

Behavioral perspective on sustainable finance: nudging investors toward SRI

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Abstract

Purpose – The study examines the impact of behavioral biases, such as herd behavior, overconfidence and reactions to ESG News, on Socially Responsible Investing (SRI) decisions in the Indian context. Additionally, it explores gender differences in SRI decisions, thereby deepening the understanding of the factors shaping SRI choices and their implications for sustainable finance and gender-inclusive investment strategies.

Design/methodology/approach – The study employs Bayesian linear regression to analyze the impact of behavioral biases on SRI decisions among Indian investors since it accommodates uncertainties and integrates prior knowledge into the analysis. Posterior distributions are determined using the Markov chain Monte Carlo technique, ensuring robust and reliable results.

Findings – The presence of behavioral biases presents challenges and opportunities in the financial sector, hindering investors' SRI engagement but offering valuable opportunities for targeted interventions. Peer advice and hot stocks strongly predict SRI engagement, indicating external influences. Investors reacting to extreme ESG events increasingly integrate sustainability into investment decisions. Gender differences reveal a greater inclination of women towards SRI in India.

Research limitations/implications – The sample size was relatively small and restricted to a specific geographic region, which may limit the generalizability of the findings to other areas. While efforts were made to select a diverse sample, the results may represent something different than the broader population. The research focused solely on individual investors and did not consider the perspectives of institutional investors or other stakeholders in the SRI industry.

Practical implications – The study's practical implications are twofold. First, knowing how behavioral biases, such as herd behavior, overconfidence, and reactions to ESG news, affect SRI decisions can help investors and managers make better and more sustainable investment decisions. To reduce biases and encourage responsible investing, strategies might be created. In addition, the discovery of gender differences in SRI decisions, with women showing a stronger propensity, emphasizes the need for targeted marketing and communication strategies to promote more engagement in sustainable finance. These implications provide valuable insights for investors, managers, and policymakers seeking to advance sustainable investment practices.

Social implications – The study has important social implications. It offers insights into the factors influencing individuals' SRI decisions, contributing to greater awareness and responsible investment practices. The gender disparities found in the study serve as a reminder of the importance of inclusivity in sustainable finance to promote balanced and equitable participation. Addressing these disparities can empower individuals of both genders to contribute to positive social and environmental change. Overall, the study encourages responsible investing and has a beneficial social impact by working towards a more sustainable and socially conscious financial system.

Originality/value – This study addresses a significant research gap by employing Bayesian linear regression method to examine the impact of behavioral biases on SRI decisions thereby offering more meaningful results compared to conventional frequentist estimation. Furthermore, the integration of behavioral finance with sustainable finance offers novel perspectives, contributing to the understanding of investors, investment



JEL Classification — Bayesian analysis (C11), Portfolio Choice; Investment Decisions (G11), Behavioral Finance: General (G40), Environment and Growth (O44), Sustainable Development (Q01)

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managers, and policymakers, therefore, catalyzing responsible capital allocation. The study's exploration of gender dynamics adds a new dimension to the existing research on SRI and behavioral finance.

Keywords Behavioral finance, SRI, ESG, Sustainable finance, Behavioral biases, Asian financial markets, G40 behavioral finance: general, G11 portfolio choice; investment decisions, C11 Bayesian analysis: general, O44 environment and growth, Q01 sustainable development

Paper type Research paper

1. Introduction

The world confronts unprecedented challenges including climate change, population growth, resource depletion, and escalating pollution, exacerbated by globalization (Baidya and Saha, 2024; McKenna, 2024). This has led to a significant economic shift towards sustainability since these issues now greatly impact the global economy (Amundi, 2023; Ali *et al.*, 2022a, b, c, d; 2024a, b; Beerbaum and Puaschunder, 2018; Carney, 2015; Kar and Kour, 2023).

In response to this, Sustainable Finance has emerged as a pivotal solution, redirecting capital towards environmentally and socially responsible companies, promoting a low-carbon circular economy (UNEP-FI, 2017; Levine, 2004; Schoenmaker and Schramade, 2019). Furthermore, the integration of ESG principles into corporate and investment strategies has propelled the progress towards SDGs through socially responsible investing (Arefeen and Shimada, 2020; Camilleri, 2017; Goel *et al.*, 2022; Risi *et al.*, 2021; Vishali and Shafi, 2024). This has prompted firms to address negative societal impacts, while also influencing a company's cost of capital based on environmental and governance practices (Busch *et al.*, 2015; Heinkel *et al.*, 2001; Vanwalleghem, 2017; Yadav *et al.*, 2023). Notably, the aftermath of events like the Asian financial crisis (1997–98) highlights the significance of transparency and efficient corporate governance in navigating financial challenges and promoting long-term sustainability (Ali *et al.*, 2024a, b).

However, gaps persist in sustainable finance research, particularly in understanding the motivations driving SRI. This understanding is crucial for guiding investment decisions towards sustainability (Kräussl *et al.*, 2023), especially in emerging markets like India, which face funding deficits and investment gaps (Goel *et al.*, 2022). Companies investing in green businesses are anticipated to benefit in the long-term, emphasizing the critical role of capital allocation in promoting sustainability (Shah, 2024; Staff, 2023). Recent studies highlight the complexity of investor behavior in SRI, specifically in underexplored regions like India (Vishali and Shafi, 2024; Kumar *et al.*, 2021). Understanding the drivers behind such decisions holds significant implications, given the lower receptiveness of Indian SRI markets compared to Europe and America (Livemint, 2021) since reasons behind investors' reluctance towards these investments remain unclear (Berry and Junkus, 2012; Glac, 2008; Kar and Kour, 2023). Recognizing the interconnectedness between sustainability and human behavior (Ali *et al.*, 2022a, b, c, d; Eberhardt-Toth and Wasieleski, 2013; Steg and Vlek, 2009), this study integrates behavioral finance with sustainable finance to explore the drivers of SRI, with a particular focus on the Indian market (Garg *et al.*, 2022), examining the impact of behavioral biases on SRI decisions using Bayesian linear regression method.

