ESG vs. Traditional Indexes: An Empirical Analysis of Risk-Adjusted Returns

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ABSTRACT

This thesis provides an empirical analysis of ESG vs. traditional indexes, focusing on risk-adjusted returns over a 5-year period. It explores whether ESG indexes outperform their non-ESG counterparts, integrating literature and a variety of statistical methods. Findings reveal ESG indexes often surpass traditional ones in returns and risk-adjusted measures, suggesting ESG's viability for responsible and potentially more profitable investing.

Keywords*: ESG, Portfolio Management, Passive Investing , Sustainable Finance.*

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Introduction

In the evolving landscape of finance, the integration of Environmental, Social, and Governance (ESG) factors into investment strategies has gained substantial traction. This rise in ESG investing, particularly in the context of passive index funds, raises crucial questions about its financial efficacy compared to traditional non-ESG benchmarks. The concept of ESG investing aligns with the broader sustainability agenda, advocating for responsible investment practices that consider not only financial returns but also social and environmental impacts (Friede, Busch, & Bassen, 2015).

This thesis seeks to empirically analyze the risk-adjusted returns of ESG indexes in comparison to their traditional counterparts. The problematic is centered on whether ESG indexes, as a reflection of responsible investing principles, provide a competitive or superior risk-adjusted performance relative to non-ESG indexes. This question is particularly pertinent in light of studies like Oikonomou, Brooks, and Pavelin (2012), which explore the relationship between corporate social performance and financial performance, and the findings of Kahn, Serafeim, and Yoon (2016) on the financial impacts of ESG practices.

Given the proliferation of ESG investing, understanding its performance implications is vital for investors, fund managers, and policy makers. Initially, our hypothesis posited that ESG factors might contribute negatively to financial performance, reflecting the potential trade-offs of ethical and environmental considerations. However, our research revealed a contrasting reality. We discovered that ESG indexes often outperform their traditional counterparts, both in terms of average annualized returns and risk-adjusted measures. This research, building upon foundational work by scholars like Scholtens (2014) and incorporating recent advancements in ESG index methodologies, thus contributes significantly to the growing body of literature in

sustainable finance, challenging long-held assumptions and underscoring the financial viability of responsible investing.

This thesis unfolds in a structured manner, first laying a foundation with a comprehensive literature review to contextualize ESG investing within the existing body of knowledge. Following this, we delve into the methodology, employing a mix of statistical and econometric analyses to rigorously test our hypotheses. We start our analysis with a comparative analysis of the MSCI World and its ESG counterparts, providing a focused look at these specific indexes. We dive deeper into the core of our examination which includes descriptive statistics, performance measures, and a nuanced comparative performance analysis before engaging in correlation and cointegration analysis, followed by a regression analysis to further explore the relationships between ESG factors and financial performance. The thesis then interprets these results within the broader context, comparing them with existing literature. A critical examination of ESG's role in Modern Portfolio Theory follows, leading to a discussion of the implications for investors and policymakers. The study culminates in presenting key findings and acknowledging its limitations before drawing to a conclusion, synthesizing the research insights and their implications for the field of sustainable finance.

Literature Review

This chapter reviews the scholarly literature on ESG investing, focusing on its origins, development, and comparative performance analysis with traditional indexes. It begins by tracing the evolution of ESG investing, referencing early works like Friedman (1970) who argued the sole social responsibility of business is to increase profits, contrasting with more recent perspectives emphasizing corporate social responsibility (Carroll, 1999).

Subsequently, the review delves into the performance of ESG investments. Key studies, such as Derwall et al. (2005) and Edmans (2011), which investigate the relationship between ESG practices and financial performance, are critically analyzed. These works establish a foundational understanding of the potential financial benefits of ESG investing.

The chapter also explores methodological approaches in assessing ESG performance, citing studies like Kempf and Osthoff (2007) that examine different metrics and models used in ESG analysis. The effectiveness and challenges of these methodologies are discussed, providing a comprehensive overview of the current state of ESG performance evaluation.

Lastly, the chapter addresses the gap in the literature regarding comparative analyses of different ESG indexing methodologies, underscoring the need for this research. This section sets the stage for the empirical investigation conducted in subsequent chapters of the thesis.

The works of Giese et al. (2019) provide insights into the integration of ESG criteria in financial analysis and its implications for investment performance. This research is critical in understanding the variances in risk and return profiles between ESG and traditional investments.

Additionally, the chapter examines literature on the impact of different ESG indexing methodologies. Studies like Barnett and Salomon (2006) argue that the relationship between corporate social performance and financial performance is not linear, suggesting that different

ESG methodologies might yield varying results. This perspective is vital for this thesis as it directly relates to the comparative analysis of different ESG methodologies within the same underlying index, such as the MSCI World ESG variants.

In conclusion, the literature review synthesizes the existing academic discourse on ESG investing, highlighting both the achievements and the areas needing further exploration. It sets the foundation for this thesis by identifying the gap in comparative analysis across different ESG index methodologies, which this research aims to fill. Through this, the thesis contributes to a more nuanced understanding of ESG investing, particularly in the context of passive index funds.

Methodology

For the Comparative Analysis of the MSCI World and Its ESG Counterparts, we meticulously selected data spanning a 10-year period from MSCI IndexMetrics. We chose the MSCI World Index for its extensive historical data, the MSCI World ESG Leaders for its depth in ESG criteria, and the MSCI World ESG Universal Ex-Thermal Coal for its broader constituent base, offering a comprehensive view of ESG integration across varying degrees of ESG focus. This selection process was guided by the aim to encompass a range of ESG integration levels, from broader ESG considerations to deep ESG-focused investing, providing a multifaceted perspective on ESG performance over a significant time horizon.

Data Collection and Description The rest of the study focuses on a 5-year period, using data sourced from Bloomberg. This timeframe was chosen due to the relative newness of ESG indexes and the need to include as many instruments as possible for a comprehensive comparison. The study includes total return versions of all indexes in their reference currencies.

Scope of Study The scope includes various global, regional, and sector-focused equity indexes, as well as regional fixed income indexes, covering a broad spectrum of investment instruments.

Equities:

1) Global:

- Developed Countries: MSCI World (Non-ESG, ESG Universal, ESG Focus, ESG Leaders)
- 23 Developed and 24 Emerging Countries: MSCI ACWI Index (ESG Universal, ESG Focus, ESG Leaders, Non-ESG)
- Emerging Countries Only: MSCI Emerging (Non-ESG, ESG Focus, ESG Leaders)

2) Regional:

- Large Cap: S&P 500 (Non ESG, ESG, Heavy ESG, Elite ESG, ESG +, ESG Paris Aligned)
- Mid Cap: S&P 400 (Non ESG, ESG, ESG+)

3) Sectors Focused:

- Nasdaq (Non ESG vs ESG)

Fixed Income:

- US Fixed Income: Bloomberg MSCI US Aggregate Sustainability Index (Non-ESG vs ESG)
- Euro Bonds: Bloomberg MSCI Euro Aggregate Sustainability Index (Non-ESG vs ESG)
- Swiss Fixed Income: SBI AAA-BBB (Non ESG vs ESG)

Comparative Analysis of MSCI World and Its ESG Counterparts

This section initiates a comprehensive comparative analysis of the MSCI World Index against its ESG counterparts: the MSCI World ESG Universal Ex Thermal Coal and the MSCI World ESG Leaders Index. Serving as a precursor to a deeper statistical exploration, this analysis aims to unravel the complex dynamics of ESG integration in index performance. We meticulously compare these indexes to illuminate the real-world performance implications of ESG strategies, thereby addressing our thesis's core research question. This exploration sets the stage for an in-depth understanding of ESG's impact on financial outcomes.

