Screening activity matters: Evidence from ESG portfolio performance from an emerging market

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Abstract:

Socially Responsible Investments (SRI) have recently generated much interest amongst asset owners, managers and academicians. Though the Efficient Market Theory suggests that stock prices fully reflect all available information, few existing studies indicate that ESG portfolios deliver superior risk-adjusted performance. ESG investing is at a nascent stage in India but is growing rapidly, especially after the COVID-19 pandemic. Asset managers always face the dilemma of choosing between different screening methods, screening intensities and stock weighting schemes to deliver outperformance. Our study attempts to investigate the impact of these portfolio construction criteria on the risk-adjusted performance of ESG portfolios in India. Our results show that there exists a trade-off between superior investment performance and unsystematic risk of ESG portfolios. Investors can benefit from investing in equally-weighted best-in-class portfolios constructed using ESG scores. We highlight the implications of our findings for asset owners, managers, index providers and regulators, and also provide directions for future research in the area of ESG portfolio management.

Keywords: ESG, sustainable finance, socially responsible investments, ethical investing, modern portfolio theory, portfolio performance, India

JEL classification: G11, G14, G15

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1. Introduction:

Climate change and finance needed to mitigate and reverse the negative climate change impacts have recently assumed paramount importance. The decisions at the Conference of Parties (COP26), which witnessed the adoption of the Glasgow Climate Pact, included strengthened efforts to build resilience to climate change, curb greenhouse gas emissions, and provide the necessary finance for both (UN Climate Change, 2022). Socially Responsible Investing (SRI) incorporates considerations such as climate change, pollution, executive remuneration and employee welfare. Launched in 2005, the UN Principles of Responsible Investing (UN PRI), which aims to help investors consider and implement Environmental, Social and Governance (ESG) factors in their investment decisions, is one of the main drivers of the SRI regime. Asset managers globally are rebranding their conventional products into sustainable offerings. Global sustainable funds attracted USD 97 billion in Q1 2022, less than the previous quarter due to inflationary pressures and the Ukraine war. However, Asian markets witnessed a 21% increase in sustainable fund flows during the same period (Morningstar, 2022). Among the emerging markets, India has recently witnessed an upsurge in the assets size of ESG funds. The ESG AUM in India jumped five-fold in the two years ending on December 2021[3]. The first ESG fund was launched in India in July 2019. A total of eight ESG mutual fund schemes exist as of June 2022, with an asset size of over USD 1,300 million.

SRI has recently seen a lot of research interest due to an upsurge in its investment inflows during the COVD-19 pandemic. ESG assets touched USD 1.65 billion in Q4 2020, boosted by record inflows during the pandemic. Given the significant growth in ESG assets, it is essential to understand the impact of the portfolio construction criteria on the investment performance of ESG

[3] Business Standard article titled "India ESG assets up 4.7 times in two years to Rs 12,300 crore, shows data" accessed on Aug 31, 2022 at https://bit.ly/3Q2VFJi

portfolios. The construction of ESG portfolios to earn superior risk-adjusted performance is a complex puzzle that has challenged asset managers globally. Different SRI settings, such as screening methods, screening intensity and stock weighting schemes, have different impacts on the investment performance of ESG portfolios (Widyawati, 2020). While extant literature is heavily concentrated on the performance evaluation of SR mutual funds, studies that investigate the impact of portfolio construction criteria on the risk-adjusted performance of SRI portfolios are limited and focused on developed markets (Lee et al., 2010; Lesser et al., 2016). The results of such studies are not contextual to emerging markets like India, which have their unique settings in terms of regulations, stage of market development and ESG coverage. Our study attempts to address this gap by empirically examining the impact of portfolio construction criteria on the risk-adjusted performance of synthetically backtested ESG portfolios in India. Our study has made a novel attempt to backtest portfolios based on ESG, E, S and G scores on Bloomberg using firms listed in an emerging market like India. We also study the impact of ESG screening on the idiosyncratic risk of ESG portfolios.

The findings of our study are helpful for researchers and policymakers in multiple ways. First, the results of our study are helpful to asset managers and index providers in developing ESG products that would deliver superior risk-adjusted performance to investors. Second, we caution investors about the significant level of diversifiable risk carried by portfolios constructed using ESG, E, S and G scores. Third, we call for measures from policymakers from emerging markets for better ESG reporting by firms. This would enable research agencies to increase the number of companies under their ESG coverage. Our study differs from two existing streams of the literature, namely, (i) studies that explore the empirical link between ESG performance and corporate financial performance (see Ahmad et al., 2021; Chen & Xie, 2022; Dalal & Thaker, 2019; Friede

et al., 2015; Nekhili et al., 2021); and (ii) studies that consider ESG as an additional risk factor (see Cheema-Fox et al., 2021; Pedersen et al., 2020; Zerbib, 2022). Overall, our study is relevant in present times since ESG investing is gaining traction globally and is a significant channel for tackling problems like climate change and social inequalities.

2. Review of Literature:

SRI is broadly defined as an investment process that involves identifying companies with high Corporate Social Responsibility (CSR) profiles where the latter are evaluated on the basis of Environmental, Social and Governance (ESG) criteria (Renneboog et al., 2008). The literature on SRI has advanced rapidly after the global financial crisis (Hua Fan & Michalski, 2020). We review the extant literature on SRI in two parts, viz., studies on the investment performance of SRI and those on the diversification of SRI portfolios.

2.1 The investment performance of SRI:

Existing literature is replete with empirical evidence on the relationship between ESG performance and investment performance. Results from these studies broadly show that the risk-return characteristics of ESG integrated strategies do not differ from the non-ESG integrated strategies (see Friede et al., 2015 and Revelli & Viviani, 2015 for a review). One body of literature compares the investment performance of companies that score good and bad on the ESG parameters (Ashwin Kumar et al., 2016; Galema et al., 2008; Humphrey et al., 2012; Mollet & Ziegler, 2014), while few researchers compare the performance of SR indices with conventional indices (Arias Fogliano de Souza Cunha & Samanez, 2013; Belghitar et al., 2014; Charfeddine et al., 2016; Demetriades & Auret, 2014; Ortas et al., 2012; Sauer, 1997; Tripathi & Kaur, 2020; Vasal & Singh, 2009). The results of such studies may be affected by

the differences in the index construction rules employed by different index providers. Research in developed countries has attempted to compare the risk-adjusted performance of SR and conventional mutual funds. Generally, such studies report no significant return difference between the two fund types. This approach has certain problems - SRI funds do not stay "true-to-label" as they are initially marketed (Henke, 2016; Utz & Wimmer, 2014; Wimmer, 2012). As a result, it becomes questionable whether packaged SRI products are suitable for investigating the link between ESG and investment performance. Contrary to the "real" SR funds that outperform the conventional ones, these "disguised" funds reveal no difference in investment performance from the conventional funds. Moreover, Kempf & Osthoff (2007) pointed out that the financial performance of mutual funds cannot be attributed only to the SR aspect alone but also to the fund manager's skills.

Empirical studies that compare the performance of SR funds with conventional funds provide three conflicting views on the economic rationale behind SR investments. The "doing good while doing well" hypothesis holds where empirical findings indicate a positive relationship between corporate social performance and investment performance and suggests that investors can benefit (lose) from choosing high (low) rated stocks (Kempf & Osthoff, 2007a; Lean et al., 2015; Pizzutilo, 2021; Rathner, 2013; Renneboog et al., 2008). This hypothesis seems to be motivated by the "slack resource theory", which states that firms with superior CFP can afford to invest in socially responsible activities. Previous studies indicate that investors may do well financially while doing social good if SRI filters enable fund managers to identify firms with superior corporate governance or to avoid the potential costs of corporate crises (Renneboog et al., 2011). Two arguments support this conjecture. The first argument is that superior environmental and social performance signals high managerial

quality that translates into favourable financial performance. For example, firms may adopt a CSR policy as an informational signal by which stakeholders can judge its quality or reputation (Fombrun & Shanley, 1990). Such signals can enable a firm to attract more committed employees or can enhance a firm's reputation as a provider of trustworthy quality products (Fisman, 2006). The second argument is that ESG screening can reduce the high costs of corporate social crises, lawsuits, or environmental disasters. If financial markets undervalue the cost of such rare events, then portfolios comprising firms with good ESG profiles can outperform broad markets. The "doing good but not well" hypothesis suggests that firms which use their resources for socially responsible activities jeopardise the welfare of their shareholders and may be at a relative disadvantage compared to firms which are less socially active (Auer & Schuhmacher, 2016). The third view is neutral and opines that SRI neither adds nor destroys portfolio value because the socially responsible activities of the firm are not priced (Brammer et al., 2006; Halbritter & Dorfleitner, 2015; Humphrey et al., 2012; Mollet & Ziegler, 2014). Investors and asset managers can thus, implement an SRI strategy without incurring significant financial cost in terms of risk or return.