Bayesian analysis, a statistical method based on Bayes' theorem, is increasingly popular in social and behavioral science research (Scott Jones, 2019; van de Schoot *et al.*, 2014). It offers a robust method for exploring complex relationships among variables without relying on p -values by accommodating uncertainties and integrating prior knowledge into the analysis (Thach *et al.*, 2021a, b). It provides comprehensive model parameter information, adaptable to various data types, enhancing conclusions and exploration opportunities (Kruschke, 2011). Jeffrey's prior is employed to minimize bias, and MCMC convergence tests confirm the model's reliability. Additionally, the study investigates gender differences in SRI decisions, noting women's heightened inclination (Berry and Junkus, 2012; Hoepner and McMillan, 2009; Lundström and Rosberg, 2017).

Consequently, the study contributes to the SRI literature by understanding the profiles and behavior of SRI investors. Beyond academia, it aids in identifying potential socially responsible investors and recognizing barriers to SRI (Robba *et al.*, 2024; Rooh *et al.*, 2023). This is further important to develop a positive attitude and consequently, intention towards SRI (Thanki *et al.*, 2022). The objective is to improve SRI strategies and enhance financial accessibility for sustainable projects by identifying prevalent behavioral biases among Indian investors. Thus, more stakeholders can be attracted to socially responsible projects, ultimately addressing funding challenges (Nicholls, 2021; Narayanan and Pradhan, 2023; Ozili, 2022).

2. Review of literature

Over recent decades, there has been a notable surge in organizations' focus on responsible business practices, with investors playing a crucial role in driving this momentum (Housley, 2020; Shavit and Adam, 2011). Consequently, SRI has emerged as a pivotal driver in the transition towards sustainable finance, encompassing investment decisions guided by social, environmental, governance, and ethical considerations (Arefeen and Shimada, 2020; Eurosif, 2016; Gajewski *et al.*, 2021; Glac, 2008; Michelson *et al.*, 2004; Pilaj, 2017; Sandberg *et al.*, 2008; Thanki *et al.*, 2022). Originating in the 1980s, the growth of SRI has gained momentum, particularly with international efforts to pressure South African businesses during the apartheid era (Camilleri, 2017).

Recent trends show a shift in SRI from emphasizing sustainable development to integrating sustainability objectives with financial performance (Busch *et al.*, 2015; Rossi *et al.*, 2018; Scholtens and Sievänen, 2012; Tu *et al.*, 2020). However, the utility function of SRIs extends beyond optimal risk-reward, encompassing personal and societal values (Bollen, 2007; Ellis, 2019; Schueth, 2003; Renneboog *et al.*, 2008; Shank *et al.*, 2005; Statman *et al.*, 2006), underscoring the importance of strategic execution in SRI strategies (Axelsson, 2022).

A surfeit of literature on SRI, including barriers to SRI, financial literacy, and perceived performance (Bauer and Smeets, 2015; Hartzmark and Sussman, 2017; Nilsson, 2009; Riedl and Smeets, 2017; Sandberg *et al.*, 2008), however, the motivations driving SRI behavior in Indian retail investors remain understudied (Kar and Kour, 2023; Mehta *et al.*, 2019; Palacios-González and Chamorro-Mera, 2018). Understanding the psychological factors influencing investors' decisions is crucial, especially given the susceptibility of investors to cognitive biases, particularly within Asian markets (Berry and Junkus, 2012; Kim and Nofsinger, 2008) and distinct behaviors exhibited by socially responsible investors compared to the conventional ones (Lewis and Mackenzie, 2000; Nilsson, 2009). Therefore, there is a growing need for comprehensive research to explore the role of behavioral finance in this context, especially in India (Kumar *et al.*, 2021; Williams, 2007). It is because behavioral biases aid in comprehending why individuals make specific decisions and how these decisions can be enhanced from the viewpoint of behavioral finance. This is because, in financial decision-making processes such as investing, individuals tend to be less rational than what traditional finance theory suggests. Consequently, rather than making optimal (rational) choices, investors frequently rely on mental shortcuts or heuristics that align more closely with their personal preferences, resulting in satisfactory yet not necessarily optimal decisions (Gorzon *et al.*, 2024).

India, with its diverse society and evolving market dynamics (Kaul, 2015; Meena, 2015), presents a unique context for studying SRI decisions (Garg *et al.*, 2022). The demand for socially responsible brand behavior is also on the rise in India (Suman, 2022). Despite India's growing relevance in the global SRI landscape, its share of global assets remains minimal, underscoring the need for dedicated research to understand the challenges, behavioral patterns, and factors influencing SRI decisions among Indian investors (Kar and Kour, 2023). By addressing these gaps, the present study provides valuable insights into the behavioral

biases affecting SRI decisions of Indian investors, thereby guiding the development of effective strategies to promote SRI practices.

2.1 Overconfidence and SRI decisions

Overconfidence among investors is associated with behaviors such as excessive trading and increased risk-taking (Barber and Odean, 2001; Broihanne *et al.*, 2014). This cognitive bias can lead investors to underperform in the market (Barber and Odean, 2001) and to exhibit both overreaction and underreaction to information (Glaser and Weber, 2007; Lee and Swaminathan, 2000). Overconfident investors may believe that their information is superior, leading them to overreact to recent news while disregarding other relevant market data (Parveen *et al.*, 2020). This tendency towards extremities can result in exaggerated market movements, with prices falling sharply on negative news and rising excessively on positive news.

Moreover, executives characterized by overconfidence may exhibit a heightened inclination towards socially responsible practices (Rooh *et al.*, 2023). Seeking to offset perceived control tendencies, these executives prioritize establishing a positive reputation through socially responsible behavior. Consistent with previous research (Baker and Nofsinger, 2002, 2010; Weber and Camerer, 1998), it is hypothesized that socially responsible investors may also be influenced by overconfidence bias.

