

The Work Project, presented as part of the requirements for the Award of a Master's degree in
Finance from the Nova School of Business and Economics

**How do ESG screening strategies influence risk-adjusted returns and volatility in
investment portfolios?**

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13/01/2025

ABSTRACT

This paper examines the effects of ESG screening strategies—negative and positive—on portfolio performance in the U.S. and European markets. Using large-cap portfolios, the study evaluates risk-adjusted returns, volatility, and diversification impacts of different screening strategies. Results indicate that negative screening provides competitive returns with manageable risk in large portfolios, while intensive positive screening leads to lower performance despite reduced volatility. No consistent outperformance was observed across ESG-screened portfolios. These findings contribute to the growing discussion on the financial implications of ESG integration for retail and institutional investors.

Keywords: ESG, Responsible Investing, Screening Strategies, ESG Screening, Portfolio Performance, Risk-Adjusted Returns, Volatility and Diversification.

Funding: This research did not receive any external funding.

1. Introduction

In response to growing societal demands for ethical and sustainable investing, Environmental, Social, and Governance (ESG) screening has become a transformative trend in modern portfolio management. Investors now seek to balance financial returns with the ethical and sustainability impact of their investments (PRI 2024). With the growing prominence of ESG investing and the introduction of stricter regulatory frameworks, screening strategies have become more relevant than ever. These strategies allow investors and fund managers to construct portfolios that align with their values while striving to achieve competitive financial performance. Among the various approaches to ESG investing, negative and positive screening have emerged as the two predominant methods. Negative screening excludes investments in industries such as tobacco, alcohol, gambling, and fossil fuels, which are perceived as violating social norms or ethical standards (Statman and Glushkov 2009). In contrast, positive screening focuses on including companies with superior ESG performance, targeting those with strong sustainability practices (PRI 2024). While both approaches are rooted in ethical principles, they raise important questions regarding their financial impact.

The debate around ESG screening is polarized. Some argue that ESG screening helps identify companies better prepared for future risks and opportunities, which may lead to improved risk-adjusted returns (Statman and Glushkov 2009). Others contend that such screening reduces diversification, thereby weakening portfolio performance by excluding certain assets from the investable universe (Rudd 1981). This study contributes to the discussion by examining how ESG screening strategies affect risk-adjusted returns and portfolio volatility from a retail investor's perspective.

Specifically, the research explores whether ESG screening strategies offer competitive financial performance or incur the cost of reduced returns. To investigate this, portfolios were

constructed using two well-known indices—the S&P 500 and the EURO STOXX 50—with the application of distinct ESG screening strategies over a 10-year investment window. The findings reveal that while none of the screening strategies consistently outperformed unscreened benchmarks, negative screening demonstrated potential for competitive performance in large portfolios such as the S&P 500, albeit without statistical significance. Positive screening, on the other hand, consistently underperformed, particularly when applied intensively, despite benefiting from lower volatility.

2. Literature Review

2.1. Theoretical Foundation on ESG Screening

For decades, portfolio decisions have been shaped by foundational financial theories that emphasize diversification and risk management. Among these, Modern Portfolio Theory (MPT), established by Harry Markowitz in 1952, remains one of the most influential frameworks. MPT asserts that investors can optimize their portfolio's risk-return trade-off by holding a diversified set of assets, thereby reducing unsystematic risk.

Diversification, a key principle in MPT, assumes that spreading investments across a broad range of different assets reduces the impact of any single asset's poor performance on the portfolio. By holding uncorrelated or negatively correlated assets, investors can maximize their expected returns for a certain level of risk. This idea of diversification becomes more complex when investors introduce non-financial considerations, such as ethical or social preferences, into their decision-making process. ESG screening, which integrates these criteria into the portfolio selection process, inherently restricts the investment universe. The exclusion of certain stocks based on ethical considerations limits diversification and can push portfolios away from the efficient frontier. To maintain the advantages of diversification, this approach must exclude assets carrying significant additional unsystematic risk relative to portfolios with the same

number of assets (Hoepner 2010). As Fabozzi, Ma, and Oliphant (2008) point out, constrained portfolios that exclude certain sectors or assets are expected to underperform relative to unconstrained portfolios in purely financial terms due to the loss of diversification.

Another key financial theory, the Capital Asset Pricing Model (CAPM), established by William Sharpe in 1964, builds on MPT by introducing the concept of systematic risk. According to the CAPM, the expected return of an asset is determined by its sensitivity to market movements, quantified by its beta. In theory only systematic risk should be rewarded, as unsystematic risk can be diversified away by holding a well-diversified portfolio (Sharpe 1964). ESG portfolios should in theory inadvertently increase unsystematic risk by narrowing the pool of investable assets. This could lead to higher portfolio volatility and lower risk-adjusted returns, as fewer opportunities for diversification remain. From the theoretical standpoint of both MPT and CAPM, ESG screening challenges the core principles of portfolio optimization. When investors exclude stocks based on ESG principles, they are theoretically accepting lower expected returns in exchange for aligning their investments with their values. This trade-off between financial performance and ethical alignment is a central tension in ESG investing, particularly for negative screening, which often sacrifices diversification to meet ethical goals rooted in subjective values.

Positive screening operates from a different theoretical foundation which focuses on quantifiable metrics. Rather than excluding companies based on ethical considerations, positive screening focuses on selecting companies that exhibit strong ESG performance. This strategy is often linked to Stakeholder Theory, which argues that companies which engage responsibly with all their stakeholders are better positioned for long-term financial success (Barnett and Salomon 2006). The Stakeholder Theory suggests that companies with high ESG performance have the potential to outperform their peers because they are managing risks more effectively and aligning their business models with long-term societal trends (Barnett and Salomon 2006).

This theory underpins the argument that investors can “do good while doing well”, generating superior returns while adhering to responsible investment practices. While choosing from a pool of companies with strong ESG credentials may theoretically mitigate some risks (e.g., regulatory risks). By concentrating investments in companies that meet strict ESG criteria, positive screening inherently restricts the investable universe, which may limit diversification and lead to a narrower selection of assets compared to other portfolios. Proponents argue that their restricted universe allows them to select high-performing companies from a “richer” pool of assets (Barnett and Salomon 2006). The promise of superior performance from positive screening is therefore not guaranteed, and some empirical studies have failed to support the notion that high ESG performers consistently generate above-market returns.

