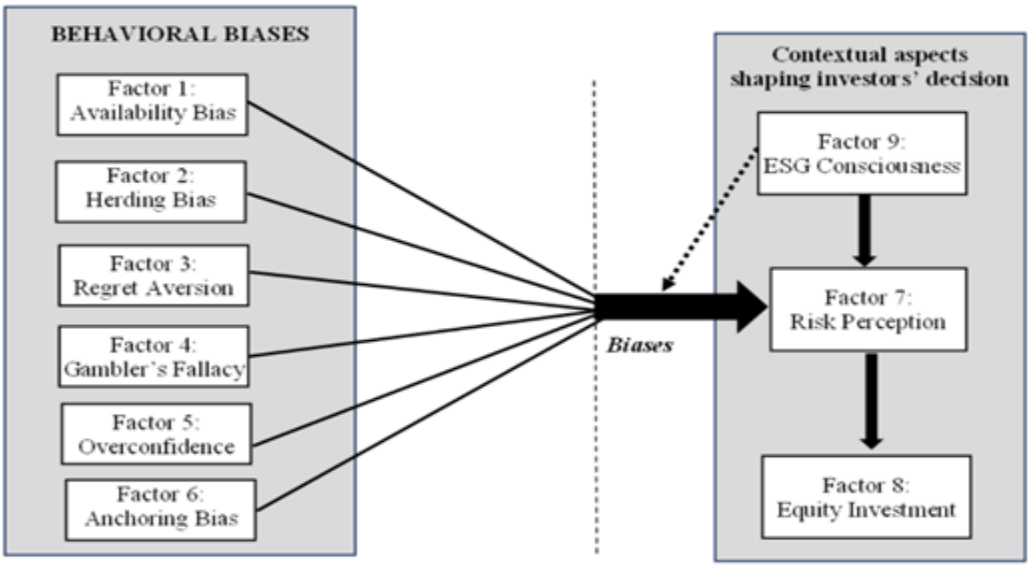

Fig 2. Mapping of factors for their model by Deka et al. (2023)

Finally, similar to the above studies, the study by Upadhyaya & Sandanshive, 2023 uses primary data in the form of a structured questionnaire from 219 investors from India. This allows for a detailed study of India-specific trends, highlighting the impact of the local context on cognitive biases and how they permeate investment strategies. The study uses a regression model to test its hypothesis, with ESG factors to be the dependent variables. However, it doesn't provide a split of the investor demographics, foregrounding concerns about the generalizability of the results. The study uses a regression model, which is good in terms of studying the relationship between the different behavioural biases the study explores and ESG decision-making. However, SEM would be a better model to use since behavioural biases are latent, or influenced by a lot of other factors. Overall, regression can be used for the study, but exploring the SEM model would help them improve the accuracy of the results.

Collectively, the studies used primary and secondary forms of research, with surveys and questionnaires being the most favoured form of data collection. Most studies had high generalizability, given their diverse demographic. However, relying on questionnaires induces concerns of biases, especially the social desirability bias, as investors wouldn't want to come across as unequipped about socially responsible investing.

Theoretical Underpinnings

Various theoretical frameworks are utilised in order to study their data and connect it with theory cohesively. These frameworks are vital to the discussion of overconfidence bias impacting ESG

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investing universally and spotlight trends and patterns seen in the real world, related to gender, geographies, etc.

All studies used various frameworks and theories to explain their research findings. These allowed for an in-depth understanding of the trends, helped authors connect theory to real-world application, and increased the credibility of results. Understanding the relevance of these theories is essential to the understanding of overconfidence bias, along with other cognitive biases, on ESG investing.

Firstly, the study by Cruciani et al., 2024 uses Prospect Theory, exploring decision-making involving risk, along with the Efficient Market Hypothesis — a hypothesis that postulates that share prices truly reflect all the available information (Downey et al., 2024). According to the EMG, all stocks are always at their fair values, and hence, investors can't time the market and outperform it, which allows for comparisons to rational investor behaviour. The EMH also helps understand investor psychology and behavioural biases. Furthermore, it uses the Regret Theory, disposition effect, and loss aversion, explaining their influence on investors' decision-making.