2.2 Overreaction and underreaction to ESG news

A study by Demski *et al.* (2017) indicates that extreme weather incidents increase public engagement in sustainability matters, while Lundgren and Olsson (2010) found that environmental events can lead to notable negative returns in the stock market. Additionally, studies by Capelle-Blancard and Petit (2019), Chen and Yang (2020), Krüger (2015), and Lämsilähti (2012) have highlighted market asymmetry in response to ESG news, with substantial negative reactions observed to adverse news. This pattern aligns with the theory that negative events attract more attention (Fiske, 1980). Consequently, it is hypothesized that overreactions and underreactions to ESG news significantly influence the SRI decisions of Indian investors.

2.3 Herding behavior in socially responsible investors

Investors may engage in ESG investing trends due to herd behavior, potentially overlooking specific ESG elements of the companies they invest in (Upadhyaya *et al.*, 2023). Cullis *et al.* (1992) suggest that consumption investors, who derive utility from ethical investing, may conform to perceived norms within their peer groups. Sociological factors can shape people's identities, influencing their preferences (Akerlof and Kranton, 2002). Herding behavior involves individuals strongly identifying with a group, leading them to question their judgment and mimic the actions of the group. Consequently, it is hypothesized that there exists a statistically significant relationship between herd behavior and the SRI decisions of investors in India.

2.4 Role of gender in socially responsible investing decisions

Gender plays a significant role in shaping investment behavior, with men and women exhibiting distinct tendencies (Marinelli *et al.*, 2017). Historically, women have been characterized as cautious and practical investors, while men tend to embrace risk-taking (Chavali and Rosario, 2019). As SRI gains traction, women are increasingly taking the lead in this domain (Curtis, 2021). They are more likely than men to prioritize social and environmental considerations when making investment decisions, positioning them as

leaders in socially responsible investing (Banerjee, 2023; Housley, 2020; Jung, 2011; Senne, 2023). Women prioritize the ESG impacts of their investments, aiming to influence societal change significantly (Gupta, 2022). Their investment decisions are often driven by a desire to support businesses that prioritize fair employee compensation, environmentally friendly practices, and abstention from controversial products like tobacco and firearms (Lacurci, 2022).

This study is among the pioneering efforts to investigate the influence of behavioral biases on the SRI decisions of Indian investors, employing a Bayesian approach. Additionally, existing studies mentioned earlier offer an incomplete overview of the literature concerning the role of behavioral biases in shaping SRI behavior among Indian investors. The utilization of Bayesian analysis aims to establish a robust empirical foundation, facilitating the development of effective strategies to promote SRI decisions in the Indian context.

3. Methodology

Since the 1990s, the application of Bayesian statistical methods has gained prominence in both social sciences research and economics (Thach *et al.*, 2021a, b). Over the years, the conventional frequentist Null-Hypothesis Significance Testing (NHST), relying on p -values, has faced substantial criticism due to theoretical and practical concerns (Kubsch *et al.*, 2021; McShane and Gal, 2017). Numerous authors have scrutinized the concept of p -values, particularly its ill-defined basis for declaring statistical significance, rendering it problematic (Edwards *et al.*, 1963). One major drawback is the lack of a unique p -value for any dataset, and frequentist estimations often yield impoverished parameter values without indicating trade-offs among parameters (Kruschke, 2021).

In response to these limitations, there has been a growing advocacy for Bayesian approaches in statistical analysis (Briggs, 2023; Kruschke, 2011; Wagenmakers *et al.*, 2017). Bayesian analysis offers valuable support to researchers, ensuring a more accurate interpretation of statistical results and enhancing transparency in result communication (Kubsch *et al.*, 2021). It presents a complete posterior probability distribution for a specific coefficient, reducing uncertainty in the model (Thach and Ngoc, 2023). Unlike the repetitive null hypothesis testing in frequentist approaches, Bayesian analysis facilitates the continuous updating of knowledge. It reflects the similarities and differences between the current study and prior research. Moreover, the Bayesian paradigm has the potential to either replicate or strengthen others' conclusions, but it may also lead to different or even opposing conclusions in certain cases (van de Schoot *et al.*, 2014).

The current research adopts Bayesian linear regression to analyze the influence of behavioral biases on Indian investors' SRI decisions. This approach is rooted in Bayesian theory, recognized for employing parameterized probability models (Briggs, 2023; Thach *et al.*, 2021a, b, 2022). Utilizing such models, Bayesian linear regression facilitates a thorough exploration of relationships among variables, accommodating uncertainties, and integrating prior knowledge into the analysis.

As emphasized by van de Schoot *et al.* (2014), the selection of priors for the analysis should be clearly established in advance to ensure the replicability of results. In cases where no specific information is available, default or non-informative priors are frequently chosen, delineating a broad spectrum of parameter values (Thach, 2023). The role of default prior in Bayesian analysis is to serve as a reference, allowing subsequent adjustments through the incorporation of an objective or subjective, personal, or pragmatic prior (Fraser *et al.*, 2010).

Objective or non-informative priors are favored for obtaining objective results, minimizing their impact on the posterior distribution. A non-informative prior is characterized by its flatness relative to the likelihood function, implying that it does not

convey substantial information. Such priors are perceived as more objective and widely utilized (SAS Institute Inc, 2015). A particularly useful non-informative prior is Jeffrey's prior, which adheres to the local uniformity property, remaining relatively constant over the region where the likelihood is significant. Jeffrey's prior is locally uniform and non-informative, being derived from the Fisher Information Matrix. It exhibits invariance to one-to-one transformations and is widely adopted due to its maximally sensitive response to data (Fraser *et al.*, 2010; Ibrahim, 1991). Given its suitability, Jeffrey's prior is employed in the present study for Bayesian linear regression analysis.

3.1 Data

A power analysis was conducted using G*Power (Faul *et al.*, 2007) to determine the required sample size for the study. The analysis initially determined a sample size of 85 participants (Table 1). However, in practice, 106 respondents were approached, resulting in a 100% response rate. Upon further evaluation, five responses were found to be invalid and were therefore rejected. Consequently, the final sample size for the study comprised 101 Indian investors.