Recent research has focused on building synthetic portfolios of SR stocks based on historical price and ESG data (Auer & Schuhmacher, 2016; C. Clark & Lalit, 2020; Demetriades & Auret, 2014; Gougler & Utz, 2020). This method of backtesting portfolios has certain advantages over using existing SR funds. ESG ratings allow for a more appropriate approach, as they directly measure the Corporate Social Performance (CSP) at the company level (Halbritter & Dorfleitner, 2015). ESG ratings by independent rating agencies (like Bloomberg, Sustainalytics, MSCI, Refinitiv, etc.) provide a holistic and objective view of the social responsibility aspect of the company's activities. In contrast to SRI funds and indices,

ESG ratings result in large panel data sets offering a considerably more precise understanding of how sustainability influences a firm's return (Halbritter & Dorfleitner, 2015). Studies that have built synthetic portfolios of SR companies have empirically tested multiple stock selection methods like positive screening, negative screening and best-in-class approach. Using social characteristic scores of companies in the US over the period January 1992 – September 2007, Statman & Glushkov (2009) found that socially responsible investors can gain an advantage over conventional investors by tilting their portfolio towards high-scoring companies. This finding is consistent with the "doing good while doing well" hypothesis. The study also found that shunning low-scoring stocks leads to underperformance compared to conventional investors, thereby confirming the "doing good but not well" hypothesis. Combining positive and negative screening strategies offsets the advantage and leaves investors with no incremental return. The findings of this study suggest that the construction of best-in-class portfolios tilted toward stocks with high social responsibility ratings and avoiding negative screening can deliver superior outperformance. Kempf & Osthoff (2007) also concluded that it is not possible to achieve significant abnormal returns by employing negative screening. Blitz & Swinkels (2021) also confirmed that excluding sin stocks involves risk related to market and peers, thus confirming the previous studies. Positive and best-in-class screening techniques deliver abnormal returns, the maximum being in the latter technique. These results are not sensitive to the stock weighting technique – equal weighting or value weighting. Derwall et al. (2011) constructed portfolios of shunned stocks and stocks of companies with strong employee relations from 1992 – 2008. The study found that the former portfolio delivered significantly positive abnormal returns over all time horizons while the latter portfolio's performance declined as the performance evaluation horizon increased.

These results are in contradiction with the earlier studies by Statman & Glushkov (2009) and Kempf & Osthoff (2007), which confirmed the "doing well while doing good" hypothesis. Derwall et al. (2011) also confirmed the findings of other studies on SR mutual funds, which point out that SR and conventional funds earn similar risk-adjusted returns. Since most SRI funds employ a combination of positive and negative screens, they tend to cancel out any outperformance. On similar lines, Cornell (2021) concluded that increased investor preference for stocks with high ESG ratings would lead to higher stock prices and lower expected returns. Gougler & Utz (2020) found that the risk-adjusted performance of best-in-class ESG portfolios is similar to the five-factor market model; however, such portfolios exhibit lower idiosyncratic risk. In contrast to the results of Nofsinger & Varma (2014), Lean & Pizzutilo (2021) found that SR and conventional indices performed similarly in all market conditions. They also did not find evidence to support the insurance function of SR indices; however, SR indices carried higher idiosyncratic risk than conventional indices. Similar evidence was reported by Su (2021) in the context of green investment stocks in China, where such stocks lagged conventional stocks in terms of returns and exhibited higher downside risks. Capelle-Blancard & Monjon (2014), Henke (2016), Leite & Cortez (2015) and Lesser et al. (2016) have argued that the performance of SRI is related to the screening processes used by the asset manager.

A critical review of SRI conducted by Renneboog et al. (2008) suggests that existing studies on SRI do not explicitly demonstrate that SRI investors are willing to accept suboptimal financial performance to pursue social or ethical objectives. The SRI movement in the existing literature groups investors based on their investment motives into two categories: values-driven and profit-seeking. Based on this distinction, Derwall et al. (2011) distinguished between two hypotheses, viz., the "shunned stock hypothesis" and the "errors-in-expectations"

hypothesis. The former hypothesis states that socially controversial stocks outperform the broad market because values-driven investors avoid investing in such stocks, pushing their prices below those of responsible stocks (Derwall et al., 2011a). In contrast, the "error-in-expectations" hypothesis states that socially responsible stocks deliver higher risk-adjusted performance because the market is slow to recognise the positive impact of CSR practices on companies' expected future cash flows (Derwall et al., 2011a).

Using stock-level data of companies included in the Dow Jones Sustainability Index (DJSI) during 2014 and 2015, Ashwin Kumar et al. (2016) found that companies incorporating ESG factors show lower volatility in their stock performances than their peers in the same industry. However, each industry is affected differently by ESG factors. Tripathi & Kaur (2020) investigated the performance of SRI in BRICS nations and concluded that ESG indices performed better than market benchmarks without penalising the investors with additional risk. The study observed that during crisis and non-crisis times, the ESG India index outperformed the market benchmark, proving to be an all-time investment haven. In the Indian scenario, Vasal (2009) concluded that the SRI portfolio in India has generated shareholder returns that are at least as attractive as those of the market from January 2005 to September 2008. Tripathi & Bhandari (2015) observed evidence in contradiction to the Modern Portfolio Theory, where portfolios of socially responsible stocks delivered significantly higher risk-adjusted performance compared to broad market benchmark indices in India.

The extant literature is replete with studies from different geographies focusing on the impact of ESG performance and investment performance. Most of these studies focus on capital markets from developed countries, especially the US (Widyawati, 2020). The results of these studies are contextual, given their geographies, time periods, ESG data and performance

evaluation tools used. Despite some academic evidence on the fact that SRI delivers positive abnormal returns (Clark, 2021; Kempf & Osthoff, 2007; Lean et al., 2015; Mollet & Ziegler, 2014; Statman & Glushkov, 2009), there seems to be a lack of consensus on which ESG dimension, screening method, screening intensity or weighting scheme positively impacts investment performance. SRI performance in emerging economies has gained increasing attention, especially during the financial crisis caused due to the COVID-19 pandemic. ESG investing was introduced in India very recently, and a total of eight ESG mutual fund schemes exist as of June 2022. Different SRI settings, such as screening mechanisms and screening intensity, can have different impacts on the investment performance of SRI portfolios (Widyawati, 2020). Hence, our study aims to study the impact of the screening method, screening intensity and weighting mechanisms on the investment performance of synthetically constructed ESG portfolios. We study the relationship between these ESG criteria on portfolio performance in India.

2.2 The diversification of SRI portfolios:

The diversification problems of the SRI portfolios are discussed in several studies; however, few of them investigate whether SRI portfolio strategies involve significant idiosyncratic risk[4]. Bello (2005) used the portfolio's normalised residual variance, calculated by Jensen's (1968) alpha market model, as a measure of the portfolio's degree of diversification to investigate the extent to which the ethical screening of stocks affects the level of diversification and risk-adjusted performance of SR MFs. The results suggested that SR MFs do not significantly differ from conventional funds with respect to the portfolio

[4] Idiosyncratic risk is also known as unsystematic risk, company specific risk or diversifiable risk. It is referred interchangeably in this article.

composition, diversification or investment performance. Luo et al. (2009) concluded that higher expenditure on CSP results in lower unsystematic risk, especially in case of firms which spend more on advertisement. Lee et al. (2010) tested the proposition that imposing non-financial screens restrict investment opportunities, reduces diversification efficiencies and thereby adversely impacts performance. They concluded that the screening intensity has no effect on the raw returns or idiosyncratic risk of SRI portfolios. Humphrey & Tan (2014) investigated the impact of positive and negative screening on SRI portfolio performance and risk. They found that the returns and risks of the screened portfolios do not significantly differ from those of the unscreened portfolios. He et al. (2022) found that ESG information disclosures enhance the informational efficiency of the stock market and reduce a firm's idiosyncratic risk. Pizzutilo (2017) devised a simple measure of the residual unsystematic risk of a selective investment portfolio strategy like SRI. He empirically employed this measure to analyse whether the MSCI SR indices carry significant levels of volatility that could be diversified by avoiding social screenings. The study concluded that a low but not negligible part of the volatility of the returns could be diversified by not restricting the investment to SR stocks.

Studies on the diversification problems of SR portfolios that focus on the idiosyncratic risk of SRI are sparse. Existing studies focus on indices and funds from developed countries. To the best of our knowledge, studies have not attempted to measure the level of idiosyncratic risk of synthetically backtested SRI portfolios. We attempt to empirically compute the idiosyncratic risk of synthetically backtested SRI portfolios in India.

3. Hypotheses:

Different SRI portfolio construction criteria, such as screening mechanisms and screening intensity, can have different impacts on the investment performance of SRI portfolios (Rathner, 2013; Widyawati, 2020). SRI studies in emerging markets have gained increasing attention (Widyawati, 2020). A study on Brazilian stocks by Ortas et al. (2012) indicates that SRI performs as well as the market in bullish periods. Arias Fogliano de Souza Cunha & Samanez (2013) find that SRI portfolios suffer from losses in periods of crisis due to constraints that lead to higher risks. South African SRI research reveals no significant impact of ESG on financial performance (Demetriades & Auret, 2014; Gladysek & Chipeta, 2012). ESG investing is at a very nascent stage in India. Academic research on different ESG portfolio construction criteria and their impact on risk-adjusted performance and diversification will guide asset managers and index providers. These facts motivate our hypotheses which aim to study the relationship between ESG criteria and portfolio performance in the Indian context.