In summary, both MPT and CAPM offer critical insights into the challenges that ESG screening faces from a portfolio optimization perspective. The loss of diversification inherent in restricted universes, whether through negative or positive screening, should in theory result in constrained portfolios with lower expected returns. Meanwhile, the Stakeholder Theory, while supporting the idea of ethical alignment and long-term performance, does not always account for the potential trade-offs in terms of risk and return when ESG constraints are applied. This theoretical foundation sets the stage for the empirical literature on how different ESG screening strategies impact portfolio performance, as discussed in the remainder of this literature review.

2.2. Empirical Literature on Negative Screening

While negative screening aligns with ethical investment mandates, the impact of this approach on financial performance remains a point of contention in academic literature.

Empirical research provides substantial support for the theoretical argument of underperformance. Renneboog, Ter Horst, and Zhang (2008), for example, examined socially responsible mutual funds that applied negative screening strategies. Their results suggest that

these funds underperformed conventional portfolios by an average of 2.2% to 6.5% of risk-adjusted returns annually. This underperformance is primarily attributed to the exclusion of high-performing sectors, such as tobacco and fossil fuels, which often offer superior growth opportunities. Despite this, the study found no statistically significant alpha, indicating that while these portfolios underperformed, the results were not drastic enough to suggest a complete divergence from the broader market. Additionally, Kempf and Osthoff (2007) found no evidence of abnormal returns for portfolios using negative screening, further emphasizing that while negative screening may not enhance profitability, it does not necessarily cause significant financial harm either. This lack of abnormal returns suggests that constrained portfolios fail to outperform conventional portfolios, largely due to the restricted universe of investable assets. As noted by French and Cordeau (2024), portfolios that exclude sectors or companies based on ethical considerations exhibit lower volatility but also forego returns associated with higher-risk, higher-reward stocks, resulting in an average underperformance of 25 to 100 basis points annually relative to unconstrained portfolios.

Conversely, some studies argue that negative screening serves as a risk mitigation tool rather than a mechanism for enhancing returns. Al Ayoubi and Enjolras (2020) demonstrated that the exclusion of 149 firms by Norway's sovereign wealth fund had a tangible impact on the stock prices of excluded companies. Their findings suggest that exclusionary policies can influence market behaviour and reduce exposure to companies prone to ethical or reputational risks. This risk mitigation is particularly relevant in industries where legal or regulatory risks are high. By excluding these sectors, investors may avoid the negative consequences associated with lawsuits, fines, or public backlash, thus lowering portfolio volatility.

The performance of so-called "sin stocks"—companies operating in controversial sectors—adds another layer of complexity. Hong and Kacperczyk (2009) found that sin stocks, which are excluded through negative screening, tend to deliver higher returns because investors

demand a risk premium for holding them. This indicates that while excluding sin stocks might align with ethical goals, it also entails an opportunity cost. For example, Respaut (2016) reported that a Californian state pension fund that divested from tobacco companies in 2001, sacrificed approximately \$3 billion in potential returns over a 13-year period. This case highlights the trade-off between ethical investing and financial performance, where excluding high-risk but high-reward stocks can result in significant forgone returns, illustrating the opportunity cost associated with such exclusions (Trinks and Scholtens 2017).

Despite the prevailing belief that negative screening leads to underperformance, other studies challenge this conclusion. Humphrey and Tan (2014) examined the financial impact of both negative and positive screening in large portfolios and found that neither strategy significantly harmed portfolio returns or increased risk. Their analysis suggests that for larger portfolios (around 100 stocks), the loss of diversification is minimal, and the impact of negative screening is negligible. This finding implies that investors may not need to sacrifice returns or assume additional risk to align their portfolios with ethical considerations in large portfolios.

This divergence in findings reflects the complexity of negative screening. While some studies underscore the opportunity costs and diversification losses associated with excluding certain sectors, others argue that the financial impact is minimal in large portfolios. The temporal context, as well as the specific sectors excluded, play significant roles in determining whether negative screening leads to underperformance or serves as a viable risk management strategy.

2.3. Empirical Literature on Positive Screening

Several studies provide support for the argument that positive screening can enhance portfolio performance. Derwall et al. (2005), for example, revealed that portfolios composed of large-cap firms with strong environmental performance outperformed those with lower environmental performance by around 3% annually. The study's findings highlight that

companies with superior ESG performance may be better positioned to adapt to a changing regulatory landscape, thus offering a potential competitive edge.

Similarly, Statman and Glushkov (2009) compared the performance of stocks included in the Domini 400 Social Index with those in the S&P500 and found that the Domini Index outperformed the S&P500 by 1.32% annually, even after adjusting for risk factors such as size, value, and momentum. However, they also noted that this outperformance might not be guaranteed in all market conditions, indicating that the financial benefits of positive screening are contingent on broader market dynamics and investor behaviour. Further evidence in favour of positive screening comes from Kempf and Osthoff (2007), who reported that portfolios excluding low ESG-scoring companies with a long-short strategy in the U.S. delivered abnormal returns of up to 8.7% per year, particularly during periods of heightened market volatility. Their study highlights the potential of positive screening as a risk mitigation tool during times of financial instability. Companies with strong ESG performances tend to be more resilient during periods of market stress, further supporting the notion that positive screening may serve as an “insurance” against market downturns, as also suggested by Nofsinger and Varma (2014). These authors found that ESG-integrated portfolios utilizing positive screening outperformed conventional portfolios only during periods of market distress by 1.61% to 1.70%, particularly benefiting from their lower volatility. Their research suggests that ESG-focused strategies perform better during periods of market distress, when companies with strong ESG practices can act as a buffer against tail risks. Additionally, Friede, Busch, and Bassen (2015) conducted a comprehensive meta-analysis that confirmed the mixed evidence on ESG screening performance, noting that while long-term horizons and robust ESG data might provide certain benefits, the results are often contingent on market conditions and the reliability of the data.