3.2 Variables

The dependent variable in this study is SRI decisions, measured through a self-reported survey on respondents' investment choices in SRI securities. The construct "SRI Decisions" comprises six questions. Independent variables include behavioral biases such as overconfidence, herd behavior, and overreaction/underreaction to ESG news. A questionnaire was developed based on Metawa *et al.* (2019), initially containing 18 items modified to the study's context. To ensure scale reliability and validity, one "herd behavior item" and two "overreaction/underreaction to ESG news" items were removed. The remaining items were grouped into three constructs: overconfidence bias (six items), herd behavior (five items), and overreaction/underreaction to ESG news (four items). In this study, McDonald's Omega (ω) and Cronbach's Alpha (α) were employed as reliability coefficients to assess the internal consistency of the measurement instrument (Cronbach, 1951). Each construct obtained values exceeding 0.7 (Table 2), indicating high internal consistency reliability (Giem and Giem, 2003; Tavakol and Dennick, 2011). Therefore, the scale reliably measures the study constructs.

To add to the novelty of this research, the study also examines the role of gender in SRI decisions (Table 10). Gender differences in decision-making processes have been attributed to psychological and social factors (Ritter, 2003; Rudman and Goodwin, 2004). Research suggests that men and women often hold differing attitudes toward social and environmental issues (Dhenge *et al.*, 2022; Li *et al.*, 2022; Zhao *et al.*, 2021). Women are typically more attentive to these issues and show a greater inclination towards supporting SRI compared to men (Housley, 2020).

Input	Effect size (f^2)	0.15
	α error Probability	0.05
	Power (1- β) error probability	0.80
Output	Critical F	2.4858849
	Denominator Degree of Freedom (df)	80
	Minimum Sample size	85
	Actual power	0.8030923

Note(s): Statistical Power Analysis by G*Power to determine the minimum sample size based on Erdfelder *et al.* (1996) method

Source(s): Table by authors

Table 1.
A priori: computation
of required sample size

Table 2.
Bayesian scale
reliability test

Estimate	McDonald's ω	Cronbach's α	Mean	SD
Posterior mean	0.920	0.925	58.098	10.099
95% CI lower bound	0.898	0.903		
95% CI upper bound	0.940	0.947		
R-hat	1.00	1.00		

Note(s): This table presents estimates and statistics for McDonald's Omega (ω) and Cronbach's Alpha (α), and Gelman-Rubin's R-hat statistic. The "Posterior Mean" column displays the average estimate obtained from Bayesian analysis. The "95% CI" columns provide the 95% confidence intervals for each estimate (lower and upper bounds). The R-hat statistic assesses the convergence of the Bayesian analysis, with a value of 1.00 indicating satisfactory convergence.

Source(s): Table by authors

4. Bayesian results and discussion

In this section, a comprehensive summary and discussion of the results obtained through Bayesian analysis of the dataset is provided. The analysis utilized Bayesian linear regression method with Jeffrey's prior as the chosen prior distribution (Jeffreys, 1998), and was conducted using the JASP software platform (Wagenmakers *et al.*, 2017).

The methodology employed in the current study aligns with the four-stage analysis process outlined by van Doorn *et al.* (2020). According to their recommendations, Bayes factor hypothesis testing is employed to determine the presence or absence of an effect. In cases where the goal is to assess the magnitude of an effect, the posterior distribution is visualized, and credible intervals are summarized. The four-stage analysis process entails integrating both testing and estimation procedures, acknowledging that these components are not mutually exclusive. Specifically, Bayes factor hypothesis testing serves as a robust tool for establishing the presence or absence of an effect, while the posterior distribution offers insights into the relative plausibility of parameter values post the integration of prior knowledge and observed data. This approach enables an in-depth exploration of both the significance and size of effects within the Bayesian framework. Wagenmakers *et al.* (2010) suggest that one-sided hypothesis testing in Bayesian analysis is more diagnostically informative compared to its two-sided alternative.

Furthermore, according to van Doorn *et al.* (2020), it is advisable to thoroughly examine the validity of model assumptions, such as normally distributed residuals and equal variances across groups, before conducting the planned analysis. This careful assessment of data quality ensures the robustness of the subsequent analysis and facilitates accurate interpretation of the results.

4.1 MCMC convergence test

Given the advancements in Markov Chain Monte Carlo (MCMC) sampling methods and computational capabilities, Bayesian statistics have evolved into a cornerstone of contemporary research, offering robust tools for statistical inference. However, the reliability of Bayesian inference hinges on the convergence of MCMC algorithms, as non-converged results may yield biased parameter estimates and misleading statistical inferences (Thach and Ngoc, 2023). Convergence of MCMC algorithms is assessed through both visual inspection, such as trace plots, and quantitative evaluation (Gelman and Rubin, 1992). In the present study the results of convergence are presented through quantitative evaluation, specifically utilizing the Gelman-Rubin statistic (R-hat) (Gelman *et al.*, 2013). The MCMC sampling algorithm starts with random parameter values and then converges to the posterior distribution as more and more samples are drawn. To assess whether the MCMC sampling has converged to the posterior distribution, it is customary to run the algorithm several times

with different starting values; these different runs are known as chains (Pfadt *et al.*, 2022). This study employs a target MCMC sample size of 10,000, with the first 2000 burn-in iterations discarded from the MCMC sample. To check the chain convergence, a thinning of 10 is set. The R-hat values, all equal to 1.00 across reliability measures in our analysis (Table 2), indicate convergence and consistency between multiple MCMC chains (Gelman *et al.*, 2013). This aligns with recommendations in the literature to utilize R-hat to quantify the mixing of chains and ensure the reliability of Bayesian inference (Vats and Knudson, 2021). Specifically, the Gelman-Rubin diagnostic compares variance within and across chains, akin to Analysis of Variance (ANOVA), to ascertain convergence (Du *et al.*, 2022).