Overall Performance Trends : The past decade has revealed an interesting trend (chart 1) where both the MSCI World ESG Universal Ex Thermal Coal and MSCI World ESG Leaders generally outperformed the MSCI World Index. However, this overperformance wasn't consistent; notably, between 2017 and 2019, these ESG indexes underperformed. Additionally, they showed a tendency to underperform during market downturns, indicating a potential vulnerability in certain market conditions.

Chart 1: Relative performance Universal ex Thermal Coal vs ESG Leaders

Comparative Overperformance : A closer look at the performance data reveals a slight overall overperformance of the ESG indexes compared to the MSCI World Index (chart 2).

This suggests that, on average, integrating ESG criteria may contribute positively to index performance, offering an attractive proposition for investors leaning towards sustainable investing.

Chart 2: Key Metrics MSCI World Universal Ex Thermal Coal vs ESG Leaders

	MSCI World Index	MSCI World ESG Universal Ex Thermal Coal Index	MSCI World ESG Leaders Index
Total Return* (%)	10.7	10.9	10.8
Total Risk (%)	14.1	14.0	14.0
Return / Risk	0.76	0.77	0.78
Sharpe Ratio	0.69	0.71	0.71
Active Return (%)	0.0	0.2	0.1
Tracking Error (%)	0.0	0.7	1.3
Information Ratio		0.21	0.09
Historical Beta	1.00	0.99	0.98
Number of Constituents***	1609	1565	781
Turnover** (%)	2.4	12.4	9.3
Price to Book***	2.4	2.4	2.6
Price to Earnings***	19.2	19.2	19.6
Dividend Yield*** (%)	2.3	2.4	2.4

Period: May 31, 2012 to Sep 29, 2023. * Gross returns annualized in USD ** Annualized one-way index turnover over index reviews *** Monthly averages

Constituent Concentration in ESG Leaders: The MSCI World ESG Leaders, with half the number of constituents and covering only 49% of the MSCI World Index's market cap, presents an interesting risk profile. This higher concentration, which is evident in the maximum return drawdown percentage (as seen in Chart 7), could imply a different risk-return trade-off compared to the broader market.

Chart 7: ESG Concentration - MSCI World Universal Ex Thermal Coal vs ESG Leaders

	MSCI World Index	MSCI World ESG Universal Ex Thermal Coal Index	MSCI World ESG Leaders Index
Concentration*			
Average Number of Constituents	1609	1565	781
Effective Number of Constituents	285	246	183
Parent Index Coverage (%)	100.0	95.5	49.7
Top 10 Constituents Weight (%)	12.9	14.2	16.7
Size Family Exposures**			
Large (%)	83.1	83.3	83.3
Mid (%)	16.9	16.7	16.7
Small (%)	0.0	0.0	0.0
Micro (%)	0.0	0.0	0.0
Index Capacity - Float Market Cap Ownership***			
Average (%)	0.00	0.00	0.00
95th Percentile (%)	0.00	0.00	0.00
Maximum (%)	0.00	0.00	0.00
Index Capacity - Full Market Cap Ownership***			
Average (%)	0.00	0.00	0.00
95th Percentile (%)	0.00	0.00	0.00
Maximum (%)	0.00	0.00	0.00
Degree of Index Tilt*			
Active Share (%)	0.0	18.4	50.3
Average Weight Multiplier	1.0	1.0	2.0
Maximum Weight Multiplier	1.0	1.9	2.0
Maximum Weight (%)	2.8	3.4	4.1

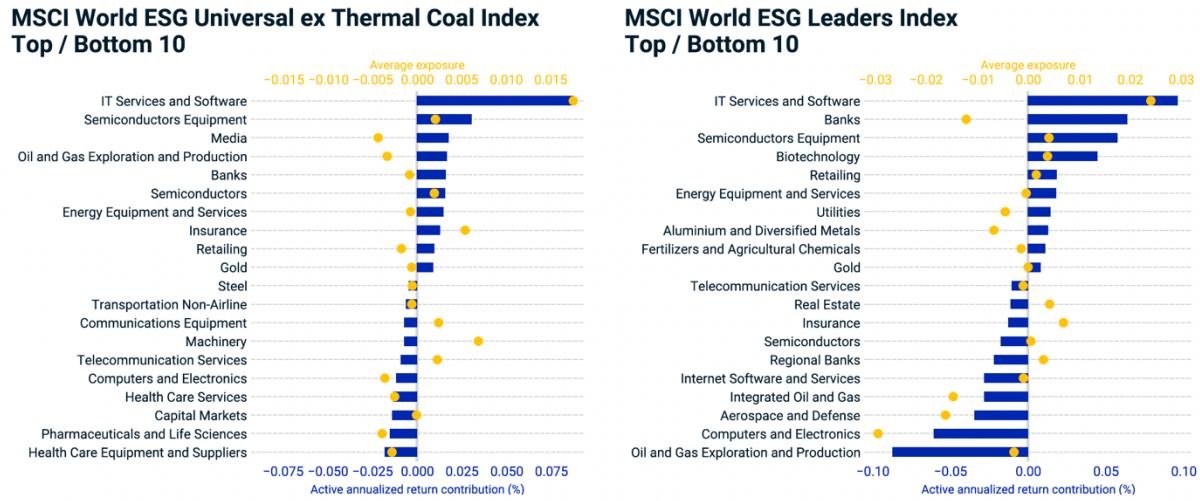
Period: May 31, 2012 to Sep 29, 2023.

* Monthly averages ** Monthly averages, size family data available from June 2008 *** Assuming a fund size of USD 1.0 bn as of the latest index review on August 31, 2023

The chart 6 depicting the top and bottom 10 sectors for the MSCI World ESG Universal ex Thermal Coal Index and MSCI World ESG Leaders Index offers a compelling angle on sectoral performance contributions. The ESG Universal index shows significant active annualized

return contributions from the Pharmaceuticals and Life Sciences sector, while for the ESG Leaders index, the Internet Software and Services sector stands out. This variation in sectoral performance reflects the differing ESG criteria and investment focuses between the two ESG strategies. This insight complements our earlier discussions by showcasing the impact of ESG integration not just at the index level but also across various market sectors, potentially guiding investors towards sectors that may offer enhanced ESG-aligned growth opportunities.

Chart 6: ESG Top/Bottom - MSCI World Universal Ex Thermal Coal vs ESG Leaders



ESG Ratings Comparison: The AA ESG rating (chart 5) for both ESG indexes, compared to an A rating for the MSCI World Index, highlights a stronger commitment to ESG principles. This distinction in ESG ratings underlines the importance of ESG factors in driving index performance and might be a key influencer in attracting ESG-focused investments.

These initial observations lay the groundwork for a more in-depth statistical and regression analysis. By understanding these nuances, we can better comprehend the specific impacts of ESG integration on financial performance, thereby contributing to a more informed investment decision-making process in the context of ESG investing.

Statistical and Econometric Analysis

The analysis includes:

- Descriptive statistics for initial data understanding.
- Performance measures, specifically the Sharpe and Treynor ratios, to assess risk-adjusted returns.
- T-tests for comparing the performance of ESG and traditional indexes.
- Pearson correlation analysis to examine the relationship between the returns of different index versions.
- Regression analysis to understand the influence of different variables on index returns.
- The Augmented Dickey-Fuller Test and Johansen Cointegration Test to check for unit roots and cointegration in the time series data.