Hypothesis 1: Abnormal returns from stock portfolios backtested using ESG, E, S and G scores that employ positive screening are statistically different from those that employ best-in-class screening.

An increase in ESG screening intensity would lead to the creation of portfolios with higher ESG scores. Following the "doing good while doing well" hypothesis, we expect stocks with higher ESG scores to deliver higher risk-adjusted performance than stocks with lower ESG scores.

Hypothesis 2: An increase in stock screening intensity leads to an increase in the abnormal returns from stock portfolios backtested using ESG, E, S and G scores.

Following the Portfolio Theory propounded by Markowitz (1952), we hypothesise that ESG portfolios have problems of diversification and optimisation since they are constructed from

a restricted universe of investments, thus leading to higher unsystematic risk. Traditionally, investors are assumed to make investment decisions considering only the risk and return of the investment securities. However, SRI investors consider ESG aspects of their investments in addition to the risk and return factors. We thus hypothesise the following about the unsystematic risk of ESG portfolios.

Hypothesis 3: The unsystematic risk of the stock portfolios back tested using ESG, E, S and G scores is significantly higher than the broad market benchmark.

4. Data and Research Design:

This section describes the dataset used and the methodology implemented in the empirical analysis. First, we describe the ESG scores used to construct the portfolios. Second, we explain the methodology followed to synthetically back test ESG portfolios on Bloomberg. The next section explains the asset pricing models used to assess portfolio performance. The final section explains the methodology used to compute the unsystematic risk of ESG portfolios.

4.1 Bloomberg ESG scores:

ESG ratings by independent rating agencies (like Bloomberg, Sustainalytics, MSCI, Refinitiv, etc.) provide a holistic view of the social responsibility aspect of the company's activities. They surpass any subjective biases in the minds of SR investors and help them to include (or exclude) companies and weight them appropriately in socially responsible portfolios. Bloomberg ESG data covers 120 environmental, social and governance indicators, including carbon emissions, climate change effect, pollution, waste disposal, renewable energy, resource depletion, supply chain, political contributions, discrimination, diversity, community relations, human rights, cumulative voting, executive compensation,

shareholders' rights, takeover defence, staggered boards, and independent directors (Hua Fan & Michalski, 2020). They have been used in earlier studies (Beloskar & Rao, 2022; Halbritter & Dorfleitner, 2015; Hua Fan & Michalski, 2020; Yu et al., 2020). Bloomberg monitors the ESG performance of listed companies by compiling data from annual reports, corporate social responsibility and sustainability reports, published disclosures and news sources, and company direct contact (Sustainable Finance | Bloomberg Professional Services). The Bloomberg ESG data covers stocks with mid ($2 billion) to large market capitalisations ($10 billion). Therefore, our sample of ESG-rated stocks is not represented by only large-cap stocks. Aligned with Refinitiv's ESG rating system, Bloomberg's ESG score ranges between 0 and 100 (with 0 being the lowest attainable score). Furthermore, a fitted normal distribution curve allows scores to range between 0 and 100, producing a comparable score across each dimension for listed ESG-rated companies. Bloomberg's ESG scores encompass 11,000 listed companies globally and assess 800 metrics to determine a firm-specific ESG score (*Sustainable Finance | Bloomberg Professional Services*).

4.2 ESG Portfolio Construction:

An upcoming approach in literature to analyse the effects of ESG criteria on portfolio performance is the construction of synthetic ESG portfolios. This approach enables the aggregation of a considerable amount of panel data in a single time-series dimension (Halbritter & Dorfleitner, 2015). This also allows the application of basic asset pricing models and provides a straightforward trading strategy for investors to exploit the relationship between ESG scores and investment performance. Also, as was previously noted, the construction of synthetic ESG portfolios to investigate the performance of SRI overcomes the

limitations associated with the assessment of SRI performance based on SRI mutual funds. We therefore follow Auer & Schuhmacher (2016), Halbritter & Dorfleitner (2015), Kempf & Osthoff (2007b) and Statman & Glushkov (2009) to synthetically back test ESG portfolios on Bloomberg.

For implementing the positive screening approach, we create stock screens consisting of stocks falling in the top (bottom) 10, 20, 30 and 50 percentiles as per their ESG, E, S and G scores from Bloomberg. We also implement a best-in-class screening approach where stock screens consist of stocks falling in the best (worst) 10, 20, 30 and 50 percentiles as per their ESG, E, S and G scores for each industry from Bloomberg. This approach intends to overcome problems of sector biases and loss of diversification (Gougler & Utz, 2020). The stocks forming part of the NIFTY 500 index are used as the investment universe for creation of the stock screens. The portfolios formed using the top or best-in-class stocks as per the ESG, E, S or G scores are referred to as high portfolios and the portfolios formed using the bottom or worst-in-class stocks as per the ESG, E, S or G scores are referred to as low portfolios. Using four kinds of Bloomberg sustainability scores (ESG, E, S and G scores), two screening approaches (positive screening and best-in-class screening), two screening types (high and low) and four screening intensities (10, 20, 30 and 50 percentiles), we created total 64 stock screens on Bloomberg. These screens were then backtested using equal weighting and value weighting schemes from January 2010 to December 2019. The outbreak of the COVID-19 pandemic was an outlier event that marked an unprecedented decline in global equity markets in the early months of 2020. The Indian equity markets observed high levels of volatility until the early months of 2022 due to the two waves of the pandemic. The pandemic period from January 2020 to December 2022 is not the focus of our study, and this period is not comparable

to normal years due to its outlier nature. Since other studies have already investigated the investment performance of ESG stocks and portfolios during the pandemic (Beloskar & Rao, 2022; Broadstock et al., 2020; Omura et al., 2020; Pavlova & de Boyrie, 2022), we restrict our data period till December 2019 to avoid any influential effect of the COVID-19 pandemic on our findings. We also created long-short portfolios consisting of long positions in the high portfolios and short positions in the low portfolios. Overall, we backtested 192 portfolios using different Bloomberg sustainability scores, screening approaches, screening types, screening intensities and weighting schemes. In line with the broad market benchmark of the Indian equity market, NIFTY 50, these portfolios were rebalanced semi-annually on January 31 and July 31 every year. We obtain the monthly returns of these portfolios from Bloomberg for our analysis. A brief snapshot of the total number of portfolios backtested on Bloomberg is provided in Table 1. We also illustrate the process followed for backtesting these portfolios on Bloomberg in Fig 1.

Insert **Table 1** here

Insert **Fig 1** here

4.3 Performance Measurement:

In the context of the Capital Asset Pricing Model (CAPM), Jensen's alpha is a widely used measure of risk-adjusted investment performance. Since CAPM is a one-factor model that only accounts for the excess return of the market portfolio, it suffers from some limitations. Fama & French (1993) added value and size factors to CAPM and proposed a three-factor model. Later, Carhart (1997) improved the model by adding the momentum factor proposed

by Jegadeesh & Titman (1993), suggesting that a four-factor model displays more explanatory power than its predecessors. The Carhart (1997) four-factor model is probably the most commonly used model in the finance literature to assess portfolio performance, including the performance of synthetic SRI portfolios (Bauer et al., 2006; Kempf & Osthoff, 2007a). Since the beginning of the new millennium, the Carhart (1997) multifactor model - which controls for size, book-to-market and momentum - has become the standard for studying the performance of SRI MFs and portfolio strategies (Pizzutilo, 2017). Therefore, we use the Carhart (1997) four-factor model to assess the performance of the stock portfolios constructed using ESG, E, S and G scores.

$$R_{i,t} - R_{f,t} = \alpha_{i,t} + \beta_{1,i} (R_{m,t} - R_{f,t}) + \beta_{2,i} SMB_t + \beta_{3,i} HML_t + \beta_{4,i} MOM_t + \varepsilon_{i,t} \quad (1)$$

where $R_{i,t}$ is the return on the portfolio i in period t; $R_{f,t}$ is the risk-free rate which is computed using the 91-days T-bill rate; $R_{m,t}$ is the return of the market portfolio; SMB_t is the return difference between a small and a large capitalisation portfolio in month t; HML_t the return difference between a portfolio of high book-to-market stocks and a portfolio of low book-to-market stocks and MOM_t is the return difference between the portfolio of the past 12-month return winners and losers. NIFTY 50 and NIFTY 50 equal-weighted indices are taken as proxies for the market portfolios for value-weighted and equal-weighted ESG portfolios, respectively. The NIFTY 50 index is one of India's broad-based market indices consisting of 50 large cap and liquid stocks listed on the National Stock Exchange (NSE) of India. It provides a fair representation of the Indian equity market, covering different industries and focusing on portfolio diversification, liquidity and replicability. The market capitalisation of the constitutents of the NIFTY 50 index account for about 70% of the market capitalisation of all stocks listed on NSE. It is also the most preferred index for index derivatives. It has been

found to represent the general market movements better and is hence considered a better proxy for the market portfolio by studies in the Indian context (Beloskar & Rao, 2022; Rajgopal & Tantri, 2022; Rao et al., 2021; Tripathi & Bhandari, 2015). The NIFTY 50 equal-weighted index bears a high correlation (97%) with the NIFTY 50 index during the period of our study. Hwang & Satchell (2002) noted that the difference in the returns of the equally-weighted and value-weighted market indices in the USA and UK is marginal. They also observed no difference in the estimated beta co-efficients when returns on the equally-weighted and the value-weighted market portfolios are used as a proxy for market return. The seminal works of Fama & MacBeth (1973) and Gibbons et al. (1989) have also used equally-weighted portfolios as market proxies in their study. The beta co-efficients measure the risk with respect to each factor, and Jensen's alpha, $\alpha_{i,t}$, measures the average abnormal return of an ESG portfolio in excess of the return on the market portfolio and other factors. Data on the SMB, HML, MOM factors and the risk-free rate for the Indian market were taken from the database maintained by Prof. Jayanth Varma, IIM Ahmedabad (Agarwalla et al., 2013).