Reliability, a fundamental concept in psychological research, plays a pivotal role in ensuring the robustness of measurement instruments such as tests and questionnaires (Pfadt *et al.*, 2022). McDonald’s Omega (ω) and Cronbach’s Alpha (α) are commonly employed reliability coefficients, offering valuable insights into the internal consistency of measurement instruments (Cronbach, 1951). McDonald’s Omega, computed from parameters of a single-factor model, provides a comprehensive measure of reliability, while Cronbach’s Alpha serves as a lower bound for reliability (Pfadt *et al.*, 2022). The results of these reliability estimates are presented in Table 2. McDonald’s Omega provides a comprehensive measure of reliability, while Cronbach’s Alpha serves as a lower bound for reliability (Pfadt *et al.*, 2022). The posterior mean estimates for ω and α , along with their 95% credible intervals, furnish researchers with reliable point estimates and uncertainty intervals, analogous to frequentist confidence intervals (Pfadt *et al.*, 2022). Importantly, both McDonald’s Omega (ω) and Cronbach’s Alpha (α) indicate high levels of internal consistency and reliability in the measurement instrument (Table 2). These results collectively underscore the robustness of our Bayesian model and enhance the credibility of study’s conclusions.

4.2 Herd behavior and SRI decisions of Indian investors

The results presented in Table 3 reveal that the “Peeradvice + Hot stocks” model emerges as a robust predictor, supported by a high probability (P(M)) and substantial posterior

Model comparison - I engage in investments that are SR Models

Models	P(M)	P(M data)	BF _M	BF ₁₀	R ²
Peeradvice + Hot stocks	0.017	0.177	12.722	1.000	0.263
Peeradvice + majority + friends’influence + Hot stocks + peerpressure	0.167	0.097	0.538	0.055	0.280
Peeradvice + majority + Hot stocks	0.017	0.086	5.524	0.483	0.275
Peeradvice + majority	0.017	0.065	4.085	0.365	0.246
Peeradvice + Hot stocks + peerpressure	0.017	0.058	3.662	0.329	0.268
Peeradvice + majority + Hot stocks + peerpressure	0.033	0.054	1.642	0.151	0.277
Peeradvice + majority + friends’influence	0.033	0.050	1.516	0.140	0.276

Note(s): BFM (Bayesian Factor Model) quantifies the evidence favoring one model over another. P(M) is the probability of a specific model. P(M|data) is the probability of the model given the observed data. BF10 is the Bayes Factor supporting the alternative hypothesis over the null hypothesis. R² represents the coefficient of determination, indicating the proportion of variance in the dependent variable explained by the independent variables

Peeradvice: I rely on my friends’/family’s/peer’s advice for making an investment decision

Majority: I make my investment decisions based on the investment decisions taken by the majority of the investors

Hot stocks: I prefer to invest more in hot stocks (high in demand)

Peerpressure: I invest/will invest in socially responsible securities because my peers have invested in the same

Friends’ influence: I invest in funds that I heard about from a friend

Source(s): Table by authors

Table 3.
Bayesian linear
regression model of
herd behavior

probability (P(M|data)), indicating the reliability of this model. The dominant Bayes Factor (BF10) of 12.722 provides strong evidence in favor of the alternative hypothesis, suggesting that investors relying on expert advice and trending stocks are more likely to engage in SRI. Additionally, the detailed posterior summary of coefficients shown in Table 4 further elucidates the influence of peer advice and the attractiveness of hot stocks on SRI decisions.

The substantial explanatory power reflected in the R^2 of 0.263 underscores an influence of external factors, including social norms, group dynamics, financial advisors, and prevailing market trends on investors' decisions towards SRI options. The influence of social networks, as evidenced by models involving majority decisions, highlights the role of conformity in driving SRI choices, in line with sociological perspectives on identity and preferences. Shared norms within a group can significantly impact individual choices, as suggested by Akerlof and Kranton (2000). These results confirm the prevailing understanding of this phenomenon, indicating that the inclination to follow others, particularly in the case of SRI, is influenced by peer behavior (Blondel, 2022; Rubbaniy et al., 2021). This observation holds for India (Danila, 2023) given its collectivist culture (Hofstede, 1980), wherein social norms and group dynamics play a significant role. Moreover, collectivism is found to be one of the primary determinants of economic progress (Thach, 2020), further emphasizing its influence on decision-making processes.

The inclination to follow the majority also serves a social purpose by encouraging empathy and altruism (Simon, 1990) and aligns with the sociological concept of external sanctions and negative emotional states induced by non-conformity (Elster, 2013). The promotion of SRI among Indian investors can leverage these findings as powerful drivers of behavior.

4.3 Impact of overconfidence on SRI decisions: influence of belief in holding the best stocks

The examination of the impact of overconfidence bias on SRI decisions is presented in Table 5. The Posterior Summaries of Coefficients (Table 6) provide estimates and uncertainty intervals for various factors influencing SRI decisions. The intercept indicates a baseline inclination towards SRI decisions, with a mean of 3.703 (95% CI: 3.555–3.854). Individual factors such as stock market awareness, skills and expertise in investing, the ability to analyze new information aptly, having the best stocks in the portfolio, making independent

Coefficient	P(incl)	P(incl data)	BF _{inclusion}	Mean	SD	95% credible interval	
						Lower	Upper
Intercept	1.000	1.000	1.000	3.703	0.078	3.549	3.846
Peeradvice	0.500	0.831	4.933	0.225	0.144	0.000	0.449
majority	0.500	0.570	1.325	0.139	0.177	-0.013	0.547
friends'influence	0.500	0.319	0.468	-0.014	0.068	-0.211	0.105
Hot stocks	0.500	0.672	2.045	0.152	0.145	0.000	0.428
peerpressure	0.500	0.426	0.742	0.057	0.109	-0.057	0.321

Note(s): Intercept: Baseline inclination towards Socially Responsible Investment (SRI) decisions

P(incl): Probability of inclusion in the model

P(incl|data): Probability of inclusion given the data

BF_{inclusion}: Bayesian factor for inclusion

Mean: Mean value of the coefficient

SD: Standard Deviation of the coefficient

95% Credible Interval: The range within which the true value of the coefficient is likely to fall with 95% confidence