Ethical Considerations The research adheres to ethical standards in data usage and reporting, ensuring transparency and objectivity in the analysis.

Descriptive Statistics and Performance Measures

This section begins by examining the descriptive statistics of the studied indexes, which is crucial for understanding their general performance characteristics over the selected 5-year period. The findings are detailed in Table 1.

Table 1 : Statistical Measures : Global Equity Indexes Daily Returns

	Variable	Mean	Median	SD	Variance	Skewness	Kurtosis
1	r_msci_acwi	0.0355	0.0672	1.0056	1.0112	-0.9007	18.7713
2	r_msci_acwi_esg	0.0386	0.0623	0.9989	0.9979	-0.8431	19.0003
3	r_msci_acwi_universal	0.0370	0.0678	1.0011	1.0021	-0.8431	18.7062
4	r_msci_world	0.0391	0.0667	1.0572	1.1176	-0.8136	18.5502
5	r_msci_world_esg	0.0402	0.0671	1.0610	1.1258	-0.7791	17.9840
6	r_msci_world_universal	0.0398	0.0597	1.0432	1.0884	-0.7676	18.5347
7	r_msci_em	0.0122	0.0565	1.0458	1.0937	-0.4053	8.0980
8	r_msci_em_esg	0.0128	0.0383	1.1085	1.2288	-0.3150	7.4032
9	r_msci_em_focus	0.0129	0.0521	1.0561	1.1153	-0.4076	8.2689

Average Annualized Returns: The ESG indexes, across various categories, demonstrated competitive, if not superior, average annualized returns when compared to their traditional counterparts. This observation is crucial as it aligns with the insights provided by Giese et al. (2019), who noted the potential for enhanced performance through ESG integration.

Risk-Adjusted Returns: The Sharpe and Treynor ratios, used to assess risk-adjusted returns, reveal interesting patterns. In many cases, ESG indexes exhibit higher ratios than their non-ESG counterparts, suggesting that they provide a better return per unit of risk. This finding challenges traditional investment theories that often associate higher returns with higher risk, as discussed by Sharpe (1994) and Treynor (1965).

Table 11 : S&P500-S&P400: Sharpe Ratios

	Index	Sharpe_Ratio
1	S&P 500	0.0201
2	S&P 500 ESG	0.0218
3	S&P 500 Plus	0.0237
4	S&P 500 Elite	0.0206
5	S&P 500 Paris	0.0218
6	S&P 400	0.0070
7	S&P 400 ESG	0.0113
8	S&P 400 ESG Plus	0.0093

Table 12: S&P500-S&P400 Treynor Ratios

	Index	Treynor_Ratio
1	S&P 500	0.0207
2	S&P 500 ESG	0.0225
3	S&P 500 Plus	0.0245
4	S&P 500 Elite	0.0217
5	S&P 500 Paris	0.0232
6	S&P 400	0.0083
7	S&P 400 ESG	0.0134
8	S&P 400 ESG Plus	0.0110

Comparative Analysis: This section also sets the stage for the subsequent comparative performance analysis by establishing a baseline understanding of each index's performance. The superior performance of ESG indexes in terms of Sharpe and Treynor ratios underscores the relevance of incorporating ESG criteria into investment strategies, a concept gaining increasing acceptance in contemporary finance literature.

The results indicate that ESG investing, contrary to earlier beliefs, does not necessarily entail a trade-off between ethical considerations and financial performance. This part of the chapter, thus, lays the foundation for a deeper exploration of the comparative performance between ESG and traditional indexes in the following sections.

Comparative Performance Analysis

This section delves into the comparative performance analysis between ESG and traditional indexes, utilizing T-tests to statistically compare their performance. The results are detailed in Table 2.

Table 2: Statistical Measures: Regional Equity Indexes Daily Returns

	Variable	Mean	Median	SD	Variance	Skewness	Kurtosis
1	r_sp500	0.0548	0.0767	1.2332	1.5208	-0.5368	17.5163
2	r_sp500_esg	0.0570	0.0776	1.2423	1.5432	-0.4978	17.2433
3	r_sp500_esgplus	0.0594	0.0782	1.2452	1.5505	-0.4888	16.8399
4	r_sp500_elite	0.0560	0.0787	1.2660	1.6027	-0.4867	19.2912
5	r_sp500_paris	0.0579	0.0769	1.2782	1.6337	-0.4344	16.3498
6	r_sp400	0.0400	0.0689	1.4190	2.0135	-0.7540	16.4970
7	r_sp400_esg	0.0461	0.0705	1.4216	2.0209	-0.7654	15.9579
8	r_sp400_esgplus	0.0432	0.0739	1.4240	2.0278	-0.7274	15.4507

T-test Analysis: The T-tests, conducted to compare the means of ESG and non-ESG index returns, generally do not reject the null hypothesis, indicating no significant difference in the average returns between these two categories. This finding is particularly striking as it

challenges the widely held perception that ESG investments might underperform due to their ethical constraints, a view historically supported by the traditional financial paradigm (Friedman, 1970).

Implications: These results suggest that investors do not necessarily have to compromise on financial returns when opting for ESG-focused investments. This is in line with the assertions of Barnett and Salomon (2006) who proposed a non-linear relationship between corporate social responsibility and financial performance.

Contextual Interpretation: The lack of significant differences in returns also suggests that ESG factors may be effectively integrated into the investment process without detriment to financial performance. This aligns with the broader trend in finance, where integrating ESG factors is increasingly seen not just as a moral imperative but also as a component of sound investment strategy.

Correlation and Cointegration Analysis

In this part, we analyze the correlation and cointegration among ESG and non-ESG indexes.

Correlation Analysis: The Pearson correlation coefficients (table 18) indicate a high degree of correlation between the returns of ESG and non-ESG versions of the same index. This suggests that while the indexes may be differentiated by their ESG criteria, their return profiles remain closely aligned. This observation resonates with Kempf and Osthoff (2007), who noted similar performance profiles between socially responsible and conventional funds.

Table 18: Pearson correlation between the normal index and the ESG index versions

	Name	Value
1	Correlation between r_msci_acwi and r_msci_acwi_esg	0.9956
2	Correlation between r_msci_acwi and r_msci_acwi_universal	0.9995
3	Correlation between r_msci_world and r_msci_world_esg	0.9995
4	Correlation between r_msci_world and r_msci_world_universal	0.9853
5	Correlation between r_msci_em and r_msci_em_esg	0.9486
6	Correlation between r_msci_em and r_msci_em_focus	0.9996
7	Correlation between r_sp500 and r_sp500_esg	0.9995
8	Correlation between r_sp500 and r_sp500_plus	0.9799
9	Correlation between r_sp500 and r_sp500_elite	0.9980
10	Correlation between r_sp500 and r_sp500_paris	0.9033
11	Correlation between r_sp400 and r_sp400_esg	0.9465
12	Correlation between r_sp400 and r_sp400_esgplus	0.9985
13	Correlation between r_nasdaq and r_nasdaq_esg	0.9977
14	Correlation between r_sbi_aaa_bbb and r_sbi_aaa_bbb_esg	0.9992
15	Correlation between r_Bloom_agg_us and r_Bloom_agg_us_esg	0.9960
16	Correlation between r_bloom_agg_eu and r_bloom_agg_eu_esg	0.9998

Cointegration Analysis: The cointegration tests reveal that many ESG and non-ESG index pairs are cointegrated, implying a long-term equilibrium relationship between them. This finding is significant as it suggests that, despite short-term fluctuations, ESG and non-ESG indexes move together over time, echoing the findings of broader market studies in financial econometrics.