We use the Carhart (1997) four-factor model to test the first two hypotheses of our study. First, we hypothesise that the abnormal returns from portfolios constructed using ESG, E, S and G scores that employ positive screening are statistically different from those that employ best-in-class screening. To test this hypothesis, we employ the Carhart (1997) four-factor model and calculate Jensen's alpha for equally weighted ESG portfolios that employ positive and best-in-class screening with 10% screening intensity. We repeat the same exercise for portfolios constructed based on E, S and G scores. Our second hypothesis states that an increase in stock screening intensity leads to an increase in abnormal returns from portfolios constructed using ESG, E, S and G scores. To test this hypothesis, we calculate Jensen's alpha

for portfolios constructed based on ESG, E, S and G scores with high (low) 10%, 20%, 30% and 50% screening intensities and equal weighting scheme. Here, we follow the screening approach that provides significantly higher abnormal returns as per the first hypothesis.

4.4 Unsystematic Risk of ESG portfolios:

We hypothesise that the unsystematic risk of the portfolio constructed based on ESG, E, S and G scores is significantly higher than the broad market benchmark due to limited diversification opportunities.

We use the measure of the residual unsystematic risk of a selective portfolio strategy proposed by Pizzutilo (2017). Pizzutilo (2015) proved the following equation to measure the diversifiable risk of an SRI portfolio.

$$UR = \sigma_{\lambda} (1- \rho_{\lambda,m}) \quad (2)$$

where UR denotes unsystematic risk, λ denotes a single stock or a portfolio of stocks, m denotes the broad market, σ_{λ} denotes the standard deviation of the returns of the stock or portfolio of stocks, $\rho_{\lambda,m}$ denotes the correlation between the returns of the stock or portfolio of stocks and the market.

For a perfectly diversified portfolio of stocks, the result of equation (2) is zero. Imperfect diversification creates a positive unsystematic risk since the correlation between the returns of the portfolio and the market is imperfect. In such cases, equation (2) is a positive value which denotes the volatility of the stock returns or the portfolio that could have been eliminated by perfectly diversifying the portfolio of stocks, assuming the classic portfolio theory given by Markowitz H. (1959).

We measure the unsystematic risk of the SRI portfolio by employing equation (2). Here, we use the portfolios constructed based on ESG, E, S and G scores that deliver the highest risk-adjusted return as per hypotheses 1 and 2. According to Pizzutilo (2015), for employing equation (2), the portfolio or the stocks analysed should be related to the market with respect to which the correlations are calculated; otherwise, the results could be spurious and misleading. Hence, to avoid the results from being influenced by non-comparable indices, the study employs the NIFTY 500 index as the broad market index in equation (2). Stocks forming part of the NIFTY 500 index were taken as the universe for constructing the portfolios based on ESG, E, S and G scores. Thus, we empirically measure the loss in diversification faced by investing in an SRI portfolio rather than in the broad market. As a robustness check, we also calculate the unsystematic risk with reference to (a) the NIFTY 50 index, India's flagship broad market index; and (b) the NIFTY LargeMidcap 250 index, which reflects the performance of a portfolio of 100 large-cap and 150 mid-cap companies listed on NSE. Rolling period returns of the portfolios constructed based on ESG, E, S and G scores and the market indices for 60 trading days (approximately three calendar months), 250 trading days (approximately one year), and 500 trading days (approximately two years) were calculated based on the data obtained from Bloomberg. The calculations involving rolling period returns may be particularly significant for practitioners as they help to understand the return variations over different market conditions. Rolling returns help investors to understand the consistency in the investment performance of the portfolio. We used a t-test to determine whether the unsystematic risk of the portfolios constructed based on ESG, E, S and G scores is significantly different from zero.

As a robustness check, we also calculate unsystematic risk for the portfolios constructed based on ESG, E, S and G scores and the NIFTY 500 index by using the below-mentioned identity of the Capital Asset Pricing Model (CAPM).

$$\sigma_p^2 = \beta_p^2 \sigma_m^2 + \sigma_{\epsilon p}^2 \quad (3)$$

where σ_p^2 is the variance of portfolio returns; β_p is the beta of the portfolio; σ_m^2 is the variance of market returns, and $\sigma_{\epsilon p}^2$ is the unsystematic risk of the portfolio.

We use the NIFTY 50 index as a proxy for the broad market in equation (3). We calculate the mean unsystematic risk as a percentage of total portfolio risk for the portfolios constructed based on ESG, E, S and G scores and the NIFTY 500 index and use a t-test to test for significant differences between the two.

5. Results and Discussion:

This section presents the results of our studies in two parts. First, we present the results of the empirical tests conducted to study the impact of portfolio construction criteria on the investment performance of the portfolios constructed based on ESG, E, S and G scores. The following section presents results related to the unsystematic risk of the portfolios.

5.1 ESG portfolio construction criteria and investment performance:

This section reports and discusses the results of the performance evaluation of portfolios constructed based on ESG, E, S, and G scores. We investigate whether the screening approach, viz., positive screening or best-in-class screening affects the risk-adjusted performance of the portfolios constructed based on ESG, E, S and G scores. Tables 2-A, 2-B, 2-C and 2-D present the descriptive statistics of the portfolios synthetically back tested using Bloomberg ESG, E,

S and G scores. In the case of most of the high portfolios, an increase in the screening intensity leads to a marginal increase in the average monthly portfolio performance. Except for the portfolios constructed using G scores, the best-in-class portfolios with a higher screening intensity have a higher number of stocks than their positively screened counterparts. This is in line with the function of best-in-class screening, which aims to achieve greater diversification by ensuring stock selection across sectors (Gougler & Utz, 2020). We use the Carhart (1997) four-factor model to evaluate the performance of the stock portfolios constructed using ESG, E, S and G scores. The performance of high, low and long-short portfolios formed using positive screening and best-in-class screening are reported in Table 3. The screening intensity is 10%, and constituent stocks are equally weighted. We have checked for multicollinearity, heteroskedasticity, and autocorrelation in all our models. None of the models has a Variance Inflation Factor (VIF) of more than 10. We have also implemented the Newey & West (1987) correction to all our models and report only heteroskedasticity and autocorrelation consistent estimates.

Insert **Table 2-A** here

Insert **Table 2-B** here

Insert **Table 2-C** here

Insert **Table 2-D** here

Insert **Table 3** here

The performance evaluation of ESG portfolios presented in panel A of Table 3 shows that high portfolios with positive screening and best-in-class screening deliver significant abnormal returns, as indicated by the significant intercept values. Portfolios with low-rated ESG stocks do not deliver any significant outperformance. However, the long-short portfolios exhibit insignificant yet negative alphas indicating that negative screening proves to be detrimental to investment performance as it erodes the alpha of the positively screened ESG portfolio. This result is in agreement with the findings of Blitz & Swinkels (2021), Derwall et al. (2011b) and Kempf & Osthoff (2007). They reported the adverse effects of negative screening on the investment performance of SRI portfolios. Derwall et al. (2011b) reported that most SRI funds do not significantly outperform conventional mutual funds since they employ a combination of positive and negative screens, which tends to cancel out the outperformance.

The results of the portfolios backtested based on environmental scores are presented in panel B of Table 3. Only the high portfolio with best-in-class screening delivers significant abnormal returns. This result is in contradiction with the findings of Su (2021) who observed underperformance of green investment stocks compared to conventional stocks in China. Low portfolios and long-short portfolios did not deliver any significant alpha. The long-short portfolio constructed by going long on the high and short on the low portfolios delivered insignificant alpha, reiterating the alpha erosion by negative screening. In case of portfolios backtested based on social and governance scores (panels C and D of Table 3), high portfolios with positive screening and best-in-class screening deliver significant abnormal returns, while low portfolios have insignificant outperformance. The alpha erosion by negative screening is

substantial, which brings the outperformance of the long-short strategy to an insignificant level.

The risk factors explain most of the variation in the portfolio returns since their co-efficients are significant at 5% level with the exception of the momentum factor in the case of a few low and long-short portfolios. The high and low portfolios are more exposed to market risk than the long-short portfolios. The portfolios with high ESG scoring firms are less exposed to size and book-to-market risk, meaning that the high-rated portfolios are less exposed to small capitalisation stocks and value firms than low-rated portfolios. The co-efficient of the momentum factor is negative and significant for the bottom 10% equal-weighted environmental and governance portfolios, indicating that these portfolios consist of firms with poor past performance. On the other hand, the equal-weighted positively screened portfolio formed using the top 10% stocks as per E scores consists of more past winners. These results are contradictory to the results of Derwall et al. (2005), where the portfolio of companies ranking high in eco-efficiency had a negative momentum coefficient. A comparison of the alphas generated by the portfolios shows that the best-in-class screening approach should be preferred for constructing portfolios constructed based on ESG, E, S and G scores since this approach delivers the highest risk-adjusted performance. Among the different ESG dimensions, the best-in-class portfolios constructed using governance scores delivered the highest abnormal returns compared to the others.