Source(s): Table by authors

Table 4.
Posterior summary of coefficients

Model comparison - I engage in investments that are SR Models	P(M)	P(M data)	BF _M	BF ₁₀	R ²
beststocksinportfolio + tradebymyself	0.010	0.206	27.026	1.000	0.254
beststocksinportfolio	0.024	0.126	5.935	0.245	0.203
skills&expertiseminvesting	0.024	0.072	3.188	0.140	0.193
analyzenewinfoaply + beststocksinportfolio + tradebymyself	0.007	0.047	6.864	0.304	0.258
skills&expertiseminvesting + tradebymyself	0.010	0.047	5.084	0.226	0.229
skills&expertiseminvesting + beststocksinportfolio + tradebymyself	0.007	0.038	5.485	0.245	0.254
beststocksinportfolio + tradebymyself + prioritytoownopinion	0.007	0.037	5.369	0.240	0.254
stockmktawareness + beststocksinportfolio + tradebymyself	0.007	0.037	5.346	0.239	0.254
stockmktawareness + skills&expertiseminvesting + analyzenewinfoaply + tradebymyself + prioritytoownopinion	0.143	0.031	0.191	0.010	0.260
skills&expertiseminvesting + beststocksinportfolio	0.010	0.021	2.261	0.103	0.216

Note (s): BFM (Bayesian Factor Model) quantifies the evidence favoring one model over another. P(M) is the probability of a specific model, P(M|data) is the probability of the model given the observed data. BF10 is the Bayes Factor supporting the alternative hypothesis over the null hypothesis. R² represents the coefficient of determination, indicating the proportion of variance in the dependent variable explained by the independent variables

Stockmktawareness: I am well aware of everything that happens in the stock market

skills&expertiseminvesting: I have the required skills and expertise needed for making investment decisions in the stock market

analyzenewinfoaply: I can analyze the new information in the market apply

Beststocksinportfolio: My portfolio contains the best stocks

Tradebymyself: I trade by myself

Prioritytoownopinion: While making an investment decision, I give priority to my opinion regarding the decision above all the other factors

Source(s): Table by authors

Table 5.
Bayesian linear
regression model of
overconfidence

Coefficient	P(incl)	P(incl data)	BF _{inclusion}	Mean	SD	95% credible interval	
						Lower	Upper
Intercept	1.000	1.000	1.000	3.703	0.079	3.555	3.854
	0.500	0.229	0.297	–	0.074	–0.196	0.193
Stockmktawareness				3.201×10^{-4}			
skills&expertiseininvesting	0.500	0.389	0.638	0.088	0.175	–0.096	0.568
analyzenewinfoaptly	0.500	0.250	0.333	–0.017	0.100	–0.290	0.168
beststocksportfolio	0.500	0.757	3.122	0.242	0.180	0.000	0.535
tradebymyself	0.500	0.690	2.224	0.155	0.132	0.000	0.366
prioritytoownopinion	0.500	0.228	0.296	0.007	0.050	–0.091	0.166

Note(s): Intercept: Baseline inclination towards Socially Responsible Investment (SRI) decisions, P(incl): Probability of inclusion in the model. P(incl|data): Probability of inclusion given the data

BF_{inclusion}: Bayesian factor for inclusion

Mean: Mean value of the coefficient

SD: Standard Deviation of the coefficient

95% Credible Interval: The range within which the true value of the coefficient is likely to fall with 95% confidence

Source(s): Table by authors

Table 6.
Posterior summary of coefficients

trades, and giving priority to one's own opinion are considered, indicating that overconfident investors prioritize their perspectives over those of acquaintances, relatives, and coworkers, particularly in financial decision-making. Overconfident individuals, according to studies (Rooh *et al.*, 2023; Sultana *et al.*, 2018), tend to consider the broader community implications of their financial decisions. This may also be linked to a perceived enhancement in financial performance, consistent with the research by Beerbaum and Puauschunder (2018) and Ortiz-de-Mandojana and Bansal (2015). As Rawat (2023) notes, companies emphasizing ESG factors exhibit greater resilience and risk mitigation capacities. Given these insights, investor education programs become crucial, particularly focusing on the principles of SRI and the potential impact of investment choices, especially for those who believe they possess the best stocks in their portfolio. Financial advisors can tailor SRI strategies, integrating ESG criteria into portfolios to align with investors' confidence in their stock picks, encompassing both financial and non-financial aspects.

However, it is imperative to recognize potential disadvantages. Overconfident investors may indulge in excessive trading and active portfolio management, as highlighted by Barber and Odean (2001), leading to a lack of diversification and overlooked investment opportunities. Hence, emphasizing risk management strategies becomes paramount, with financial advisors playing a pivotal role in guiding clients towards a well-balanced and diversified portfolio. This not only addresses the behavioral aspects associated with overconfidence but also underscores the role of investor education in fostering responsible and well-informed investment decisions.

4.4 Investors' reaction to extreme ESG events shapes SRI decisions

The Model Comparison for investors engaging in SRI, influenced by the overreaction and underreaction to Environmental, Social, and Governance (ESG) news is described in Table 7. The "recentevents + activeduringextremeweatherevents" model stands out with a P(M) of 0.033 and a dominant Bayes Factor (BF₁₀) of 14.903, indicating substantial support for its influence on SRI decisions. Investors' reaction to extreme ESG events shaping SRI decisions, as shown in Table 8, is comprehensively depicted through a posterior summary of coefficients derived from Bayesian analysis. This model, encompassing the impact of recent events in the stock market as well as extreme weather events, suggests that investors who react to recent events and consider extreme