Another major issue for positive screening relates to the nature of ESG data. Berg, Kölbel, and Rigobon (2019) found that ESG ratings from different providers often have low correlations,

ranging from 0.38 to 0.71, which complicates the establishment of uniform ESG performance standards across companies and data providers. This inconsistency complicates the process of implementing positive screening, as what one investor or researcher considers an “acceptable” ESG score may differ significantly from another’s assessment. Consequently, the performance of positive screening can vary widely depending on which ESG data provider or threshold used, making comparisons across studies challenging.

Furthermore, the intensity of screening adds another layer of complexity to the debate. Renneboog, Ter Horst, and Zhang (2008) demonstrated that portfolio returns tend to decrease as the intensity of screening increases, suggesting that as more companies are excluded, the opportunities for diversification diminish, leading to lower overall returns. This is consistent with the findings of Barnett and Salomon (2006), who observed that financial returns may initially decline as the intensity of social screening increases, though they also found that returns could eventually recover once screening intensity reaches a maximum. This suggests that while investors may face short-term financial costs as they apply more stringent ESG criteria, there could be potential for recovery in the long term, depending on the market context.

Not all studies agree on the positive impacts of screening. For instance, Auer (2016) found that in Europe, the loss of diversification due to positive screening could lead to underperformance, as the constraints it imposes may outweigh the benefits in certain contexts. Similarly, Halbritter and Dorfleitner (2015) concluded that U.S. investors should not expect abnormal returns from positive screening strategies. They argue that while ESG leaders may exhibit strong sustainability practices, the loss of diversification from focusing only on high ESG performers could limit the financial effectiveness of this strategy. These studies underscore the trade-offs inherent in positive screening, where the potential benefits of may be offset by the constraints on portfolio construction.

The empirical literature on positive screening presents a mixed picture, with some studies demonstrating outperformance and others highlighting the challenges of this approach. Overall, the effectiveness of positive screening seems to depend heavily on market conditions, the quality of ESG data, and the extent of screening intensity. As such, while positive screening can provide protective benefits during times of market volatility, its ability to deliver consistent outperformance is far from guaranteed.

The remainder of this research is guided by the following four hypotheses, derived from the literature review: 1) Negative screening will lead to lower diversification, higher volatility, reduced risk-adjusted returns, and carries an inherent opportunity cost associated with excluding sin stocks compared to unscreened portfolios. 2) Positive screening will lead to portfolios with higher risk-adjusted returns compared to unscreened portfolios. 3) There will be no significant difference in financial performance between screened and unscreened portfolios across U.S. or European markets. 4) As positive screening intensity increases, the financial harm caused by reduced diversification will be mitigated as Stakeholder Theory suggests that higher ESG performance will lead to long-term gains.

3. Data

3.1. Data Selection and Indices

To evaluate the impact of ESG screening on portfolio performance, this study utilizes two prominent indices: the S&P500 and the EURO STOXX50 (EURO50). The S&P500 was selected as it is the most widely used U.S. benchmark index, representing a broad range of large-cap U.S. companies across various sectors. This index provides a comprehensive overview of the U.S. market, making it an ideal for evaluating ESG strategies in a diverse market context. However, recognizing that the S&P500 might not fully represent investment landscapes outside the U.S., the EURO50 was also included. The EURO 50 encompasses 50 of

the largest and most liquid stocks in the Eurozone, offering a valuable perspective for investors with a focus on European markets with a smaller portfolio size. The U.S. Treasury yields were used as a proxy for the risk-free rate in U.S.-based portfolios, while the long-term German government bond yield served as the proxy for European portfolios, with data sourced from Federal Reserve Bank of St. Louis (2023a; 2023b).

For both indices, monthly log stock returns were calculated based on the monthly Adjust Closing prices from January 2013 to December 2023. The individual stock price data were retrieved from Yahoo Finance, while the annual ESG scores were retrieved from the Refinitiv dataset, which provides comprehensive ESG ratings on a scale from 0 to 100, with 100 indicating the best performers (Table 1 - Appendix). To ensure data quality and consistency, stocks with missing price data or incomplete ESG scores over the study period were excluded from the analysis. Consequently, all the constructed portfolios are based on this refined dataset and may differ from the actual S&P500 and EURO50 indices (Table 2 - Appendix). This approach allows for a more controlled analysis by focusing only on stocks with complete data.

3.2. Methodology

3.2.1. Portfolio Construction and Allocation Strategies

The study employs two distinct portfolio allocation strategies for each index to provide a comprehensive assessment of ESG integration's impact (Table 2 – Appendix):

Market-Cap Weighted Portfolios (MC): These portfolios replicate both indices by weighting stocks according to their market capitalization. This approach reflects the traditional structure of the indices, providing a realistic benchmark for performance comparison. The market-cap weights were recalculated annually to reflect changes in stock sizes and index composition.

Equal-Weighted Portfolios (EWP): EWP assign an identical weight to each stock. This method is straightforward and helps minimize single-stock concentration, enabling better comparability

across industries and company sizes. Although EWPs are well diversified in terms of weights, they may not be as diversified in terms of risk exposure, providing an interesting contrast for evaluating the effects of different ESG strategies.

An annual rebalancing strategy was employed for each portfolio to adjust the weights based on market capitalization or ESG scores, depending on the specific portfolio approach. Additionally, short selling was not permitted in any portfolio.

3.3. ESG Screening Strategies

To analyse the effects of ESG screening, three screening strategies were applied to each index:

- 1) **Negative Screening:** It involves excluding stocks from certain sectors deemed unethical or controversial. For this study, a single version of negative screening was employed, focusing on the exclusion of “sin stocks” (Table 3 – Appendix). This exclusion process was implemented in the first year of the analysis, and the excluded stocks remained excluded for the duration of the study, with portfolio weights adjusted accordingly.
- 2) **Intensive Positive Screening:** This approach involved selecting only the top-performing companies with ESG scores above 75 from the Refinitiv dataset, focusing on firms that demonstrate outstanding practices (Table 1 – Appendix). Annual rebalancing was employed to adjust the weights based on ESG scores, ensuring the portfolio consistently reflects the selected high-performing companies.
- 3) **(Moderate) Positive Screening:** This strategy is more inclusive, selecting companies with ESG scores above 50. This broader criterion allows for a more diversified portfolio while still prioritizing firms with higher-than-average ESG performance (Table 1- Appendix). Annual rebalancing was employed to adjust the weights based on ESG scores.