Next, we test whether abnormal returns of the portfolios are affected by the intensity of stock screening as per the ESG, E, S and G scores. Accordingly, the performance of high, low and long-short portfolios formed using best-in-class screening using 10%, 20%, 30% and 50% screening intensities are reported in Tables 4-A, 4-B, 4-C and 4-D.

Insert **Table 4-A** here

Insert **Table 4-B** here

Insert **Table 4-C** here

Insert **Table 4-D** here

The results show that best-in-class portfolios deliver significant positive alphas. In contrast, the worst-in-class and long-short portfolios do not show any significant positive abnormal returns, with the exception of the portfolio constructed using worst-in-class 50% social scores. We observe an increase in the abnormal returns of ESG portfolios with an increase in the screening intensity. The co-efficients of the factor loadings remain the same as earlier. Overall, we conclude that 10% screening intensity should be preferred for best-in-class portfolios constructed using ESG, E, S, and G scores since it delivers the highest alpha amongst all the screening intensities. As a robustness check, we also evaluate the performance of value-weighted portfolios constructed based on ESG, E, S and G scores with different screening intensities. The results reported in Table 5 show that except for the value-weighted best-in-class portfolio formed using G scores and 10% screening intensity, all other portfolios deliver either a negative or insignificant risk-adjusted performance. All other value-weighted portfolios constructed using different scores and screening intensities do not deliver significant outperformance on a risk-adjusted basis. For the sake of brevity, we only report the performance estimates of portfolios with 10% screening intensity. For the value-weighted portfolios constructed using G scores, we test whether the abnormal returns are affected by

the intensity of stock screening. The results reported in Table 6 show that the best-in-class portfolio with 10% screening intensity delivers a positive and significant outperformance. However, this outperformance is less than that of its equally-weighted counterpart. Thus, our findings are robust irrespective of the use of equally-weighted or value-weighted portfolio returns. Our study concludes that the equal-weighted best-in-class screening with 10% screening intensity should be preferred for constructing portfolios using ESG, E, S, and G scores since they provide the highest risk-adjusted returns. In the next section, we empirically test the unsystematic risk of the best-in-class equal-weighted portfolios constructed at 10% screening intensity of ESG, E, S and G scores. These portfolios were considered for our analysis since they provided the highest risk-adjusted performance.

Insert **Table 5** here

Insert **Table 6** here

5.2 Unsystematic risk of ESG portfolios:

Well-diversified portfolios would carry negligible unsystematic risk, while an imperfectly diversified portfolio would carry positive unsystematic risk (Pizzutilo, 2017). In such cases, the correlation between the returns of the portfolio and the market would not be perfect; hence, unsystematic risk, as per equation (2), would be a positive value. This positive value would denote the portfolio's return volatility, which could be minimised or eliminated by perfectly diversifying the portfolio of stocks. We have employed equation (2) to measure the unsystematic risk of the best-in-class equal-weighted portfolios constructed at 10% screening

intensity of ESG, E, S and G scores. We used 60, 250 and 500-days rolling period returns of the portfolios constructed based on ESG, E, S and G scores and the market indices to calculate the unsystematic risk as per equation (2). We used a t-test to determine the statistical significance of the unsystematic risk of the portfolios constructed based on ESG, E, S and G scores calculated as per equation (2).

The values in Table 7 show the mean, median, minimum and maximum unsystematic risk of the portfolios calculated as per equation (2). The mean unsystematic risk denotes the portion of the total risk of the portfolio that could be diversified by not restricting investment to SRI stocks but investing in the corresponding broad market. We have used the NIFTY 50 index, NIFTY 500 index and NIFTY Large Midcap 250 index as proxies of the broad market in equation (2). To aid readability, we have annualised the values of unsystematic risk. To understand the unsystematic risk, we also report the standard deviation of the unsystematic risk of the portfolios. Percentage values express the part of the total risk of the SRI portfolio that could be diversified by not restricting investments to SRI stocks.

Insert **Table 7** here

The results of the t-tests show that the mean unsystematic risk of the portfolios constructed using ESG, E, S, and G scores is statistically significant. The results indicate that a considerable part of the volatility of the returns could have been diversified by not limiting the investment to SRI stocks. This finding is in line with the findings of Lean & Pizzutilo (2021). The portfolio constructed using social scores suffers from higher risk due to loss of diversification compared to portfolios constructed using other scores. Notably, the lowest unsystematic risk values were measured for portfolios constructed using governance scores

(only 0.69% and 0.67% of the total volatility could have been diversified by investing in the NIFTY Large Midcap 250 index). No significant change in the mean unsystematic risk is observed over different time horizons in the analysis. However, a larger time horizon reduces the variability and the range of the unsystematic risk borne by the SRI portfolios. For example, the standard deviation of unsystematic risk of the ESG portfolio drops from 0.60 to 0.48 and 0.41 as the time horizon of the analysis increases from 60-days to 250 and 500-days, respectively. This indicates that investors should stay invested in SRI portfolios for longer time periods to minimise their exposure to unsystematic risk. Surprisingly, greater levels of unsystematic risk are observed when the analysis is conducted with respect to the NIFTY 50 index rather than the NIFTY 500 index. The limited diversification of SRI portfolios can be attributed to the limited ESG coverage by Bloomberg. As of December 2020, only the top 330 stocks by market capitalisation were rated on ESG parameters by Bloomberg. This implies that few stocks from the small-cap space are under ESG coverage. As the ESG coverage of research agencies increases in the future, SRI portfolios can achieve a considerable level of diversification.

We confirm the robustness of our results by calculating the unsystematic risk of the portfolios constructed based on ESG, E, S and G scores and the NIFTY 500 index by employing equation (3). We use a t-test to check for significant differences in the mean unsystematic risk as a percentage of total portfolio risk for the portfolios constructed based on ESG, E, S and G scores and the NIFTY 500 index. The results of the t-test are presented in Table 8.

Insert **Table 8** here

The results of the t-test indicate that the unsystematic risk of the portfolios constructed based on ESG, E, S and G scores are more than four times that of a well-diversified market benchmark. Notably, the unsystematic risk of the portfolio constructed using social scores is the highest, followed by the portfolio constructed using environmental scores. The portfolio constructed using governance scores has the least unsystematic risk. These results reiterate our earlier findings, which showed that the unsystematic risk of SRI portfolios is higher than the broad market because of restrictions on diversification. Thus, the excess returns delivered by the ESG portfolio are on account of the additional unsystematic risk of the portfolio.

6. Conclusion:

SRI is a considerably new concept in emerging markets. India has recently seen the advent of ESG mutual funds, and their AUM growth has been phenomenal since the COVID-19 pandemic. Investor demand for ESG products is increasing globally with an increased focus on positive and best-in-class screening (Amir & Serafeim, 2018). However, the correct combination of different portfolio construction criteria in emerging markets was not investigated in the literature. Hence, we examined the impact of portfolio construction criteria on the risk-adjusted performance of ESG portfolios in India. We also examined whether limiting the investment universe to ESG stocks leads to a significant increase in the unsystematic risk of ESG portfolios.

Towards the end of our article, we reconcile our findings with earlier studies on the performance evaluation of ESG portfolios. Our study validates the findings of Statman & Glushkov (2009) and Gougler & Utz (2020), which provided evidence in support of the best-in-class screening method and against negative screening. We also confirm the evidence against negative screening by Blitz & Swinkels (2021) and Kempf & Osthoff (2007b). Extending the

evidence provided by Tripathi & Kaur (2020), we add to the literature on the investment performance and unsystematic risk of ESG portfolios in the context of the Indian market. Our study makes a novel attempt to measure the unsystematic risk of ESG portfolios in India using the measure proposed by Pizzutilo (2017).

Our study makes several practical contributions to the extant literature on SRI. The findings of our study show that best-in-class screening with 10% screening intensity of ESG, E, S and G scores delivers superior investment performance. However, this involves a risk trade-off. Loss of diversification increases the idiosyncratic risk of such portfolios. From a practical lens, our empirical findings guide asset managers and index providers in emerging markets to create ESG products that provide superior risk-adjusted performance to investors. Our study also contributes to the literature on the distinction between values-driven and profit-seeking investors. Values-driven investors prioritise social performance over the financial performance of firms. The latter set of investors seeks potential positive alphas from their investments over social values. The results of our study indicate that values-driven investors can employ best-in-class screening with 10% screening intensity to achieve superior risk-adjusted performance over the long term. Specifically, portfolios constructed based on governance scores performed marginally better than other portfolios. The equal-weighted best-in-class portfolio constructed using 10% screening intensity of governance scores delivers the highest abnormal return and carries the least unsystematic risk for investors. However, investors in SRI need to take into account the additional risk on account of loss in diversification. Alpha-seeking investors also must consider that the diversifiable risk of SRI portfolios is a byproduct of additional alpha. The results of our study call for increasing the coverage of ESG stocks by research agencies by including more mid-cap and

small-cap stocks to attain better diversification of SRI portfolios. Regulatory intervention to guide better and transparent ESG reporting can facilitate greater ESG coverage by research agencies.