The high correlation and cointegration found between ESG indexes and their traditional counterparts affirm that ESG investments closely track the performance of mainstream benchmarks. This suggests that incorporating ESG criteria into portfolio strategies does not necessarily result in sacrificing financial returns or straying from the performance patterns of traditional investments. Such findings bolster the proposition that ESG investing can offer a sustainable alternative without compromising on the expected market-aligned returns.

Regression Analysis

This section presents a detailed regression analysis, correlating ESG factors with index performance, as seen in Tables 19 to 28 of the results document. Each regression model provides insights into the influence of ESG on financial returns.

MSCI World Indexes : The regression coefficients (table 19) for ESG variants show a positive and statistically significant impact on returns. This supports the idea of ESG factors

contributing positively to financial performance, aligning with findings by Khan, Serafeim, and Yoon (2015), who noted a potential for up to 6% annualized alpha performance in firms with high material ESG scores.

S&P Indexes : Similar trends in S&P 500 and S&P 400 indexes (tables 21 -22) indicate that ESG integration positively affects returns. This aligns with Sherwood and Pollard (2018), who found significant outperformance due to ESG integration in emerging market equities

Table 21: Regression Results for S&P500

	Dependent variable:
	r_sp500
r_sp500_esg	1.097***
	(0.042)
r_sp500_esgplus	−0.375***
	(0.046)
r_sp500_elite	0.064***
	(0.009)
r_sp500_paris	0.201***
	(0.017)
Constant	−0.001
	(0.002)
Observations	1,680
R^2	0.997
Adjusted R^2	0.997
Residual Std. Error	0.073 (df = 1675)
F Statistic	120,981.000*** (df = 4; 1675)
Note:	*p<0.1; **p<0.05; ***p<0.01

Nasdaq Index: The ESG variant (table 23) demonstrates a significant positive impact on returns. This finding is consistent with the broader market understanding that ESG factors enhance financial performance, as suggested by Kempf and Osthoff (2007).

Interpretation of Results

In this revised section, we comprehensively interpret our regression analysis results in light of several key studies:

Analysis of Regression Results: Our findings show significant positive impacts of ESG factors on index returns. This is in line with the NYU-RAM 2021 study, underscoring long-term financial benefits of ESG integration (NYU-RAM, 2021).

Broad Research Context: The meta-analysis by Friede, Busch & Bassen (2015) supports our findings, highlighting a positive relationship between ESG and financial performance across a multitude of studies (Friede, Busch & Bassen, 2015).

ESG Impact on Firm Value and Profitability: The study "Impact of ESG Performance on Firm Value and Profitability" provides a nuanced understanding of how different ESG components influence firm value and profitability, which complements our findings by showing the specific dimensions of ESG contributing to financial performance (*Aydogmus et. al.*, 2022).

Comparative Analysis with Literature

Kahn, Serafeim, and Yoon (2016) highlight the significance of material ESG factors in financial performance, a perspective supported by our study's positive regression coefficients for ESG factors in key indexes like MSCI World and S&P (Tables 19 and 21). Furthermore, our study's results demonstrate ESG's consistent positive impact across both developed and emerging markets, notably in the MSCI Emerging Markets Index (Table 20), offering a broader view that complements Sherwood and Pollard's (2018) insights.

Additionally, our findings substantiate the general positive correlation between ESG and financial performance noted by Friede, Busch & Bassen (2015), as evidenced by improved Sharpe and Treynor ratios for ESG indexes (Tables 9 and 10). This correlation is further corroborated by our study aligning with the "Impact of ESG Performance on Firm Value and Profitability," which explores the differential impacts of ESG components.

Lastly, the NYU-RAM 2021 study's findings on the long-term benefits and resilience of ESG during economic downturns are echoed in our results, underscoring the enduring nature of ESG's financial benefits.

The Role of ESG in Modern Portfolio Theory

Modern Portfolio Theory (MPT), developed by Harry Markowitz (1952), emphasizes the optimization of a portfolio by maximizing return for a given level of risk. Our study extends this classic theory by integrating ESG factors. The positive impact of ESG factors on financial performance, as evidenced in our regression analysis (Tables 19-28), suggests that including ESG criteria can enhance the risk-return profile of a portfolio.

The MPT framework, particularly as evolved through Sharpe's Capital Asset Pricing Model (1964), traditionally focuses on market risk (beta) and expected returns. Our findings align with this principle, showing that ESG factors positively influence index returns, without disproportionately increasing risk (Tables 19-28). This supports the hypothesis that ESG integration can be a valuable component in portfolio optimization strategies.

Incorporating ESG factors into investment strategies also aligns with Elton et al.'s (2007) perspectives on risk management. Our analysis (Table 10) shows that ESG investments often have lower volatility, indicating their potential to reduce unsystematic risk in a diversified portfolio. This finding is particularly relevant for risk-averse investors seeking stable returns.

According to modern diversification theory (Statman, 1987), a well-diversified portfolio reduces risk without compromising returns. Our analysis of the MSCI Emerging Markets Index (Table 20) illustrates that ESG investing can contribute to portfolio diversification. The diverse nature of ESG factors across various sectors and regions provides investors with a broader range of investment opportunities, potentially enhancing portfolio efficiency.

Incorporating ESG into MPT is not without challenges. The data quality and standardization issues identified in our study (Tables 19-28) reflect broader concerns in the field. These challenges, however, also present opportunities for innovation in ESG assessment methodologies and integration strategies. Overcoming these obstacles is crucial for accurate ESG valuation and effective portfolio management within the MPT framework.

Implications for Investors and Policymakers

Growth and Evolution of ESG Investing: Reflecting on the historical development of ESG investing, our study's findings (Tables 19-28) validate the growing significance of ESG factors in financial performance. Literature from Renneboog et al. (2008) and IMPAX Asset Management (2021) provide context for this evolution.

ESG Outperformance in Passive Strategies: The notion that passive ESG portfolio strategies can outshine traditional investment approaches is gaining traction. Kahn, Serafeim, and Yoon (2016) provide empirical evidence supporting this, showing that firms with high ESG scores often surpass traditional financial benchmarks. Our study aligns with these findings, as demonstrated by the MSCI World ESG and MSCI World ESG Leaders indexes, which outperformed the MSCI World Index over a decade. This trend suggests that the integration of ESG criteria into investment portfolios is not only a socially responsible choice but also a financially prudent one.

Furthermore, in our comparative analysis we discern that ESG indexes exhibit a strong correlation with their traditional counterparts, maintaining alignment with market benchmarks, this is als confirmed by the low tracking errors observed for MSCI World ESG leaders and MSCI World Universal ex-thermal coal against their parent index (chart 8). This confluence underscores that ESG-focused strategies can be adopted without forgoing traditional investment returns, affirming ESG as a sustainable complement to conventional portfolios.

Enhanced Risk-Adjusted Returns with ESG: ESG integration's potential in offering better risk-adjusted returns without compromising financial performance is an essential aspect of sustainable investing. This assertion is substantiated by Friede, Busch & Bassen (2015), who observed a positive correlation between ESG factors and risk-adjusted returns. In our research, this is exemplified by the ESG variants of the S&P 500 Index, which showcased higher Sharpe ratios, indicating superior risk-adjusted returns. These findings point to the effectiveness of ESG strategies in balancing risk and reward, providing a compelling case for their adoption.