Model comparison - I engage in investments that are SR Models	P(M)	P(M data)	BF _M	BF ₁₀	R ²
recentevents + activeduringextremeweatherevents	0.033	0.339	14.903	1.000	0.362
recentevents + negativereactiontonegativeESGnews + activeduringextremeweatherevents	0.050	0.155	3.481	0.304	0.368
quickreactiontomktinfo + recentevents + negativereactiontonegativeESGnews + activeduringextremeweatherevents	0.200	0.143	0.666	0.070	0.368
Activeduringextremeweatherevents	0.050	0.111	2.365	0.217	0.315
quickreactiontomktinfo + recentevents + activeduringextremeweatherevents	0.050	0.101	2.128	0.198	0.362
recentevents + negativereactiontonegativeESGnews	0.033	0.050	1.515	0.146	0.335
negativereactiontonegativeESGnews + activeduringextremeweatherevents	0.033	0.030	0.905	0.089	0.328
quickreactiontomktinfo + activeduringextremeweatherevents	0.033	0.025	0.752	0.074	0.325
quickreactiontomktinfo + negativereactiontonegativeESGnews	0.050	0.017	0.330	0.033	0.336

Note(s): BFM (Bayesian Factor Model) quantifies the evidence favoring one model over another. P(M) is the probability of a specific model, P(M|data) is the probability of the model given the observed data. BF10 is the Bayes Factor supporting the alternative hypothesis over the null hypothesis. R² represents the coefficient of determination, indicating the proportion of variance in the dependent variable explained by the independent variables

recentevents: Impact of recent events in the stock market on investment decisions
 activeduringextremeweatherevents: Level of activity on sustainability issues during extreme weather events or climate changes
 negativereactiontonegativeESGnews: Reacting negatively to negative Environmental, Social, and Governance (ESG) related news about a specific company
 quickreactiontomktinfo: Quick reaction to new information in the market

Source(s): Table by authors

Table 7.
Bayesian linear regression model comparison of overreaction and underreaction to ESG News

Coefficient	P(incl)	P(incl data)	BF _{inclusion}	Mean	SD	95% credible interval	
						Lower	Upper
Intercept	1.000	1.000	1.000	3.703	0.073	3.568	3.838
Quickreactiontomktinfo	0.500	0.304	0.436	0.002	0.060	-0.141	0.157
Recentevents	0.500	0.814	4.389	0.277	0.184	0.000	0.575
negativereaction	0.500	0.412	0.701	0.058	0.108	-0.044	0.337
onegativeESGnews							
Activeduringextr	0.500	0.921	11.664	0.409	0.202	0.000	0.711
emeweatherevents							

Note(s): Intercept: Baseline inclination towards Socially Responsible Investment (SRI) decisions, P(incl): Probability of inclusion in the model
P(incl|data): Probability of inclusion given the data
BF_{inclusion}: Bayesian factor for inclusion
Mean: Mean value of the coefficient
SD: Standard Deviation of the coefficient
95% Credible Interval: The range within which the true value of the coefficient is likely to fall with 95% confidence

Table 8.
Posterior summary of coefficients

Source(s): Table by authors

weather or climate-related events are more inclined to make decisions aligned with SRI (Demski et al., 2017; Sabbaghi, 2022; Yoon, 2023). The significance of increased activity in sustainability issues during extreme weather events indicates a growing trend of investors integrating sustainability into their decision-making, potentially contributing to long-term positive impacts on ESG and SRI practices. This is especially evident from the remarkable growth of such investing in recent years wherein ESG funds in India experienced a notable expansion over the past few years surging from ₹22bn in 2019 to ₹124bn in 2022 (Rawat, 2023). This can be attributed to the COVID-19 pandemic which brought a heightened awareness of the relationship between ESG factors and economic growth. As a result, market disruptions and uncertainties due to the pandemic prompted a significant influx of investors into responsible securities. In the initial three months of 2020 alone, global investments in ESG funds reached \$54.6bn. This trend continued with investments in global ESG funds more than doubled between 2020 and 2021 (CNBC, 2021; Vinay, 2023). Thus, this confirms the results that investors choose to invest sustainably and responsibly as a result of becoming more active on sustainability issues when extreme weather events or climate changes occur. Therefore, crises often act as catalysts for behavioral shifts. The global crisis of the pandemic might have accelerated the integration of ESG considerations into investment decisions, potentially influencing overreactions and underreactions to ESG news.

Given the significance of climate-related activism in influencing investment decisions, companies can engage in environmentally conscious practices, support sustainable initiatives, and implement systems that enable investors to access timely updates on the company's socially responsible efforts as well as responses to market events. Moreover, companies should establish stakeholder engagement programmes involving investors in their sustainability initiatives. Additionally, there is a need to develop robust mechanisms for measuring and reporting the social and environmental impact of companies' activities, providing quantified data on the positive outcomes of their socially responsible practices.

4.5 SRI decisions differ statistically significantly for men and women

Table 9 offers descriptive statistics and a detailed comparison of SRI decisions between men and women, illustrating notable gender differences in investment preferences. Female participants consistently demonstrate higher mean scores across various aspects of SRI

Table 9.
Descriptive statistics of
SRI decisions of men
and women

	Group	N	Mean	SD	SE	Coefficient of variation
I engage in investments that are socially responsible	Female	31	3.806	1.014	0.182	0.266
	Male	69	3.159	1.093	0.132	0.346
I am a socially responsible investor	Female	31	3.710	1.006	0.181	0.271
	Male	70	3.214	1.034	0.124	0.322
I prefer sustainably oriented portfolios to make investments	Female	31	4.065	0.727	0.131	0.179
	Male	70	3.357	1.117	0.133	0.333
I consider the companies' impact on the environment before investing in it	Female	31	3.613	1.230	0.221	0.340
	Male	70	2.886	1.123	0.134	0.389
I aim to promote environmental and societal causes through my investment decisions	Female	30	3.700	0.988	0.180	0.267
	Male	70	3.057	1.115	0.133	0.365
I believe that my investments impact the environment positively	Female	31	3.645	1.142	0.205	0.313
	Male	70	2.957	1.197	0.143	0.405

Source(s): Table by authors

compared to their male counterparts. These findings underscore the significance of gender in shaping SRI attitudes and highlight the potential implications for investment practices.