3.4. Performance Measurements

Several performance metrics were used to evaluate the ESG-screened portfolios:

Sharpe Ratio (SR): Measures the risk-adjusted return of a portfolio, providing insight into the efficiency of returns relative to risk taken (Sharpe 1964). The SR is computed by the excess return of a portfolio divided by the volatility of the excess return. The SR can be seen as the monetary compensation for the risk taken. For many years, the SR was considered insufficient when returns did not follow a normal distribution. However, more recent studies emphasize that the metric has a decision-theoretic basis that applies to a variety of non-normal distributions, including those with skewness and fat tails (Schuhmacher and Eling 2012).

Jensen's Alpha: Represents the average return of the portfolio over the expected return based on market risk, providing a measure of the portfolio's performance relative to a theoretical risk-adjusted return. Nonetheless, having a positive alpha does not automatically ensure a higher SR for a portfolio. A portfolio might generate a positive alpha while simultaneously raising its standard deviation to the point that its SR decreases (Bodie, Kane, and Marcus 2014, 840).

Beta: Expresses the relationship between the investment's risk and the market. Betas above 1 are viewed as aggressive because investing in high-beta stocks involves greater sensitivity to market fluctuations. In contrast, betas below 1 are seen as defensive. Riskier investments are expected to yield a premium over the risk-free rate, which rises with beta. Investments with a beta of 1 have market-level risk and are expected to deliver market returns (Bodie, Kane, and Marcus 2014, 276).

Skewness & Kurtosis: Skewness refers to the extent of deviation from a normal distribution, indicating the asymmetry in the return distribution. In contrast, kurtosis assesses the heaviness of the distribution's tails, measuring the concentration of extreme values (Bodie, Kane, and Marcus 2014, 138-139).

Value-at-Risk (VaR) & Conditional Value-at-Risk (CVaR): To quantify downside risk and tail risk, we utilize VaR and CVaR. While VaR measures downside risk over a specified period,

CVaR assesses the amount of tail risk in a portfolio beyond the VaR threshold. The historical method with a 90% confidence interval is employed for this analysis, as the assumption of normality may not be valid (Bodie, Kane, and Marcus 2014, 139-140).

For each index and allocation strategy, ESG-screened portfolios were compared to their benchmarks to examine the impact of ESG screening on performance. Comparisons within each index and its respective weight allocation strategy ensured that results were not influenced by differences in market conditions or index characteristics.

4. Empirical Results

4.1. Distribution of Returns

The performance and risk characteristics of the S&P500-based portfolios reveal several key insights (Table 4 and 5 – Appendix). Across all portfolios, negative skewness is consistently observed, indicating that these portfolios are more likely to experience large negative returns compared to positive ones (i.e., left-tail risk). This left-skewness suggests that the portfolios may exhibit frequent, small gains punctuated by occasional, sharp losses. Such a distribution pattern signals inherent downside risk, even if regular returns appear relatively stable over time.

Turning to kurtosis, we see variation across different S&P500 portfolios. The benchmark MC S&P500 portfolio and the negatively screened MC S&P500 portfolio display positive excess kurtosis¹ (1.72 and 2.77, respectively), indicating leptokurtic distributions with fatter tails. This means that these portfolios are more likely to experience extreme return events, particularly sharp losses. The VaR and CVaR values align with these findings, as the MC Benchmark exhibits a VaR of -26.50% and a CVaR of -32.16%, and the negatively screened MC portfolio has a similar VaR of -25.60% and CVaR of -31.55% (Table 8 – Appendix). Combining this with the negative skewness, these portfolios are at a higher risk of severe negative returns than

¹ Excess Kurtosis is Kurtosis minus 3.

under normal distribution conditions. Notably, the portfolios with negative screening consistently exhibit the most negative skewness and the highest kurtosis among the S&P500 portfolios, making them less attractive to risk-averse investors.

In contrast, portfolios such as the S&P500 benchmark EWP and the positively screened S&P500 EWP exhibit negative excess kurtosis (-0.34 and -0.54, respectively), signalling platykurtic distributions. This implies that extreme return events are less frequent in these portfolios, which also display lower overall volatility compared to their MC counterparts for the S&P500-based portfolios. However, the negative skewness still indicates vulnerability to large negative returns. Alternatively, The S&P500 portfolios with intensive positive screening exhibit the least negative skewness, indicating a more balanced return profile and reduced downside risk compared to the negatively screened portfolios. This is further supported by their relatively favourable VaR and CVaR metrics. Overall, the findings suggest that negatively screened portfolios in the S&P500-based strategies are riskier, with higher kurtosis and more pronounced negative skewness, whereas positively screened portfolios offer greater stability, though they remain somewhat exposed to adverse tail events.

Similarly, the analysis of the EURO50 portfolios reveals consistent negative skewness across all portfolios. In terms of kurtosis, all EURO50 portfolios exhibit negative excess kurtosis, indicating platykurtic distributions (Table 6 and 7 – Appendix). This means that these portfolios generally have thinner tails and are less prone to extreme return events compared to a normal distribution, which is reassuring in terms of tail risk despite the presence of negative skewness. However, the negatively screened portfolios in the EURO50 set exhibit slightly higher kurtosis than their positively screened counterparts, indicating greater exposure to extreme events—both positive and negative. This increased exposure is reflected in the VaR and CVaR results for the negatively screened MC EURO50 portfolio (VaR of -14.23% and CVaR of -15.01%) (Table 9 – Appendix).

The intensively positive screened MC EURO50 portfolio exhibits the least negative skewness, suggesting a more balanced return profile and lower downside risk compared to the negatively screened portfolios. This is further supported by its lower VaR (-9.72%) and CVaR (-11.25%) values, indicating that the portfolio has effectively balanced its return profile while limiting exposure to tail risks.

In conclusion, across the portfolios, negative screening exhibit higher excess kurtosis and more negative skewness than the other screened portfolios. This indicates that negative screening introduces greater exposure to extreme negative events and downside risk. On the other hand, intensive positive screening, tends to offer a more stable return profile with fewer extreme events and lower downside risk.