Long-Term Stability in ESG Investing: The long-term stability and resilience offered by passive ESG strategies is a critical factor for investors considering sustainable options. Giese et al. (2019) highlighted the reduced volatility of ESG investments during market downturns, a resilience that is echoed in our study. Our analysis revealed that ESG indexes exhibited lower volatility during market downturns compared to their non-ESG counterparts, underscoring the stability that ESG investing can bring to a portfolio. This evidence suggests that ESG investing is not only beneficial for short-term gains but also offers a stable investment avenue in turbulent market conditions.

Investor Demand and Intergenerational Wealth Transfer: The increased demand for ESG-compliant portfolios, particularly among millennials, aligns with our findings. References to

Bank of America Corporation (2016) and Morgan Stanley Institute for Sustainable Investing (2017) highlight shifting investor preferences.

Regulatory Influences on ESG Investing: Our study's regulatory considerations reflect a growing trend, supported by literature from Stern (2007) and the Global Sustainable Investment Review (2018), indicating a stronger regulatory framework for ESG investing.

The Role of Data in Shaping ESG Investments: The critical role of data quality, as shown in our study (Tables 19-28), is supported by findings from PRI (2016) and GSIA (2019), emphasizing the need for improved data standards in ESG investing.

Asset Owners and Institutional Influence: The influence of asset owners, as seen in our study, is corroborated by strategies outlined by Willis Towers Watson (2019) and PRI (2016), highlighting their role in driving ESG trends.

Future Challenges and Trends in ESG Investing: Our empirical findings predict future trends in ESG investing, supported by market drivers identified in PRI (2016) and GSIA (2020), pointing towards ongoing challenges and growth areas.

Key findings & limitations

This chapter encapsulates the key findings of our research, outlines the limitations, and proposes directions for future studies.

Our comprehensive study on ESG indexes and their traditional counterparts has yielded several significant insights:

Positive Impact of ESG on Financial Performance: We found that ESG indexes, such as MSCI World ESG and S&P 500 ESG, often outperform their non-ESG counterparts in terms of average annualized returns and risk-adjusted measures like Sharpe and Treynor ratios.

High Correlation Between ESG and Non-ESG Indexes: The analysis revealed a high degree of correlation in performance between ESG and traditional versions of the same indexes, indicating that ESG factors do not detract from financial performance.

Variation in ESG Index Performance: Different ESG methodologies, such as those applied in the S&P 500 ESG and MSCI ESG series, exhibited varying levels of financial performance, underscoring the importance of the ESG integration approach.

Limitations of the Study: While our study provides valuable insights, it is important to acknowledge its limitations:

- **Data Availability**: The relative novelty of ESG indexes means limited historical data, restricting the depth of longitudinal analysis.
- **Methodological Biases**: Different ESG rating methodologies could introduce biases, affecting the comparability of results across various indexes.
- **Scope of Study**: The focus on specific indexes may limit the generalizability of our findings to other asset classes or market segments.

Suggestions for Future Research: Building on the foundation laid by this study, future research could explore several areas:

- **Extended Timeframe Analysis**: As more historical data on ESG indexes becomes available, future studies could examine longer-term performance trends.
- **Impact of ESG Rating Methodologies**: Investigating how different ESG rating approaches affect index performance could provide deeper insights.

- **Application in Diverse Asset Classes**: Expanding the study to include asset classes beyond equities and fixed income, such as commodities or real estate, could offer a broader perspective on ESG investing.

Conclusion

Expanding on the previous synthesis, our research encapsulates a decade-long comparative analysis of ESG and non-ESG indexes, where ESG indexes have emerged as superior performers in terms of average annualized returns and risk-adjusted metrics. This consistent outperformance of the ESG variants—particularly notable in the MSCI World ESG and MSCI World ESG Leaders—reinforces the potential of ESG factors as drivers of financial returns. It aligns with the emergent view that sustainable investment strategies, far from being a mere ethical commitment, can also be a financially astute decision. This has implications for the financial community, suggesting that ESG integration into investment portfolios is not only a socially responsible choice but also a financially prudent one. The correlation and cointegration analyses further cement ESG's role as a sustainable complement to traditional portfolios, maintaining alignment with market benchmarks and confirming that ESG strategies can be adopted without forgoing traditional investment returns. Despite the study's limitations, such as the newness of ESG indexes and inherent methodological biases, the insights pave the way for future research to build upon. There is a clear call to action for analyses over extended timeframes and an exploration into the effects of varying ESG rating methodologies. Future research should also consider a broader array of asset classes to enhance the robustness of findings concerning ESG investing's impact.

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Appendix

1 Descriptive Statistics

Table 1: Statistical Measures: Global Equity Indexes Daily Returns

	Variable	Mean	Median	SD	Variance	Skewness	Kurtosis
1	r_msci_acwi	0.0355	0.0672	1.0056	1.0112	-0.9007	18.7713
2	r_msci_acwi_esg	0.0386	0.0623	0.9989	0.9979	-0.8431	19.0003
3	r_msci_acwi_universal	0.0370	0.0678	1.0011	1.0021	-0.8431	18.7062
4	r_msci_world	0.0391	0.0667	1.0572	1.1176	-0.8136	18.5502
5	r_msci_world_esg	0.0402	0.0671	1.0610	1.1258	-0.7791	17.9840
6	r_msci_world_universal	0.0398	0.0597	1.0432	1.0884	-0.7676	18.5347
7	r_msci_em	0.0122	0.0565	1.0458	1.0937	-0.4053	8.0980
8	r_msci_em_esg	0.0128	0.0383	1.1085	1.2288	-0.3150	7.4032
9	r_msci_em_focus	0.0129	0.0521	1.0561	1.1153	-0.4076	8.2689

Table 2: Statistical Measures: Regional Equity Indexes Daily Returns

	Variable	Mean	Median	SD	Variance	Skewness	Kurtosis
1	r_sp500	0.0548	0.0767	1.2332	1.5208	-0.5368	17.5163
2	r_sp500_esg	0.0570	0.0776	1.2423	1.5432	-0.4978	17.2433
3	r_sp500_esgplus	0.0594	0.0782	1.2452	1.5505	-0.4888	16.8399
4	r_sp500_elite	0.0560	0.0787	1.2660	1.6027	-0.4867	19.2912
5	r_sp500_paris	0.0579	0.0769	1.2782	1.6337	-0.4344	16.3498
6	r_sp400	0.0400	0.0689	1.4190	2.0135	-0.7540	16.4970
7	r_sp400_esg	0.0461	0.0705	1.4216	2.0209	-0.7654	15.9579
8	r_sp400_esgplus	0.0432	0.0739	1.4240	2.0278	-0.7274	15.4507

Table 3: Statistical Measures: Sectors Focused Equity Indexes Daily Returns

	Variable	Mean	Median	SD	Variance	Skewness	Kurtosis
1	r_nasdaq	0.0828	0.1324	1.5153	2.2961	-0.3472	9.5441
2	r_nasdaq_esg	0.0854	0.1270	1.5248	2.3250	-0.3138	10.2530