On the other hand, the study by Imade & Agbashe, 2024 explores the influence of behavioural biases within corporate governance frameworks: a framework consisting of rules, practices, and processes which elaborate how a company is governed (Byrne, n.d.).

The study by Raut & Kumar, 2018 draws upon seven crucial behavioural finance concepts: availability bias, representativeness, emotional contagion, herding, informational cascades, anchoring and overconfidence bias. The authors also acknowledge theories such as the Efficient Market Hypothesis (EMH) in the literature review, and their limitations in the real-world market where investors don’t truly act and make decisions rationally.

Next, the study by Deka et al., 2023 uses various frameworks such as overconfidence bias, risk perception formulation, perceived regret aversion, gambler's fallacy, etc. Through these, seven different research hypotheses are formed to explore. For all the hypotheses, the dependent variable is the risk perception formulation.

Finally, the study by Upadhyaya & Sandanshive, 2023 uses an ESG framework, breaking down the term into three different subparts. As seen in the image, the authors divided ESG into its three subparts and listed all the factors that impact each specific factor. This allows them to “understand the significance of ESG factors in investment decisions.” Given that the ESG framework isn't standardised, data is used from five ESG data providers — SASB, Refinitiv, MSCI, S&P Global, and the Stakeholder Capitalism Metric — to increase comparability. Furthermore, the study also talks about the SASB framework, “which are the standards for disclosing sustainability risks and opportunities.”

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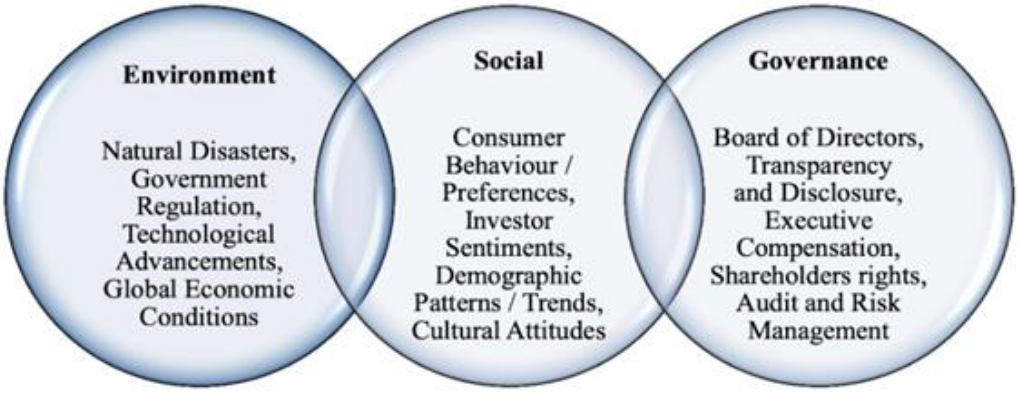

Fig 3. List of ESG factors that impact investment decisions

To conclude, all studies use various frameworks to analyse their results and to increase the accuracy of the results. Furthermore, it allows for structured arguments, as ESG data generally lacks standardisation.

Reviewing the Evidence and Conclusions Across Contexts

Building on the frameworks and research methodology, the studies' key findings & contributions provide insights into patterns and results about overconfidence bias in ESG investing. These results not only affirm the theoretical frameworks used but also show the real-life application of this area of inquiry.

The study by Cruciani et al., 2024 shows that 72.91% of participants exhibited great knowledge of sustainable finance topics, which was greater than previous studies on Swiss investors referred to by the authors. The study also found that financial self-efficacy had a positive relationship with overconfidence, whereas those who were confident in handling their own finances well had increased overconfidence. On the other hand, increased interest in ESG led to lower overconfidence. Furthermore, in general, results proved that females showed lower overconfidence than males.

Next, the study by Imade & Agbashe, 2024, through the use of various case studies, explores the impact of different cognitive biases on investor decisions. For example, for overconfidence bias, the study concluded that investors overestimated ESG performance, clouding their decision-making. A case study on the Enron Corporation supported this. Next, the study highlighted three points that raised problems with ESG investment decisions: the different rating methods and ESG metric standards, the interpretation of ESG scores leads to subjectivity, and biases causing market inefficiencies and asset bubbles.