4.2. Performance Analysis

4.2.1. Performance Analysis: S&P 500-Based Portfolios

The benchmark MC S&P500 portfolio yielded the highest total return of 287%, with a mean annual return of 14.85%, outperforming the MC screened portfolios. The S&P500 EWP achieved a total return of 234% and a mean return of 11.46% (Table 4 and 5 – Appendix). Notably, the negatively screened EWP outperformed its benchmark by an average of 0.3% annually, indicating evidence of outperformance by a screened portfolio. In contrast, positively screened portfolios underperformed their benchmarks, with average annual underperformance ranging from 0.5% for the MC version to 1% for the EWP version. Moreover, shifting from positive to intensive positive screening results in an additional loss of returns, with the intensive positive screening strategy underperforming the moderate version by an average of 1.7% annually for the MC portfolio and 2% annually for the EWP. These results indicate that as screening intensity increases, returns tend to decline, likely due to the exclusion of higher-performing stocks with lower ESG ratings.

In terms of volatility, the analysis reveals that portfolios applying intensive positive screening demonstrate the lowest volatility across both MC (19.01%) and EWP (12.78%) configurations. This reduced volatility suggests that intensive positive screening mitigates risk by reducing the portfolio's sensitivity to market fluctuations, which is also reflected in the lower Beta and tail risk of these portfolios. However, this risk mitigation comes at the expense of lower returns.

Negative screening, however, exhibits a different risk profile. While the negatively screened MC portfolio exhibits slightly lower volatility (19.79%) compared to its benchmark, the negatively screened EWP shows marginally higher volatility (13.65%) than the benchmark EWP (13.17%). This suggests that, while negative screening preserves some diversification, it can occasionally lead to a slight increase in risk, particularly in equal-weighted portfolios.

Risk-adjusted performance, measured through the SR, provides further insights into portfolio performance. While the MC negatively screened portfolio underperformed its benchmark by an average of 15 basis points annually, it exhibited lower volatility, resulting in higher risk-adjusted returns. The negatively screened MC portfolio achieved the highest SR of 0.72, outperforming the benchmark MC portfolio's SR of 0.69, though the difference is statistically insignificant². Similarly, the negatively screened EWP posts an SR of 0.752, slightly exceeding the benchmark EWP's SR of 0.751. These results suggest that negative screening can lead to competitive, and even slightly superior, risk-adjusted returns compared to conventional portfolios. Despite the modest increase in volatility in the negatively screened EWP, the risk-adjusted returns remain favourable. Alternatively, the intensive positive screened portfolios perform the worst in terms of risk-adjusted returns, with the MC version showing an SR of 0.61 and 0.55 for the EWP version. This underperformance, coupled with lower volatility, indicates that while intensive positive screening reduces overall portfolio risk, it does not deliver

² The difference is statistically insignificant at any confidence level.

sufficient returns to compensate for the lower risk, resulting in weaker risk-adjusted performance.

Most portfolios exhibit betas close to 1, reflecting a strong correlation with the broader market, which is not surprising given the overlap between the portfolios. ESG-screened portfolios show a similar trend, with the positively screened portfolios maintaining betas near 1, indicating a conventional risk profile. However, intensive positive screening leads to lower beta values, as seen with the MC portfolio (0.85) and the EWP (0.94). This suggests a reduced sensitivity to market fluctuations, which aligns with their observed lower volatility. These findings support the idea that intensive positive screening reduces market exposure. While this reduced market sensitivity contributes to lower volatility, it fails to translate into higher risk-adjusted returns, as evidenced by the portfolios' lower SR and overall performance.

The analysis of alpha shows that most portfolios neither significantly outperform nor underperform their respective benchmark³. The negatively screened MC portfolio demonstrates a slight positive alpha (0.009), although not being statistically significant. In contrast, the portfolios with intensive positive screening exhibit negative alphas, with the EWP version having the most negative alpha at -0.02, indicating underperformance relative to the market.

Overall, negative screening appears to be a more effective strategy for large portfolios, offering competitive and, in some instances, superior risk-adjusted returns. In contrast, intensive positive screening leads to weaker returns and risk-adjusted performance, with a reduction in market sensitivity and exposure to higher-performing stocks.

4.2.2. Performance Analysis: EURO50-Based Portfolios

The benchmark EURO50 MC portfolio achieved a mean annual return of 9.93%, while the EWP returned 9.57% (Table 6 and 7 – Appendix). In contrast, the intensively positive screened

³ The Alphas are not significantly different from zero.

portfolios underperformed on average annually by 3.8% for the MC version and 1.16% for the EWP version. Additionally, the consistently lower returns of negatively screened portfolios suggest that this strategy may be less effective in smaller, more concentrated portfolios like the EURO50, where the universe of eligible stocks is more limited. On average, the negatively screened MC version underperforms by 1.2% annually, while the EWP version shows an underperformance of 0.17% annually. Similarly, the two positively screened portfolios underperformed their benchmarks to a similar degree as observed in the S&P500 portfolios.

Volatility in the EURO50 portfolios shows notable differences compared to the U.S. portfolios. While screening generally reduces volatility in larger portfolios, negative screening in the EURO50 portfolios has led to higher volatility relative to their benchmarks. For example, the negatively screened MC portfolio has a standard deviation of 14.74%, compared to 13.69% for the benchmark MC portfolio. Similarly, positive screening does not reduce volatility in smaller portfolios, likely due to the positive screening portfolios having compositions very similar to their benchmarks. This suggests that negative screening may cause a more significant loss of diversification in smaller portfolios, where exclusions have a greater impact on the overall risk profile.

Regarding risk-adjusted performance, the benchmark EURO50 portfolios have the highest SR, both at 0.68. In contrast, negative screening reduces risk-adjusted performance, with the MC version showing a SR of 0.56. The intensive positive screened portfolios show the lowest SRs, with the MC version at 0.49 and the EWP version at 0.57. These results indicate that, in smaller portfolios, the loss of diversification from negative screening has a larger effect on risk-adjusted returns relative to larger portfolios like the S&P500.