Our study has certain limitations which may be of interest to future researchers. First, the ESG coverage of Bloomberg has expanded during the period of our study, from the top 269 companies (as per market capitalisation) as of March 2010 to the top 346 companies as of March 2019. This increase is not enormous and may not have any significant impact on our results. Second, the ESG portfolios back tested in our study predominantly consist of large-cap and mid-cap stocks because of limited ESG coverage by Bloomberg in the small-cap segment in India. This has an impact on portfolio diversification and, consequently, on the idiosyncratic risk of ESG portfolios. Third, our study shows that the portfolios with best-in-class screening and 10% screening intensity deliver the highest risk-adjusted performance. However, the results of our study are contextual to the time period used (January 2010 to December 2019). We are not suggesting that the superior performance of these portfolios will continue in future. Future studies can construct ESG portfolios using ESG scores from multiple research agencies to understand if the results are transversal to other data sources. Studies can also focus on other emerging markets where ESG investing is gaining momentum.

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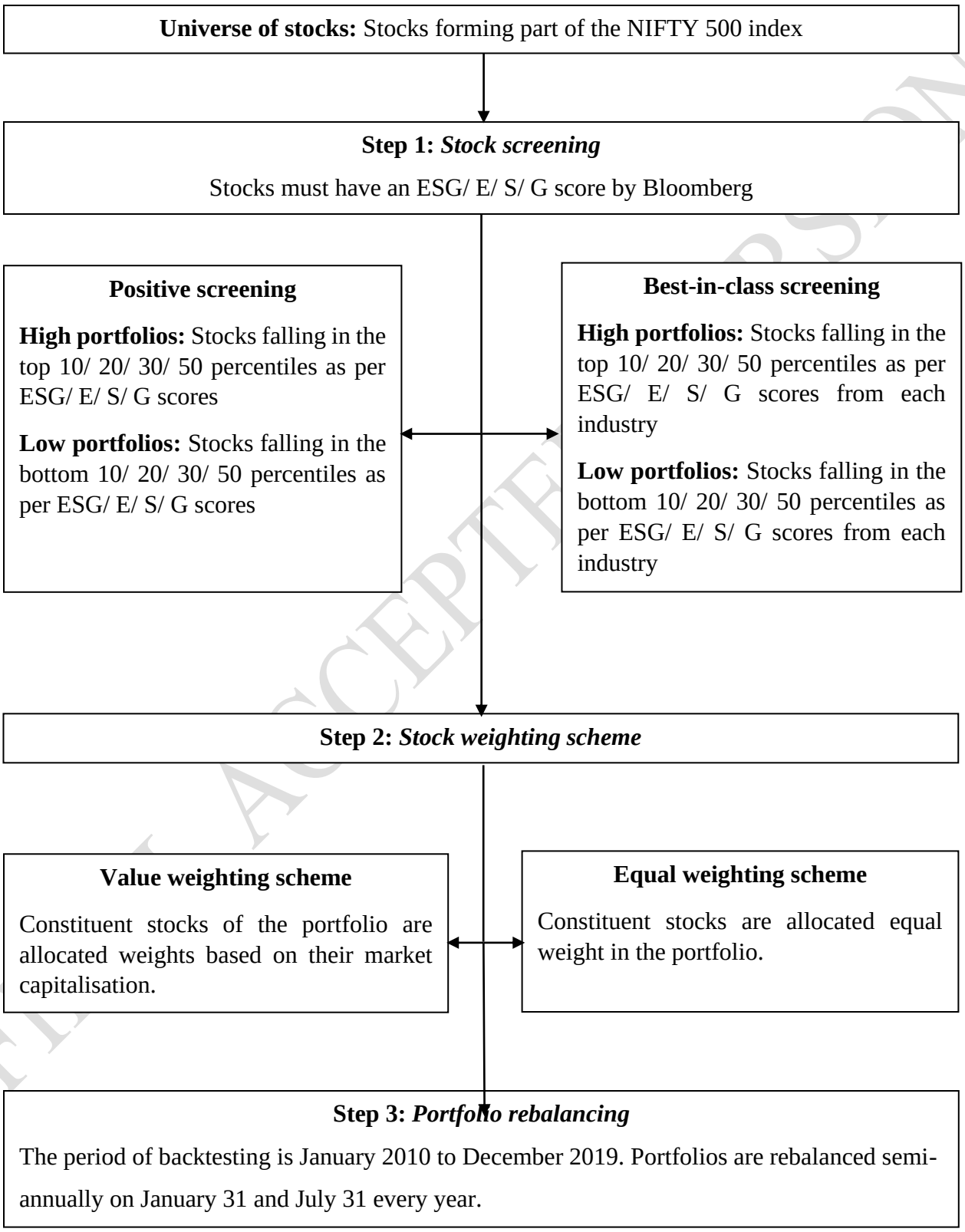
Figures:

Fig 1. Process of backtesting portfolios on Bloomberg using ESG, E, S and G scores



Tables:

Table 1: Total number of portfolios backtested on Bloomberg

Positive screening		**BIC screening**	
Equal weighting	**Value weighting**	**Equal weighting**	**Value weighting**
Top 10/ 20/ 30/ 50 percentiles	Top 10/ 20/ 30/ 50 percentiles	BIC 10/ 20/ 30/ 50 percentiles	BIC 10/ 20/ 30/ 50 percentiles
Bottom 10/ 20/ 30/ 50 percentiles	Bottom 10/ 20/ 30/ 50 percentiles	WIC 10/ 20/ 30/ 50 percentiles	WIC 10/ 20/ 30/ 50 percentiles
Top (Long) - Bottom (Short)	Top (Long) - Bottom (Short)	BIC (Long) - WIC (Short)	BIC (Long) - WIC (Short)

BIC: Best-in-Class; WIC: Worst-in-Class

Each cell of the above table represents four portfolios. Thus, 48 portfolios were synthetically constructed using Bloomberg ESG scores, E scores, S scores and G scores each.

Table 2: Portfolio performance estimates – screening approach

Panel A – ESG portfolios						
Particulars	**Top - 10% - Equal weights**	**BIC - 10% - Equal weights**	**Bottom - 10% - Equal weights**	**WIC - 10% - Equal weights**	**Top - Bottom - 10% - Equal weights**	**BIC - WIC - 10% - Equal weights**
Intercept	**0.405 ****	**0.447 ****	**0.163**	**0.364**	**-0.331**	**-0.490**
Rm - Rf	0.973 ***	0.968 ***	0.918 ***	0.906 ***	0.056	0.062
SMB	0.195 ***	0.259 ***	0.557 ***	0.498 ***	-0.366 ***	-0.244 *
HML	0.073 *	0.142 ***	0.378 ***	0.454 ***	-0.306 ***	-0.312 ***
MOM	0.010	-0.001	-0.054	-0.069	0.064	0.069
R^2	0.92	0.93	0.88	0.68	0.38	0.16
No. of observations	120	120	120	120	120	120
Panel B – E portfolios						
Particulars	**Top - 10% - Equal weights**	**BIC - 10% - Equal weights**	**Bottom - 10% - Equal weights**	**WIC - 10% - Equal weights**	**Top - Bottom - 10% - Equal weights**	**BIC - WIC - 10% - Equal weights**
Intercept	**0.281**	**0.482 ****	**0.142**	**-0.169**	**-0.434**	**0.078**
Rm – Rf	0.951 ***	0.987 ***	1.036 ***	1.052 ***	-0.084	-0.065
SMB	0.195 ***	0.225 ***	0.616 ***	0.639 ***	-0.426 ***	-0.419 *
HML	0.046	0.105 **	0.331 ***	0.079	-0.285 ***	0.026
MOM	0.116 ***	-0.024	-0.212 ***	-0.196	0.330 ***	0.173
R^2	0.88	0.92	0.88	0.4	0.54	0.07
No. of observations	120	120	120	120	120	120
Panel C – S portfolios						
Particulars	**Top - 10% - Equal weights**	**BIC - 10% - Equal weights**	**Bottom - 10% - Equal weights**	**WIC - 10% - Equal weights**	**Top - Bottom - 10% - Equal weights**	**BIC - WIC - 10% - Equal weights**