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Furthermore, the study by Raut & Kumar, 2018 found that the investors had "a similar perception for availability bias, representativeness and emotional contagion", while "herding, informational cascades, anchoring and overconfidence" saw significant discrimination between the two pre-determined groups: new investors and experienced investors. In terms of overconfidence, the study found a significant difference between the new investors and the experienced investors. The mean overconfidence value for new investors in the market is 1.06, while it is 0.96 for experienced investors. The study shows that newer investors are more prone to overconfidence in investment decision-making than experienced investors, matching with results of other studies. Finally, overconfidence was the second most discriminating factor with a coefficient of 0.54. The p-value was 0.00, suggesting statistically significant results.

Similar to other studies, the study by Deka et al., 2023 also finds that overconfidence influences investors' perceived risk. This also had an impact on optimism, leading to irrational investment decisions for Indian retail investors. The study also finds a relationship between ESG knowledge and risk perception of investors: those who are conscious of the ESG factors are less likely to make poor decisions and, hence, are less prone to taking enormous risks.

Lastly, the study by Upadhyaya & Sandanshive, 2023 concluded that behavioural biases and ESG knowledge were closely related. With a statistically significant $p<0.001$, the regression model used for behaviour was highly accurate. The p-value being below 0.001 suggests very strong evidence against the null hypothesis, ruling out the role of luck and chance. The study finds that almost 33% of the investors' behaviour variations can be attributed to ESG factors. The study finds that the governance factor has the most significant influence, followed by environmental factors, and finally by social factors.

What do the Studies Miss? A Comparative Look at Limitations.

Overall, the results of the studies complement each other and show similar results. They confirmed the belief that overconfidence bias, among other cognitive biases, leads to overconfidence and overestimating one's financial knowledge.

Even though the studies shed light on the relationship between overconfidence bias and other cognitive biases, and ESG investing. However, all studies have limitations in their scope of research, given current technology and ability.

To begin, the statistical model used in the study by Cruciani et al., 2024 to analyse the dataset has a few limitations. Firstly, some groups are very underrepresented: there are only 3 respondents with a Master's and/or PhD. Next, the questionnaire was "constructed with some specific aims and objectives, so the list of independent variables is a consequence of previous choices and decisions." Since framed questions greatly influence the dummy variables, framing

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biases cause limitations, which is further worsened by social desirability bias. This may lead to a spurious correlation between the two variables. Lastly, the quantification and interpretation of the dependent variable are subjective and challenging to interpret.

Conversely, in the study by Imade & Agbashe, 2024, the authors don't acknowledge any limitations. However, the paper does have a few limitations. Firstly, it relies heavily on the analysis of case studies rather than using empirical data. These case studies, often, can't be extrapolated and generalised for large data sets as they happened due to very specific circumstances, which reduces their validity on a larger scale. Furthermore, the ESG metrics aren't standardised at all, making it harder to analyse and compare different data. This was an issue across all studies as there are innumerable ESG rating scales, such as the 0-100 scale, letter-based scale, Institutional Shareholder Services Environmental, Social, and Governance (ISS ESG), etc.

In the study by Raut & Kumar, 2018, the authors acknowledge that "this study is restricted to responses from the investors of four states only" and to increase generalisability, "it is required to capture responses from more diverse areas". Furthermore, a more diverse demographic also increases generalisability and expands the knowledge of behavioural biases' impact amongst different groups. Even though it isn't acknowledged by the study in its limitations, the study uses a convenience sampling method, which leads to bias in its results and makes the sample non-representative and non-random.

Next, the study by Deka et al., 2023 has a few limitations: in using the different literature, given their "time focus" and scope, they are a bit outdated. Furthermore, using only those studies that came up based on the keyword searches limited the possible behavioural factors. This induces selection bias and reduces reciprocity as there isn't complete transparency, which is advocated by the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) framework. Furthermore, a longitudinal study was a better option, but a time crunch pushed the researchers to pursue a time-bound study.