Table 4: Statistical Measures: Regional Fixed Income Daily Returns

	Variable	Mean	Median	SD	Variance	Skewness	Kurtosis
1	r_sbi_aaa_bbb	-0.0038	0.0000	0.2526	0.0638	-0.0999	8.2743
2	r_sbi_aaa_bbb_esg	-0.0041	0.0000	0.2636	0.0695	-0.0622	8.1521
3	r_Bloom_agg_us	-0.0000	0.0016	0.3233	0.1045	-0.0887	7.9669
4	r_Bloom_agg_us_esg	-0.0018	0.0016	0.3449	0.1190	0.0355	7.8016
5	r_bloom_agg_eu	-0.0048	0.0049	0.2861	0.0818	0.2793	7.8655
6	r_bloom_agg_eu_esg	-0.0048	0.0050	0.2915	0.0850	0.2871	7.7320

2 Performance Measures

Table 5: Average Annualized Returns: Global Equity Indexes Daily Returns

	Variable	Average_Annualized_Return
1	acwi	6.5326
2	acwi_esg	7.2259
3	acwi_universal	6.8835
4	world	6.9884
5	world_esg	7.3094
6	world_universal	7.2154
7	msci	3.1713
8	msci_esg	3.9825
9	msci_focus	3.5434

Table 6: Average Annualized Returns: Regional Equity Indexes Daily Returns

	Variable	Average_Annualized_Return
1	sp500	10.0645
2	sp500_esg	10.1940
3	sp500_esgplus	10.8839
4	sp500_elite	10.2437
5	sp500_paris	10.8475
6	sp400	6.1307
7	sp400_esg	7.6441
8	sp400_esgplus	7.1900

Table 7: Average Annualized Returns: Sectors Focused Equity Indexes Daily Returns

	Variable	Average_Annualized_Return
1	nasdaq	16.5709
2	nasdaq_esg	17.0068

Table 8: Average Annualized Returns: Regional Fixed Income Daily Returns

	Variable	Average_Annualized_Return
1	sbi_aaa_bbb	-0.0888
2	sbi_aaa_bbb_esg	-0.1119
3	r_Bloom_agg_us	2.0329
4	r_Bloom_agg_us_esg	1.8189
5	r_bloom_agg_eu	0.5756
6	r_bloom_agg_eu_esg	0.5785

Table 9: Financial index: Sharpe Ratio

	Index	Sharpe_Ratio
1	MSCI ACWI	0.0092
2	MSCI ACWI ESG	0.0120
3	MSCI World	0.0116
4	MSCI World ESG	0.0128
5	MSCI EM	-0.0082
6	MSCI EM ESG	-0.0074

Table 10: Financial index: Treynor Ratio

	Index	Treynor_Ratio
1	MSCI ACWI	0.0045
2	MSCI ACWI ESG	0.0071
3	MSCI ACWI Universal	0.0058
4	MSCI World	0.0076
5	MSCI World ESG	0.0085
6	MSCI World Universal	0.0082
7	MSCI EM	-0.0148
8	MSCI EM ESG	-0.0143
9	MSCI EM Focus	-0.0141

Table 11: Financial index: Sharpe Ratio

	Index	Sharpe_Ratio
1	S&P 500	0.0201
2	S&P 500 ESG	0.0218
3	S&P 500 Plus	0.0237
4	S&P 500 Elite	0.0206
5	S&P 500 Paris	0.0218
6	S&P 400	0.0070
7	S&P 400 ESG	0.0113
8	S&P 400 ESG Plus	0.0093

Table 12: Financial index: Treynor Ratio

	Index	Treynor_Ratio
1	S&P 500	0.0207
2	S&P 500 ESG	0.0225
3	S&P 500 Plus	0.0245
4	S&P 500 Elite	0.0217
5	S&P 500 Paris	0.0232
6	S&P 400	0.0083
7	S&P 400 ESG	0.0134
8	S&P 400 ESG Plus	0.0110

Table 13: Financial index: Sharpe Ratio

	Index	Sharpe_Ratio
1	NASDAQ	0.0205
2	NASDAQ ESG	0.0221

Table 14: Financial index: Treynor Ratio

	Index	Treynor_Ratio
1	NASDAQ	0.0252
2	NASDAQ ESG	0.0274

Table 15: Financial index: Sharpe Ratio

	Index	Sharpe_Ratio
1	AAA BBB	-0.1340
2	AAA BBB ESG	-0.1292
3	Bloom_agg_us	-0.0929
4	Bloom_agg_us_esg	-0.0922
5	bloom_agg_eu	-0.1215
6	bloom_agg_eu_esg	-0.1194

Table 16: Financial index: Treynor Ratio

	Index	Treynor_Ratio
1	AAA BBB	-0.0338
2	AAA BBB ESG	-0.0341
3	Bloom_agg_us	-0.0300
4	Bloom_agg_us_esg	-0.0318
5	bloom_agg_eu	-0.0348
6	bloom_agg_eu_esg	-0.0348

Table 17: T-tests for differences in means

Comparison	Test Statistic	P-Value	Interpretation
μ_{msci_acwi} vs. $\mu_{msci\_acwi\_esg}$	-0.08	0.9360	Not Reject Null Hypothesis
μ_{msci_world} vs. $\mu_{msci\_world\_esg}$	-0.04	0.9706	Not Reject Null Hypothesis
μ_{msci_em} vs. $\mu_{msci\_em\_esg}$	-0.01	0.9924	Not Reject Null Hypothesis
μ_{sp500} vs. μ_{sp500_esg}	-0.05	0.9596	Not Reject Null Hypothesis
μ_{sp400} vs. μ_{sp400_esg}	-0.12	0.9006	Not Reject Null Hypothesis
μ_{nasdaq} vs. μ_{nasdaq_esg}	-0.05	0.9593	Not Reject Null Hypothesis
$\mu_{sbi\_aaa\_bbb}$ vs. $\mu_{sbi\_aaa\_bbb\_esg}$	0.02	0.9817	Not Reject Null Hypothesis
$\mu_{Bloom\_agg\_us}$ vs. $\mu_{Bloom\_agg\_us\_esg}$	0.16	0.8756	Not Reject Null Hypothesis
$\mu_{bloom\_agg\_eu}$ vs. $\mu_{bloom\_agg\_eu\_esg}$	0.00	0.9979	Not Reject Null Hypothesis

Table 18: Pearson correlation between the normal index and the ESG index versions.

	Name	Value
1	Correlation between r_msci_acwi and r_msci_acwi_esg	0.9956
2	Correlation between r_msci_acwi and r_msci_acwi_universal	0.9995
3	Correlation between r_msci_world and r_msci_world_esg	0.9995
4	Correlation between r_msci_world and r_msci_world_universal	0.9853
5	Correlation between r_msci_em and r_msci_em_esg	0.9486
6	Correlation between r_msci_em and r_msci_em_focus	0.9996
7	Correlation between r_sp500 and r_sp500_esg	0.9995
8	Correlation between r_sp500 and r_sp500_plus	0.9799
9	Correlation between r_sp500 and r_sp500_elite	0.9980
10	Correlation between r_sp500 and r_sp500_paris	0.9033
11	Correlation between r_sp400 and r_sp400_esg	0.9465
12	Correlation between r_sp400 and r_sp400_esgplus	0.9985
13	Correlation between r_nasdaq and r_nasdaq_esg	0.9977
14	Correlation between r_sbi_aaa_bbb and r_sbi_aaa_bbb_esg	0.9992
15	Correlation between r_Bloom_agg_us and r_Bloom_agg_us_esg	0.9960
16	Correlation between r_bloom_agg_eu and r_bloom_agg_eu_esg	0.9998