Intercept	**0.419 ****	**0.425 ****	**0.022**	**-0.980**	**-0.176**	**0.832**
Rm - Rf	0.904 ***	0.991 ***	0.979 ***	0.595 ***	-0.074	0.396 **
SMB	0.181 ***	0.234 ***	0.656 ***	0.593 ***	-0.480 ***	-0.364 *
HML	0.120 ***	0.145 ***	0.322 ***	0.362 **	-0.203 ***	-0.218
MOM	0.035	-0.062	0.026	0.119	0.010	-0.180
R^2	0.90	0.92	0.89	0.30	0.42	0.18
No. of observations	120	120	120	120	120	120
Panel D – G portfolios						
Particulars	**Top - 10% - Equal weights**	**BIC - 10% - Equal weights**	**Bottom - 10% - Equal weights**	**WIC - 10% - Equal weights**	**Top - Bottom - 10% - Equal weights**	**BIC - WIC - 10% - Equal weights**
Intercept	**0.466 *****	**0.579 *****	**0.006**	**-0.929**	**-0.113**	**0.935**
Rm – Rf	0.998 ***	0.996 ***	0.923 ***	0.731 ***	0.075	0.265
SMB	0.188 ***	0.249 ***	0.571 ***	0.417 *	-0.388 ***	-0.173
HML	0.121 ***	0.097 ***	0.466 ***	0.652 ***	-0.346 ***	-0.556 ***
MOM	-0.051	-0.053	-0.110 *	0.209	0.06	-0.260 *
R^2	0.94	0.94	0.89	0.46	0.46	0.17
No. of observations	120	120	120	120	120	120

This table presents the results of the Carhart (1997) four-factor model for the portfolios constructed based on ESG, E, S and G scores from January 2010 to December 2019 on a monthly basis. The R^2s, alphas, and factor loadings concerning market, size, value and momentum are reported. Top and BIC portfolios denote the high portfolios, while Bottom and WIC denote the low portfolios. The high (low) portfolios are formed with the 10% highest (lowest) rated companies according to ESG, E, S or G scores. Top and Bottom portfolios denote portfolios formed using positive screening, while BIC and WIC portfolios denote portfolios formed using best-in-class screening. Top-Bottom and BIC-WIC denotes the long-short portfolios. The Long-Short portfolio trades the High portfolio long while the Low portfolio is traded short. The portfolios are equally weighted. Standard errors were estimated using Newey & West (1987) adjustment. ***, **, and * indicates significance at the 0.10%, 1% and 5% level. BIC: Best-in-Class; WIC: Worst-in-Class.

Table 3-A: Portfolio performance estimates – screening intensity of ESG scores

Particulars	**BIC - 10% - Equal weights**	**BIC - 20% - Equal weights**	**BIC - 30% - Equal weights**	**BIC - 50% - Equal weights**
Intercept	**0.447 ****	**0.360 ****	**0.359 ****	**0.365 ****
Rm - Rf	0.968 ***	0.978 ***	0.960 ***	0.955 ***
SMB	0.259 ***	0.282 ***	0.321 ***	0.378 ***
HML	0.142 ***	0.184 ***	0.194 ***	0.226 ***
MOM	-0.001	-0.024	-0.038	-0.049 *
R^2	0.931	0.956	0.955	0.953
No. of observations	120	120	120	120

Particulars	**WIC - 10% - Equal weights**	**WIC - 20% - Equal weights**	**WIC - 30% - Equal weights**	**WIC - 50% - Equal weights**
Intercept	**0.364**	**-0.107**	**-0.127**	**0.279**
Rm - Rf	0.906 ***	0.945 ***	0.977 ***	0.972 ***
SMB	0.498 ***	0.571 ***	0.668 ***	0.633 ***
HML	0.454 ***	0.408 ***	0.409 ***	0.375 ***
MOM	-0.069	-0.047	-0.02	-0.072
R^2	0.68	0.85	0.90	0.92
No. of observations	120	120	120	120

Particulars	**BIC - WIC - 10% - Equal weights**	**BIC - WIC - 20% - Equal weights**	**BIC - WIC - 30% - Equal weights**	**BIC - WIC - 50% - Equal weights**
Intercept	**-0.49**	**-0.106**	**-0.087**	**-0.487 *****
Rm - Rf	0.062	0.034	-0.017	-0.016
SMB	-0.244 *	-0.294 ***	-0.352 ***	-0.260 ***
HML	-0.312 ***	-0.225 ***	-0.216 ***	-0.149 ***
MOM	0.069	0.024	-0.017	0.024
R^2	0.16	0.26	0.41	0.48

No. of observations	120	120	120	120

This table presents the results of the Carhart (1997) four-factor model for the portfolios constructed based on ESG scores from January 2010 to December 2019 on a monthly basis. The R^2s, alphas, and factor loadings concerning market, size, value and momentum are reported. BIC portfolios denote the high portfolios, while WIC denote the low portfolios. and The high (low) portfolios are formed with the 10% highest (lowest) rated companies according to ESG, E, S or G scores. BIC and WIC portfolios denote portfolios formed using best-in-class screening. BIC-WIC denotes the long-short portfolios. The Long-Short portfolio trades the High portfolio long while the Low portfolio is traded short. The portfolios are equally weighted. Standard errors were estimated using Newey & West (1987) adjustment. ***, **, and * indicates significance at the 0.10%, 1% and 5% level. BIC: Best-in-Class; WIC: Worst-in-Class.

Table 3-B: Portfolio performance estimates – screening intensity of E scores

Particulars	**BIC - 10% - Equal weights**	**BIC - 20% - Equal weights**	**BIC - 30% - Equal weights**	**BIC - 50% - Equal weights**
Intercept	**0.482 ** **	**0.355 ** **	**0.386 ** **	**0.389 *** **
Rm - Rf	0.987 ***	0.976 ***	0.954 ***	0.957 ***
SMB	0.225 ***	0.236 ***	0.262 ***	0.343 ***
HML	0.105 **	0.144 ***	0.175 ***	0.215 ***
MOM	-0.024	-0.036	-0.046	-0.025
R^2	0.92	0.94	0.95	0.96
No. of observations	120	120	120	120

Particulars	**WIC - 10% - Equal weights**	**WIC - 20% - Equal weights**	**WIC - 30% - Equal weights**	**WIC - 50% - Equal weights**
Intercept	**-0.169**	**0.129**	**0.297**	**0.303**
Rm - Rf	1.052 ***	0.957 ***	0.934 ***	0.899 ***
SMB	0.639 ***	0.594 ***	0.651 ***	0.592 ***
HML	0.079	0.393 ***	0.343 ***	0.315 ***
MOM	-0.196	-0.113	-0.094	-0.084 *
R^2	0.47	0.72	0.86	0.91
No. of observations	120	120	120	120

Particulars	**BIC - WIC - 10% - Equal weights**	**BIC - WIC - 20% - Equal weights**	**BIC - WIC - 30% - Equal weights**	**BIC - WIC - 50% - Equal weights**
Intercept	**0.078**	**-0.347**	**-0.485 ***	**-0.487 *****
Rm - Rf	-0.065	0.019	0.02	0.059
SMB	-0.419 *	-0.362 ***	-0.393 ***	-0.254 ***
HML	0.026	-0.250 **	-0.169 ***	-0.101 ***
MOM	0.173	0.077	0.049	0.060 *
R^2	0.07	0.19	0.37	0.39
No. of observations	120	120	120	120

This table presents the results of the Carhart (1997) four-factor model for the portfolios constructed based on E scores from January 2010 to December 2019 on a monthly basis. The R^2s, alphas, and factor loadings concerning market, size, value and momentum are reported. BIC portfolios denote the high portfolios, while WIC denote the low portfolios. and The high (low) portfolios are formed with the 10% highest (lowest) rated companies according to ESG, E, S or G scores. BIC and WIC portfolios denote portfolios formed using best-in-class screening. BIC-WIC denotes the long-short portfolios. The Long-Short portfolio trades the High portfolio long while the Low portfolio is traded short. The portfolios are equally weighted. Standard errors were estimated using Newey & West (1987) adjustment. ***, **, and * indicates significance at the 0.10%, 1% and 5% level. BIC: Best-in-Class; WIC: Worst-in-Class.

Table 3-C: Portfolio performance estimates – screening intensity of S scores

Particulars	**BIC - 10% - Equal weights**	**BIC - 20% - Equal weights**	**BIC - 30% - Equal weights**	**BIC - 50% - Equal weights**
Intercept	**0.425 ** **	**0.356 * **	**0.375 * **	**0.304 * **
Rm - Rf	0.991 ***	0.966 ***	0.936 ***	0.942 ***
SMB	0.234 ***	0.250 ***	0.276 ***	0.318 ***
HML	0.145 ***	0.191 ***	0.220 ***	0.217 ***
MOM	-0.062	-0.04	-0.052	-0.042
R^2	0.92	0.94	0.93	0.94
No. of observations	120	120	120	120

Particulars	**WIC - 10% - Equal weights**	**WIC - 20% - Equal weights**	**WIC - 30% - Equal weights**	**WIC - 50% - Equal weights**
Intercept	**-0.98**	**-0.237**	**0.102**	**0.339 * **

Rm - Rf	0.595 ***	0.993 ***	0.988 ***	0.978 ***
SMB	0.593 ***	0.776 ***	0.685 ***	0.629 ***
HML	0.362 **	0.338 ***	0.311 ***	0.316 ***
MOM	0.119	0.002	-0.042	-0.070 *
R^2	0.36	0.83	0.91	0.93
No. of observations	120	120	120	120

Particulars	**BIC - WIC - 10% - Equal weights**	**BIC - WIC - 20% - Equal weights**	**BIC - WIC - 30% - Equal weights**	**BIC - WIC - 50% - Equal weights**
Intercept	**0.832**	**0.02**	**-0.3**	**-0.608 *****
Rm - Rf	0.396 **	-0.027	-0.051	-0.036
SMB	-0.364 *	-0.530 ***	-0.413 ***	-0.316 ***
HML	-0.218	-0.148 *	-0.092 *	-0.100 ***
MOM	-0.18	-0.041	-0.009	0.029
R^2	0.18	0.33	0.41	0.46
No. of observations	120	120	120	120

This table presents the results of the Carhart (1997) four-factor model for the portfolios constructed based on S scores from January 2010 to December 2019 on a monthly basis. The R^2s, alphas, and factor loadings concerning market, size, value and momentum are reported. BIC portfolios denote the high portfolios, while WIC denote the low portfolios. and The high (low) portfolios are formed with the 10% highest (lowest) rated companies according to ESG, E, S or G scores. BIC and WIC portfolios denote portfolios formed using best-in-class screening. BIC-WIC denotes the long-short portfolios. The Long-Short portfolio trades the High portfolio long while the Low portfolio is traded short. The portfolios are equally weighted. Standard errors were estimated using Newey & West (1987) adjustment. ∗∗∗, ∗∗, and ∗ indicates significance at the 0.10%, 1% and 5% level. BIC: Best-in-Class; WIC: Worst-in-Class.