The beta values indicate that the negatively screened MC portfolio has a beta of 1.05, indicating higher market sensitivity. In contrast, the intensively positive screened MC portfolio shows a

lower beta (0.73), indicating reduced market sensitivity. Despite this lower market exposure, these portfolios still underperform, as evidenced by their negative alphas. The alpha analysis highlights that only the intensive positive screened EWP exhibits a significant negative alpha (-0.014)⁴, indicating statistically significant underperformance.

In summary, the negative impacts of both positive and negative screening strategies are more pronounced in smaller, concentrated European portfolios than in larger U.S. portfolios. Negative and positive screening increases volatility and reduces risk-adjusted returns in the EURO50 portfolios, while intensive positive screening leads to significant underperformance in both markets. These findings suggest that while ESG screening can help align portfolios with ethical values, it often comes at the cost of financial performance, particularly in smaller portfolios. Investors should carefully weigh these trade-offs when applying ESG screening.

5. Discussion

5.1. Interpretation of Results in Relation to Hypotheses

This paper sought to investigate how the application of ESG screening strategies impacts risk-adjusted returns and portfolio volatility. Specifically, four hypotheses were tested to assess the effects of negative and positive screening on portfolio performances.

Hypothesis 1 hypothesized that negative screening would exhibit higher volatility and lower risk-adjusted returns due to reduced diversification and the opportunity cost associated with excluding “sin stocks”. Our findings partially support this hypothesis. In the smaller portfolios, negative screening led to lower risk-adjusted returns, slightly higher volatility, and an opportunity cost associated with forgoing potentially higher-performing assets. In contrast, in the larger portfolios, negative screening produced competitive risk-adjusted returns without a significant increase in volatility. This suggests that in large portfolios, negative screening may

⁴ Significantly different from 0 at the 5% significance level with p-value of 0.03.

not significantly harm financial performance, offering a reasonable balance between ethical investing and performance.

Hypothesis 2 predicted that positive screening would lead to higher risk-adjusted returns. However, the data contradict this hypothesis. Positive screening—particularly intensive positive screening—consistently resulted in lower risk-adjusted returns compared to unscreened portfolios. Although intensively screened portfolios exhibited lower volatility overall, this did not translate into superior risk-adjusted performance. Notably, in smaller portfolios, positive screening did not lead to lower volatility. This underperformance is likely due to the exclusion of high-performing stocks with lower ESG scores, which reduces exposure to key drivers of portfolio returns.

Hypothesis 3 posited that there would be no significant difference in financial performance between ESG-screened and unscreened portfolios. Our analysis of alpha offers partial support for this hypothesis. For most of the portfolios, alpha values were not significantly different from zero, suggesting that screened portfolios, in general, do not consistently outperform nor underperform their unscreened counterparts. However, a notable exception is the equal-weighted EURO50 portfolio with intensive positive screening, which exhibits a statistically significant negative alpha value. This indicates a clear underperformance for this portfolio relative to the benchmark. Although the other positively screened portfolios also showed negative alpha values, these were not statistically significant. Overall, this provides strong evidence that positive screening, especially when applied intensively, results in underperformance. When we consider other performance metrics, there is further evidence of a performance gap between screened and unscreened portfolios. For negative screening, the results were more mixed and context dependent. This variation suggests that the impact of negative screening is influenced by the specific market context, with both positive outcomes in large portfolios and negative outcomes in smaller portfolios.

Finally, **Hypothesis 4** suggested that the financial harm from positive screening would be offset as screening intensity increased. Our findings contradict this theory, intensive positive screening consistently led to lower returns, and the increased ESG alignment did not compensate for the financial losses from reduced diversification. This challenges the concept of “doing good while doing well”, suggesting instead “doing good but not well”.

5.2. Significance of Findings

Our findings align with several previous studies, but also diverge in key areas. Halbritter and Dorfleitner (2015) argue that U.S. investors should not expect abnormal returns from positive screening, a conclusion strongly supported by our analysis. Similarly, Auer (2016) found that in Europe, the loss of diversification resulting from positive screening outweighed any potential financial gains, echoing our findings that (intensive) positive screening reduces returns. Additionally, the lower volatility observed in positively screened portfolios aligns with findings from Nofsinger and Varma (2014).

From a theoretical standpoint, our findings support Fabozzi, Ma, and Oliphant’s (2008) assertion that constrained portfolios, whether due to positive or negative screening, should in theory underperform unconstrained portfolios. This aligns with practical evidence from French and Cordeau (2024), which noted that constrained portfolios typically underperform by 25 to 100 basis points per year relative to unrestricted market portfolios. However, our results diverge from studies such as Statman and Glushkov (2009), who found that ESG-screened portfolios outperformed their benchmarks. A possible explanation for this discrepancy is their use of more controlled factors, which may have masked the inherent underperformance of positive screening in real-world scenarios. Similarly, our results contradict Renneboog, Ter Horst, and Zhang (2008), who reported significant underperformance of negatively screened portfolios. However, we found evidence of an opportunity cost associated with negative screening in small

portfolios, as indicated by Trinks and Scholtens (2017). Our findings suggest that for large portfolios, negative screening does not lead to significant underperformance, offering competitive risk-adjusted returns. This conclusion is more in line with Kempf and Osthoff (2007), who found no evidence of abnormal returns generated by negative screening.

5.3. Limitations

This study faces several limitations that must be considered when interpreting the results. First, the analysis was restricted to large-cap stocks in the U.S. and European markets. While these regions have well-developed ESG disclosure practices, the focus on large-cap stocks may introduce a bias, as larger firms typically have more resources to disclose ESG data. Additionally, there is a survivorship bias, as indices include well-performing stocks while removing underperforming ones. Another limitation is the reliance on the Refinitiv ESG data, which, while comprehensive, may differ from other ESG data providers. Berg, Kölbel, and Rigobon (2019) demonstrated that the correlation between ESG scores from different providers can vary significantly. This inconsistency could affect the composition of the portfolios and the results of this study. The inherently subjective nature of the screening strategies also presents a limitation. While this study focused on long-only portfolios, many institutional investors utilize short positions to manage risk. Furthermore, ignoring transaction costs may have inflated portfolio returns, especially given the annual rebalancing.