In the study by Upadhyaya & Sandanshive, 2023, the authors mentioned that a convenient sampling technique was used, similar to the study by Raut & Kumar, 2018, which produced bias while selecting their 219 investors. The survey results aren't verified by empirical/real-time data either, which means that they haven't verified the responses, increasing the potential of having self-reporting bias. Even though it is not a huge limitation, the study would have benefited from a longitudinal study design as it would have helped understand the changes in behaviours and possible new trends that have emerged over the recent years.

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Synopsis

Fig 4. Summary/Glance of all the research papers explored

Name of Study	Authors	Year	Country in Focus	Sample Size	Method	Findings	Limitations
Behavioral Biases in the Sustainability Framework: An Empirical Study	Cruciani et al.	2024	Italian Retail Investors	48 Individual Investors	Questionnaires	Overconfidence was positively correlated with financial self-efficacy, while overconfidence was higher among individuals who felt competent at managing their own money	Underrepresented groups; questionnaire conducted with specific aims and objectives, which led to framing biases; interpretation of DV is subjective
Impact of Cognitive Biases on ESG Investment Decisions	Imade and Agbashe	2024	Retail and Institutional investors from around the world (US, Europe, etc)	Uses case studies from across the world	Surveys Market Data	Investors overestimated ESG performance, as seen through the different case studies	less empirical data - case studies can't be extrapolated; Different rating methods and ESG metric standards
Investment Decision-Making Process Between Different Groups of Investors: A Study of Indian Stock Market	Raut and Kumar	2018	Four Indian states: Jharkhand, Bihar, Odisha, and West Bengal	229 respondents	Questionnaires	Newer investors are more prone to overconfidence in investment decision-making than experienced investors	restricted to only four states; incorporate diverse areas for generalisability; convenience sampling methods used - non-representative and non-random
Linking ESG-investing Consciousness, Behavioral Biases, and Risk-perception: Scale Validation With Specifics of Indian Retail Investors	Deka et al.	2023	Indian Retail Investors	438 Indian retail investors	Questionnaires	Overconfidence influences investors' perceived risk and optimism; Understanding of ESG factors reduces the probability of poor decisions	outdated scope and "time focus"; studies selected from a list that came up with keyword searches; due to a time crunch, a time-bound study was conducted even though a longitudinal study is better
A Study of Impact of Behavioural Factors on ESG Investment	Upadhyaya and Sandanshive	2023	India	219 Indian investors	Structured Questionnaire	Concluded that behavioural biases, including overconfidence, were closely related to ESG knowledge; governance factor influenced most decisions the most, then environmental, then social.	convenient sampling technique used; surveys not backed by empirical data; would have benefited from a longitudinal study

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Conclusion

In conclusion, all five studies highlight the role played by cognitive biases, including overconfidence bias, in poor decision-making in ESG investments.

In general, all the research papers highlight that many factors are vital in decision-making in sustainable stocks (preferences, demographics, biases such as overconfidence, herding, etc). These papers have different geographies that they study, but they all show a consistent trend between behavioural biases and ESG investment decision-making. The studies posit a few suggestions and solutions which can mitigate the impact of overconfidence biases and other cognitive biases on poor decision-making. These provide strong foundations for further research to be continued in this specific area of inquiry.

Firstly, the studies promote transparency in the form of non-financial information and the certification of third parties like rating agencies, as it reduces information asymmetry, which helps in enhancing decision-making. To complement this, financial literacy is also becoming more relevant as investors must know the basic pillars of ESG. Financial institutions must make it an objective to increase financial literacy — whether objective or subjective.

Another big insight is that the past performance of sustainable/"green" products is less important for investors' future decisions. Last but not least, values play an indispensable role over the returns, as seen through the investors' altruistic values being positively correlated with the importance of social responsibility. A few strategies recommended in the papers were investor education programs, standardised ESG reporting, cognitive bias training modules, integration of artificial intelligence (AI) and data, transparency, policies that improve investors' decision-making, diversification, and, last but not least, awareness of financial products.

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