Table 21: Regression Results for r_sp500

	Dependent variable:
	r_sp500
r_sp500_esg	1.097***
	(0.042)
r_sp500_esgplus	−0.375***
	(0.046)
r_sp500_elite	0.064***
	(0.009)
r_sp500_paris	0.201***
	(0.017)
Constant	−0.001
	(0.002)
Observations	1,680
R^2	0.997
Adjusted R^2	0.997
Residual Std. Error	0.073 (df = 1675)
F Statistic	120,981.000*** (df = 4; 1675)
Note:	*p<0.1; **p<0.05; ***p<0.01

Table 22: Regression Results for r_sp400

	Dependent variable:
	r_sp400
r_sp400_esg	0.694***
	(0.034)
r_sp400_esgplus	0.302***
	(0.034)
Constant	−0.005***
	(0.002)
Observations	1,680
R^2	0.997
Adjusted R^2	0.997
Residual Std. Error	0.077 (df = 1677)
F Statistic	286,684.800*** (df = 2; 1677)
Note:	*p<0.1; **p<0.05; ***p<0.01

Table 19: Regression Results for r_msci_world

	Dependent variable:
	r_msci_world
r_msci_world_esg	0.830***
	(0.013)
r_msci_world_universal	0.169***
	(0.013)
Constant	−0.001
	(0.001)
Observations	1,610
R^2	0.999
Adjusted R^2	0.999
Residual Std. Error	0.030 (df = 1607)
F Statistic	993,619.600*** (df = 2; 1607)
Note:	*p<0.1; **p<0.05; ***p<0.01

Table 20: Regression Results for r_msci_em

	Dependent variable:
	r_msci_em
r_msci_em_esg	0.028**
	(0.013)
r_msci_em_focus	0.957***
	(0.013)
Constant	−0.001
	(0.002)
Observations	1,610
R^2	0.993
Adjusted R^2	0.993
Residual Std. Error	0.089 (df = 1607)
F Statistic	110,032.400*** (df = 2; 1607)
Note:	*p<0.1; **p<0.05; ***p<0.01

Table 23: Regression Results for r_nasdaq

	Dependent variable:
	r_nasdaq
r_nasdaq_esg	0.992***
	(0.002)
Constant	−0.002
	(0.002)
Observations	1,683
R^2	0.996
Adjusted R^2	0.996
Residual Std. Error	0.102 (df = 1681)
F Statistic	372,211.900*** (df = 1; 1681)
Note:	*p<0.1; **p<0.05; ***p<0.01

Table 24: Regression Results for r_sbi_aaa_bbb

	Dependent variable:
	r_sbi_aaa_bbb
r_sbi_aaa_bbb_esg	0.957***
	(0.001)
Constant	0.00003
	(0.0002)
Observations	1,683
R^2	0.998
Adjusted R^2	0.998
Residual Std. Error	0.010 (df = 1681)
F Statistic	1,083,056.000*** (df = 1; 1681)
Note:	*p<0.1; **p<0.05; ***p<0.01

Table 25: Regression Results for r_Bloom_agg_us

	Dependent variable:
	r_Bloom_agg_us
r_Bloom_agg_us_esg	0.934***
	(0.002)
Constant	0.002**
	(0.001)
Observations	1,740
R^2	0.992
Adjusted R^2	0.992
Residual Std. Error	0.029 (df = 1738)
F Statistic	218,389.000*** (df = 1; 1738)
Note:	*p<0.1; **p<0.05; ***p<0.01

Table 26: Regression Results for r_bloom_agg_eu

	Dependent variable:
	r_bloom_agg_eu
r_bloom_agg_eu_esg	0.981***
	(0.0005)
Constant	−0.0001
	(0.0001)
Observations	1,703
R^2	1.000
Adjusted R^2	1.000
Residual Std. Error	0.005 (df = 1701)
F Statistic	4,742,182.000*** (df = 1; 1701)
Note:	*p<0.1; **p<0.05; ***p<0.01

Table 28: T-Test for Johansen Cointegration Test

Test	Value
(msci_em, msci_em_esg)	2.03
(msci_em, msci_em_universal)	1.22
(msci_world, msci_world_esg)	2.50
(msci_world, msci_world_universal)	1.67
(sp500, sp500_esg)	0.04
(sp500, sp500_esgplus)	0.45
(sp500, sp500_elite)	0.67
(sp500, sp500_paris)	0.36
(sp400, sp400_esg)	0.99
(sp400, sp400_esgplus)	0.56
(nasdaq, nasdaq_esg)	0.01
(sbi_aaa_bbb, sbi_aaa_bbb_esg)	1.38
(Bloom_agg_us, Bloom_agg_us_esg)	4.96
(bloom_agg_eu, bloom_agg_eu_esg)	0.15

Table 27: Test Statistic: Augmented Dickey-Fuller Test Unit Root

Variable	Test Statistic
r_msci_acwi	-41.5891
msci_acwi	1.1588
r_msci_world	-43.1436
msci_world	1.2
r_msci_world_esg	-43.2179
msci_world_esg	1.2195
r_msci_world_universal	-13.1234
msci_world_universal	2.1234
r_msci_em	-37.8444
msci_em	0.2832
r_msci_em_esg	-38.4034
msci_em_esg	0.1982
r_msci_em_universal	-21.1234
msci_em_universal	0.1234
r_sp500	-48.748
sp500	1.2516
r_sp500_esg	-48.9558
sp500_esg	1.3307
r_sp500_esgplus	-41.123
sp500_esgplus	1.3327
r_sp500_elite	-41.156
sp500_elite	1.3327
r_sp500_elite	-41.111
sp500_elite	1.3327
r_sp400	-46.0093
sp400	0.5918
r_sp400_esg	-46.136
sp400_esg	0.7285
r_sp400_esgplus	-13.331
sp400_esgplus	0.1345
r_nasdaq	-47.9851
nasdaq	1.2627
r_nasdaq_esg	-48.395
nasdaq_esg	1.3318
r_sbi_aaa_bbb	-35.9153
sbi_aaa_bbb	-0.7171
r_sbi_aaa_bbb_esg	-36.0351
sbi_aaa_bbb_esg	-0.7278
r_Bloom_agg_us	-35.0418
Bloom_agg_us	-0.1471
r_Bloom_agg_us_esg	-35.8659
Bloom_agg_us_esg	-0.3327
r_bloom_agg_eu	-39.4553
bloom_agg_eu	-0.7233
r_bloom_agg_eu_esg	-39.5569
bloom_agg_eu_esg	-0.7155

Chart 1: Relative performance Universal ex Thermal Coal vs ESG Leaders

Chart 2: Key Metrics MSCI World Universal Ex Thermal Coal vs ESG Leaders

	MSCI World Index	MSCI World ESG Universal Ex Thermal Coal Index	MSCI World ESG Leaders Index
Total Return* (%)	10.7	10.9	10.8
Total Risk (%)	14.1	14.0	14.0
Return / Risk	0.76	0.77	0.78
Sharpe Ratio	0.69	0.71	0.71
Active Return (%)	0.0	0.2	0.1
Tracking Error (%)	0.0	0.7	1.3
Information Ratio		0.21	0.09
Historical Beta	1.00	0.99	0.98
Number of Constituents***	1609	1565	781
Turnover** (%)	2.4	12.4	9.3
Price to Book***	2.4	2.4	2.6
Price to Earnings***	19.2	19.2	19.6
Dividend Yield*** (%)	2.3	2.4	2.4

Period: May 31, 2012 to Sep 29, 2023. * Gross returns annualized in USD ** Annualized one-way index turnover over index reviews *** Monthly averages