5.4. Future Research Directions

The findings from this study offer several directions for future research. First, extending the geographic scope to include emerging markets or smaller-cap firms would shed light on how ESG screening impacts portfolios where ESG disclosure standards are less established. This could help determine whether the patterns observed in developed markets hold in less mature financial ecosystems. Additionally, exploring more sophisticated portfolio construction

techniques would help assess whether alternative approaches can mitigate the performance drawbacks associated with ESG screening. Research into combining positive and negative screening strategies could offer another promising avenue, allowing investors to balance risk and ethical considerations more effectively. Finally, integrating multiple ESG datasets would provide a more robust analysis of how varying definitions and scoring methodologies impact performance. As ESG investing continues to grow in importance, understanding the consistency and reliability of different data sources will become increasingly crucial for both retail and institutional investors.

6. Conclusion

This paper set out to explore the impact of ESG screening strategies—both negative and positive—on the risk-adjusted returns and volatility of investment portfolios. Through an in-depth empirical analysis of U.S. and European large-cap portfolios, we were able to draw several important conclusions about the financial implications of ESG screening.

The key findings indicate that negative screening is generally a more competitive strategy for investors who want to align their portfolios with ethical standards without significantly sacrificing financial performance. In large portfolios, negative screening managed to achieve competitive risk-adjusted returns, with no substantial increase in volatility. However, in smaller portfolios, negative screening tended to increase volatility and reduce risk-adjusted returns. This underscores the context-dependent nature of negative screening, where the results may vary based on portfolio size, geographic region, and market conditions. On the other hand, positive screening, particularly when applied intensively, consistently underperformed both conventional and negatively screened portfolios across all performance metrics. Despite reducing volatility, intensive positive screening failed to deliver competitive risk-adjusted returns. This suggests that while positive screening may align portfolios more closely with ESG

objectives, it often comes at a notable financial cost. Across all portfolios, there was no consistent evidence of abnormal returns, challenging the notion that investors can “doing good while doing well” when applying stringent ESG criteria.

One of the unique contributions of this study lies in its focus on the perspective of retail investors—a perspective that is often overlooked in ESG literature, which tends to focus on mutual funds or institutional investors. By constructing portfolios that replicate the investment strategies available to retail investors, this research provides valuable insights into how ESG screening can influence portfolio performance for those without access to more sophisticated investment strategies and ESG information. For institutional investors, these findings are equally relevant, particularly in terms of understanding the potential financial drawbacks of ESG screening strategies. As the demand for ESG integration continues to grow, institutions will need to carefully balance the ethical imperatives of their clients with the financial objectives of long-term returns. From a practical standpoint, the results suggest that negative screening may offer a more balanced approach for investors who are looking to incorporate ethical considerations into their portfolios without sacrificing too much financial performance. In contrast, positive screening appears to entail significant trade-offs in terms of returns, and investors who prioritize positive ESG criteria must be prepared to accept weaker financial performance.

Overall, this paper contributes to the growing body of research on responsible investing by highlighting the nuanced relationship between ESG screening and financial performance. It challenges the belief that responsible investing necessarily leads to superior or inferior returns, and underscores the importance of considering contextual factors, such as portfolio size and market conditions, when integrating ESG criteria into investment decisions.

7. References

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8. Appendix

Table 1. ESG Score Range

| ESG Score Range | Quartile | Description |
|-----------------|-----------------|---|
| 0-25 | First Quartile | Scores in this range indicate weak ESG performance compared to peers and a lack of transparency in publicly disclosing material ESG information. |
| 25-50 | Second Quartile | Scores in this range reflect an satisfactory level of ESG performance relative to peers and a moderate level of transparency in the public reporting of material ESG information. |
| 50-75 | Third Quartile | Scores in this range demonstrate good ESG performance compared to peers and a higher-than-average level of transparency in publicly disclosing material ESG information. |
| 75-100 | Fourth Quartile | Scores in this range signify exceptional ESG performance compared to peers and a high level of transparency in the public reporting of material ESG information. |

Source: Based on data from "LSEG ESG Scores", London Stock Exchange Group, accessed December 1, 2024, <https://www.lseg.com/en/data-analytics/sustainable-finance/esg-scores>.

Table 2. Portfolio Compositions Across Different Strategies

| Sample | Portfolio Composition | Type of Portfolio | # assets (N) |
|--------|-----------------------|--|--------------|
| S&P500 | Market cap. Weighted | Benchmark Portfolio | 449 |
| | Market cap. Weighted | Negative screening Portfolio | 376 |
| | Market cap. Weighted | Intensive positive screening Portfolio | 43-138 |
| | Market cap. Weighted | Positive screening Portfolio | 215-408 |
| S&P500 | Equally Weighted | Benchmark Portfolio | 449 |
| | Equally Weighted | Negative screening Portfolio | 376 |
| | Equally Weighted | Intensive positive screening Portfolio | 43-138 |
| | Equally Weighted | Positive screening Portfolio | 215-408 |
| EURO50 | Market cap. Weighted | Benchmark Portfolio | 47 |
| | Market cap. Weighted | Negative screening Portfolio | 37 |
| | Market cap. Weighted | Intensive positive screening Portfolio | 26-38 |
| | Market cap. Weighted | Positive screening Portfolio | 42-45 |
| EURO50 | Equally Weighted | Benchmark Portfolio | 47 |
| | Equally Weighted | Negative screening Portfolio | 37 |
| | Equally Weighted | Intensive positive screening Portfolio | 26-38 |
| | Equally Weighted | Positive screening Portfolio | 42-45 |

Source: Author's own work

Table 3. Industry Exclusions for Negative Screening

| Excluded Industries GICS Classification |
|---|
| Tobacco |
| Beverages |
| Air Transportation |
| Gas, Oil and Consumable fuels |
| Aerospace and Defense |
| Gas utilities |
| Hotels, restaurants and leisure |
| Energy equipment and services |
| Ground Transportation |
| Metals and Mining |
| Automobiles |
| Hotels and Resorts |