The results in Table 10 indicate a statistically significant difference in SRI decisions based on gender. Specifically, female participants reported higher levels of engagement in SRI ($p = 0.006$), greater consideration of the impact of companies on the environment ($p = 0.004$), a stronger preference for sustainably oriented portfolios ($p = 0.001$), a greater desire to promote environmental and societal causes ($p < 0.05$), and a stronger belief that their investments have a positive impact on the environment (<0.05) compared to male participants. These findings are consistent with previous research (Banerjee, 2023; Gupta, 2022; Lacurci, 2022; Money Crashers, 2020) and are significant for financial institutions and investment firms, which may need to tailor their marketing and investment strategies to attract more female investors. Moreover, it highlights the importance of gender diversity in investment decision-making, as

	t	df	p	Mean difference	SE difference	Cohen's d	SE Cohen's d
I engage in investments that are socially responsible	2.798	98	0.006	0.647	0.231	0.605	0.229
I am a socially responsible investor	2.239	99	0.027	0.495	0.221	0.483	0.224
I prefer sustainably oriented portfolios to make investments	3.231	99	0.002	0.707	0.219	0.697	0.233
I consider the companies' impact on the environment before investing in it	2.914	99	0.004	0.727	0.250	0.629	0.230
I aim to promote environmental and societal causes through my investment decisions	2.731	98	0.007	0.643	0.235	0.596	0.231
I believe that my investments impact the environment positively	2.701	99	0.008	0.688	0.255	0.583	0.228

Note(s): Student's *t*-test to compare mean scores between groups on various dimensions related to attitudes towards SRI. Cohen's *d* values suggest moderate to large effect sizes, highlighting the practical significance of the observed differences

Source(s): Table by authors

Table 10.
Gender differences in
attitudes towards SRI:
Independent Samples
T-Test Results

having a broader range of perspectives and insights may lead to more SRI decisions. This observation also underscores the need for more education and awareness campaigns aimed at male investors to promote SRI and ethical practices among them. In summary, this research has the potential to inform and influence the development of policies and practices related to SRI, with the ultimate goal of creating a more sustainable and responsible investment landscape.

5. Limitations

While this study provides valuable insights, it is essential to acknowledge its limitations. The relatively small sample size and geographic restrictions may limit the generalizability of the findings. While efforts were made to select a diverse sample, the results may represent something different than the broader population. Additionally, the study focused solely on individual investors, overlooking the perspectives of institutional investors and other stakeholders in the SRI industry. Future research could explore these viewpoints to gain a more comprehensive understanding of SRI in India. Furthermore, the study's cross-sectional nature prevents an examination of changes in behavior or attitudes over time. Longitudinal studies could offer deeper insights into the effectiveness of SRI interventions and the evolution of attitudes towards SRI.

Regarding the use of Bayesian linear regression, while the non-informative priors provide valuable insights into explored behavioral biases, several limitations should be acknowledged. Firstly, the sensitivity of the results to the choice of a non-informative prior must be recognized, emphasizing that different prior could yield divergent conclusions. It is crucial to note that the intentional exclusion of domain-specific information in non-informative priors limits the incorporation of valuable prior knowledge, which could enhance the model's performance and capture the dynamics of the studied phenomena more effectively. Despite being labeled as non-informative, these priors may carry implicit assumptions about data distribution, challenging the practical definition of truly non-informative priors. Furthermore, the risk of overfitting should be acknowledged, as non-informative priors may not penalize complex models as rigorously as informative priors, especially concerning the available data (van de Schoot *et al.*, 2014). Communicating uncertainty is another consideration, as non-informative priors may not effectively convey the inherent uncertainty in parameter estimates.

While this study contributes valuable insights into the drivers of SRI behavior in India, it is crucial to consider these limitations when interpreting the findings and drawing conclusions. Future research could address these limitations to further the understanding of SRI in India and its potential for promoting SRI practices. Another avenue for future research involves exploring the comparison between Ordinary Least Squares (OLS) regression and Bayesian regression in the context of SRI decision-making among Indian investors. Although Bayesian analysis was chosen as the primary methodological approach for this study due to its theoretical and practical advantages, comparing the results with those obtained through OLS regression could offer additional insights into the robustness and reliability of the findings.

6. Conclusion

Drawing from behavioral economics literature emphasizing nudging towards social responsibility (Pilaj, 2017), this study examines the influence of behavioral biases, such as herd behavior, overconfidence bias, and reactions to ESG news, on SRI decisions among Indian investors using Bayesian linear regression analysis. Additionally, the study investigates gender disparities in SRI decisions.

By integrating behavioral finance with sustainable finance within the Indian context, this study augments the existing literature, generating novel insights into the determinants shaping individual investment choices.

The study presents compelling evidence of the significant influence of behavioral biases on SRI decisions among Indian investors, particularly influenced by external factors such as social norms, group dynamics, and prevailing market trends. Conformity and peer behavior within social networks emerge as pivotal drivers of SRI choices, underscoring the need for investor education programs to raise awareness about SRI principles and potential impacts.

Moreover, overconfident investors prioritize their perspectives over those of others, particularly in financial decision-making. Concurrently, extreme weather events and climate changes drive shifts towards sustainability, emphasizing the significance of considering ESG factors in investment strategies to mitigate climate risks and promote positive societal impacts.

Additionally, the research identifies a stronger inclination among female participants towards sustainability and a greater desire to promote environmental and societal causes compared to male participants.

The implications of these findings reverberate across multiple stakeholders, including the economy, investors, financial advisors, investment managers, and policy-makers. They underscore the imperative of enhancing investor education and awareness to propagate SRI practices effectively.

Encouraging SRI behavior among investors involves identifying and addressing these biases. However, nudges must be carefully planned and aligned with investor values to avoid unfavorable responses and maintain SRI's reputation. Behavioral interventions and nudges should complement a comprehensive investment approach and, therefore, be implemented ethically and rigorously evaluated to ensure their effectiveness in promoting SRI practices.

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