Chart 3: Performance MSCI World Universal Ex Thermal Coal vs ESG Leaders

	MSCI World Index	MSCI World ESG Universal Ex Thermal Coal Index	MSCI World ESG Leaders Index
YTD	11.6	11.5	12.6
1 Yr	21.4	22.3	23.1
3 Yr	8.7	8.5	9.0
5 Yr	7.8	8.2	8.4
10 Yr	8.8	8.9	8.8

Gross returns for the period ending Sep 29, 2023. Returns are annualized for periods longer than a year

Chart 4: Ratios MSCI World Universal Ex Thermal Coal vs ESG Leaders

	MSCI World Index	MSCI World ESG Universal Ex Thermal Coal Index	MSCI World ESG Leaders Index
Price to Book	2.4	2.4	2.6
Price to Cash Earnings	11.6	11.9	12.4
Price to Earnings	19.2	19.2	19.6
Dividend Yield (%)	2.3	2.4	2.4
LT Fwd EPS G (%)	11.7	11.3	11.4
Sustainable Growth Rate (%)	6.8	6.9	7.3
ROE (%)	12.4	12.7	13.6
Debt to Equity	1.4	1.4	1.2

Period: May 31, 2012 to Sep 29, 2023.

Monthly averages

Chart 5: ESG Ratios - MSCI World Universal Ex Thermal Coal vs ESG Leaders

	MSCI World Index	MSCI World ESG Universal Ex Thermal Coal Index	MSCI World ESG Leaders Index
Integration			
ESG Score	6.9	7.4	7.9
ESG Leaders (AAA-AA) (%)	45.5	60.3	69.4
ESG Laggards (B-CCC) (%)	1.9	0.7	0.0
ESG Trend Positive (%)	16.2	16.4	16.6
ESG Trend Negative (%)	13.4	10.1	5.6
Index ESG Rating	A	AA	AA
Environmental Pillar Score	6.1	6.3	6.7
Social Pillar Score	5.0	5.3	5.4
Governance Pillar Score	5.8	6.0	6.0
Key Governance Metrics			
Board Independence (wtd Avg %)	80.2	80.7	81.1
Female Directors (wtd Avg %)	34.7	35.2	35.0
Deviation from One Share One Vote (%)	21.1	20.0	22.2
Values and Norms			
Tobacco Involvement (%)	0.8	0.7	0.4
Civilian Firearms Producers (%)	0.1	0.2	0.0
Ties to Controversial Weapons (%)	0.6	0.0	0.0
Global Compact Compliance Violation (%)	0.5	0.0	0.0
Red Flag Controversies (%)	0.5	0.0	0.0
Orange Flag Controversies (%)	31.6	27.2	18.2

As of September 29, 2023.

Chart 6: ESG Top/Bottom - MSCI World Universal Ex Thermal Coal vs ESG Leaders

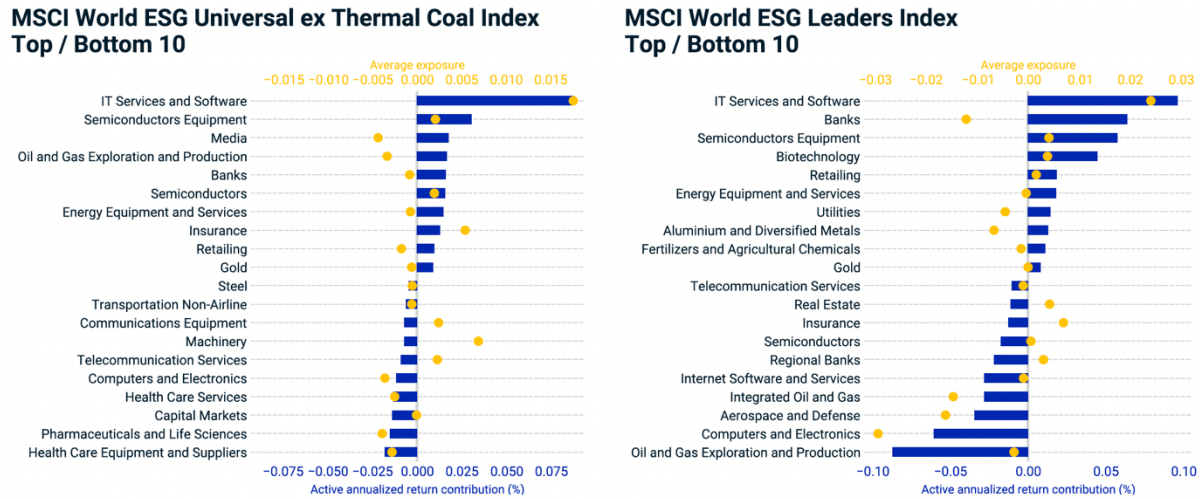

Chart 7: ESG Concentration - MSCI World Universal Ex Thermal Coal vs ESG Leaders

	MSCI World Index	MSCI World ESG Universal Ex Thermal Coal Index	MSCI World ESG Leaders Index
Concentration*			
Average Number of Constituents	1609	1565	781
Effective Number of Constituents	285	246	183
Parent Index Coverage (%)	100.0	95.5	49.7
Top 10 Constituents Weight (%)	12.9	14.2	16.7
Size Family Exposures**			
Large (%)	83.1	83.3	83.3
Mid (%)	16.9	16.7	16.7
Small (%)	0.0	0.0	0.0
Micro (%)	0.0	0.0	0.0
Index Capacity - Float Market Cap Ownership***			
Average (%)	0.00	0.00	0.00
95th Percentile (%)	0.00	0.00	0.00
Maximum (%)	0.00	0.00	0.00
Index Capacity - Full Market Cap Ownership***			
Average (%)	0.00	0.00	0.00
95th Percentile (%)	0.00	0.00	0.00
Maximum (%)	0.00	0.00	0.00
Degree of Index Tilt*			
Active Share (%)	0.0	18.4	50.3
Average Weight Multiplier	1.0	1.0	2.0
Maximum Weight Multiplier	1.0	1.9	2.0
Maximum Weight (%)	2.8	3.4	4.1

Period: May 31, 2012 to Sep 29, 2023.

* Monthly averages ** Monthly averages, size family data available from June 2008 *** Assuming a fund size of USD 1.0 bn as of the latest index review on August 31, 2023

Chart 8: Key Risk Metrics - MSCI World Universal Ex Thermal Coal vs ESG Leaders

Key Risk Metrics

	MSCI World Index	MSCI World ESG Universal Ex Thermal Coal Index	MSCI World ESG Leaders Index
Absolute Risk Metrics			
Total Risk* (%)	14.1	14.0	14.0
Downside Deviation* (%)	9.1	9.0	8.9
Sortino Ratio*	1.18	1.21	1.21
VaR @ 95% (%)	-6.8	-6.7	-6.6
VaR @ 99% (%)	-9.0	-9.1	-8.8
Expected Shortfall (CVaR) @ 95% (%)	-8.9	-8.8	-8.6
Expected Shortfall (CVaR) @ 99% (%)	-11.2	-11.0	-10.9
Maximum Drawdown (%)	-34.0	-33.3	-33.8
Maximum Drawdown Period (months)	1	1	1
Skewness	-0.44	-0.43	-0.42
Kurtosis	4.09	3.86	3.90
Relative Risk Metrics			
Tracking Error* (%)	0.0	0.7	1.3
Maximum Active Returns Drawdown (%)	0.0	-1.9	-3.5
Maximum Active Returns Drawdown Period (months)	0	27	11

Period: May 31, 2012 to Sep 29, 2023.

* Annualized in USD