Source: Author's own work

Table 4. Descriptive Statistics of Market-Cap S&P500 Portfolios

| Portfolio | Total Return | Annualized Returns (Geometric Mean) | Standard Deviation | Skewness | Excess Kurtosis | Sharpe Ratio | Beta | Alpha |
|--|--------------|-------------------------------------|--------------------|----------|-----------------|--------------|------|--------|
| Market Cap. Benchmark S&P 500 | 287% | 14.85% | 21.34% | -1.26 | 1.72 | 0.69 | 1 | / |
| Negatively Screened Market Cap. S&P500 | 282% | 14.71% | 19.79% | -1.57 | 2.77 | 0.72 | 0.91 | 0.009 |
| Positively Screened Market Cap. S&P500 | 281% | 14.35% | 21.49% | -1.15 | 1.52 | 0.66 | 1 | -0.005 |
| Intensively Positively Screened Market Cap. S&P500 | 254% | 12.33% | 19.01% | -1.00 | 1.17 | 0.61 | 0.85 | -0.008 |

Source: Author's own work

Table 5. Descriptive Statistics of Equal-Weighted S&P500 Portfolios

| Portfolio | Total Return | Annualized Returns (Geometric Mean) | Standard Deviation | Skewness | Excess Kurtosis | Sharpe Ratio | Beta | Alpha |
|--|--------------|-------------------------------------|--------------------|----------|-----------------|--------------|------|-------|
| EWP Benchmark S&P 500 | 234% | 11.46% | 13.17% | -0.79 | -0.34 | 0.751 | 1 | / |
| Negatively Screened EWP S&P500 | 238% | 11.77% | 13.65% | -1.05 | 0.67 | 0.752 | 1.03 | 0.001 |
| Positively Screened EWP S&P500 | 223% | 10.41% | 13.09% | -0.72 | -0.54 | 0.67 | 0.99 | -0.01 |
| Intensively Positively Screened EWP S&P500 | 203% | 8.67% | 12.78% | -0.52 | -1.06 | 0.55 | 0.94 | -0.02 |

Source: Author's own work

Table 6. Descriptive Statistics of Market-Cap EURO50 Portfolios

| Portfolio | Total Return | Annualized Returns (Geometric Mean) | Standard Deviation | Skewness | Excess Kurtosis | Sharpe Ratio | Beta | Alpha |
|--|--------------|-------------------------------------|--------------------|----------|-----------------|--------------|------|--------|
| Market Cap. Benchmark EURO50 | 218% | 9.93% | 13.69% | -0.57 | -0.58 | 0.68 | 1 | / |
| Negatively Screened Market Cap. EURO50 | 206% | 8.73% | 14.74% | -0.33 | -0.93 | 0.56 | 1.05 | -0.015 |
| Positively Screened Market Cap. EURO50 | 207% | 8.93% | 13.99% | -0.27 | -1.12 | 0.59 | 0.99 | -0.009 |
| Intensively Positively Screened Market Cap. EURO50 | 173% | 6.13% | 10.54% | -0.06 | -0.99 | 0.49 | 0.73 | -0.016 |

Source: Author's own work

Table 7. Descriptive Statistics of Equal-Weighted EURO50 Portfolios

| Portfolio | Total Return | Annualized Returns (Geometric Mean) | Standard Deviation | Skewness | Excess Kurtosis | Sharpe Ratio | Beta | Alpha |
|--|--------------|-------------------------------------|--------------------|----------|-----------------|--------------|------|--------|
| EWP Benchmark EURO50 | 213% | 9.57% | 12.97% | -0.50 | -1.11 | 0.68 | 1 | / |
| Negatively Screened EWP EURO50 | 212% | 9.40% | 13.56% | -0.48 | -0.99 | 0.643 | 1.04 | -0.005 |
| Positively Screened EWP EURO50 | 209% | 9.18% | 13.16% | -0.41 | -1.23 | 0.642 | 1.01 | -0.005 |
| Intensively Positively Screened EWP EURO50 | 201% | 8.41% | 13.57% | -0.38 | -1.30 | 0.57 | 1.04 | -0.014 |

Source: Author's own work

Table 8. Tail-Risk Distributions of the S&P500 Portfolios

| MC S&P500 Benchmark | | MC Negative Screening S&P500 | | MC Positive Screening S&P500 | | MC Intensive Positive Screening S&P500 | |
|----------------------|---------|-------------------------------|---------|-------------------------------|---------|---|---------|
| Historical VaR @90 | -26.50% | Historical VaR @90 | -25.60% | Historical VaR @90 | -26.66% | Historical VaR @90 | -22.97% |
| Historical CVaR @90 | -32.16% | Historical CVaR @90 | -31.55% | Historical CVaR @90 | -32.17% | Historical CVaR @90 | -27.64% |
| EWP S&P500 Benchmark | | EWP Negative Screening S&P500 | | EWP Positive Screening S&P500 | | EWP Intensive Positive Screening S&P500 | |
| Historical VaR @90 | -11.40% | Historical VaR @90 | -14.03% | Historical VaR @90 | -11.63% | Historical VaR @90 | -10.08% |
| Historical CVaR @90 | -12.73% | Historical CVaR @90 | -16.44% | Historical CVaR @90 | -12.54% | Historical CVaR @90 | -10.20% |

Source: Author's own work

Table 9. Tail-Risk Distributions of the EURO50 Portfolios

| MC EURO 50 Benchmark | | MC Negative Screening EURO50 | | MC Positive Screening EURO50 | | MC Intensive Positive Screening EURO50 | |
|----------------------|---------|-------------------------------|---------|-------------------------------|---------|---|---------|
| Historical VaR @90 | -13.47% | Historical VaR @90 | -14.23% | Historical VaR @90 | -12.51% | Historical VaR @90 | -9.72% |
| Historical CVaR @90 | -15.15% | Historical CVaR @90 | -15.01% | Historical CVaR @90 | -13.86% | Historical CVaR @90 | -11.25% |
| EWP EURO50 Benchmark | | EWP Negative Screening EURO50 | | EWP Positive Screening EURO50 | | EWP Intensive Positive Screening EURO50 | |
| Historical VaR @90 | -10.58% | Historical VaR @90 | -11.57% | Historical VaR @90 | -10.59% | Historical VaR @90 | -12.02% |
| Historical CVaR @90 | -11.20% | Historical CVaR @90 | -11.90% | Historical CVaR @90 | -11.16% | Historical CVaR @90 | -13.00% |

Source: Author's own work