Table 3-D: Portfolio performance estimates – screening intensity of G scores

Particulars	**BIC - 10% - Equal weights**	**BIC - 20% - Equal weights**	**BIC - 30% - Equal weights**	**BIC - 50% - Equal weights**
Intercept	**0.579 *** **	**0.445 *** **	**0.378 ** **	**0.512 *** **
Rm - Rf	0.996 ***	1.010 ***	0.996 ***	0.966 ***
SMB	0.249 ***	0.266 ***	0.301 ***	0.382 ***
HML	0.097 ***	0.143 ***	0.180 ***	0.208 ***
MOM	-0.053	-0.061 *	-0.042	-0.056 *

R^2	0.94	0.95	0.96	0.94
No. of observations	120	120	120	120

Particulars	**WIC - 10% - Equal weights**	**WIC - 20% - Equal weights**	**WIC - 30% - Equal weights**	**WIC - 50% - Equal weights**
Intercept	**-0.929**	**-0.025**	**-0.159**	**-0.04**
Rm - Rf	0.731 ***	0.872 ***	0.887 ***	0.928 ***
SMB	0.417 *	0.627 ***	0.605 ***	0.602 ***
HML	0.652 ***	0.521 ***	0.493 ***	0.441 ***
MOM	0.209	-0.037	-0.081	-0.101 *
R^2	0.46	0.83	0.89	0.92
No. of observations	120	120	120	120

Particulars	**BIC - WIC - 10% - Equal weights**	**BIC - WIC - 20% - Equal weights**	**BIC - WIC - 30% - Equal weights**	**BIC - WIC - 50% - Equal weights**
Intercept	**0.935**	**-0.103**	**-0.037**	**-0.021**
Rm - Rf	0.265	0.138	0.109 *	0.038
SMB	-0.173	-0.366 ***	-0.308 ***	-0.225 ***
HML	-0.556 ***	-0.379 ***	-0.314 ***	-0.234 ***
MOM	-0.260 *	-0.023	0.04	0.046
R^2	0.17	0.34	0.42	0.45
No. of observations	120	120	120	120

This table presents the results of the Carhart (1997) four-factor model for the portfolios constructed based on G scores from January 2010 to December 2019 on a monthly basis. The R^2s, alphas, and factor loadings concerning market, size, value and momentum are reported. BIC portfolios denote the high portfolios, while WIC denote the low portfolios. and The high (low) portfolios are formed with the 10% highest (lowest) rated companies according to ESG, E, S or G scores. BIC and WIC portfolios denote portfolios formed using best-in-class screening. BIC-WIC denotes the long-short portfolios. The Long-Short portfolio trades the High portfolio long while the Low portfolio is traded short. The portfolios are equally weighted. Standard errors were estimated using Newey & West (1987) adjustment. ***, **, and * indicates significance at the 0.10%, 1% and 5% level. BIC: Best-in-Class; WIC: Worst-in-Class.

Table 4: Unsystematic risk of the portfolios constructed based on ESG, E, S and G scores

	ESG - BIC 10% equal-weighted index			E - BIC 10% equal-weighted index			S - BIC 10% equal-weighted index			G - BIC 10% equal-weighted index		
Market indices -	**NIFTY 50**	**NIFTY 500**	**NIFTY Large Midcap 250**	**NIFTY 50**	**NIFTY 500**	**NIFTY Large Midcap 250**	**NIFTY 50**	**NIFTY 500**	**NIFTY Large Midcap 250**	**NIFTY 50**	**NIFTY 500**	**NIFTY Large Midcap 250**
(a) 60-days analysis												
Mean UR	1.45***	0.76***	0.57***	1.56***	0.96***	0.85***	1.82***	1.08***	0.91***	1.37***	0.79***	0.69***
Median UR	1.33	0.70	0.53	1.52	0.93	0.80	1.69	1.03	0.85	1.22	0.70	0.64
Max. UR	0.32	0.18	0.17	0.55	0.33	0.30	0.62	0.41	0.34	0.34	0.25	0.17
Min. UR	4.40	2.27	1.71	3.43	1.80	1.87	4.46	2.30	2.32	3.94	2.17	2.04
SD of UR	0.65	0.31	0.24	0.53	0.32	0.30	0.71	0.37	0.34	0.59	0.34	0.29
(b) 250-days analysis												
Mean UR	1.49***	0.76***	0.57***	1.58***	0.95***	0.83***	1.85***	1.08***	0.90***	1.40***	0.78***	0.67***
Median UR	1.41	0.75	0.56	1.56	0.91	0.81	1.75	1.00	0.80	1.27	0.75	0.70
Max. UR	0.63	0.35	0.31	1.02	0.62	0.50	0.89	0.65	0.52	0.76	0.45	0.33
Min. UR	2.72	1.26	0.94	2.46	1.46	1.35	3.08	1.67	1.46	2.72	1.43	0.99
SD of UR	0.48	0.22	0.15	0.29	0.18	0.17	0.51	0.25	0.22	0.42	0.22	0.16
(c) 500-days analysis												
Mean UR	1.50***	0.76***	0.56***	1.57***	0.94***	0.83***	1.86***	1.08***	0.90***	1.42***	0.79***	0.67***
Median UR	1.47	0.75	0.59	1.54	0.89	0.78	1.77	1.05	0.88	1.30	0.75	0.68
Max. UR	0.82	0.45	0.36	1.13	0.74	0.65	1.10	0.75	0.58	0.90	0.51	0.39
Min. UR	2.24	1.12	0.78	2.10	1.31	1.16	2.67	1.48	1.25	2.17	1.26	0.97
SD of UR	0.41	0.19	0.13	0.22	0.16	0.15	0.43	0.21	0.17	0.35	0.19	0.14

The above table shows the unsystematic risk of the portfolios constructed based on ESG, E, S and G scores. The results are reported of the analysis of 60, 250 and 500 trading day time horizons in panels (a), (b) and (c). The results are expressed in percentage terms on an annual basis. Mean UR indicates the risk that could have been eliminated by not imposing socially responsible constraints on the universe of eligible stocks. ***, **, and * indicates that the result is statistically different from 0 at the 0.10%, 1% and 5% levels, respectively. UR: Unsystematic Risk; SD: Standard Deviation

Table 5: Results of t-test for unsystematic risk of the portfolios constructed based on ESG, E, S and G scores and the NIFTY 500 index

Hypothesis: $\mu_{ESG} > \mu_{NIFTY500}$				
	N	**Mean**	**Std. Dev.**	**SE Mean**
Unsystematic risk as a % of total risk				
Best-in-class 10% equal-weighted ESG scores portfolio	109	0.1730	0.0925	0.0089
NIFTY 500 index	109	0.0416	0.0284	0.0027
Difference		0.1314***		
Hypothesis: $\mu_{E} > \mu_{NIFTY500}$				
	N	**Mean**	**Std. Dev.**	**SE Mean**
Unsystematic risk as a % of total risk				
Best-in-class 10% equal-weighted E scores portfolio	109	0.1751	0.0969	0.0093
NIFTY 500 index	109	0.0416	0.0284	0.0027
Difference		0.1334***		
Hypothesis: $\mu_{S} > \mu_{NIFTY500}$				
	N	**Mean**	**Std. Dev.**	**SE Mean**
Unsystematic risk as a % of total risk				
Best-in-class 10% equal-weighted S scores portfolio	109	0.2010	0.1020	0.0098
NIFTY 500 index	109	0.0416	0.0284	0.0027
Difference		0.1596***		
Hypothesis: $\mu_{G} > \mu_{NIFTY500}$				
	N	**Mean**	**Std. Dev.**	**SE Mean**
Unsystematic risk as a % of total risk				
Best-in-class 10% equal-weighted G scores portfolio	109	0.1621	0.0987	0.0095
NIFTY 500 index	109	0.0416	0.0284	0.0027
Difference		0.1204***		

***, **, and * indicates significance at the 0.10%, 1% and 5% level.